



**Evidence for
Excellence in
Education**



Department of
Education

www.deni.gov.uk

AN ROINN
Oideachais

MÄNNYSTRIE O
Lear

Report

**Student Achievement in Northern
Ireland: Results in Mathematics,
Science, and Reading Among 15-Year
Olds from the OECD PISA 2012 Study**

**OECD Programme for International
Student Assessment**

**National Foundation for Educational
Research (NFER)**



Student Achievement in Northern Ireland: Results in Mathematics, Science, and Reading Among 15-Year-Olds from the OECD PISA 2012 Study

OECD Programme for International Student Assessment

Rebecca Wheeler
Robert Ager
Bethan Burge
Juliet Sizmur

Published in December 2013

By the National Foundation for Educational Research,
The Mere, Upton Park, Slough, Berkshire SL1 2DQ
www.nfer.ac.uk

© 2013 National Foundation for Educational Research
Registered Charity No. 313392

ISBN: 978-1-908666-97-0

How to cite this publication:

Wheeler, R., Ager, R., Burge, B. and Sizmur, J. (2013). *Student Achievement in Northern Ireland: Results in Mathematics, Science, and Reading Among 15-Year-Olds from the OECD PISA 2012 Study (OECD Programme for International Student Assessment)*. Slough: NFER.



Contents

Acknowledgements	5
Executive summary	6
1 Introduction	10
1.1 What is PISA?	10
1.2 Organisation of this report	11
2 Mathematics	12
2.1 Comparison countries	12
2.2 Scores in Northern Ireland	15
2.3 Differences between highest and lowest attainers	26
2.4 Differences between boys and girls	31
2.5 Summary	32
3 Pupils and mathematics	34
3.1 How do mathematics scores link with pupils' backgrounds?	34
3.2 Pupils' attitudes to school and learning	36
3.3 Pupils' attitudes to learning mathematics	37
3.4 Pupils' experience of learning mathematics	44
3.5 Summary	46
4 Science	48
4.1 Comparison countries	48
4.2 Scores in Northern Ireland	50
4.3 Differences between highest and lowest attainers	52
4.4 Differences between boys and girls	54
4.5 Summary	54
5 Reading	56
5.1 Comparison countries	56
5.2 Scores in Northern Ireland	58
5.3 Differences between highest and lowest attainers	60
5.4 Differences between boys and girls	62
5.5 Summary	62
6 Schools	64
6.1 School management	65

6.3	Resources	72
6.4	Assessment	73
6.5	Summary	74
7	PISA in the UK	75
7.1	Mathematics	76
7.2	Science	84
7.3	Reading	88
7.4	Schools and pupils	91
7.5	Summary	93
	References	96
Appendix A	Background to the survey	97
A1	The development of the survey	97
A2	What PISA measures	98
A3	What the scales mean	100
A4	Survey administration	101
A5	The PISA sample	103
Appendix B		105
Appendix C		132
Appendix E		144
Appendix F		146

Acknowledgements

This survey could not have taken place without the co-operation of the pupils, teachers and principals in the participating schools. We are very grateful for their help.

The authors would like to thank all the colleagues in various departments at NFER who contributed to the success of the survey and the publication of this report. In particular, we would like to thank:

- The Project Coordinator, Pat Bhullar, for all her work throughout the project, especially in production of tests and questionnaires and organisation of marking.
- Nick Ward and the Print Shop team for printing all the publicity and survey materials.
- Michael Neaves, Mark Bailey and their colleagues in Research Operations for their invaluable work in supporting and communicating with the PISA schools.
- Colleagues in the Centre for Statistics, NFER, for their analysis of the PISA national data. In particular, we are grateful to Jack Worth for his assistance in interpretation of the data and for his technical contributions to the report.

PISA is a collaborative project with a number of international partners. We are grateful to all the members of the PISA International Consortium whose hard work and support contributed towards successful implementation of PISA 2012. We would also like to thank Andreas Schleicher and colleagues at OECD for their support and flexibility which were much appreciated.

We are also grateful for the support and guidance we have received at all stages of the survey from colleagues at the Department of Education, Northern Ireland, in particular Gayle Kennedy and Patricia Wyers.

Executive summary

Background

The Programme for International Student Assessment (PISA) is a survey of the educational achievement of 15-year-olds organised by the Organisation for Economic Co-operation and Development (OECD). In the UK, PISA 2012 was carried out on behalf of the respective governments by the National Foundation for Educational Research.

PISA assesses students' mathematics, science and reading skills. Mathematics was the main subject in PISA 2012 and so was assessed in greater depth compared with the other two areas. In addition pupils and schools complete questionnaires to provide information about pupil background and attitudes, and aspects of school management and school climate respectively.

Results for the United Kingdom as a whole are included in the international PISA report published by OECD with the results of the other 64 participating countries. With the UK, this included 34 OECD member countries and 27 members of the European Union. The results from PISA provide the Government with complementary information to that provided by other international surveys, such as the Trends in International Maths and Science Survey (TIMSS) and Progress in International Reading Literacy Study (PIRLS). In addition, Northern Ireland's performance in mathematics will also feed into the debate following Northern Ireland's numeracy results in the OECD Survey of Adult Skills (PIAAC), which found that Northern Ireland's performance in numeracy was below the OECD average.

Strict international quality standards are applied at all stages of the PISA survey to ensure equivalence in the translation and adaptation of instruments, sampling procedures and survey administration in all participating countries. In Northern Ireland, a total of 89 schools took part in PISA 2012. The response rate for the UK was 89 per cent of sampled schools and 86 per cent of sampled pupils. This is a good response rate and fully met the PISA 2012 participation requirements.

Mathematics in Northern Ireland

Northern Ireland's performance in mathematics has remained fairly stable since PISA 2006 and is significantly below the OECD average. In PISA 2012, there were 25 countries that significantly outperformed Northern Ireland in mathematics and ten countries with a score that was not significantly different from that of Northern Ireland. Of the 25 countries with mean scores in mathematics that were significantly higher, the seven highest achieving countries were in East and South East Asia. There were 12 EU countries that significantly outperformed Northern Ireland and six EU countries that performed similarly. Twenty-nine countries had mean scores which were significantly lower than Northern Ireland. This group contained eight EU countries.

Northern Ireland had a relatively low percentage of pupils in the highest achieving levels and a similar difference in performance between the highest and lowest attainers to the OECD average. There was no significant difference between the performance of boys and girls in Northern Ireland. Boys performed significantly better than girls in nearly two-thirds of participating countries.

As mathematics was the main subject in PISA 2012, it was assessed in greater depth than science and reading and, therefore, performance of pupils in different areas of mathematics can be compared. In Northern Ireland, pupils are relatively strong on questions that focus on probability and statistics (*uncertainty and data*) or require them to *interpret, apply and evaluate* mathematical outcomes in order to solve problems, and they are less strong on questions that focus on aspects of *space and shape* or that require them to *formulate* situations mathematically in order to solve a problem.

Science in Northern Ireland

Northern Ireland's performance in science has remained stable since PISA 2006 and is comparable with many EU and OECD countries. Northern Ireland's performance in 2012 was not significantly different from the OECD average.

There were 17 countries which performed at a level significantly higher than Northern Ireland, including six EU countries (Finland, Estonia, Poland, Germany, the Netherlands and the Republic of Ireland). In ten countries, science attainment was not significantly different from that of Northern Ireland, while the remaining 37 countries performed significantly less well. Seven EU countries did not perform significantly differently from Northern Ireland and 13 performed less well.

There was a relatively large difference between the score points of the lowest scoring pupils and the highest scoring pupils in Northern Ireland compared with other countries. Only eight countries had a wider distribution. The proportion of pupils at each level of achievement shows that Northern Ireland tends to have a greater proportion of high achievers and a lower proportion of low achievers than the OECD average. That said, compared with other high achieving countries, Northern Ireland tends to have a greater proportion of lower achievers and, consequently, raising the attainment of lower achievers would be an important step towards improving Northern Ireland's performance.

There was no clear pattern of performance by gender across participating countries. In Northern Ireland, there was no significant gender difference in performance between boys and girls.

Reading in Northern Ireland

Northern Ireland's performance in reading was not significantly different from the OECD average and has remained stable since PISA 2006. The proportion of pupils at each level of achievement in Northern Ireland was broadly similar to the OECD average. However, Northern Ireland had a relatively large difference between the lowest and the highest scoring pupils in reading compared with many other countries – only 18 countries had a wider distribution than Northern Ireland.

Nineteen countries had a mean score for reading significantly higher than that of Northern Ireland. In 12 countries the difference in mean scores from that in Northern Ireland was not statistically significant. Thirty-three countries had mean scores which were significantly lower than Northern Ireland. Of the 19 countries with higher mean scores (where the difference was statistically significant), seven are EU members (Finland, Republic of Ireland, Poland, Estonia, Netherlands, Belgium and Germany). Eight EU countries did not perform significantly differently from Northern Ireland and ten performed less well.

Girls scored significantly higher than boys in all countries, although in Northern Ireland the gender difference, while statistically significant, was not as large as in the majority of other countries. In Northern Ireland, this difference was 27 score points between girls and boys compared with an OECD average of 38 score points.

Pupils and mathematics in Northern Ireland

Pupils in Northern Ireland reported moderate interest in learning mathematics, but recognised that it is useful. A very high proportion of pupils reported that their parents believe in the importance of mathematics and three out of five pupils believed their parents like mathematics. Pupils in Northern Ireland show greater motivation to learn mathematics than the OECD average and report a high sense of belonging and satisfaction with school, similar to the OECD average.

Pupils reported a high amount of control over their ability to succeed in mathematics and a high level of conscientiousness towards learning mathematics. Pupils in Northern Ireland generally reported a greater level of conscientiousness and perseverance for mathematics tasks than the OECD average. Generally, pupils in Northern Ireland showed a high level of confidence in their ability to perform mathematical tasks, and fairly low levels of anxiety about learning mathematics.

Pupils in Northern Ireland reported a higher level of support from their mathematics teachers than that found for the OECD on average and reported that a wide variety of tasks and strategies are used by their teachers in the mathematics lessons.

Pupils in Northern Ireland are less able to overcome disadvantage to achieve scores higher than predicted by their background when compared with some other OECD countries.

Schools in Northern Ireland

Principals in Northern Ireland reported that they have a high level of responsibility for most aspects of school management. This was also the case in 2009. However, compared with 2009, principals reported a lower degree of involvement from national education authorities in the management of schools while the role of local authorities was largely unchanged. Compared with the OECD average, principals in Northern Ireland play a greater role in most aspects of school management.

Principals in Northern Ireland also reported a higher frequency for most school leadership activities than their OECD counterparts, with over 70 per cent of principals in Northern Ireland saying they worked to enhance the school's reputation in the community.

Principals in Northern Ireland reported that staffing shortages had increased since 2009. The biggest staffing issue in this survey was a shortage of teachers of subjects other than mathematics, science or English. The greatest resource issue for principals is inadequacy of school buildings and grounds.

Schools in Northern Ireland reported a more positive climate for learning and noted that learning was less hindered by problems, particularly disciplinary problems compared with their OECD counterparts. Pupils were on the whole positive about the climate of their school, although they were least positive about the extent to which they felt their teachers were interested in or listened

to them. They were generally more positive about their relationship with their teachers than the average across OECD countries.

In schools in Northern Ireland, assessments serve various purposes, with the most frequent use being to inform parents, to monitor year-on-year progress and to compare the school to local or national performance. Principals in Northern Ireland reported a much greater use of pupil assessments for a variety of reasons than the OECD average.

PISA in the United Kingdom

In mathematics, the mean scores for England and Scotland and England and Northern Ireland were similar. Scotland significantly outperformed Northern Ireland. The mean score of pupils in Wales was significantly lower than that in the other parts of the UK. In England, Scotland and Wales, boys significantly outperformed girls. In Northern Ireland, the difference between the performance of boys and girls was not significant. The spread of attainment was greatest in England and Northern Ireland and this was above the OECD average for both countries. Wales and Scotland had a similar narrower spread of attainment. Across the OECD on average, 15 per cent of the variance in mathematics scores can be explained by socio-economic background. Of the UK countries, only Northern Ireland had a variance greater than the OECD average (at 17 per cent), while Wales had the lowest percentage (10 per cent). This suggests that socio-economic background has the least impact on performance in mathematics in Wales, whereas it has the biggest impact in Northern Ireland.

In science, there were no significant differences between England, Scotland and Northern Ireland but the mean score in Wales was significantly lower. Boys significantly outperformed girls in England, Scotland and Wales. The spread of attainment was greatest in England and Northern Ireland. Wales and Scotland had a narrower spread of attainment. Scotland had the narrowest spread of attainment of UK countries.

In reading, the mean scores in England, Scotland and Northern Ireland were similar. The mean score of pupils in Wales was significantly lower than that of pupils in the other parts of the UK. The spread of attainment was greatest in England and Northern Ireland and this was above the OECD average for both countries. Wales and Scotland had a narrower spread of attainment compared with the OECD average, and Scotland had the narrowest spread of attainment of UK countries. Girls outperformed boys in all parts of the UK, as they did in every other country in the PISA survey, although the difference in performance of boys and girls was less in all parts of the UK than the OECD average.

Pupils in all parts of the UK showed moderate interest in mathematics. Pupils in England tended to look forward to their mathematics lessons most and pupils in Northern Ireland were most likely to worry that mathematics classes would be difficult.

There were some differences in staffing and resource shortages with principals in Northern Ireland reporting a greater shortage of resources than principals in other parts of the UK. Principals in Scotland reported the highest shortage of teachers of subjects other than mathematics, science or reading.

1 Introduction

1.1 What is PISA?

The Programme for International Student Assessment (PISA) is a survey of educational achievement organised by the Organisation for Economic Co-operation and Development (OECD). In England, Wales, Northern Ireland and Scotland, the PISA 2012 survey was carried out on behalf of the respective governments by the National Foundation for Educational Research (NFER). The PISA surveys provide Government with detailed comparative evidence on which to base educational policy.

The OECD has 34 member countries, of which the United Kingdom is one, and is an organisation dedicated to global development. As a measure of educational outcomes PISA complements the other educational indicators gathered by OECD members to make international comparisons. It assesses the knowledge, skills and readiness for adult life of pupils aged 15. Pupils are assessed on their competence to address real life challenges involving reading, mathematics and science. This aim differentiates PISA from other pupil assessments which measure their mastery of the school curriculum, as instead it measures their 'literacy' in these areas. In 2012, there was also an assessment of problem solving, in which England was the only part of the UK to participate. Results for problem solving will be reported separately in March 2014.

PISA is carried out on a three-year cycle. The first PISA study was in 2000 (supplemented in 2002) and was undertaken in 43 countries (32 in 2000 and another 11 in 2002). Since then, the number of participating countries has increased. In PISA 2012, 65 countries took part. Of these, 34 were members of OECD. Each round of PISA focuses on one of the three areas of literacy in which knowledge and skills are assessed: mathematics, science and reading. The main focus for PISA 2012 was mathematics, with science and reading as minor domains.

In addition to the PISA assessment, pupils completed a questionnaire. The Student Questionnaire provided information on pupils' economic and social backgrounds, study habits, and attitudes to mathematics and to mathematics activities in school. A School Questionnaire was also completed by principals in participating schools. This provided information on the school's size, intake, resources and organisation, as well as mathematics activities available in the school. The questionnaires provided contextual information to support a more detailed analysis of the findings.

Age, rather than year group, is used to define pupils eligible to participate in the survey. This has an advantage over year group definitions as the age at which pupils start school can make it difficult to determine comparable year groups and because countries have different policies about holding pupils back a year or pushing them forward depending on their performance at school. The pupils who took part were mainly in Year 12 in Northern Ireland, Year 11 in England and Wales and S3 or S4 in Scotland.

All pupils sat some mathematics questions and approximately 70 per cent of the pupils who took part were assessed in science and reading. Mathematics is therefore covered more fully than science and reading. The results reported for each domain are estimates for the whole population of 15-year-olds in Northern Ireland, based on the performance of pupils who were presented with

test items in each domain. These estimates take into account information about how pupils with specific characteristics performed. The characteristics cover a wide range of variables from the Student Questionnaires (see OECD (forthcoming)). Further details on the development of the survey, what PISA measures, PISA scales and proficiency levels, how the survey was administered and the PISA sample are included in Appendix A. This appendix details some of the guidelines for survey procedures to ensure the quality of the data collected in every country.

1.2 Organisation of this report

There are 65 countries in PISA 2012, including the UK. The OECD international report includes outcomes for all 65 participating countries. In this national report, the scores for Northern Ireland are compared with the 64 other countries, excluding the UK.

Chapters 2, 4 and 5 describe PISA results for mathematics, science and reading. Chapter 3 discusses pupils' responses to the Student Questionnaire, in particular, responses on attitudes towards mathematics. Chapter 6 presents responses by principals to the School Questionnaire and also responses by pupils to questions in the Student Questionnaire where questions are related. Chapter 7 describes and discusses the PISA results in the four constituent parts of the United Kingdom. In each chapter, comparisons are made with the OECD average. This is the average of the 34 members of the OECD. This is more useful than a comparison with all participating countries as it enables comparison with similarly developed countries or emerging countries. Information about how to interpret differences in performance between participating countries is included in each chapter which discusses attainment data. Further details on the background to PISA 2012 are included in Appendix A.

The international tables and figures presented in the appendices of this report include the results for the United Kingdom since these are reported in all international tables. In most cases, tables and figures include results for England, Wales, Northern Ireland and Scotland since these figures are referred to in Chapter 7. Where comparisons with performance of the constituent parts of the UK are made with PISA 2009 and 2006, figures come from analysis carried out for the national reports for these surveys (Bradshaw *et. al.*, 2009; Bradshaw *et. al.*, 2006).

More detailed analyses of international results can be found in the OECD report on PISA 2012, which also includes results for the United Kingdom (OECD, 2013). The results from the separate parts of the UK are reported in an Annex to the international report.

2 Mathematics

Chapter outline

This chapter reports the attainment of pupils in Northern Ireland in mathematics and how performance varies on different aspects of mathematical literacy. It draws on findings outlined in the international report (OECD, 2013) and places outcomes for Northern Ireland in the context of those findings. Throughout the chapter, comparisons are made between the findings for PISA 2012 and those from PISA 2006 and 2009. It is important to note that for PISA 2006 and 2009, mathematics was a minor domain and, as such, it is not possible to compare the subscale data obtained in this PISA cycle where mathematics was the main focus. It is also not possible to compare the findings from PISA 2012 with those from 2003 (the last time that mathematics was the main focus) because in 2003 the UK did not meet the data requirements and therefore OECD does not make comparisons before 2006.

Key findings

- Northern Ireland's performance is significantly lower than the OECD average and in 2012 is slightly lower than the performance in the last two cycles of the survey (2006 and 2009). The numbers of countries outperforming Northern Ireland has increased to 25 in 2012.
- Pupil performance varied across the four mathematical content areas and three mathematical process areas, as was the case in other countries. In Northern Ireland, pupils are relatively strong on the questions that focus on probability and statistics (*uncertainty and data*) or require them to *interpret, apply and evaluate* mathematical outcomes in order to solve problems. They are less strong on questions that focus on aspects of *space and shape* or that require them to *formulate* situations mathematically in order to solve a problem.
- Since 2006 there has been a small increase in the proportion of low achieving pupils whereas the proportion of high achieving pupils has remained relatively stable. However, compared with the high performing countries Northern Ireland has a relatively low percentage of pupils in the top two proficiency levels (Levels 5 and 6).
- The spread of performance in Northern Ireland is similar to the OECD average and several comparison countries have wider score distributions. However, in 2012 the difference between the highest and lowest attainers has increased in Northern Ireland.
- There is no significant difference in the performance of boys and girls in mathematics in PISA 2012. The gap between boys and girls has decreased since 2009 and as a result the gender difference is no longer significant.

2.1 Comparison countries

The international report includes outcomes for all 65 participating countries, including the UK as a whole (outcomes for the four nations of the UK are not reported separately in the international report). In this chapter, scores for Northern Ireland are compared with 64 other countries, excluding the UK. Comparisons between Northern Ireland and the other three constituent parts of

the UK are reported in Chapter 7. While findings for all countries are reported in this chapter where relevant, most findings relate to a sub-group of countries.

The countries forming the comparison group include OECD countries, EU countries and other countries with relatively high scores. Since countries with very low scores are not as relevant for comparison purposes, those with a mean score for mathematics of less than 430 have been omitted from the tables unless they are in OECD or the EU. Hence, the comparison group for mathematics in this chapter comprises 50 countries (of which 26 are EU members and 33 OECD members).

Table 2.1 Countries compared with Northern Ireland

Australia	France*	<i>Lithuania*</i>	<i>Shanghai-China</i>
Austria*	Germany*	Luxembourg*	<i>Singapore</i>
Belgium*	Greece*	<i>Macao-China</i>	Slovak Republic*
<i>Bulgaria*</i>	<i>Hong Kong-China</i>	Mexico	Slovenia*
Canada	Hungary*	Netherlands*	Spain*
Chile	Iceland	New Zealand	Sweden*
<i>Chinese Taipei</i>	Israel	Norway	Switzerland
<i>Croatia*</i>	Italy*	Poland*	Turkey
<i>Cyprus*</i>	Japan	Portugal*	<i>United Arab Emirates</i>
Czech Republic*	<i>Kazakhstan</i>	Republic of Ireland*	United States
Denmark*	Korea	<i>Romania*</i>	<i>Vietnam</i>
Estonia*	<i>Latvia*</i>	<i>Russian Federation</i>	
Finland*	<i>Liechtenstein</i>	<i>Serbia</i>	

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

In addition to the countries listed above, tables and figures in Appendix B include the data for all four constituent parts of the United Kingdom.

Outcomes for the United Kingdom as a whole are presented in the international report (OECD, 2013) and in the appendices that accompany this chapter (Appendix B). Outcomes for Northern Ireland (and the other three constituent parts of the UK) are derived from the 'sub-national' level analysis carried out by the international consortium, as well as from additional analysis carried out by NFER using the international dataset. Comparisons between the four constituent parts of the UK are provided in Chapter 7.

Interpreting differences between countries

It is important to know what can reasonably be concluded from the PISA data and which interpretations would be going beyond what can be reliably supported by the results. This section outlines some points that need to be kept in mind while reading this chapter.

Sources of uncertainty

There are two sources of uncertainty which have to be taken into account in the statistical analysis and interpretation of any test results. These are described as *sampling error* and *measurement error*. The use of the term 'error' does not imply that a mistake has been made; it simply highlights the necessary uncertainty.

Sampling error stems from the inherent variation of human populations which can never be summarised with absolute accuracy. It affects virtually all research and data collection that makes use of sampling. Only if every 15-year-old in each participating country had taken part in PISA could it be stated with certainty that the results are totally representative of the attainment of the entire population of pupils in those countries. In reality the data was collected from a sample of 15-year-olds. Therefore, the results are a best estimation of how the total population of 15-year-olds could be expected to perform in these tests. There are statistical methods to measure how good the estimation is. It is important to recognise that all data on human performance or attitudes which is based on a sample carries a margin of error.

Measurement error relates to the results obtained by each individual pupil, and takes account of variations in their score which are not directly due to underlying ability in the subject but which are influenced by other factors related to individuals or to the nature of the tests or testing conditions, such as sickness on the day of testing.

Interpreting rank order

Because of the areas of uncertainty described above, interpretations of very small differences between two sets of results are often meaningless. Were they to be measured again it could well be that the results would turn out the other way round. For this reason, this chapter focuses mainly on *statistically significant* differences between mean scores rather than the simple rank order of countries. Statistically significant differences are unlikely to have been caused by random fluctuations due to sampling or measurement error.

Where statistically significant differences between countries are found, these may be the result of a great number of factors. The data for some of these factors were not collected in the PISA survey. Therefore, the PISA survey is only able to explain the reasons for differences between countries to a limited extent. For example, differences in school systems and educational experiences in different countries could play a part, but so could a wide range of different out-of-school experiences. It is important to bear this in mind while reading this report.

2.2 Scores in Northern Ireland

Mathematical literacy

'...an individual's capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. It assists individuals in recognising the role that mathematics plays in the world and to make the well-founded judgements and decisions needed by constructive, engaged and reflective citizens.' (OECD, 2013)

Northern Ireland's pupils achieved a mean score of 487 in mathematics in PISA 2012, which was significantly lower than the OECD mean of 494. (See section 2.1 on interpreting differences between countries for an explanation of how statistical significance should be interpreted in this report.) Northern Ireland's performance in mathematics has declined slightly since 2006, when the mean score was 494. In 2006 and 2009, Northern Ireland's mean score was not significantly different from the OECD average. Tables 2.2 to 2.4 show whether countries' mean scores have changed significantly since PISA 2009 (further data including mean scores for mathematics for the previous PISA cycles can be found in Appendix B21).

Internationally, the performance in mathematics in 25 of the other 64 participating countries was significantly higher than that in Northern Ireland (see Table 2.2). Since 2006, the number of countries with mean scores significantly higher than Northern Ireland has increased from 18 to 20 in 2009, to 25 in 2012. This increase is due in part to the high performance of countries participating for the first time, such as Shanghai-China and Singapore in 2009 and Vietnam in 2012, but it is also due to improved performance in other countries. There was some movement amongst the group of countries outperforming Northern Ireland, with the major changes being the movement of Iceland out of the group, and the movement of Poland, Vietnam (in 2012 they were new participants in PISA), Austria, Republic of Ireland, the Czech Republic and France into it. Notably, Poland and the Republic of Ireland have had significant increases in mean score for mathematics between PISA 2009 and 2012.

Ten countries performed at a level that was not significantly different from that of Northern Ireland (shown in Table 2.3). There was some movement in this group of countries, with Latvia, Italy, Spain and the Russian Federation moving into this group; in PISA 2009 these four countries performed significantly less well than Northern Ireland. For two of these countries, Latvia and the Russian Federation, significant increases in mean score for mathematics between PISA 2009 and 2012 resulted in the move into this group. The remaining 29 countries performed significantly less well than Northern Ireland (shown in Table 2.4). Of these countries, four (Costa Rica, Cyprus, Malaysia, and the United Arab Emirates) were participating in PISA for the first time in 2012.

Twelve of the countries that significantly outperformed Northern Ireland are EU members (Netherlands, Estonia, Finland, Poland, Belgium, Germany, Austria, Republic of Ireland, Slovenia, Denmark, the Czech Republic and France). A further six EU countries did not perform significantly differently from Northern Ireland and eight performed less well. Among OECD countries, 18

outperformed Northern Ireland, eight performed similarly, and seven performed less well. This indicates that Northern Ireland is not among the highest achieving group of countries internationally, with a number of EU and OECD countries outperforming them in terms of mathematics achievement.

In terms of English speaking countries, three (Australia, Republic of Ireland and New Zealand) have a mean score in mathematics that is significantly higher than Northern Ireland, and Canada (a predominantly English speaking country) also outperforms Northern Ireland. The United States had a score that was not significantly different to Northern Ireland's. Comparisons between the constituent parts of the UK can be found in Chapter 7.

Further data can be found in Appendix B1 (mean scores and standard errors for Northern Ireland and the comparison group countries and significant differences between Northern Ireland and the comparison group countries) including the data for all four constituent parts of the UK.

Table 2.2 Countries outperforming Northern Ireland in mathematics (significant differences)

Country	Mean score	Country	Mean score
<i>Shanghai-China</i>	613 ^	Poland*	518 ^
<i>Singapore</i>	573 ^	Belgium*	515
<i>Hong Kong-China</i>	561	Germany*	514
<i>Chinese Taipei</i>	560 ^	<i>Vietnam</i>	511
Korea	554	Austria*	506
<i>Macao-China</i>	538 ^	Australia	504 v
Japan	536	Republic of Ireland*	501 ^
<i>Liechtenstein</i>	535	Slovenia*	501
Switzerland	531	Denmark*	500
Netherlands*	523	New Zealand	500 v
Estonia*	521 ^	Czech Republic*	499
Finland*	519 v	France*	495
Canada	518 v		

OECD countries (not italicised) *Countries not in OECD (italicised)*

*EU countries

^ v Indicates a significant change since PISA 2009

Table 2.3 Countries not significantly different from Northern Ireland in mathematics

Country	Mean score	Country	Mean score
Iceland	493 √	Italy*	485
<i>Latvia*</i>	491 ^	Spain*	484
Luxembourg*	490	<i>Russian Federation</i>	482 ^
Norway	489 √	Slovak Republic*	482 √
Portugal*	487	United States	481
Northern Ireland*	487		

OECD countries (not italicised) *Countries not in OECD (italicised)* *EU countries

^ √ Indicates a significant change since PISA 2009

Table 2.4 Countries significantly below Northern Ireland in mathematics

Country	Mean score	Country	Mean score
<i>Lithuania*</i>	479	<i>Romania*</i>	445 ^
Sweden*	478 √	<i>Cyprus*</i>	440
Hungary*	477 √	<i>Bulgaria*</i>	439
<i>Croatia*</i>	471 ^	<i>United Arab Emirates</i>	434 ^
Israel	466 ^	<i>Kazakhstan</i>	432 ^
Greece*	453 √	Chile	423
<i>Serbia</i>	449	Mexico	413
Turkey	448		
		<i>plus 14 other countries</i>	

OECD countries (not italicised) *Countries not in OECD (italicised)* *EU countries

^ √ Indicates a significant change since PISA 2009

2.2.1 Mathematics content process category scale scores

2.2.1.1 Mathematics content category scale scores

Mathematical literacy in PISA is assessed in relation to four content categories (*quantity, uncertainty and data, change and relationships, and space and shape*). Brief descriptions of each of these content categories are provided below (OECD, 2013). Figures 2.1 to 2.4 provide examples of released PISA 2012 mathematics items covering the four content areas (and the three mathematical process subscales; see section 2.2.2). (The mark schemes for these items can be found in Appendix B22). In addition to their overall performance, pupils' performance in mathematics was analysed separately by content category and by mathematical process (section 2.2.2). In some countries, pupils showed notably stronger or weaker performance in some of these areas, relative to their mean performance. If mean scores on some subscales are lower than on others, this could have implications for teaching and learning or might suggest that the balance of these areas in the curriculum should be evaluated. Appendices B5 to B11 show the mean scores

for each comparison group country on each of the seven subscales, while Appendices B12 to B18 summarise the statistically significant differences for these scales.

Table 2.5 shows the difference between the overall mean mathematics scores and the mean scores for each of the content categories and mathematical processes for each of the countries that outperformed Northern Ireland. The size of the difference has been colour coded and the key for the table should be interpreted in the following way:

	The score is more than 20 score points lower than the overall country mean
	The score is between 11 and 20 score points lower than the overall country mean
	The score is between 5 and 10 score points lower than the overall country mean
	The score is between 5 and 10 score points higher than the overall country mean
	The score is between 11 and 20 score points higher than the overall country mean
	The score is more than 20 score points higher than the overall country mean

Table 2.5 Differences between scale scores in countries outperforming Northern Ireland in 2012

	Overall mathematics mean	Difference from overall mathematics mean						
		Mathematics content categories				Mathematical processes		
		<i>quantity</i>	<i>uncertainty and data</i>	<i>change and relationships</i>	<i>space and shape</i>	<i>formulate</i>	<i>employ</i>	<i>interpret</i>
<i>Shanghai-China</i>	613	-22	-21	11	36	12	0	-34
<i>Singapore</i>	573	-5	-14	7	6	8	1	-18
<i>Hong Kong-China</i>	561	4	-8	3	6	7	-3	-10
<i>Chinese Taipei</i>	560	-16	-11	1	32	19	-11	-11
Korea	554	-16	-16	5	19	8	-1	-14
<i>Macao-China</i>	538	-8	-13	4	20	7	-2	-9
Japan	536	-18	-8	6	21	18	-6	-5
<i>Liechtenstein</i>	535	3	-9	7	4	0	1	5
Switzerland	531	0	-9	-1	13	7	-2	-2
Netherlands*	523	9	9	-5	-16	4	-4	3
Estonia*	521	4	-10	9	-8	-3	4	-8
Finland*	519	8	0	2	-12	0	-3	9
Canada	518	-3	-2	7	-8	-2	-2	3
Poland*	518	1	-1	-8	7	-2	1	-3
Belgium*	515	4	-7	-1	-6	-2	1	-2
Germany*	514	4	-5	2	-6	-3	2	3
<i>Vietnam</i>	511	-2	8	-2	-4	-14	12	-15
Austria*	506	5	-7	1	-5	-6	4	3
Australia	504	-4	4	5	-8	-6	-4	10
Republic of Ireland	501	4	7	0	-24	-9	1	5
Slovenia*	501	3	-5	-2	2	-9	4	-3
Denmark*	500	2	5	-6	-3	2	-5	8
New Zealand	500	-1	6	1	-9	-4	-5	11
Czech Republic*	499	6	-11	0	0	-4	5	-5
France*	495	1	-3	2	-6	-12	1	16
Northern Ireland*	487	4	9	-1	-23	-7	-1	9

OECD countries (not italicised) *Countries not in OECD (italicised)*

*EU countries

Differences have been calculated using unrounded mean scores.

Quantity

Quantity incorporates the quantification of attributes of objects, relationships, situations, and entities in the world, understanding various representations of those quantifications, and judging interpretations and arguments based on quantity. It involves understanding measurements, counts, magnitudes, units, indicators, relative size, and numerical trends and patterns, and employing number sense, multiple representations of numbers, mental calculation, estimation, and assessment of reasonableness of results (OECD, 2013).

Figure 2.1 below is an example of a question from PISA 2012 that assesses the content area of *quantity*.

Northern Ireland's mean score on the *quantity* subscale was four points higher than the overall mean for mathematics. A number of the countries that outperformed Northern Ireland also had mean scores for this subscale that were slightly higher than the overall mean (for example: Hong-Kong China, Estonia, Belgium, Germany and the Republic of Ireland). However, of the seven top performing countries five had mean scores for *quantity* that were more than ten points below the overall mean score for mathematic. For example, the mean score for *quantity* in Shanghai-China was 591, 22 points lower than the overall mean.

Figure 2.1 DVD Rental: a released quantity question from PISA 2012

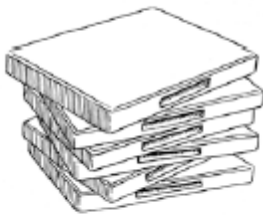
DVD RENTAL

Jenn works at a store that rents DVDs and computer games.

At this store the annual membership fee costs 10 zeds.

The DVD rental fee for members is lower than the fee for non-members, as shown in the following table:

Non-member rental fee for one DVD	Member rental fee for one DVD
3.20 zeds	2.50 zeds



What is the minimum number of DVDs a member needs to rent so as to cover the cost of the membership fee? Show your work.

.....

.....

.....

Number of DVDs:

Uncertainty and data

Uncertainty and data covers two closely related sets of issues: how to identify and summarise the messages that are embedded in sets of data presented in many ways, and how to appreciate the likely impact of the variability that is inherent in many real processes. Uncertainty is part of scientific predictions, poll results, weather forecasts, and economic models; variation occurs in manufacturing processes, test scores, and survey findings; and chance is part of many recreational activities that individuals enjoy. Probability and statistics, taught as part of mathematics, address these issues (OECD, 2013).

Figure 2.2 shows an example of a question from PISA 2012 that assesses the content area of *uncertainty and data*.

Northern Ireland's mean score for this content area was nine points above the overall mean. However, the majority of countries that outperformed Northern Ireland had lower scale scores for *uncertainty and data*, although the Netherlands, Vietnam, Australia, the Republic of Ireland, Denmark and New Zealand did have higher mean scores in this content area compared with the overall mean. This suggests that pupils in Northern Ireland are relatively strong in answering questions related to statistics and probability (*uncertainty and data*) compared with pupils in a number of the high performing countries.

Change and relationships

Change and relationships focuses on the multitude of temporary and permanent relationships among objects and circumstances, where changes occur within systems of interrelated objects or in circumstances where the elements influence one another. Some of these changes occur over time; some are related to changes in other objects or quantities. Being more literate in this content category involves understanding fundamental types of change and recognising when change occurs so that suitable mathematical models can be employed to describe and predict change (OECD, 2013).

Figure 2.3 shows an example of a question from PISA 2012 that assesses the content area of *change and relationships*.

In Northern Ireland, the mean score for the *change and relationships* is similar to the overall mean score for mathematics (a difference of one score point). Amongst the high performing countries over half have higher mean scores for this content area compared with the overall mean, with the difference ranging from 11 points higher in Shanghai-China to only one point in Chinese Taipei, Austria and New Zealand. Notable exceptions are the Netherlands, Poland and Denmark who have a lower mean score in *change and relationships* compared with the overall mean (a difference of five, eight and six points respectively).

Figure 2.2 Penguins: a released uncertainty and data question from PISA 2012

PENGUINS

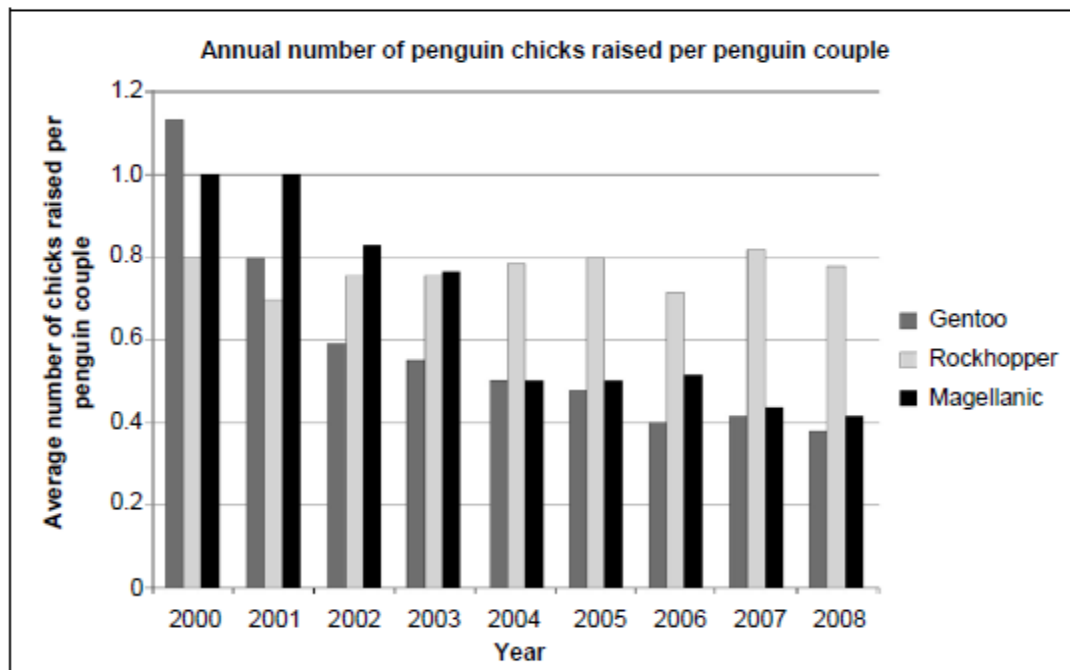


The animal photographer Jean Baptiste went on a year-long expedition and took numerous photos of penguins and their chicks.

He was particularly interested in the growth in the size of different penguin colonies.

After he gets home from his trip, Jean Baptiste has a look on the Internet to see how many chicks a penguin couple raise on average.

He finds the following bar chart for the three penguin types Gentoo, Rockhopper and Magellanic.



Based on the chart above, are the following statements about these three penguin types true or false?

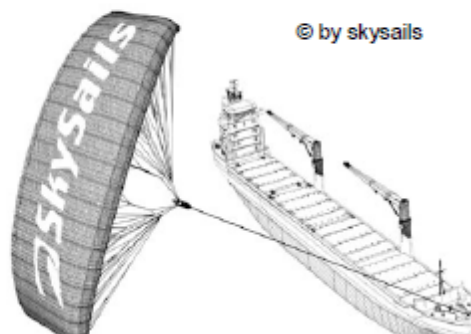
Circle "True" or "False" for each statement.

Statement	Is the statement true or false?
In 2000, the average number of chicks raised per penguin couple was larger than 0.6.	True / False
In 2006, on average, less than 80% of penguin couples raised a chick.	True / False
By about 2015 these three penguin types will be extinct.	True / False
The average number of Magellanic penguin chicks raised per penguin couple decreased between 2001 and 2004.	True / False

SAILING SHIPS

Ninety-five percent of world trade is moved by sea, by roughly 50 000 tankers, bulk carriers and container ships. Most of these ships use diesel fuel.

Engineers are planning to develop wind power support for ships. Their proposal is to attach kite sails to ships and use the wind's power to help reduce diesel consumption and the fuel's impact on the environment.



Due to high diesel fuel costs of 0.42 zeds per litre, the owners of the ship *NewWave* are thinking about equipping their ship with a kite sail.

It is estimated that a kite sail like this has the potential to reduce the diesel consumption by about 20% overall.

Name: *NewWave*

Type: freighter

Length: 117 metres

Breadth: 18 metres

Load capacity: 12 000 tons

Maximum speed: 19 knots

Diesel consumption per year without a kite sail: approximately 3 500 000 litres



The cost of equipping the *NewWave* with a kite sail is 2 500 000 zeds.

After about how many years would the diesel fuel savings cover the cost of the kite sail? Give calculations to support your answer.

.....

.....

.....

.....

.....

.....

.....

.....

Number of years:

Space and shape

Space and shape encompasses a wide range of phenomena that are encountered everywhere: patterns, properties of objects, positions and orientations, representations of objects, decoding and encoding of visual information, navigation, and dynamic interaction with real shapes and their representations. Geometry is essential to space and shape, but the category extends beyond traditional geometry in content, meaning and method, drawing on elements of other mathematical areas, such as spatial visualisation, measurement and algebra. Mathematical literacy in space and shape involves understanding perspective, creating and reading maps, transforming shapes with and without technology, interpreting views of three-dimensional scenes from various perspectives, and constructing representations of shapes (OECD, 2013).

Figure 2.4 below is an example of a question from PISA 2012 that assesses the content area of *space and shape*.

Northern Ireland's mean score for this content area was considerably lower than the overall mean score for mathematics; a difference of 23 score points. The Republic of Ireland has a similar size of difference between the mean score for *space and shape* and the overall mean score. A number of the EU countries that outperform Northern Ireland (for example: the Netherlands, Estonia, Finland and Austria) also have a mean score on this scale that is lower than the overall mean., although in these countries the size of the difference is not as pronounced as in Northern Ireland. Northern Ireland does not compare well, on this content area, with the highest performing countries. The nine highest performing countries all had mean scores for *space and shape* that were higher than their overall scores for mathematics (for example, Shanghai-China and Chinese Taipei had a difference of over 30 score points).

2.2.1.2 Mathematics process category scale scores

The PISA items are also classified according to the main mathematical process that a pupil uses to solve the problem they are presented with. There are three process categories:

- *formulating* situations mathematically
- *employing* mathematical concepts, facts, procedures and reasoning
- *interpreting, applying and evaluating* mathematical outcomes.

As shown in Table 2.5¹, Northern Ireland's highest mathematical process score was attained in the *interpret* subscale, with a mean of 496; nine points higher than its overall mean for mathematics. Eight of the countries that outperformed Northern Ireland also achieved the highest process score on the *interpret* subscale. Compared with Northern Ireland, only three of these countries (Australia, New Zealand and France) had larger differences between the mean score for this subscale and the overall mean score for mathematics. Northern Ireland's mean scale score for the *employ* subscale was closer to the overall mean, only one point lower. A number of the countries that outperformed Northern Ireland also achieved mean scores in this process category that were close to the overall mean for mathematics. For example Singapore, Korea, Liechtenstein, Poland, Belgium, the Republic of Ireland and France all had a difference of one point between the mean score for *employ* and their overall mean. Northern Ireland's lowest mathematical process score

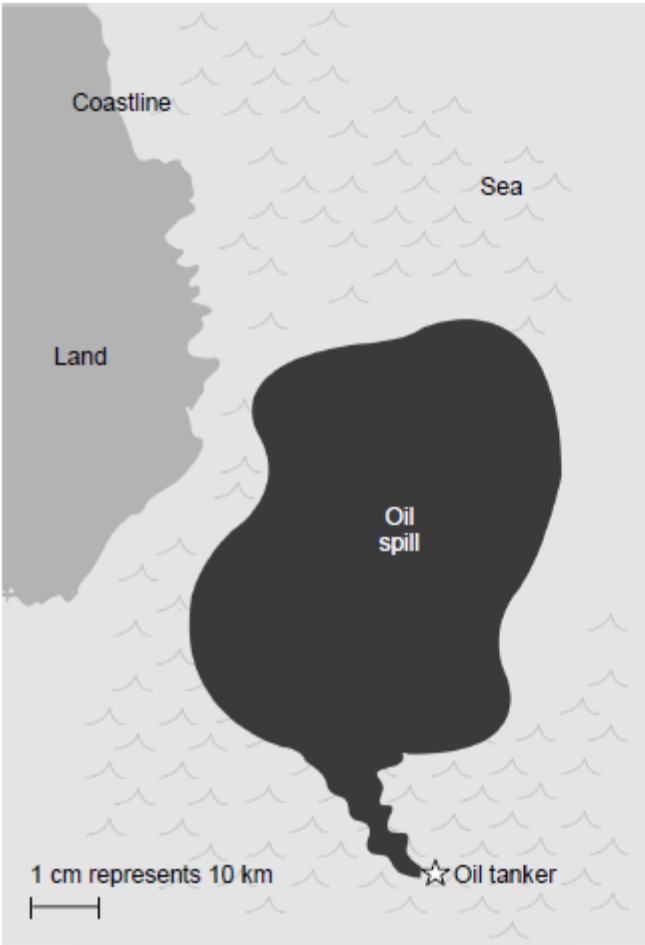
¹ Differences have been calculated using unrounded mean scores.

was attained in the *formulate* subscale, seven points lower than the overall mean. Half of the countries that out performed Northern Ireland had this pattern of performance and the seven top performing countries all had mean scores for the *formulate* subscale that were higher than the overall mean.

Figure 2.4 Oil spill: a released space and shape question from PISA 2012

OIL SPILL

An oil tanker at sea struck a rock, making a hole in the oil storage tanks. The tanker was about 65 km from land. After a number of days the oil had spread, as shown on the map below.



Using the map scale, estimate the area of the oil spill in square kilometres (km²).

Answer: km²

Summary

In Northern Ireland, pupil performance varied across the four mathematical content categories and the three mathematical process categories; variation was also seen in other countries. None of the countries that significantly outperformed Northern Ireland demonstrated consistent performance across the four content categories and the three mathematical processes (see Table 2.5 above). Of the four content categories, Northern Ireland achieved the highest mean score on the *uncertainty and data* scale (496), nine score points higher than the overall mean for mathematics. Northern Ireland's lowest score was attained on the *space and shape* scale (463), 23 score points lower than the overall mean. This trend was not observed in several of the highest performing countries, where conversely the mean score for *space and shape* was higher than the overall mean and the mean score for *uncertainty and data* was lower than the overall mean. For example, Shanghai-China scored 36 score points higher than its overall mean on *space and shape* but over 20 score points lower on the *quantity* and *uncertainty and data* subscales. Chinese Taipei, Japan, Korea and Macao-China showed the same subscale trends as Shanghai-China, although to a less pronounced degree.

Comparing mean scores for the three mathematical processes, of the 50 comparison countries 22 had relatively higher scores on the *interpret* subscale (see Appendix B4) mirroring the findings for Northern Ireland. However, a number of the high performing countries (for example: Shanghai-China, Singapore and Japan) had lower mean scores for this process compared with their other mathematical process subscale scores and their overall mean. These high performing countries had higher mean scores on the *formulate* subscale, Northern Ireland's weakest process area.

These findings suggest that, in Northern Ireland, pupils are relatively strong on the questions that focus on probability and statistics (*uncertainty and data*) and require them to *interpret, apply and evaluate* mathematical outcomes in order to solve problems. However, they are less strong on questions focusing on aspects of *space and shape* and those questions requiring them to *formulate* situations mathematically in order to solve a problem.

2.3 Differences between highest and lowest attainers

In addition to knowing how well pupils in Northern Ireland performed overall and across the different subscales assessed, it is also important for the purposes of teaching and learning to examine the spread in performance between the highest and lowest achievers. Amongst countries with similar mean scores there may be differences in the numbers of high- and low-scoring pupils (the highest and lowest attainers). A country with a wide spread of attainment may have large numbers of pupils who are underachieving as well as pupils performing at the highest levels. A country with a lower spread of attainment may have fewer very high achievers but may also have fewer underachievers.

2.3.1 Distribution of scores

The first way in which the spread of performance in each country can be examined is by looking at the distribution of scores. Appendix B2 shows the scores achieved by pupils at different percentiles. The 5th percentile is the score at which five per cent of pupils score lower, while the 95th percentile is the score at which five per cent score higher. The difference between the highest

and lowest attainers at the 5th and 95th percentiles is a better measure of the spread of scores for comparing countries than using the lowest and highest scoring pupils. Such a comparison may be affected by a small number of pupils in a country with unusually high or low scores. Comparison of the 5th and the 95th percentiles gives a better indication of the typical spread of attainment.

The score of pupils in Northern Ireland at the 5th percentile was 332, while the score of those at the 95th percentile was 638, a difference of 305 score points². By comparison, the average difference across the OECD countries was 301 score points, indicating that Northern Ireland has a similar distribution of scores. Twenty-three comparison group countries exceeded Northern Ireland's spread of attainment. These were 15 OECD countries and eight non OECD countries (Chinese Taipei, Singapore, Shanghai-China, Hong Kong-China, Liechtenstein, Cyprus, Bulgaria and Macao-China). All five of the countries with the highest overall mean score for mathematics have a higher spread of attainment than Northern Ireland, with a difference of between 318 (Hong Kong-China) and 375 (Chinese Taipei) scale points between the lowest and highest scoring pupils. Comparisons between the four constituent parts of the UK are provided in Chapter 7.

2.3.2 Performance across PISA proficiency levels

Proficiency levels for mathematics overall

The second way of examining the spread of attainment is by looking at Northern Ireland's performance at each of the PISA proficiency levels. The PISA proficiency levels are devised by the PISA consortium. As explained in Appendix A3, mathematics attainment in PISA is described in terms of six levels of achievement. These six performance levels are outlined in Figure 2.5 and Figure 2.6. Figure 2.5 shows the cumulative percentages at each level for the OECD average and for Northern Ireland. In all participating countries there were some pupils at or below the lowest level of achievement (Level 1) and, in all countries, at least some pupils achieved the highest level (Level 6). Full information on the proportion of pupils at each level in all comparison countries is provided in Appendices B19 and B20.

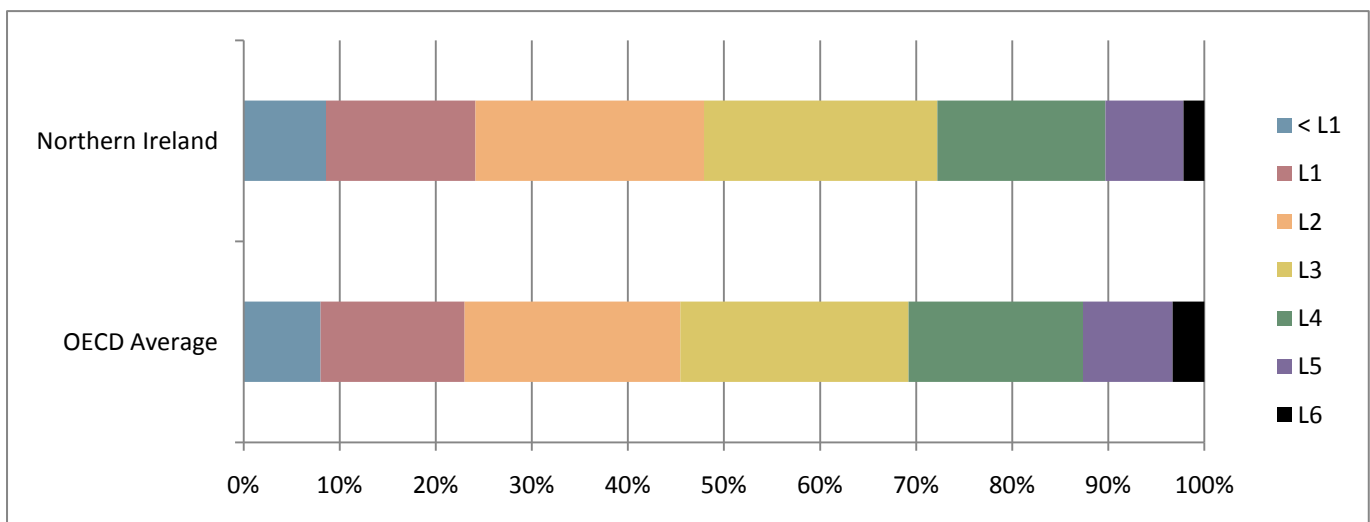
² Differences have been calculated using unrounded mean scores.

Figure 2.5 PISA mathematics proficiency levels

Level	% at this level		What students can typically do at each level
	OECD	NI	
6	3.3% perform tasks at Level 6	2.2% perform tasks at Level 6	Students at Level 6 of the PISA mathematics assessment are able to successfully complete the most difficult PISA items. At Level 6, students can conceptualise, generalise and use information based on their investigations and modelling of complex problem situations, and can use their knowledge in relatively non-standard contexts. They can link different information sources and representations and move flexibly among them. Students at this level are capable of advanced mathematical thinking and reasoning. These students can apply this insight and understanding, along with a mastery of symbolic and formal mathematical operations and relationships, to develop new approaches and strategies for addressing novel situations. Students at this level can reflect on their actions, and can formulate and precisely communicate their actions and reflections regarding their findings, interpretations and arguments, and can explain why they were applied to the original situation.
5	12.6% perform tasks at least at Level 5	10.3% perform tasks at least at Level 5	At Level 5, students can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models. Students at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriate linked representations, symbolic and formal characterisations, and insights pertaining to these situations. They begin to reflect on their work and can formulate and communicate their interpretations and reasoning.
4	30.8% perform tasks at least at Level 4	27.8% perform tasks at least at Level 4	At Level 4, students can work effectively with explicit models on complex, concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic representations, linking them directly to aspects of real-world situations. Students at this level can use their limited range of skills and can reason with some insight, in straightforward contexts. They can construct and communicate explanations and arguments based on their interpretations, reasoning and actions.
3	54.5% perform tasks at least at Level 3	52.1% perform tasks at least at Level 3	At Level 3, students can execute clearly described procedures, including those that require sequential decisions. Their interpretations are sufficiently sound to be the basis for building a simple model or for selecting and applying simple problem-solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They typically show some ability to handle percentages, fractions and decimal numbers, and to work with proportional relationships. Their solutions reflect that they have engaged in basic interpretation and reasoning.

Level	% at this level		What students can typically do at each level
	OECD	NI	
2	77.0% perform tasks at least at Level 2	75.9% perform tasks at least at Level 2	At Level 2, students can interpret and recognise situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures or conventions to solve problems involving whole numbers. They are capable of making literal interpretations of the results.
1	92.0% perform tasks at least at Level 1	91.4% perform tasks at least at Level 1	At Level 1 students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are almost always obvious and follow immediately from the given stimuli.

Figure 2.6 Percentage of pupils achieving each PISA level in the 2012 mathematics assessment



The figure above demonstrates the proportion of pupils in Northern Ireland at each PISA proficiency level was similar to the OECD average. The table in Appendix B20 shows the proportion at each level in all comparison countries.

In Northern Ireland, 8.6 per cent of pupils scored below PISA Level 1. This was very slightly higher than the OECD average (8.0 per cent). Northern Ireland had 24.1 per cent of pupils at Level 1 or below, compared with an OECD average of 23.0 per cent. However, 30 of the 64 comparison countries had fewer pupils at or below Level 1 than Northern Ireland. Northern Ireland therefore has a relatively long tail of underachievement compared with the highest scoring countries. In Shanghai-China, Singapore and Hong Kong-China, for example, fewer than ten per cent of pupils were at Level 1 or below.

In contrast to the number of low attaining pupils, however, Northern Ireland also has some high achievers. Just over two per cent of Northern Ireland's pupils achieved PISA Level 6, although this is a smaller percentage than the OECD average (3.3 per cent). Combining the two top levels

(Levels 5 and 6), Northern Ireland is again below the OECD average with 10.3 per cent compared with an OECD average of 12.6 per cent. The number of pupils scoring at these high levels does not compare well with the higher performing countries. In fact, with the exception of Denmark, all the countries that outperformed Northern Ireland in mathematics had a higher percentage of pupils at Level 5 or above. For example, Shanghai-China had 55.4 per cent of pupils in the top two levels and Belgium and the Netherlands had over 19 per cent of pupils at Level 5 or above.

Proficiency levels for mathematics content and process categories

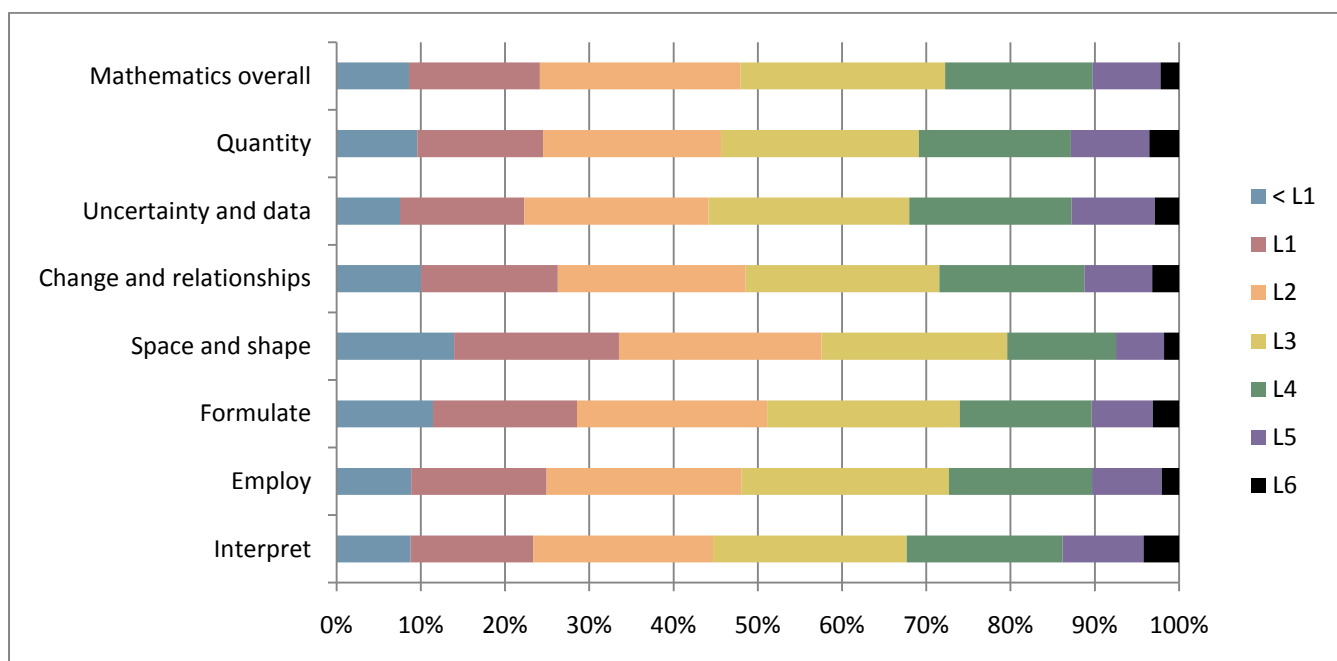
Findings presented earlier showed that there was some inconsistency in the performance of pupils in Northern Ireland across the mathematical content subscales and the mathematical process subscales. We might expect to see a similar pattern of achievement for each subscale at each proficiency level. Table 2.6 and Figure 2.7 show the percentage of pupils in Northern Ireland at each level for each mathematics subscale.

The proficiency distribution reflects that seen for mathematics overall in Northern Ireland:, that is, that there are slightly higher proportions of pupils at the higher proficiency levels in the *quantity*, *uncertainty and data*, *change and relationships* and *interpret* subscales. In the top two proficiency levels there were 12.8 per cent of pupils in the *quantity* and *uncertainty and data* subscales, 11.3 per cent of pupils in the *change and relationships* subscale and 13.8 per cent in the *interpret* subscale, compared with 10.3 per cent for mathematics overall.

Table 2.6 Percentage at each level in Northern Ireland for each mathematics subscale

Scale	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Mathematics overall	8.6	15.5	23.8	24.3	17.5	8.1	2.2
<i>Quantity</i>	9.6	14.9	21.1	23.5	18.0	9.3	3.5
<i>Uncertainty and data</i>	7.5	14.8	21.9	23.8	19.3	9.9	2.9
<i>Change and relationships</i>	10.0	16.2	22.3	23.0	17.2	8.1	3.2
<i>Space and shape</i>	13.9	19.6	24.0	22.0	12.9	5.7	1.8
<i>Formulate</i>	11.4	17.1	22.6	22.9	15.7	7.2	3.1
<i>Employ</i>	8.9	16.1	23.1	24.6	17.0	8.3	2.0
<i>Interpret</i>	8.8	14.6	21.3	23.0	18.5	9.6	4.2

Figure 2.7 Percentage of pupils at each level in Northern Ireland for each mathematics subscale



2.3.3 Comparison with PISA 2006 and 2009

This section compares the distribution of scores in PISA 2012 with those from PISA 2006 and 2009. It is important to note that, for PISA 2006 and 2009, mathematics was a minor domain and, as such, it is not possible to compare the subscale data obtained in this PISA cycle where mathematics was the main focus.

The proportion of low achieving pupils (pupils achieving Level 1 or below) in Northern Ireland has increased slightly since 2006 (22.6 per cent in 2006, 21.4 per cent in 2009 and 24.1 per cent in 2012). However, the proportion of pupils in the top two levels combined has stayed the same since 2009 at 10.3 per cent (a slight decrease from 12.2 per cent in 2006). The OECD average has also remained virtually unchanged since 2009. In Northern Ireland the difference between high and low attainers increased by 17 score points between 2009 (289) and 2012 (305). However, the points difference observed in 2012 is very similar to 2006 (306 score points). Since 2006 the mean score of pupils in the lowest percentile has decreased (341 in 2006, 348 in 2009 and 332 in 2012) whereas the mean score achieved by the highest percentile of pupils has remained relatively stable over the last two cycles of PISA (637 in 2009 and 638 in 2012).

2.4 Differences between boys and girls

Of the 64 other participating countries in PISA 2012, 41 had a statistically significant difference in performance in mathematics by gender. In 36 countries this favoured boys and in five (Jordan, Qatar, Thailand, Malaysia and Iceland) it favoured girls (see Appendix B2).

In Northern Ireland, there was no significant difference between the mean scores of boys and girls. Twenty-two comparison countries also showed no significant gender difference for mathematics (for example, Singapore, United States, Finland). Among OECD countries, Luxembourg and Chile had the largest difference (25 score points) and among the non-OECD comparison countries the largest difference was in Liechtenstein (23 score points).

In terms of the distribution of gender differences across the subscales, in Northern Ireland no significant gender differences were found on any of the subscales. However, there was considerable variation in the pattern of gender differences across the subscales for mathematics between the comparison countries. In 17 comparison countries there were significant gender differences on all the subscales whereas in a number of countries there were only significant differences on one or two of the subscales (for example, United States, Sweden, Singapore and Israel). This suggests that in some countries boys are relatively stronger on some mathematical content areas and in using some mathematical processes compared with girls, whereas in Northern Ireland boys and girls are performing similarly in each of the content areas and they are able to use the mathematical processes equally well in order to solve mathematical problems.

It is interesting to compare this pattern of gender difference with that found in other assessments used in Northern Ireland, both national and international. At Key Stage 4, attainment in the GCSE mathematics qualification (taken by 25,578 pupils in 2013) shows very little gender difference with 21.4 per cent of boys and 22.4 per cent of girls achieving an A* or A grade (www.jcq.org.uk). In terms of international assessments, TIMSS 2011 found that for pupils aged 9 – 10 there was no significant difference in the overall mathematics performance of boys and girls. It seems that results from these two measures tell the same story about gender differences as the PISA survey.

2.4.1 Comparison with PISA 2006 and 2009

This section compares the gender differences found in PISA 2012 with those from PISA 2006 and 2009. However, as mathematics was a minor domain in 2006 and 2009, it is not possible to compare the subscale data obtained in this PISA cycle where mathematics was the main focus.

In 2012, as in 2006, there was no significant difference between boys and girls in PISA. However, this differs from 2009 where there was a significant gender difference favouring boys, with a difference of 17 score points between boys and girls (one of the highest differences within the comparison countries). The 2012 survey brings the results for PISA in line with other assessments in Northern Ireland, for example GCSE and TIMSS, where there is no significant gender difference. In contrast the OECD average for gender difference remained relatively stable over the last three cycles of PISA (11 points in 2006, 12 points in 2009 and 11 points in 2012).

2.5 Summary

Northern Ireland's performance in mathematics has declined slightly since 2006. In 2012, Northern Ireland's mean score for mathematics was 487, five scale points lower than in 2009 and seven scale points lower than in 2006. In 2006 and 2009, Northern Ireland's mean score was not significantly different from the OECD average; however, in 2012 Northern Ireland's score was significantly lower than the OECD average. In addition, since 2006 the number of countries with mean scores significantly higher than Northern Ireland has increased from 18 in 2006, to 20 in 2009, to 25 in 2012. This increase is due in part to the high performance of countries participating for the first time, i.e. Shanghai-China and Singapore who participated for the first time in 2009 and Vietnam in 2012, but it is also due to improved performance in other countries that have participated in the last three cycles of PISA.

The spread of performance in Northern Ireland is similar to the OECD average; several comparison countries had wider score distributions. The difference in scores between the score of pupils at the 5th percentile and the score of pupils at the 95th percentile was 305 score points (the OECD average was 301 score points). This is an increase of 17 score points between 2009 and 2012, but the points difference observed in 2012 is similar to that in 2006 (306 score points).

In terms of the PISA proficiency levels, in 2012, there was a small increase in the proportion of low achieving pupils whereas the proportion of high achieving pupils has remained relatively stable. Seventy-six per cent of pupils achieved Level 2 or above, comparing favourably with the OECD average. However, compared with the high performing countries Northern Ireland had a relatively low percentage of pupils, 10.3 per cent, in the top two proficiency levels (this was also lower than the OECD average of 12.6 per cent).

In terms of gender differences, in Northern Ireland, there was no significant difference in the performance of boys and girls. The gap between boys and girls has decreased since 2009 and as a result the gender difference is no longer significant. This narrowing of the gender gap brings the results for PISA in line with other assessments, for example GCSE and TIMSS, where there is no significant gender difference. Twenty-two comparison countries also showed no significant gender difference for mathematics.

3 Pupils and mathematics

Chapter outline

This chapter reports on pupils' attitudes to school and learning, their drive and motivation for mathematics-related tasks, and their self-beliefs and participation in mathematics. In addition, aspects of mathematics lessons are discussed. The chapter begins by looking at the link between mathematics scores and pupils' backgrounds.

Key findings

- On average, pupils in Northern Ireland have a socio-economic status that is higher than the OECD average.
- Socio-economic status is associated with attainment in mathematics in Northern Ireland and across the OECD, with lower status related to lower mean scores.
- For Northern Ireland, 17 per cent of the variance in mathematics scores can be explained by socio-economic background, which is slightly higher than the OECD average of 15 per cent.
- Pupils in Northern Ireland report a high sense of belonging to and satisfaction with school, similar to the OECD average.
- Pupils in Northern Ireland, similar to the OECD average, regard school as useful and worthwhile.
- With regard to mathematics in particular, pupils report only moderate interest in learning mathematics, but recognise that it is useful.
- Pupils in Northern Ireland show greater motivation to learn mathematics than the OECD average.
- Pupils report a high level of control over their ability to succeed in mathematics and a high level of conscientiousness towards learning mathematics. Pupils in Northern Ireland generally report a greater level of conscientiousness and perseverance for mathematics tasks than the OECD average.
- Pupils in Northern Ireland report that they are confident in their ability to perform mathematics tasks and have low anxiety about mathematics.
- Pupils in Northern Ireland report a higher level of support from their mathematics teachers than that found for the OECD on average.
- Pupils in Northern Ireland report that a wide variety of tasks and strategies are used by their teachers in mathematics lessons.

3.1 How do mathematics scores link with pupils' backgrounds?

This section reports on interactions between socio-economic background and mathematics scores. Socio-economic background in PISA is reported as the ESCS Index (economic, social and cultural status). This is based on pupils' responses to questions about their parents' background and education, and possessions in their homes. The index is set to a mean of zero across OECD countries, with a standard deviation of one.

Northern Ireland's mean score on the ESCS Index was 0.29, indicating that on average pupils in the PISA sample in Northern Ireland have a higher socio-economic status than the average across OECD countries. In general there was a gap in achievement in OECD countries between those who are highest and those who are lowest on the ESCS Index, and this was also the case in Northern Ireland. As shown in Table 3.1, those in the bottom quarter of the ESCS Index have a mathematics score of 444, those in the second quarter 471, in the third quarter 502 and in the top quarter 541. This compares with the overall mean score for Northern Ireland of 487. The difference between the top and bottom quarters is 97 points, which represents approximately just over two years of schooling. Appendix E shows the Index for comparator countries.

Table 3.1 Socio-economic background and mathematics performance in Northern Ireland and the OECD

	PISA index of economic, social and cultural status (ESCS)	Mathematics overall mean score	Mean scores on the mathematics scale, by national quarters of the ESCS index				Score point difference in mathematics associated with one unit increase in the ESCS	Percentage of explained variance in mathematics performance
	Mean index for all students		Bottom quarter	Second quarter	Third quarter	Top quarter		
Northern Ireland	0.29	487	444	471	502	541	45	16.7
OECD average	0	494	452	482	506	542	39	14.6

The change in score for each unit of the ESCS Index in Northern Ireland is 45 points on the PISA mathematics scale, and this is relatively large. This means that for a change of one standard deviation on the ESCS Index there will be a predicted difference in score of 45 points. The OECD average is 39. This suggests that socio-economic background has a larger effect in Northern Ireland than on average in OECD countries. Only six OECD countries had a larger change in score (from largest to smallest effect): France, Slovak Republic, New Zealand, Czech Republic, Israel and Hungary.

However, to gain a true picture of interactions between mathematics score and the ESCS Index it is also necessary to look at the amount of variance in scores which can be explained by socio-economic background. This shows the extent to which the scores of pupils in each country are predicted by socio-economic background. In the case of Northern Ireland, 17 per cent of the variance in scores can be explained by socio-economic background. The OECD average is 15 per cent. In Hungary, where the change in score per unit of the ESCS was 47 (slightly higher than for Northern Ireland), the amount of variance explained was 23 per cent. This means that the more disadvantaged pupils in Northern Ireland have more chance of performing as well as their more advantaged peers than their counterparts in Hungary. On the other hand, in Korea where the predicted change in mathematics score per unit of ESCS was 42, the amount of explained variance was only 10 per cent. This suggests that the education system in Korea is more successful at overcoming the effects of socio-economic background. The country in which the most disadvantaged pupils have the least chance of succeeding because of their background is the Slovak Republic. Here, the change in the mathematics score per unit is 54 and the amount of variance explained is 25 per cent. The country in which the most disadvantaged pupils have the

best chance of succeeding in spite of their background is Macao-China, where the change in the mathematics score per unit is 17 and the amount of variance explained is three per cent.

3.2 Pupils' attitudes to school and learning

Pupils in Northern Ireland, and across the OECD on average, reported a high sense of belonging to and satisfaction with school, as shown in Table 3.2. Pupils might be expected to be able to achieve more if they feel comfortable in their learning environment. The proportions of responses were very similar for Northern Ireland and the OECD average with the exception of the statement "Things are ideal in my school"; 72 per cent of pupils in Northern Ireland agreed or strongly agreed with this compared with 61 per cent for the OECD average.

Table 3.2 Pupils' sense of belonging

Thinking about your school, to what extent do you agree with the following statements?		
	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
I make friends easily at school.	88%	87%
I feel like I belong at school.	79%	81%
Other students seem to like me.	93%	89%
I feel happy at school.	82%	80%
Things are ideal in my school.	72%	61%
I am satisfied with my school.	83%	78%
	<i>disagree/strongly disagree</i>	
I feel like an outsider (or left out of things) at school.	89%	89%
I feel awkward and out of place in my school.	87%	88%
I feel lonely at school.	92%	91%

Pupils were asked two further questions about their attitude towards school: one focused on learning outcomes (reported in Table 3.3), the other on learning activities (reported in Table 3.4). Attitudes are believed to be important because they can predict pupils' intentions, which can then predict behaviours. However, the international PISA report (Volume 3, Chapter 2, OECD, 2013) found that pupils' attitudes towards school were not highly associated with mathematics performance. Pupils in Northern Ireland, and on average across the OECD, reported that they regarded school as useful, with the overwhelming majority of pupils in Northern Ireland agreeing or strongly agreeing that "Trying hard at school is important" (97 per cent; slightly higher than the OECD average of 93 per cent). In addition, 79 per cent of pupils in Northern Ireland disagreed or strongly disagreed with the statement "School has done little to prepare me for adult life" (higher than the OECD average of 71 per cent).

Table 3.3 Pupils' attitudes towards school: learning outcomes

Thinking about what you have learned at school, to what extent do you agree with the following statements?		
	Northern Ireland	OECD average
<i>disagree/strongly disagree</i>		
School has done little to prepare me for adult life when I leave school.	79%	71%
School has been a waste of time.	91%	88%
<i>agree/strongly agree</i>		
School has helped give me confidence to make decisions.	84%	77%
School has taught me things which could be useful in a job.	91%	87%

Table 3.4 Pupils' attitudes towards school: learning activities

Thinking about your school, to what extent do you agree with the following statements?		
	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
Trying hard at school will help me get a good job.	96%	91%
Trying hard at school will help me get into a good university.	96%	94%
I enjoy receiving good marks.	97%	95%
Trying hard at school is important.	97%	93%

3.3 Pupils' attitudes to learning mathematics

Pupils' attitudes towards mathematics in particular were investigated in a series of questions looking at motivation, beliefs about success and conscientiousness.

Motivation to learn mathematics was measured on two scales in the Student Questionnaire, looking at *intrinsic motivation* to learn mathematics (based on a pupil's interest and enjoyment) and *instrumental motivation* (where learning mathematics is seen as a useful activity).

Table 3.5 shows the percentages of pupils in Northern Ireland, and on average across OECD countries, who agreed or strongly agreed with the statements presented as part of this question. Pupils did not report a particularly high level of intrinsic motivation to learn mathematics, and there is little difference between the proportions of pupils in Northern Ireland and the OECD average, apart from a slightly greater proportion of pupils in Northern Ireland reporting that they look forward to their mathematics lessons (42 per cent compared with the OECD average of 36 per cent).

While pupils are, on average, not particularly interested in learning mathematics, they show a greater level of instrumental motivation to learn mathematics, apparently recognising that it is useful. In addition, larger differences for the statements relating to instrumental motivation were shown than for intrinsic motivation, with pupils in Northern Ireland showing greater motivation to learn mathematics than pupils across the OECD on average. Ninety-two per cent of pupils in Northern Ireland said that learning mathematics is worthwhile because it will improve career

chances, compared with the OECD average of 78 per cent. This difference of 14 percentage points was also seen for the statement “Making an effort in mathematics is worth it because it will help me in the work that I want to do later on”, with which 89 per cent of pupils in Northern Ireland agreed.

Table 3.5 Pupils’ motivation to learn mathematics

Thinking about your views on mathematics, to what extent do you agree with the following statements?		
	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
<i>Intrinsic motivation to learn mathematics</i>		
I enjoy reading about mathematics.	33%	31%
I look forward to my mathematics lessons.	42%	36%
I do mathematics because I enjoy it.	38%	38%
I am interested in the things I learn in mathematics.	51%	53%
<i>Instrumental motivation to learn mathematics</i>		
Making an effort in mathematics is worth it because it will help me in the work that I want to do later on.	89%	75%
Learning mathematics is worthwhile for me because it will improve my career chances.	92%	78%
Mathematics is an important subject for me because I need it for what I want to study later on.	76%	66%
I will learn many things in mathematics that will help me get a job.	85%	70%

A large proportion of pupils reported that learning mathematics was worthwhile because it was important. They also reported feeling high levels of control over their ability to succeed in mathematics. As shown in Table 3.6, pupils in Northern Ireland reported a high degree of perceived control of success in mathematics, similar to the OECD average. Almost all pupils said that with sufficient effort they could succeed in mathematics (96 per cent for Northern Ireland, slightly higher than the OECD average of 92 per cent). The international PISA report (Volume 3, Chapter 3, OECD, 2013) found that pupils who strongly agreed that they can succeed in mathematics if they put in enough effort performed better (by 32 score points) on the PISA mathematics assessment than those pupils who did not feel such a strong belief in their ability to succeed in mathematics. This link between perceived control of success in mathematics and performance in the PISA mathematics assessment was also found to be the case for the mathematics performance of pupils in Northern Ireland.

Table 3.6 Pupils' perceived control of success in mathematics

Thinking about your mathematics lessons, to what extent do you agree with the following statements?		
	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
If I put in enough effort I can succeed in mathematics.	96%	92%
Whether or not I do well in mathematics is completely up to me.	83%	83%
If I wanted to, I could do well in mathematics.	86%	83%
	<i>disagree/strongly disagree</i>	
Family demands or other problems prevent me from putting a lot of time into my mathematics work.	72%	73%
If I had different teachers, I would try harder in mathematics.	71%	64%
I do badly in mathematics whether or not I study for my exams.	73%	73%

One question asked pupils to imagine that they had recently been doing badly on mathematics tests, and to say whether they were likely to blame this on any of a series of factors. As reported above, pupils felt a high level of control over their ability to succeed in mathematics, and, as shown in Table 3.7, pupils in Northern Ireland were generally less likely to attribute blame for failing to succeed than pupils across the OECD on average. While there was little difference in the proportions agreeing with the statement which placed the blame on themselves, "I'm not very good at solving mathematics problems" (54 per cent in Northern Ireland and 58 per cent for the OECD average), pupils in Northern Ireland were less likely to attribute the failing on their teachers or bad luck.

Table 3.7 Pupils' self-responsibility for failing in mathematics

Imagine you are a student in the following situation:		
<i>Each week, your mathematics teacher gives a short test. Recently you have done badly on these tests. Today you are trying to figure out why.</i>		
How likely are you to have these thoughts or feelings in this situation?		
	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
I'm not very good at solving mathematics problems.	54%	58%
My teacher did not explain the concepts well this week.	38%	48%
This week I made bad guesses on the test.	40%	46%
Sometimes the course material is too hard.	67%	71%
The teacher did not get students interested in the material.	42%	53%
Sometimes I am just unlucky.	38%	49%

Pupils reported a high level of conscientiousness towards mathematics-related tasks. Pupils in Northern Ireland generally reported a greater level of conscientiousness towards mathematics-related tasks than pupils across the OECD on average. In particular, pupils in Northern Ireland

were more likely to report putting effort into their work for mathematics homework and for mathematics tests. As shown in Table 3.8, 76 per cent of pupils in Northern Ireland agreed or strongly agreed that “I work hard on my mathematics homework” compared with 56 per cent for the OECD average and 66 per cent agreed or strongly agreed that “I study hard for mathematics tests” compared with 52 per cent for the OECD average.

Table 3.8 Pupils’ conscientiousness towards mathematics-related tasks

Thinking about the mathematics you do for school, to what extent do you agree with the following statements?		
	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
I finish my homework in time for mathematics lessons.	84%	68%
I work hard on my mathematics homework.	76%	56%
I am prepared for my mathematics exams.	74%	67%
I study hard for mathematics tests.	66%	52%
I keep studying until I understand mathematics material.	63%	60%
I pay attention in mathematics lessons.	87%	77%
I listen in mathematics lessons.	91%	83%
I avoid distractions when I am studying mathematics.	56%	58%
I keep my mathematics work well organised.	73%	59%

An associated question, relating to perseverance with tasks, showed a slightly less positive picture of pupils’ attitudes. As shown in Table 3.9, pupils were asked how well a set of statements (this time not related to mathematics) described themselves. Pupils reported a lower level of commitment to achieving tasks in this question than the previous one (see Table 3.8), though pupils in Northern Ireland reported a greater level of perseverance than the OECD average. The international PISA report (Volume 3, Chapter 3, OECD, 2013) found that in most countries and economies (including Northern Ireland) the association between pupils’ perseverance and mathematics performance was relatively strong.

Table 3.9 Pupils’ perseverance

How well does each of the following statements describe you?		
	<i>very much or mostly like me</i>	
	Northern Ireland	OECD average
When confronted with a problem, I give up easily.	60%	56%
I put off difficult problems.	46%	37%
I remain interested in the tasks that I start.	52%	49%
I continue working on tasks until everything is perfect.	48%	44%
When confronted with a problem, I do more than what is expected of me.	35%	34%

In addition to investigating pupils’ conscientiousness and perseverance, the Student Questionnaire asked pupils about their willingness to tackle problems. This openness to problem

solving is considered an important characteristic alongside proficiency in academic subjects. Generally, pupils showed a moderate amount of openness to problem solving, with just over half agreeing or strongly agreeing with four of the five statements, as shown in Table 3.10. The statement, “I like to solve complex problems”, was the one with which the lowest proportion of pupils agreed, both in Northern Ireland and on average across the OECD.

The proportions of pupils agreeing or strongly agreeing with statements about their openness to problem solving in Northern Ireland were similar to the OECD averages. The international PISA report (Volume 3, Chapter 3, OECD, 2013) found that, in most countries and economies, there is a strong association between pupils’ openness to problem solving (as measured by this group of statements) and mathematics performance and, for Northern Ireland compared with other countries, the association is one of the strongest.

Table 3.10 Pupils’ openness to problem solving

How well does each of the following statements describe you?	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
I can handle a lot of information.	52%	53%
I am quick to understand things.	53%	57%
I seek explanations for things.	61%	61%
I can easily link facts together.	58%	57%
I like to solve complex problems.	35%	33%

Pupils’ attitudes to mathematics were further explored by questions looking at the influence of friends and parents, self-confidence in tackling mathematics, anxiety about mathematics and mathematics activities done at home and at school.

The influence of parents and friends on pupils’ attitudes towards mathematics is expected to impact on their behaviour, where positive attitudes and behaviours will be more likely to result from a social environment which promotes mathematics and the study of mathematics. Table 3.11 shows that high proportions of pupils reported that their parents believe in the importance of mathematics and that three out of five pupils believe their parents like mathematics. The proportions of pupils agreeing or strongly agreeing with the statements are generally very similar in Northern Ireland and across the OECD on average.

However, there is an apparent difference between Northern Ireland and the OECD in terms of the proportions of pupils reporting that their friends do well and work hard at mathematics, with 79 per cent of pupils in Northern Ireland saying that most of their friends do well (compared with the OECD average of 60 per cent) and 72 per cent saying that most of their friends work hard at mathematics (the OECD average is 51 per cent). The proportion of pupils reporting that their friends enjoy taking mathematics tests is similarly low for Northern Ireland and the OECD on average (12 and 13 per cent respectively). This may be influenced by the fact that pupils answered this question in the Student Questionnaire just after finishing the PISA assessment.

Table 3.11 Pupils' subjective norms in mathematics

Thinking about how people important to you view mathematics, how strongly do you agree with the following statements?		
	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
Most of my friends do well in mathematics.	79%	60%
Most of my friends work hard at mathematics.	72%	51%
Most of my friends enjoy taking mathematics tests.	12%	13%
My parents believe it's important for me to study mathematics.	97%	90%
My parents believe that mathematics is important for my career.	89%	80%
My parents like mathematics.	58%	58%

A question asking pupils how confident they felt about having to do specific mathematical tasks was intended to measure pupils' self-efficacy in mathematics. It is believed that pupils who are not confident of their ability are at risk of underperforming if their lack of confidence does not reflect a lack of ability. Generally pupils showed a high level of confidence in their ability to perform the tasks, as shown in Table 3.12. For two of the tasks, the proportions of pupils in Northern Ireland saying they were confident or very confident were slightly higher than the OECD averages, and for six tasks the proportions were slightly lower. The largest difference was seen for the task "Calculating the petrol consumption rate of a car"; 47 per cent of pupils in Northern Ireland said they were confident or very confident about this, compared with the OECD average of 56 per cent.

Table 3.12 Pupils' self-efficacy in mathematics

How confident do you feel about having to do the following mathematics tasks?		
	<i>confident/very confident</i>	
	Northern Ireland	OECD average
Using a train timetable to work out how long it would take to get from one place to another.	82%	81%
Calculating how much cheaper a TV would be after a 30% discount.	79%	80%
Calculating how many square metres of tiles you need to cover a floor.	65%	68%
Understanding graphs presented in newspapers.	84%	80%
Solving an equation like $3x + 5 = 17$.	82%	85%
Finding the actual distance between two places on a map with a 1:10,000 scale.	53%	56%
Solving an equation like $2(x + 3) = (x + 3)(x - 3)$.	66%	73%
Calculating the petrol consumption rate of a car.	47%	56%

In addition to reporting that they were fairly confident in their ability to perform mathematics tasks, pupils also showed generally positive mathematics self-concepts and low anxiety about mathematics. As shown in Table 3.13, pupils in Northern Ireland reported greater belief in their abilities in mathematics than was the case for the OECD on average. In particular, 67 per cent of pupils in Northern Ireland reported that they get good marks in mathematics compared with 59 per

cent for the OECD average. Pupils in Northern Ireland reported a similar level of anxiety about learning mathematics as was seen across the OECD on average.

Table 3.13 Pupils' self-concept in mathematics alongside pupils' mathematics anxiety

Thinking about studying mathematics, to what extent do you agree with the following statements?		
	<i>agree/strongly agree</i>	
Self-concept in mathematics	Northern Ireland	OECD average
I am just not good at mathematics. (<i>figures for disagree/strongly disagree</i>)	62%	57%
I get good marks in mathematics.	67%	59%
I learn mathematics quickly.	52%	52%
I have always believed that mathematics is one of my best subjects.	40%	38%
In my mathematics class, I understand even the most difficult work.	44%	37%
Mathematics anxiety		
I often worry that it will be difficult for me in mathematics classes.	57%	59%
I get very tense when I have to do mathematics homework.	33%	33%
I get very nervous doing mathematics problems.	31%	31%
I feel helpless when doing a mathematics problem.	25%	30%
I worry that I will get poor marks in mathematics.	62%	61%

When asked about mathematics behaviour at school and outside of school, pupils generally reported that they did not perform tasks relating to mathematics very often. The most common behaviour was helping friends with mathematics, which a quarter of pupils did often, almost always or always (in Northern Ireland and across the OECD on average). As shown in Table 3.14, fewer pupils in Northern Ireland than across the OECD on average reported that they frequently did most of the mathematics-related tasks.

Table 3.14 Pupils' mathematics behaviours

How often do you do the following at school and outside of school?		
	<i>often, almost always or always</i>	
	Northern Ireland	OECD average
I talk about mathematics problems with my friends.	13%	18%
I help my friends with mathematics.	25%	25%
I do mathematics as an extra-curricular activity.	8%	15%
I take part in mathematics competitions.	3%	7%
I do mathematics more than 2 hours a day outside of school.	5%	9%
I play chess.	7%	12%
I program computers.	13%	15%
I participate in a mathematics club.	4%	4%

3.4 Pupils' experience of learning mathematics

In the Student Questionnaire, pupils were asked about how supportive their mathematics teachers were in lessons. Table 3.15 shows that a large proportion of pupils said that teachers were supportive in most or all lessons. The proportions of pupils in Northern Ireland agreeing with these statements were greater than the OECD average. The largest difference was for the statement “The teacher helps students with their learning” which around nine out of ten pupils in Northern Ireland said happened in most or all lessons, compared with around seven out of ten across the OECD on average. The lowest proportion in Northern Ireland was for “The teacher gives students an opportunity to express opinions” which two-thirds of pupils said happened in most or all lessons (similar to the OECD average).

Table 3.15 Teacher support in mathematics classes

How often do these things happen in your mathematics lessons?		
	<i>most/all lessons</i>	
	Northern Ireland	OECD average
The teacher shows an interest in every student's learning.	75%	63%
The teacher gives extra help when students need it.	83%	72%
The teacher helps students with their learning.	88%	72%
The teacher continues teaching until the students understand.	75%	66%
The teacher gives students an opportunity to express opinions.	67%	66%

Pupils were also asked how often teachers ask pupils to tackle mathematics problems in their lessons. Responses are reported in Table 3.16. These statements have been described as reflecting different types of ‘cognitive activation’ which pupils are asked to use. For all but one of the approaches mentioned in the question, greater proportions of pupils in Northern Ireland, compared with the OECD average, reported that they occurred often or almost always or always in their mathematics lessons. The largest difference was for the statement “The teacher helps us to learn from mistakes we have made” which nearly four-fifths of pupils in Northern Ireland (79 per cent) said happened frequently, compared with just under three-fifths of pupils across the OECD on average (59 per cent). The approach which the lowest proportion of pupils in Northern Ireland reported as common practice was “The teacher asks us to decide on our own procedures for solving complex problems”. Just over two-fifths (41 per cent) said this happened often, almost always or always (matching the OECD average).

Table 3.16 Pupils' cognitive activation in mathematics lessons

Thinking about the mathematics teacher who taught your last mathematics lesson, how often does he or she do each of the following?		
	<i>often, almost always or always</i>	
	Northern Ireland	OECD average
The teacher asks questions that make us reflect on the problem.	68%	59%
The teacher gives us problems that require us to think for an extended time.	67%	52%
The teacher asks us to decide on our own procedures for solving complex problems.	41%	41%
The teacher presents problems which have no immediately obvious method for finding the answer.	52%	46%
The teacher presents problems in different contexts so that students know whether they have understood the concepts.	68%	58%
The teacher helps us to learn from mistakes we have made.	79%	59%
The teacher asks us to explain how we have solved a problem.	80%	69%
The teacher presents problems that require students to apply what they have learned to new contexts.	73%	61%
The teacher gives us problems that can be solved in several different ways.	64%	59%

A similar question asked pupils about the instructional strategies used by their mathematics teachers. These strategies represent the three categories of 'structuring', 'student orientation' and 'enhanced activities'. As shown in Table 3.17, there are considerable differences between the proportions of pupils reporting that the various strategies are used in most or all lessons, something which might be expected due to the nature of the work appropriate to each strategy. For instance, 88 per cent of pupils in Northern Ireland reported that "The teacher tells us what we have to learn" in most or all lessons, and this is something that would be expected to feature in most lessons, unlike pupils helping to plan classroom activities or topics (reported by nine per cent of pupils), which might be expected to happen infrequently.

Comparing the findings for Northern Ireland with the OECD average there is no clear pattern of differences. While the majority of instructional strategies are reported as more common in Northern Ireland than on average across the OECD, this is not the case for all statements and some of the differences are small. The largest differences were seen for two statements (with percentages in Northern Ireland and the OECD average, respectively): "The teacher asks questions to check whether we have understood what was taught" (83 per cent, 70 per cent); and "The teacher tells us what is expected of us when we get a test or assignment" (73 per cent, 60 per cent). The lowest proportion for Northern Ireland was for the statement "The teacher asks us to help plan classroom activities or topics" which only nine per cent of pupils said happened in most or all lessons.

Table 3.17 Teaching practices in mathematics: instructional strategies

How often do these things happen in your mathematics lessons?		
	<i>most or all lessons</i>	
	Northern Ireland	OECD average
The teacher sets clear goals for our learning.	65%	68%
The teacher asks me or my classmates to present our thinking or reasoning at some length.	51%	55%
The teacher gives different work to classmates who have difficulties learning and/or to those who can advance faster.	18%	29%
The teacher sets projects that require at least one week to complete.	17%	16%
The teacher tells me about how well I am doing in my mathematics class.	33%	31%
The teacher asks questions to check whether we have understood what was taught.	83%	70%
The teacher puts us in small groups to come up with joint solutions to a problem or task.	12%	22%
At the beginning of a lesson, the teacher presents a short summary of the previous lesson.	43%	40%
The teacher asks us to help plan classroom activities or topics.	9%	17%
The teacher gives me feedback on my strengths and weaknesses in mathematics.	31%	26%
The teacher tells us what is expected of us when we get a test or assignment.	73%	60%
The teacher tells us what we have to learn.	88%	79%
The teacher tells me what I need to do to become better in mathematics.	57%	46%

3.5 Summary

Pupils in Northern Ireland reported a high sense of belonging and satisfaction with school and an understanding that it is useful, showing a similar level of satisfaction as pupils across the OECD on average. Pupils in Northern Ireland showed a similar level of interest and enjoyment in learning mathematics as the OECD average. For both groups, the motivation to learn mathematics was less to do with enjoyment and more to do with regarding mathematics as a useful activity, and pupils in Northern Ireland showed a greater appreciation of the importance of mathematics than the OECD average. They also reported feeling high levels of control over their ability to succeed in mathematics.

Pupils reported a high level of conscientiousness towards mathematics-related tasks, with the majority of pupils in Northern Ireland saying that they worked hard and sensibly in order to learn mathematics. This was to a greater degree than the OECD average.

Pupils in Northern Ireland reported that their parents believe in the importance of mathematics, possibly reflecting home environments which encourage the study of mathematics. This was greater than the OECD average. Generally, pupils in Northern Ireland showed a high level of

confidence in their ability to perform mathematical tasks, and fairly low levels of anxiety about learning mathematics.

Compared with the OECD average, more pupils in Northern Ireland reported that their teachers asked them to approach mathematics learning in a variety of ways. Pupils in Northern Ireland were also more likely to report that their mathematics teachers taught in an active and engaging way, but were less likely to give responsibility to pupils than in other OECD countries.

In Northern Ireland, socio-economic background had a relatively high connection with mathematics scores compared with OECD countries. However, many pupils in Northern Ireland can overcome disadvantage and achieve scores higher than predicted by their background. In some other OECD countries, it is much more difficult than in Northern Ireland for disadvantaged pupils to reach high levels of attainment.

4 Science

Chapter outline

This chapter explores attainment in science. It draws on findings outlined in the international report (OECD, 2013) and places outcomes for Northern Ireland in the context of those findings.

Key findings

- Northern Ireland's performance in science is comparable with many other EU and OECD countries and Northern Ireland's performance was not significantly different from the OECD average.
- The achievement of pupils in Northern Ireland has remained stable since 2006. However, the number of countries with mean scores significantly above Northern Ireland's has increased from ten in 2009 to 17 in PISA 2012. Therefore, other countries have shown improvements since PISA 2009 so that they now outperform Northern Ireland. Poland and the Republic of Ireland have shown particularly strong improvements. Vietnam has also entered PISA in 2012, with a stronger performance than Northern Ireland.
- Northern Ireland had a relatively large difference between the score points of the lowest scoring pupils and the highest scoring pupils compared with other countries – only eight countries had a wider distribution. Compared with other high achieving countries, Northern Ireland tends to have a greater proportion of lower achievers and, consequently, raising the attainment of lower achievers would be an important step towards improving Northern Ireland's performance.

4.1 Comparison countries

As with mathematics, the comparator countries reported here include OECD countries, EU countries and other countries with relatively high scores. Since countries with very low scores are not so relevant for comparison purposes, those with a mean score for science of less than 430 (14 countries) have been omitted from tables unless they are in the OECD or EU. This results in a comparison group of 50 countries as shown in Table 4.1.

Table 4.1 Countries compared with Northern Ireland

Australia	France*	Luxembourg*	<i>Singapore</i>
Austria*	Germany*	<i>Macao-China</i>	Slovak Republic*
Belgium*	Greece*	Mexico	Slovenia*
<i>Bulgaria*</i>	<i>Hong Kong-China</i>	Netherlands*	Spain*
Canada	Hungary*	New Zealand	Sweden*
Chile	Iceland	Norway	Switzerland
<i>Chinese Taipei</i>	Israel	Poland*	<i>Thailand</i>
<i>Croatia*</i>	Italy*	Portugal*	Turkey
<i>Cyprus*</i>	Japan	Republic of Ireland*	<i>United Arab Emirates</i>
Czech Republic*	Korea	<i>Romania*</i>	United States
Denmark*	<i>Latvia*</i>	<i>Russian Federation</i>	<i>Vietnam</i>
Estonia*	<i>Liechtenstein</i>	<i>Serbia</i>	
Finland*	<i>Lithuania*</i>	<i>Shanghai-China</i>	

OECD countries (not italicised)

Countries not in OECD (*italicised*)

*EU countries

In addition to the countries listed above, tables and figures in Appendix C include the data for all four constituent parts of the United Kingdom.

Outcomes for the United Kingdom as a whole are presented in the international report (OECD, 2013) and in the appendices that accompany this chapter (Appendix C). Outcomes for Northern Ireland (and the other three constituent parts of the UK) are derived from the 'sub-national' level analysis carried out by the international consortium, as well as from additional analysis carried out by NFER using the international dataset. Comparisons between the four constituent parts of the UK are provided in Chapter 7.

Interpreting differences between countries

As for mathematics, it is important to know what can reasonably be concluded from the PISA data and which interpretations would be going beyond what can be reliably supported by the results. This section outlines some points that need to be kept in mind while reading this chapter.

Sources of uncertainty

There are two sources of uncertainty which have to be taken into account in the statistical analysis and interpretation of any test results. These are described as *sampling error* and *measurement error*. The use of the term 'error' does not imply that a mistake has been made; it simply highlights the necessary uncertainty.

Sampling error stems from the inherent variation of human populations which can never be summarised with absolute accuracy. It affects virtually all research and data collection that makes use of sampling. Only if every 15-year-old in each participating country had taken part in PISA could it be stated with certainty that the results are totally representative of the attainment of the entire population of pupils in those countries. In reality the data was collected from a sample of 15-year-olds. Therefore, the results are a best estimation of how the total population of 15-year-olds could be expected to perform in these tests. There are statistical methods to measure how good the estimation is. It is important to recognise that all data on human performance or attitudes which is based on a sample carries a margin of error.

Measurement error relates to the results obtained by each individual pupil, and takes account of variations in their score which are not directly due to underlying ability in the subject but which are influenced by other factors related to individuals or to the nature of the tests or testing conditions, such as sickness on the day of testing.

Interpreting rank order

Because of the areas of uncertainty described above, interpretations of very small differences between two sets of results are often meaningless. Were they to be measured again it could well be that the results would turn out the other way round. For this reason, this chapter focuses mainly on *statistically significant* differences between mean scores rather than the simple rank order of countries. Statistically significant differences are unlikely to have been caused by random fluctuations due to sampling or measurement error.

Where statistically significant differences between countries are found, these may be the result of

a great number of factors. The data for some of these factors were not collected in the PISA survey. Therefore, the PISA survey is only able to explain the reasons for differences between countries to a limited extent. For example, differences in school systems and educational experiences in different countries could play a part, but so could a wide range of different out-of-school experiences. It is important to bear this in mind while reading this report.

4.2 Scores in Northern Ireland

Pupils in Northern Ireland achieved a mean score of 507 for science, not significantly different from the OECD average of 501.

Internationally, 17 countries performed at a level significantly higher than Northern Ireland. In ten countries, science attainment was not significantly different from that of Northern Ireland, while the remaining 37 out of a total of 64 countries performed significantly less well. Table 4.2 below shows the countries which significantly outperformed Northern Ireland. Table 4.3 shows the countries whose performance was not significantly different from that of Northern Ireland, while Table 4.4 shows the comparison countries which were significantly lower. (See the box above on interpreting differences between countries for an explanation of how statistical significance should be interpreted in this report.)

Of the 17 countries with mean scores significantly above Northern Ireland, six are EU members (Finland, Estonia, Poland, Germany, Netherlands, Republic of Ireland); this compares with only two EU countries outperforming Northern Ireland in 2009. Seven EU countries did not perform significantly differently from Northern Ireland and 13 performed less well. Among OECD countries, ten outperformed Northern Ireland (Japan, Finland, Estonia, Korea, Poland, Canada, Germany, Netherlands, Republic of Ireland and Australia), whilst nine performed similarly and 14 performed less well. This indicates that Northern Ireland, while not among the highest achieving group of countries internationally, is comparable with many other EU and OECD countries in terms of science achievement.

Compared with other English speaking countries, the Republic of Ireland and Australia outperformed Northern Ireland. Canada (with a significant number of English speakers) also performed significantly better. New Zealand and the United States performed similarly to Northern Ireland. Two other countries (Hong Kong-China and Singapore) have strong historical links with the education system of the UK, and English is the medium of instruction in Singapore. Both performed significantly better than Northern Ireland.

Northern Ireland's mean score in science and the OECD average score have both remained stable since 2006. Northern Ireland's mean score has varied by only four score points. The number of countries with mean scores significantly above Northern Ireland increased from nine to ten between the 2006 and 2009 cycles, but has increased to 17 in PISA 2012. There are some high performing countries that did not participate in PISA 2006 – Shanghai-China and Singapore joined PISA 2009 and Vietnam has joined as a high performing country in PISA 2012. However, other countries have shown improvements since PISA 2009 so that they now outperform Northern

Ireland. Poland and the Republic of Ireland have shown particularly strong improvements and show significant increases in performance since 2009.

More information can be found in Appendix C1, which summarises significant differences in attainment between Northern Ireland and the comparison group countries, while Appendix C2 gives mean scores with standard errors for these countries. Appendix C6 shows how the performance of participating countries has changed since 2006.

Table 4.2 Countries outperforming Northern Ireland in science (significant differences)

Country	Mean score		Country	Mean score	
<i>Shanghai-China</i>	580		Canada	525	
<i>Hong Kong-China</i>	555		<i>Liechtenstein</i>	525	
<i>Singapore</i>	551	^	Germany*	524	
Japan	547		<i>Chinese Taipei</i>	523	
Finland*	545	v	Netherlands*	522	
Estonia*	541	^	Republic of Ireland*	522	^
Korea	538		Australia	521	
<i>Vietnam</i>	528		<i>Macao-China</i>	521	^
Poland*	526	^			

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

^ v Indicates a significant change since PISA 2009

Table 4.3 Countries not significantly different from Northern Ireland in science

Country	Mean score		Country	Mean score	
New Zealand	516	v	Belgium*	505	
Switzerland	515		<i>Latvia</i> *	502	
Slovenia*	514		France*	499	
Czech Republic*	508		Denmark*	498	
Northern Ireland	507		United States	497	
Austria*	506				

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

^ v Indicates a significant change since PISA 2009

Table 4.4 Countries significantly below Northern Ireland in science

Country	Mean score		Country	Mean score	
Spain*	496	^	Israel	470	^
<i>Lithuania*</i>	496		Greece*	467	
Norway	495		Turkey	463	
Hungary*	494		<i>United Arab Emirates</i>	448	
Italy*	494		<i>Bulgaria*</i>	446	
<i>Croatia*</i>	491		Chile	445	
Luxembourg*	491		<i>Serbia</i>	445	
Portugal*	489		<i>Thailand</i>	444	^
<i>Russian Federation</i>	486		<i>Romania*</i>	439	^
Sweden*	485	v	<i>Cyprus*</i>	438	
Iceland	478	v	Mexico	415	
Slovak Republic*	471	v	<i>plus 14 other countries</i>		

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

^ v Indicates a significant change since PISA 2009

4.3 Differences between highest and lowest attainers

It is important for teaching and learning purposes to know the spread of attainment between the highest and lowest scoring pupils. Countries with similar mean scores may have differences in the numbers of high or low attainers. A country with a wide spread of attainment may have a long tail of underachievement as well as pupils who are achieving at the highest levels. A country with a lower spread may have fewer very high achievers but may also have fewer underachievers, indicating greater social equality.

The first way in which the spread of performance in each country can be examined is by looking at the distribution of scores. Appendix C2 shows the average science score of pupils at each percentile and the size of the difference between the highest and lowest attainers (at the 5th and 95th percentiles) in each country. The 5th percentile is the score at which five per cent of pupils score lower, while the 95th percentile is the score at which five per cent score higher. This is a better measure for comparing countries than using the lowest and highest attaining pupils, as such a comparison may be affected by a small number of pupils in a country with unusually high or low scores.

The score of pupils in Northern Ireland at the 5th percentile was 338 while the score of those at the 95th percentile was 669, a difference of 331 score points. This was larger than the OECD average difference of 304 score points and only eight countries had a wider distribution than Northern Ireland. Seven of these countries were comparison group countries; these were the OECD

countries Israel, New Zealand, Luxembourg, Slovak Republic and Belgium and also Singapore and Bulgaria from the non-OECD comparison countries.

The difference between scores at the 5th and the 95th percentile has narrowed slightly for the OECD average from 311 score points in 2006 to 304 in 2012. The difference in scores between the 5th and 95th percentile is similar in Northern Ireland for PISA 2012 and PISA 2009 – 331 score points in 2012 compared with 335 in 2009 and the scores at the 5th and 95th percentile are also similar. The decrease in the difference between the 5th and 95th percentile since 2006, when it was 367 points, has therefore been maintained in 2012.

The second way of examining the spread of attainment is by looking at Northern Ireland's performance at each of the PISA proficiency levels. The PISA proficiency levels are devised by the PISA Consortium and are not linked to National Curriculum levels in Northern Ireland. PISA science attainment is described in terms of six levels of achievement. (See Appendix C3 for a full description of typical performance at each of these six levels.) In all participating countries there were some pupils at or below the lowest level of achievement (Level 1), while in most countries at least some pupils achieved the highest level (Level 6). See Appendices C4 and C5 for details.

In Northern Ireland, 4.7 per cent of pupils scored below PISA Level 1 in science. This was similar to the OECD average of 4.8 per cent. At Level 1 or below, the OECD average was 17.8 per cent compared with 16.8 per cent in Northern Ireland. The proportion of pupils at the highest level in Northern Ireland is 2.0 per cent, compared with an OECD average of 1.2 per cent. When the top two levels are combined (Level 5 and Level 6), a percentage of 10.3 for Northern Ireland is above the OECD average of 8.4 per cent. Northern Ireland, therefore, has a slightly greater number of high achievers and a similar number of low achievers compared with the OECD average. There are only six countries with a larger percentage of pupils at Level 6 than Northern Ireland. These are Singapore, Shanghai-China, Japan, Finland, New Zealand and Australia.

Although the numbers scoring at each level compare well with the OECD average, Northern Ireland's distribution of scores needs to be considered alongside the score distributions for those countries significantly outperforming or not significantly different from Northern Ireland in their science achievement. All countries that significantly outperformed Northern Ireland, or were not significantly different from Northern Ireland in their science achievement, have a smaller proportion of pupils at Level 1 or below, except for France, the United States and Belgium. That is, Northern Ireland has a relatively large number of underachievers when compared with the highest scoring countries.

The OECD average proportions of pupils performing at each of the proficiency levels in science are very similar for PISA 2006, 2009 and 2012. In Northern Ireland, the proportion of low achieving pupils (at Level 1 or below) decreased slightly from 20.4 per cent in 2006 to 16.7 in 2009 and has remained stable at 16.8 in 2012. The proportion of pupils at Level 5 or above is similar to 2009. In 2012 it was 10.3 compared with 11.8 per cent in 2009.

4.4 Differences between boys and girls

Of the 64 other countries participating in PISA 2012, 27 had a statistically significant difference in gender performance on the science scale; 17 favouring girls and ten favouring boys. The OECD average shows a statistically significant gender difference in performance which favours boys by one score point. Consistent with results in 2009 and 2006, there was no significant difference in performance between girls and boys in Northern Ireland. This was also the case in almost all countries that either outperformed Northern Ireland or were not significantly different. There were six exceptions and these were Finland (16 point difference in favour of girls), Latvia (15 point difference in favour of girls), Slovenia (nine point difference in favour of girls), Japan (11 point difference in favour of boys), Denmark (ten point difference in favour of boys) and Switzerland (six point difference in favour of boys).

The range of science subjects on offer at GCSE makes a direct comparison of gender differences between the PISA 2012 scores and GCSE performance far from straightforward. Pupils are able to take science, additional science or the separate sciences of biology, chemistry and physics at GCSE. The provisional results for Northern Ireland for GCSE science from June 2013 show that, on the whole, boys and girls perform similarly, with girls tending to slightly outperform boys at the highest grades but boys tending to achieve more A*-C grades overall than girls (www.jcq.org.uk). Additionally, in the 2011 Trends in Maths and Science Survey (TIMSS), no gender difference was found for pupils assessed in science, either in Year 5 or Year 9 (Sturman *et al.*, 2012).

4.5 Summary

This section summarises Northern Ireland's performance in science and compares the science achievement of pupils in Northern Ireland in PISA 2012 with their achievement in science in PISA 2009 and PISA 2006. In 2006, science was the main subject so there were more science questions than in PISA 2009 and 2012. The questions used for PISA 2012 and PISA 2009 are identical and are the 'link items'. They were used in PISA 2006 and some were also used in previous cycles of PISA.

Northern Ireland's performance in science in PISA 2012 was not significantly different from the OECD average. Seventeen countries significantly outperformed Northern Ireland; of these six were EU members and ten OECD countries. Northern Ireland had a relatively large difference between the score points of the lowest scoring pupils and the highest scoring pupils compared with other countries – only eight countries had a wider distribution. The proportion of pupils at each level of achievement shows that Northern Ireland tends to have a greater proportion of high achievers and a lower proportion of low achievers than the OECD average. That said, compared with high achieving countries, Northern Ireland tends to have a greater proportion of lower achievers and, consequently, raising the attainment of lower achievers would be an important step towards improving Northern Ireland's performance.

Performance by gender was variable across the countries that participated. In Northern Ireland there was no significant gender difference.

For science, pupil performance in Northern Ireland has been very stable since PISA 2006, only varying by four score points in the three cycles. The number of countries that significantly

outperform Northern Ireland has increased since 2009 from ten to 17, during which time there has been little change in the countries participating in the survey. In Northern Ireland, the proportion of pupils at each proficiency level in science is similar in PISA 2012 to 2009. The spread of attainment, when scores at the 5th and 95th percentile are considered, shows some narrowing of the gap since 2006.

5 Reading

Chapter outline

This chapter explores attainment in reading. It draws on findings outlined in the international report (OECD, 2013) and places outcomes for Northern Ireland in the context of those findings.

Key findings

- Northern Ireland's performance in reading in PISA 2012 was not significantly different from the OECD average.
- Northern Ireland had a relatively large difference between the score points of the lowest scoring pupils and the highest scoring pupils compared with many other countries.
- The proportion of pupils at each level of achievement was broadly similar to the OECD average.
- Girls scored significantly higher in reading in PISA 2012 than boys in all countries, although in Northern Ireland this gender difference, while statistically significant, was not as large as that in the majority of other countries.
- In general, Northern Ireland's performance in reading in 2012 does not differ greatly from that in the last PISA surveys in 2009 or 2006. However, in 2012 the number of countries outperforming Northern Ireland increased to 19, compared with nine in 2009 and seven in 2006.

5.1 Comparison countries

While findings for all countries are reported in this chapter where relevant, most findings relate to a sub-group of countries. As with mathematics and science, the comparator countries reported here include OECD countries, EU countries and other countries with relatively high scores. Since countries with very low scores are not so relevant for comparison purposes, those with a mean score for reading of less than 430 have been omitted from tables unless they are in the OECD or the EU. As a result, the comparison group in this chapter for reading comprises 51 countries (of which 26 are EU members and 33 OECD members), as shown in Table 5.1.

Table 5.1 Countries compared with Northern Ireland

Australia	Finland*	<i>Lithuania*</i>	<i>Shanghai-China</i>
Austria*	France*	Luxembourg*	<i>Singapore</i>
Belgium*	Germany*	<i>Macao-China</i>	Slovak Republic*
<i>Bulgaria*</i>	Greece*	Mexico	Slovenia*
Canada	<i>Hong Kong-China</i>	Netherlands*	Spain*
Chile	Hungary*	New Zealand	Sweden*
<i>Chinese Taipei</i>	Iceland	Norway	Switzerland
<i>Costa Rica</i>	Israel	Poland*	<i>Thailand</i>
<i>Croatia*</i>	Italy*	Portugal*	Turkey
<i>Cyprus*</i>	Japan	Republic of Ireland*	<i>United Arab Emirates</i>
Czech Republic*	Korea	<i>Romania*</i>	United States
Denmark*	<i>Latvia*</i>	<i>Russian Federation</i>	<i>Vietnam</i>
Estonia*	<i>Liechtenstein</i>	<i>Serbia</i>	

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

In addition to the countries listed above, tables and figures in Appendix D include the data for all four constituent parts of the United Kingdom (UK).

Outcomes for the United Kingdom as a whole are presented in the international report (OECD, 2013) and in the appendices that accompany this chapter (Appendix D). Outcomes for Northern Ireland (and the other three constituent parts of the UK) are derived from the 'sub-national' level analysis carried out by the international consortium, as well as from additional analysis carried out by NFER using the international dataset. Comparisons between the four constituent parts of the UK are provided in Chapter 7.

Interpreting differences between countries

As for mathematics and science, it is important to know what can reasonably be concluded from the PISA data and which interpretations would be going beyond what can be reliably supported by the results. This section outlines some points that need to be kept in mind while reading this chapter.

Sources of uncertainty

There are two sources of uncertainty which have to be taken into account in the statistical analysis and interpretation of any test results. These are described as *sampling error* and *measurement error*. The use of the term 'error' does not imply that a mistake has been made; it simply highlights the necessary uncertainty.

Sampling error stems from the inherent variation of human populations which can never be summarised with absolute accuracy. It affects virtually all research and data collection that makes use of sampling. Only if every 15-year-old in each participating country had taken part in PISA could it be stated with certainty that the results are totally representative of the attainment of the entire population of pupils in those countries. In reality the data was collected from a sample of 15-year-olds. Therefore, the results are a best estimation of how the total population of 15-year-olds

could be expected to perform in these tests. There are statistical methods to measure how good the estimation is. It is important to recognise that all data on human performance or attitudes which is based on a sample carries a margin of error.

Measurement error relates to the results obtained by each individual pupil, and takes account of variations in their score which are not directly due to underlying ability in the subject but which are influenced by other factors related to individuals or to the nature of the tests or testing conditions, such as sickness on the day of testing.

Interpreting rank order

Because of the areas of uncertainty described above, interpretations of very small differences between two sets of results are often meaningless. Were they to be measured again it could well be that the results would turn out the other way round. For this reason, this chapter focuses mainly on *statistically significant* differences between mean scores rather than the simple rank order of countries. Statistically significant differences are unlikely to have been caused by random fluctuations due to sampling or measurement error.

Where statistically significant differences between countries are found, these may be the result of a great number of factors. The data for some of these factors were not collected in the PISA survey. Therefore, the PISA survey is only able to explain the reasons for differences between countries to a limited extent. For example, differences in school systems and educational experiences in different countries could play a part, but so could a wide range of different out-of-school experiences. It is important to bear this in mind while reading this report.

5.2 Scores in Northern Ireland

Northern Ireland's pupils achieved a mean score of 498 in reading, which was not significantly different from the OECD average of 496. The results for reading in 2012 were not significantly different from those in PISA 2009, when the mean for Northern Ireland was 499 and was not significantly different from the OECD average of 493.

Internationally, the performance in reading in 19 of the other 64 participating countries was at a significantly higher level than in Northern Ireland (see Table 5.2). Twelve countries performed at a level that was not significantly different from that of Northern Ireland, while the remaining 33 countries performed significantly less well. Tables 5.3 and 5.4 show the comparison group countries which performed similarly to Northern Ireland, and those whose performance was lower than Northern Ireland's. (See the box above in section 5.1 on interpreting differences between countries for an explanation of how statistical significance should be interpreted in this report.)

Of the 19 countries with mean scores in reading that are significantly higher than in Northern Ireland, three are English speaking (the Republic of Ireland, New Zealand and Australia) and one has a substantial number of English speakers (Canada). Two other countries (Hong Kong-China and Singapore) have strong historical links with the education system of the UK, and English is the medium of instruction in Singapore. The mean score of the United States, the only remaining English-speaking country, was not significantly different from Northern Ireland's.

Seven of the countries that significantly outperformed Northern Ireland are EU members (Finland, the Republic of Ireland, Poland, Estonia, the Netherlands, Belgium and Germany). Eight EU countries did not perform significantly differently from Northern Ireland and 11 performed less well. Among OECD countries, 13 outperformed Northern Ireland, ten performed similarly, and ten performed less well. This indicates that, in terms of reading achievement, Northern Ireland, while not among the highest achieving group of countries internationally, is comparable with many other EU and OECD countries.

In 2012 Northern Ireland’s overall mean score for reading (498) was one score point lower than it was in 2009 (499). In 2006 the mean score for reading in Northern Ireland was 495. In each cycle the mean score was not significantly different from the OECD average.

In 2012, the number of countries with mean scores significantly above Northern Ireland’s has increased from nine to 19 since 2009. In 2006 this number was only seven, but a number of high performing countries joined the survey for the first time in 2009.

In 2012, nine countries that were performing at a similar level to Northern Ireland in 2009 are now significantly outperforming Northern Ireland in reading: the Republic of Ireland, Chinese Taipei, Poland, Estonia, Liechtenstein, the Netherlands, Belgium, Switzerland and Germany – all of these apart from Belgium and the Netherlands have significantly improved their performance since 2009. One country (Macao-China) which scored significantly lower than Northern Ireland in 2009 scored significantly better than Northern Ireland in 2012, and two countries which were similar to Northern Ireland in PISA 2009 now perform at a significantly lower level (Sweden and Iceland). Six countries which were significantly below Northern Ireland in 2009 are now performing at a similar level. This suggests that there have been significant improvements in reading in some other countries while Northern Ireland’s performance has remained stable.

Appendix D1 (significant differences between Northern Ireland and the comparison group countries) and Appendix D2 (mean scores and standard errors for Northern Ireland and the comparison group countries) provide further data.

Table 5.2 Countries outperforming Northern Ireland in reading (significant differences)

Country	Mean score		Country	Mean score	
<i>Shanghai-China</i>	570	^	Estonia*	516	^
<i>Hong Kong-China</i>	545	^	<i>Liechtenstein</i>	516	^
<i>Singapore</i>	542	^	New Zealand	512	v
Japan	538	^	Australia	512	
Korea	536		Netherlands*	511	
Finland*	524	v	Belgium*	509	
Republic of Ireland*	523	^	Switzerland	509	^
Canada	523		<i>Macao-China</i>	509	^
<i>Chinese Taipei</i>	523	^	Germany*	508	^
Poland*	518	^			

OECD countries (not italicised)

Countries not in OECD (*italicised*)

*EU countries

^ v Indicates a significant change since PISA 2009

Table 5.3 Countries not significantly different from Northern Ireland

Country	Mean score		Country	Mean score	
<i>Vietnam</i>	508		Italy*	490	
France*	505	^	Austria*	490	
Norway	504		<i>Latvia</i> *	489	
Northern Ireland*	498		Hungary*	488	
United States	498		Portugal*	488	
Denmark*	496		Israel	486	
Czech Republic*	493	^			

OECD countries (not italicised) Countries not in OECD (italicised) *EU countries

^ v Indicates a significant change since PISA 2009

Table 5.4 Countries significantly below Northern Ireland

Country	Mean score		Country	Mean score	
Spain*	488	^	Slovak Republic*	463	v
Luxembourg*	488	^	<i>Cyprus</i> *	449	
<i>Croatia</i> *	485		<i>Serbia</i>	446	
Sweden*	483	v	<i>United Arab Emirates</i>	442	
Iceland	483	v	Chile	441	
Slovenia*	481		<i>Thailand</i>	441	^
<i>Lithuania</i> *	477	^	<i>Costa Rica</i>	441	
Greece*	477		<i>Romania</i> *	438	^
Turkey	475	^	<i>Bulgaria</i> *	436	
<i>Russian Federation</i>	475	^	Mexico	424	
			<i>plus 13 other countries</i>		

OECD countries (not italicised) Countries not in OECD (italicised) *EU countries

^ v Indicates a significant change since PISA 2009

5.3 Differences between highest and lowest attainers

It is important for teaching and learning purposes to know the spread of attainment between the highest and lowest scoring pupils in reading. Countries with similar mean scores may nevertheless have differences in the numbers of high or low attainers. A country with a wide spread of attainment may have large numbers of pupils who are underachieving as well as pupils performing at the highest levels. A country with a lower spread of attainment may have fewer very high achievers but may also have fewer underachievers.

The first way in which the spread of performance in each country can be examined is by looking at the distribution of scores. Appendix D2 shows the average reading score of pupils at each percentile and the size of the difference between the highest and lowest attainers (at the 5th and 95th percentiles) in each country. The 5th percentile is the score at which five per cent of pupils score lower, while the 95th percentile is the score at which five per cent score higher. This a better measure for comparing countries than using the lowest and highest scoring pupils, as such a

comparison may be affected by a small number of pupils in a country with unusually high or low scores.

The score of pupils in Northern Ireland at the 5th percentile was 333, while the score of those at the 95th percentile was 646, a difference of 313 score points. This was slightly higher than the OECD average difference, which was 310 score points. Almost two-thirds of the OECD countries had a smaller difference between the highest and lowest percentiles than Northern Ireland.

There have been slight changes in the distribution of reading scores between PISA 2009 and 2012. The score of high achievers in the 95th percentile has decreased by five score points to 646 and the mean score of low achievers at the 5th percentile has decreased by three score points since 2009 to 333. The difference between the highest and lowest achievers, therefore has decreased by just two points to 313 which is similar to the OECD average of 310. This spread of achievement is narrower than in 2006, when it was 348. However, as in 2006 and 2009, there are still only a minority of comparison countries (18) with a wider spread of attainment than Northern Ireland overall.

The highest scoring countries at the 95th percentile were Singapore (698), Shanghai-China (690) and Japan (689), compared with 646 for Northern Ireland. Of the countries that outperformed Northern Ireland overall, two (Estonia and Macao-China) had a lower mean among their highest achievers. At the 5th percentile, among the high performing countries, low achievers in New Zealand and Belgium had lower mean scores than those in Northern Ireland.

The second way of examining the spread of attainment is by looking at performance on each of the PISA proficiency levels. For reading there are seven levels, which include the sub-levels 1a and 1b and below 1b. These reading levels are outlined in Appendix D3.

In all participating countries there were some pupils at Level 1 or below, while in most countries (including all the comparison countries) at least some pupils achieved the highest level (Level 6). See Appendices D4 and D5 for details of the proportions at each level in all comparison countries.

The OECD average for the proportion of pupils at Level 1 or below, was 18.0 per cent. Northern Ireland has 16.7 per cent of pupils at these levels. At the highest level (Level 6) the OECD average is 1.1 per cent of pupils, compared with 1.2 per cent in Northern Ireland. Looking at the top two levels combined (Levels 5 and 6), Northern Ireland was again very similar to the OECD average with 8.3 per cent of pupils achieving at this level in reading, compared with an OECD average of 8.4 per cent.

Twenty-two of the comparison countries had a higher proportion of pupils at Level 5 or above. These included all of the countries outperforming Northern Ireland in PISA 2012 (see Table 5.2) except Macao-China. France, Norway and Israel also had a higher proportion of high achievers, although their overall mean scores were not significantly different from Northern Ireland's. Luxembourg had a higher proportion of high achievers, but also a higher proportion of low achievers. All 20 comparison countries that had significantly lower scores than Northern Ireland also had a higher proportion of pupils at Level 1 or below.

A comparison of proportions of pupils at each of the PISA performance levels indicates a slight increase in the proportion of lower achievers (below Level 1a) in Northern Ireland. In PISA 2009, 4.8 per cent were below PISA Level 1a, whereas in 2012 this rose slightly to 5.2. However, both of these figures are lower than the proportion of low achievers in 2006 which was 7.7 per cent. Northern Ireland's proportion of high achievers (Level 5 and above) dropped again in 2012, to 8.3 per cent, compared with 9.3 per cent in 2009 and 10.4 per cent in 2006.

5.4 Differences between boys and girls

Of the 64 other countries participating in PISA 2012, all had a statistically significant difference in gender performance on the reading scale, favouring girls. (see Appendix D2).

In Northern Ireland, there was a difference of 27 score points between girls and boys compared to an OECD average of 38 score points. This was one of the lowest score point differences among the comparison countries, with over four-fifths having a greater difference than Northern Ireland. Among OECD countries, Finland had the largest difference (with girls outperforming boys by 62 score points) and among the non-OECD comparison countries the largest difference was a 70 point difference in Bulgaria.

The higher attainment of girls in reading is a common pattern seen in other measurements of attainment. The PISA results confirm these findings. However, it is encouraging that the difference in Northern Ireland in PISA 2012, while significant, is smaller than that in many other countries.

In 2009 and 2006, as in 2012, all participating countries had a statistically significant gender difference in favour of girls for reading. It appears that the gender gap in Northern Ireland has remained fairly stable between 2009 and 2012 with a difference of 29 and 27 score points respectively, whereas in 2006 the difference was 33 score points. The OECD average for gender difference has decreased by one score point since 2009 to 38, the same as it was in 2006.

5.5 Summary

Northern Ireland's performance in reading in PISA 2012 was not significantly different from the OECD average. Northern Ireland had a relatively large difference between the score points of the lowest scoring pupils and the highest scoring pupils compared with many other countries. However, the proportion of pupils at each level of achievement was broadly similar to the OECD average.

Girls scored significantly higher than boys, which was the case in every country which participated in the PISA 2012 study. However, this gender difference, while statistically significant, was not as large in Northern Ireland as that in the majority of other countries.

There was a small increase in the proportion of low achievers and a decrease in the proportion of high achievers. In general, Northern Ireland's performance in reading in 2012 does not differ greatly from that in the last PISA surveys in 2009, or 2006. However, in 2012, the number of countries outperforming Northern Ireland increased to 19, compared with nine in 2009 and seven in 2006. While in 2009 a number of high performing countries had joined the survey, this was not the case in 2012, where only one of the countries outperforming Northern Ireland was new

(Vietnam). Nine countries that were not significantly different from Northern Ireland in 2009 were significantly better in 2012 (the Republic of Ireland, Chinese Taipei, Poland, Estonia, Liechtenstein, the Netherlands, Belgium, Switzerland and Germany); Macao-China performed significantly better in 2012 despite having been significantly below Northern Ireland in 2009. Six countries that were significantly below Northern Ireland in 2009 were not significantly different in 2012. These findings suggest that some other countries have shown greater improvement than Northern Ireland between 2009 and 2012.

In sum, attainment in reading shows slight changes in Northern Ireland between PISA 2009 and PISA 2012. Although the overall mean is similar to that of 2009, the proportion of low attaining pupils has increased and the proportion of high attaining pupils has decreased; the means for both groups have decreased. The spread of achievement has remained similar to 2009 and is considerably narrower than in 2006.

6 Schools

Chapter outline

This chapter draws on responses to the School and Student Questionnaires to describe aspects of school management, school climate, assessment practices and school resources.

Key findings

- Principals in Northern Ireland report that they have a high level of responsibility for many aspects of school management.
- Compared with the OECD average, principals in Northern Ireland play a greater role in most aspects of school management.
- Compared with 2009, principals report there is a lower degree of involvement from national education authorities in the management of schools while the role of local authorities is largely unchanged.
- Principals in Northern Ireland report a substantially greater involvement in enhancing the school's reputation and in ensuring that teachers are working to the school's aims than the OECD average.
- A smaller proportion of principals report pupil-related problems that hindered learning than the OECD average.
- Teacher-related problems that hinder learning are also reported at a lower level by principals in Northern Ireland than the OECD average.
- Teacher morale is reported to be very high across the OECD, with principals in Northern Ireland also enthusiastic and valuing academic achievement.
- On the specific question of morale, fewer principals in Northern Ireland report that it is high for the teachers in their school, compared with the OECD average.
- Compared with principals, pupils in Northern Ireland report a greater degree of disruption to their lessons. The level of disruption reported by pupils is similar to the OECD average.
- Pupils in Northern Ireland are generally very positive about their relationships with their teachers, and more positive than the OECD average.
- A lack of qualified teachers (of subjects other than mathematics, science or English) is reported as the greatest staffing problem hindering schools' capacity to provide instruction. This was reported by 18 per cent of principals. In 2009 a shortage of such teachers was reported by only four per cent of principals.
- The greatest resource issue for principals is shortage or inadequacy of school buildings and grounds.
- Principals in Northern Ireland report much greater use of pupil assessments for a variety of purposes than the OECD average.

6.1 School management

The School Questionnaire asked about responsibility for aspects of school management.

Table 6.1 summarises the responses of principals. Principals reported a high level of responsibility for many aspects of the management of their schools. They reported they had the least involvement with the following aspects: choosing textbooks, establishing teachers' starting salaries and determining course content. The responsibility for choosing textbooks and determining course content lay predominantly with teachers; starting salaries were most often the responsibility of the school governing body, but the principal and decisions at national and local level also played a part.

As well as starting salaries, the aspects on which principals reported the most involvement of bodies external to the school – i.e. local or national government – were in formulating the school budget, dismissing teachers and deciding on pupil admissions. However, even for these aspects the principal was still considered to have more responsibility.

Teachers were reported as having a large amount of responsibility for more instructional or classroom-related issues such as choosing textbooks, determining course content, choosing courses and discipline policies. Responses also showed considerable involvement of school governing bodies in all aspects of the school, with the exception of choosing textbooks and deciding course content.

Comparing responses to this question with those for the same question in PISA 2009, principals in Northern Ireland have reported a reduction in the role of the national education authority in school management. In particular, for "Establishing teachers' starting salaries" the proportion of principals reporting that national education authorities played a role reduced from 67 per cent in 2009 to 18 per cent in 2012. There was also a large drop in the proportions for "Determining course content", from 41 to 14 per cent. The role of local authorities (such as Education and Library Boards) was largely unchanged, while the biggest difference for school governing bodies was an increase in their role relating to "Formulating the school budget" which was reported by 48 per cent of principals in 2009 compared with 66 per cent in 2012. Teachers were seen to have a greater role in "Establishing student disciplinary policies" (increasing from 58 per cent to 79 per cent) and "Establishing student assessment policies" (increasing from 70 per cent to 83 per cent). Principals' role also increased for "Determining teachers' salary increases" (from 38 per cent to 54 per cent) and "Formulating the school budget" (from 55 per cent to 67 per cent).

Table 6.1 School autonomy

Regarding your school, who has a considerable responsibility for the following tasks? (Please tick as many boxes as appropriate in each row)					
	<i>Principal</i>	<i>Teachers</i>	<i>School governing body</i>	<i>Local or Regional Authority</i>	<i>National education authority</i>
Selecting teachers to recruit	81%	7%	89%	7%	9%
Dismissing teachers	54%	-	86%	29%	20%
Establishing teachers' starting salaries	26%	1%	44%	16%	18%
Determining teachers' salary increases	54%	1%	57%	8%	57%
Formulating the school budget	67%	1%	66%	33%	32%
Deciding on budget allocations within the school	90%	11%	62%	2%	4%
Establishing student disciplinary policies	91%	79%	72%	10%	7%
Establishing student assessment policies	92%	83%	45%	8%	13%
Approving students for admission to the school	90%	6%	73%	22%	20%
Choosing which textbooks are used	22%	100%	4%	-	-
Determining course content	32%	99%	5%	7%	14%
Deciding which courses are offered	88%	79%	44%	3%	13%

- indicates no responses while 0% indicates a response from less than 0.5% of principals

Looking specifically at the role of principals, a comparison with the OECD average shows that principals in Northern Ireland play a greater role in school management than is the case across the OECD for all aspects except choosing textbooks and dismissing teachers. For other aspects of school management, as shown in Table 6.2, principals in Northern Ireland have greater responsibility than those across the OECD on average. In particular, their role in establishing pupil assessment policies and determining salary increases is considerably greater than the OECD average.

Table 6.2 Principals' role in school management: comparing Northern Ireland and the OECD average

	Northern Ireland	OECD average
Selecting teachers to recruit	81%	71%
Dismissing teachers	54%	57%
Establishing teachers' starting salaries	26%	18%
Determining teachers' salary increases	54%	23%
Formulating the school budget	67%	56%
Deciding on budget allocations within the school	90%	75%
Establishing student disciplinary policies	91%	71%
Establishing student assessment policies	92%	57%
Approving students for admission to the school	90%	72%
Choosing which textbooks are used	22%	28%
Determining course content	32%	25%
Deciding which courses are offered	88%	60%

A second aspect of school management which was explored in the School Questionnaire is school leadership, specifically the amount of involvement which principals have in various activities in their school. Table 6.3 reports these responses in Northern Ireland ordered by the proportions of principals reporting that they did each activity on a weekly or more frequent basis.

It is interesting to compare some of these responses with those reported across the OECD on average (also shown in Table 6.3). These are shaded where there is a difference of at least 20 percentage points. There are only two categories where the response of principals in Northern Ireland was at least 20 percentage points higher. These were: working to enhance the school's reputation in the community, the activity that principals reported doing the most; and ensuring that teachers work according to the school's educational goals. The activity that principals reported doing the least was leading or attending in-service activities concerned with instruction; this was also the case for the OECD average.

Table 6.3 School leadership

Below are statements about your management of this school. Please indicate the frequency of the following activities and behaviours in your school during the last academic year.		
	<i>Once a week or more</i>	
	Northern Ireland	OECD average
I work to enhance the school's reputation in the community.	71%	46%
I pay attention to disruptive behaviour in classrooms.	66%	56%
I ensure that teachers work according to the school's educational goals.	55%	34%
I praise teachers whose students are actively participating in learning.	51%	38%
I engage teachers to help build a school culture of continuous improvement.	49%	42%
When a teacher brings up a classroom problem, we solve the problem together.	44%	45%
I draw teachers' attention to the importance of pupils' development of critical and social capacities.	43%	28%
When a teacher has problems in his/her classroom, I take the initiative to discuss matters.	42%	37%
I provide staff with opportunities to participate in school decision-making.	40%	37%
I make sure that the professional development activities of teachers are in accordance with the teaching goals of the school.	36%	19%
I use student performance results to develop the school's educational goals.	32%	16%
I promote teaching practices based on recent educational research.	27%	21%
I review work produced by students when evaluating classroom instruction.	21%	13%
I discuss the school's academic goals with teachers at staff meetings.	18%	15%
I refer to the school's academic goals when making curricular decisions with teachers.	14%	14%
I ask teachers to participate in reviewing management practices.	13%	12%
I discuss academic performance results with staff to identify curricular strengths and weaknesses.	13%	9%
I conduct informal observations in classrooms on a regular basis (informal observations are unscheduled, last at least 5 minutes, and may or may not involve written feedback or a formal meeting).	13%	22%
I evaluate the performance of staff.	12%	13%
I set aside time at staff meetings for teachers to share ideas or information from in-service activities.	11%	10%
I lead or attend in-service activities concerned with instruction.	10%	8%

6.2 School climate

Information on school climate is available from questions in both the Student and School Questionnaires. Principals were asked the extent to which learning in their school is hindered by a variety of problems. These were divided into teacher-related and pupil-related issues. Table 6.4 shows responses, from the most frequently reported to the least.

In comparison with the OECD average, principals in Northern Ireland were less likely to report that pupil-related factors hindered learning (for seven out of the eight problems). The problem reported most frequently was pupils truanting, which 20 per cent of principals in Northern Ireland said hindered learning. This compares to the OECD average of 32 per cent. Principals reported pupils skipping classes much less frequently than the OECD average. This was the second least common factor that hindered learning in Northern Ireland, compared with the third most common problem in OECD countries, on average.

Teacher-related problems that hindered learning were reported much less frequently in Northern Ireland compared with the OECD average. For both Northern Ireland and the OECD average the most commonly reported problem was “Teachers having to teach students of mixed ability within the same class”. While the OECD average was over half (53 per cent), just under a third of principals in Northern Ireland said that this was a problem.

Of the options presented in this question, twelve had also appeared in a similar question in PISA 2009. The answers from principals in the two surveys were largely similar. The only notable difference was in the proportion of principals saying that “Students lacking respect for teachers” hindered pupils’ learning a lot or to some extent. The proportion increased from seven per cent in 2009 to 19 per cent in 2012.

Table 6.4 Issues that hinder learning in school

In your school, to what extent is the learning of students hindered by the following?		
	<i>to some extent/a lot</i>	
	Northern Ireland	OECD average
Student-related		
Student truancy	20%	32%
Students arriving late for school	19%	31%
Students lacking respect for teachers	19%	19%
Disruption of classes by students	18%	32%
Students not attending compulsory school events (e.g. sports day) or excursions	12%	13%
Students intimidating or bullying other students	8%	10%
Students skipping classes	7%	30%
Student use of alcohol or illegal drugs	1%	6%
Teacher-related		
Teachers having to teach students of mixed ability within the same class	32%	53%
Teacher absenteeism	12%	13%
Teachers not meeting individual students' needs	10%	23%
Teachers having to teach students of diverse ethnic backgrounds (i.e. language, culture) within the same class	10%	18%
Staff resisting change	9%	25%
Teachers not being well prepared for classes	8%	8%
Teachers' low expectations of students	6%	14%
Students not being encouraged to achieve their full potential	4%	21%
Teachers being late for classes	3%	7%
Teachers being too strict with students	1%	10%
Poor student-teacher relations	1%	7%

Principals were also asked about the morale of the teachers at their school. As shown in Table 6.5, principals in Northern Ireland reported a very high level of pride and enthusiasm amongst their staff. The lowest proportion of positive responses, at 85 per cent, was for the statement which asked directly about the morale of teachers. For all remaining statements, the proportion agreeing or strongly agreeing was higher in Northern Ireland than the average across the OECD.

Table 6.5 Teacher morale

Thinking about the teachers in your school, how much do you agree with the following statements?		
	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
The morale of teachers in this school is high.	85%	91%
Teachers work with enthusiasm.	99%	93%
Teachers take pride in this school.	97%	94%
Teachers value academic achievement.	99%	96%

It is possible to compare the principals' views with pupils' reports about the climate of their school. Pupils were asked about discipline, specifically in their mathematics lessons. Table 6.6 summarises their responses. Eighteen per cent of principals in Northern Ireland reported that disruption of classes by pupils hindered learning, which is similar to the 16 per cent of pupils who said that pupils cannot work well in mathematics lessons. However, larger proportions of pupils said that disruption occurred in most or all lessons. Around 30 per cent of pupils said that there was often noise and disorder or that pupils did not listen to the teacher in their mathematics lessons. These proportions were similar to the average across the OECD. Pupils' responses to questions about the time for a class to settle and pupils to start working and whether pupils are able to work well in class were more positive than the OECD average.

A similar question to this was asked in PISA 2009, but related to English lessons rather than mathematics lessons. There is very little difference in the percentages of pupils reporting disruption to lessons between the two surveys.

Table 6.6 Discipline in mathematics classes

How often do these things happen in your mathematics lessons?		
	<i>in most or all lessons</i>	
	Northern Ireland	OECD average
Students don't listen to what the teacher says.	31%	32%
There is noise and disorder.	29%	32%
The teacher has to wait a long time for students to settle down.	23%	27%
Students don't start working for a long time after the lesson begins.	19%	27%
Students cannot work well.	16%	22%

As seen in Table 6.4 (above), only one per cent of principals in Northern Ireland said that poor student-teacher relations hindered pupils learning. Table 6.7 shows pupils' responses to questions on relationships with teachers. This also shows a largely positive feeling among pupils in Northern Ireland about the relationship they have with their teachers. However, over a quarter of pupils did not agree or strongly agree that most of their teachers really listen to them. For all the statements, pupils in Northern Ireland were more positive about relationships with teachers than pupils across the OECD on average.

Table 6.7 Teacher-pupil relationships

Thinking about the teachers at your school, to what extent do you agree with the following statements?	<i>agree/strongly agree</i>	
	Northern Ireland	OECD average
	If I need extra help, I will receive it from my teachers.	90%
Most of my teachers treat me fairly.	88%	79%
Most teachers are interested in students' well-being.	87%	76%
Students get along well with most teachers.	87%	81%
Most of my teachers really listen to what I have to say.	77%	73%

See Chapter 3, section 3.4 for further discussion of the findings from the Student Questionnaire concerning other aspects of teaching practice.

6.3 Resources

The School Questionnaire asked about the extent to which schools had problems with lack of resources or a lack of qualified staff. Table 6.8 summarises responses sorted by frequency for Northern Ireland, plus OECD averages.

The most frequent staffing problem in Northern Ireland was a lack of qualified teachers in subjects other than mathematics, science and English, reported by 18 per cent. Shortages of qualified staff were reported at a slightly lower level in Northern Ireland than across the OECD. However, principals in Northern Ireland reported much higher shortages of resources than the OECD average for all but science laboratory equipment and library materials. Particular shortages or inadequacies were in school buildings and grounds and in IT capabilities – computers, software and internet connectivity.

Ten of the options presented to principals also appeared in PISA 2009. For the four staffing-related options, the proportions of principals reporting them as a hindrance to instruction increased. In particular the proportion saying that a lack of qualified teachers of subjects (other than mathematics, science or English) was a problem increased from four per cent in 2009 to 18 per cent in 2012. The resource-related options also saw increases between 2009 and 2012 (except for shortages of library materials). The differences in the proportions for the remaining items was ten per cent or greater, with the largest increase being for “Lack or inadequacy of internet connectivity” which was reported by 22 per cent of principals in 2009 compared with 43 per cent in 2012.

Table 6.8 Staffing and resources

Is your school's capacity to provide instruction hindered by any of the following issues?		
	<i>to some extent/a lot</i>	
	Northern Ireland	OECD average
Staffing		
A lack of qualified teachers of other subjects	18%	20%
A lack of qualified mathematics teachers	11%	17%
A lack of qualified science teachers	10%	17%
A lack of qualified English teachers	6%	9%
Resources		
Shortage or inadequacy of school buildings and grounds	62%	34%
Shortage or inadequacy of computers for instruction	58%	33%
Shortage or inadequacy of computer software for instruction	43%	31%
Lack or inadequacy of internet connectivity	43%	21%
Shortage or inadequacy of instructional space (e.g. classrooms)	38%	32%
Shortage or inadequacy of heating/cooling and lighting systems	29%	23%
Shortage or inadequacy of science laboratory equipment	26%	30%
Shortage or inadequacy of instructional materials (e.g. textbooks)	23%	19%
Shortage or inadequacy of library materials	17%	25%

6.4 Assessment

The school questionnaire asked about the purposes of assessment within the school. As shown in Table 6.9, schools in Northern Ireland use assessments for a variety of purposes in the vast majority of cases, and assessments were used for each purpose more than on average in the OECD. All principals in Northern Ireland reported that assessments were used to inform parents about their child's progress and to monitor the school's progress; 96 per cent used assessments to compare the school's performance with local or national performance and 94 per cent to identify areas to be improved. Across the OECD, the only similarly high response was given for using assessment to inform parents about their child's progress.

The percentages for Northern Ireland are similar to those reported in 2009 by principals. The largest differences are for two items. The proportions of principals saying that assessments are used "To make decisions about students' retention or promotion" in their schools increased from 69 to 84 per cent. Similarly for, "To group students for instructional purposes", the increase was from 64 to 83 per cent.

Table 6.9 Purposes of assessment

In your school, are assessments used for any of the following purposes for students in Years 11 and 12?		
	Yes	
	Northern Ireland	OECD average
To inform parents about their child's progress	100%	97%
To monitor the school's progress from year to year	100%	80%
To compare the school to local or national performance	96%	62%
To identify aspects of instruction or the curriculum that could be improved	94%	79%
To compare the school with other schools	90%	51%
To make decisions about students' retention or promotion	84%	76%
To group students for instructional purposes	83%	50%
To make judgements about teachers' effectiveness	63%	50%

6.5 Summary

Principals reported a high degree of responsibility for most aspects of management of their schools, generally to a degree greater than the OECD average. School governing bodies also had a large influence. Local or national education authorities had responsibility for financial matters. Compared with the findings from PISA 2009, the role of national education authorities had reduced while the role of local authorities remained the same. Principals in Northern Ireland also reported a higher frequency for most school leadership activities than their OECD counterparts, with over 70 per cent of principals in Northern Ireland saying they worked to enhance the school's reputation in the community.

Principals in Northern Ireland reported that staffing shortages had increased since 2009. The biggest staffing issue in this survey was a shortage of qualified teachers of subjects other than mathematics, science or English. In 2009, four per cent of principals said it hindered instruction to some extent or a lot, compared with 18 per cent in 2012. The most frequently reported resource problem was shortage or inadequacy of school buildings and grounds.

Responses to the School Questionnaire on issues which hinder learning showed a more positive school climate than the OECD average for most aspects. This was particularly the case for problems related to pupil behaviour. Pupils were, on the whole, positive about the climate of their school, although they were least positive about the extent to which they felt their teachers listened to them. They were generally more positive about their relationship with their teachers than the OECD average.

Pupil assessments served various purposes, the most frequent being to inform parents, to monitor year-on-year progress and compare the school to local or national performance. Assessments were used more frequently in Northern Ireland for a wider variety of reasons than across the OECD on average.

7 PISA in the UK

Chapter outline

This chapter describes some of the main outcomes of the PISA survey in England, Wales, Northern Ireland and Scotland. In particular, it outlines some aspects where there were differences in attainment, in the range of attainment, in the pattern of gender differences or in responses to the School and Student Questionnaires.

Key findings

- Across mathematics, science and reading, there were no significant differences between Scotland, England and Northern Ireland, with the exception of mathematics where Scotland scored significantly higher than Northern Ireland.
- In all subjects, scores for Wales were significantly below those of other UK countries and the OECD average.
- England had the widest spread of attainment in all three subjects.
- Scotland had the smallest percentage of pupils working at the lowest levels in all three subjects and their low achievers scored more highly in all subjects.
- England had the highest proportion of pupils working at Levels 5 and above, and their high achievers scored more highly in all subjects.
- Northern Ireland was the only country where boys did not significantly outperform girls in mathematics and science.
- In all subjects, Scotland had the lowest percentage of pupils at Level 1 or below, while Wales had the lowest percentage at Levels 5 and above. This pattern is consistent with findings from the 2006 and 2009 surveys.

Mathematics

- Scores in Scotland and England were similar to the OECD average. However, scores in Northern Ireland and Wales were significantly lower than the OECD average.
- Scores in Wales were lower and significantly different from those in the rest of the UK.
- Scotland had the lowest percentage of pupils working below Level 1 in mathematics (4.9 per cent).
- In each of the UK countries, gender gaps for mathematics were similar to the OECD average; however they were smaller than in many other countries.

Science

- In science, there were no significant differences between England, Scotland and Northern Ireland, but the mean score in Wales was significantly lower.
- The spread of attainment was less in Scotland than in the other parts of the UK.
- Scotland's lowest attainers in science scored 28 points higher than low attainers across the OECD and at least 22 points higher than low attainers in the rest of the UK.
- The difference between the performance of boys and girls in science was much larger in the UK than across the OECD in general, particularly in England and Wales.

Reading

- In reading, there were no significant differences between England, Scotland and Northern Ireland but the mean score in Wales was significantly lower.
- England had the widest spread of attainment for reading.
- Girls outperformed boys in all parts of the UK, as they did in every other country in the PISA survey.

Schools and pupils

- More principals in England reported informal observations in classrooms and weekly evaluations of staff, and fewer reported these in Northern Ireland.
- Principals in Scotland reported greater involvement of local authorities in dismissing teachers, formulating budgets and establishing assessment policies, and less involvement of governing bodies compared with other UK countries. They were also most likely to report that truancy hindered learning, or to report problems with pupils skipping classes or disrupting classes.
- Principals in Northern Ireland reported greater shortages or inadequacy of computers for instruction, instructional space (e.g. classrooms), and school buildings and grounds than those in England, Scotland and Wales.
- In Scotland, 36 per cent of teachers reported a shortage of qualified subject teachers, other than in mathematics, science or reading; this was at least twice as many as in other UK countries.
- Differences between the responses of pupils in the different UK countries were minimal.
- Pupils in England were more likely to say that they looked forward to mathematics lessons.
- Pupils in Northern Ireland were more likely to report that they often worried about mathematics classes.
- The mean scores for UK countries on the PISA index of economic, social and cultural status (ESCS) all indicate that on average pupils in the PISA samples in the UK have a higher socio-economic status than the average across OECD countries.
- Only in Northern Ireland did the figures indicate that more disadvantaged pupils have significantly less chance of performing well.

7.1 Mathematics

This section compares the findings outlined in Chapter 2 with the comparable findings for the other parts of the UK.

7.1.1 Mean scores in mathematics

Table 7.1 summarises the mean scores for each of England, Wales, Northern Ireland and Scotland on the mathematics achievement scale. The highest attainment for mathematics was in Scotland, followed by England and then Northern Ireland. However, scores between Scotland and England or between Northern Ireland and England were similar and differences were not significant. The lack of a significant difference between the mean scores of England and Northern Ireland does not reflect the finding for TIMSS Grade 4 (9-10-year-olds) where pupils in Northern

Ireland performed at a significantly higher level than pupils in England. However the mean score in Northern Ireland was significantly lower than that in Scotland. The lowest attainment was in Wales, where the mean score was significantly lower than the other constituent parts of the UK.

Table 7.1 Mean scores for mathematics overall

	Mean	S	E	NI	W	OECD
Scotland	498		NS	S	S	NS
England	495	NS		NS	S	NS
Northern Ireland	487	S	NS		S	S
Wales	468	S	S	S		S
OECD average	494	NS	NS	S	S	

S = significantly different NS = no significant difference

On the four content subscales, more differences emerged. Scores in these areas are shown in Tables 7.2 to 7.5 All four countries showed some difference between the mean score in each of the content areas and their overall mean score, with the exception of England where there was no difference between the mean score for *quantity* and the overall score for mathematics. However, the biggest difference for all countries was found in the *space and shape* subscale; and for all countries, their lowest mean score was in this content area. All four parts of the UK scored higher on the *uncertainty and data* subscale compared with their overall mathematics score. This suggests that in all four parts of the UK, pupils are relatively strong on the questions that focus on probability and statistics (*uncertainty and data*) and they are less strong on questions that focus on aspects of *space and shape*.

Wales' scores in all four content areas were significantly lower than those for the other three countries. Scotland's scores were significantly higher than Northern Ireland's in all content areas apart from *uncertainty and data*. England's scores on two content areas (*change and relationships* and *space and shape*) were significantly higher than Northern Ireland's.

Table 7.2 Mean scores on the Quantity scale

	Mean	Scotland	England	Northern Ireland	Wales
Scotland	501		NS	S	S
England	495	NS		NS	S
Northern Ireland	491	S	NS		S
Wales	465	S	S	S	

S = significantly different NS = no significant difference

Table 7.3 Mean scores on the Uncertainty and data scale

	Mean	Scotland	England	Northern Ireland	Wales
Scotland	504		NS	NS	S
England	503	NS		NS	S
Northern Ireland	496	NS	NS		S
Wales	483	S	S	S	

S = significantly different NS = no significant difference

Table 7.4 Mean scores on the Change and relationships scale

	Mean	Scotland	England	Northern Ireland	Wales
Scotland	497		NS	S	S
England	498	NS		S	S
Northern Ireland	486	S	S		S
Wales	470	S	S	S	

S = significantly different NS = no significant difference

Table 7.5 Mean scores on the Space and shape scale

	Mean	Scotland	England	Northern Ireland	Wales
Scotland	482		NS	S	S
England	477	NS		S	S
Northern Ireland	463	S	S		S
Wales	444	S	S	S	

S = significantly different NS = no significant difference

Tables 7.6 to 7.8 show mean scores on the process subscales: *formulate*, *employ* and *interpret*. In all four parts of the UK, pupils were relatively stronger on the *interpret* subscale and relatively weaker on the other two subscales. As was the case for the content areas, Wales' scores in the three process subscales were significantly lower than all other parts of the UK.

Table 7.6 Mean scores on the Formulate scale

	<i>Mean</i>	Scotland	England	Northern Ireland	Wales
Scotland	490		NS	S	S
England	491	NS		NS	S
Northern Ireland	479	S	NS		S
Wales	457	S	S	S	

S = significantly different NS = no significant difference

Table 7.7 Mean scores on the Employ scale

	<i>Mean</i>	Scotland	England	Northern Ireland	Wales
Scotland	496		NS	S	S
England	493	NS		NS	S
Northern Ireland	486	S	NS		S
Wales	466	S	S	S	

S = significantly different NS = no significant difference

Table 7.8 Mean scores on the Interpret scale

	<i>Mean</i>	Scotland	England	Northern Ireland	Wales
Scotland	510		NS	S	S
England	502	NS		NS	S
Northern Ireland	496	S	NS		S
Wales	483	S	S	S	

S = significantly different NS = no significant difference

7.1.2 Distribution of performance in mathematics

Chapter 2 showed that there was some degree of variation around the mean score for mathematics in all countries, as would be expected. The size of this variation indicates the extent of the gap between low and high attaining pupils. This can be seen by comparing the scores of pupils at the 5th percentile (low attainers) and that of pupils at the 95th percentile (high attainers).

The scores at the 5th and the 95th percentile and the differences³ between them are shown in Table 7.9 The difference between the OECD average score at the 5th percentile and at the 95th percentile was 301 score points. The range was wider than this in England and Northern Ireland and narrower in Scotland and Wales. The highest difference of 316 was found in England.

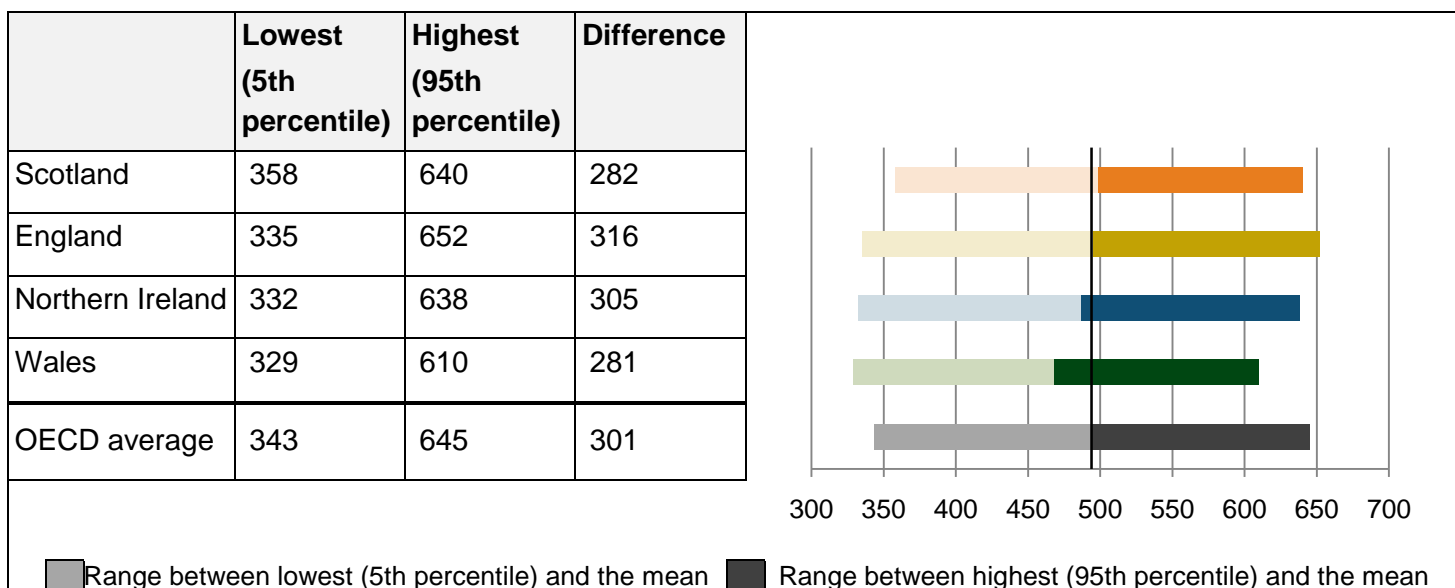
³ Differences have been calculated using unrounded mean scores.

The lowest scoring pupils in England, Northern Ireland and Wales performed slightly less well than the OECD average at the 5th percentile. However, in Scotland, the score of 358 at the 5th percentile was 15 points higher than the OECD average of 343.

At the highest percentile, the OECD average was 645 and the equivalent score in England was seven points above this. The scores at the highest percentile in Wales, Northern Ireland and Scotland were lower than the OECD average; the largest difference was in Wales where the highest performers scored 35 points below the OECD average.

The impact of socio-economic status is discussed in section 7.4.2.1.

Table 7.9 Scores of highest and lowest achieving pupils in mathematics



Differences have been calculated using unrounded scores.

Full information on the distribution of performance is in Appendix B2.

7.1.3 Percentages at each level in mathematics

The range of achievement in each country is further emphasised by the percentages of pupils at each of the PISA proficiency levels. These percentages are summarised in Figure 7.1, which shows that all parts of the UK have some pupils at the top and bottom of the achievement range, but that the percentages vary in each case.

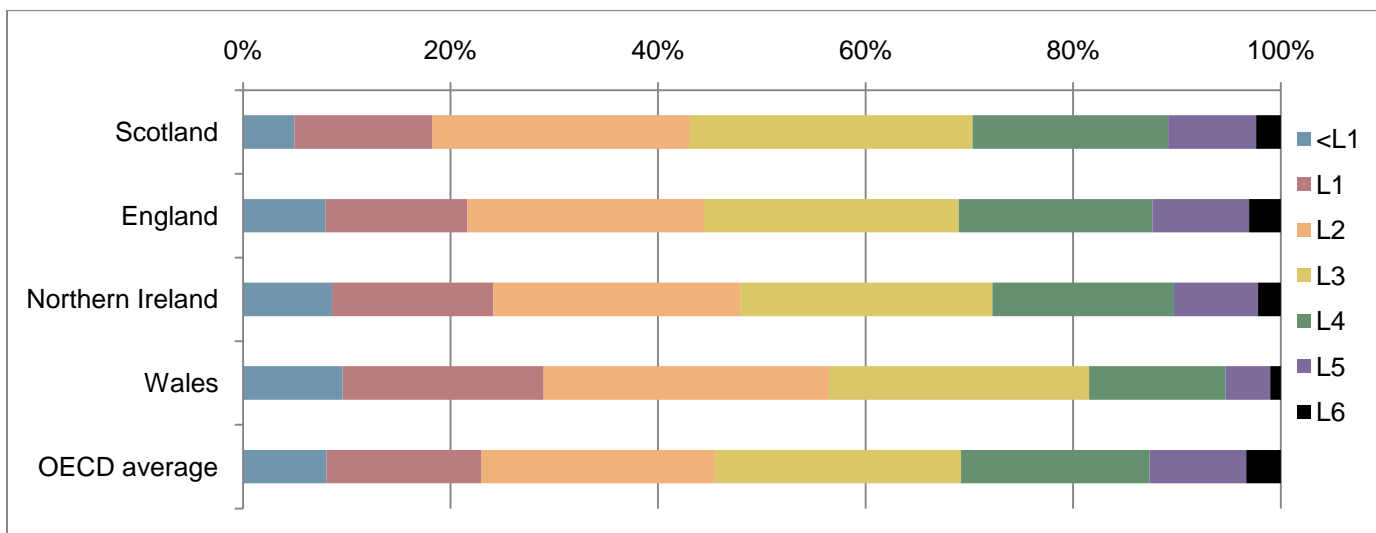
Scotland had the lowest percentage of pupils working below Level 1 in mathematics (4.9 per cent). This compares with the OECD average of 8.0 per cent. In England and Northern Ireland the proportion of pupils working at the lowest level of proficiency in mathematics was close to, or the same as, the OECD average (8 and 8.6 per cent respectively). At 9.6 per cent, Wales had the largest percentage of pupils working below Level 1, which was above the OECD average.

This pattern is highlighted when pupils at Level 1 and below are combined. Scotland had 18.3 per cent working at the lowest proficiency levels in mathematics, England 21.6 per cent, Northern Ireland 24.1 per cent and Wales 29.0 per cent. The OECD average was 23.0 per cent.

At the other end of the scale, all four parts of the UK had a lower percentage of pupils than the OECD average at Level 6 (3.3), although for England this difference from the OECD average is small and unlikely to be statistically significant.

When the top two levels (Levels 5 and 6) are combined, further differences emerge. England's proportion of high achievers (12.4 per cent) was comparable with the OECD average of 12.6 per cent. Northern Ireland and Scotland were slightly below, with 10.3 and 10.8 per cent respectively. Wales had 5.3 per cent of pupils working at the highest levels of proficiency in mathematics, a lower proportion than the other parts of the UK or the OECD average.

Figure 7.1 Percentages at PISA mathematics levels



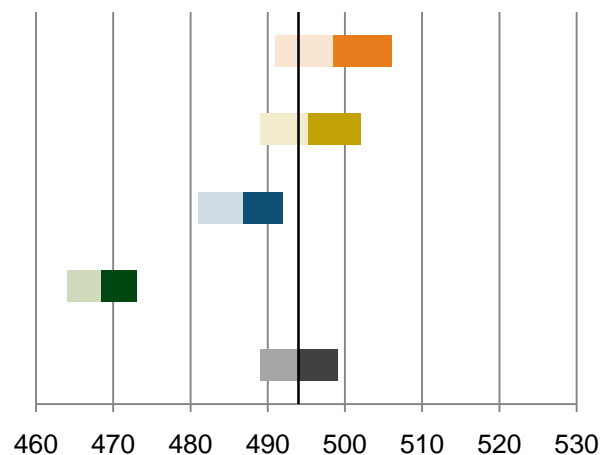
Full information on the percentages at each level is presented in Appendices B19 and B20. Level descriptions showing full details of the expected performance at each of the PISA mathematics levels are provided in Figure 2.5 in Chapter 2. It should be noted that the PISA levels are not the same as levels used in any of the educational systems of the UK.

7.1.4 Gender differences in mathematics

There were differences in the four parts of the UK in terms of the achievement of boys and girls. Table 7.10 shows the mean scores for boys and girls and highlights differences that were statistically significant.

Table 7.10 Mean scores of boys and girls in mathematics

	Overall mean score	Mean score of boys	Mean score of girls	Difference
Scotland	498	506	491	14*
England	495	502	489	13*
Northern Ireland	487	492	481	10
Wales	468	473	464	9*
OECD average	494	499	489	11*



Range between girls' mean score and the mathematics mean
 Range between boys' mean score and the mathematics mean

* Statistically significant difference

Differences have been calculated using unrounded mean scores

In all cases, boys had a higher mean score than girls and, apart from in Northern Ireland, these differences were statistically significant. The differences in Scotland and England were of a similar size, whereas in Wales the difference was slightly smaller. In all parts of the UK the differences between boys and girls were not as great as those in some other countries and were similar to the OECD average.

Tables 7.11 to 7.13 show the gender differences on each of the mathematics subscales. As was the case for the overall mean score, in Northern Ireland there were no significant gender differences on the mathematics subscales. For the other three countries in the UK there were no clear patterns in terms of gender differences. In England and Wales the largest difference was on the *change and relationships* subscale, whereas for Scotland the largest difference was on the *space and shape* subscale. This is in contrast to the OECD average, where the largest difference was on the *formulate* subscale. The findings for the four constituent parts of the UK reflect what is seen across the comparison countries; that is, considerable variation in the pattern of gender differences across the subscales for mathematics.

Table 7.11 Mean scores of boys and girls in the mathematics content areas of quantity and uncertainty and data

	<i>quantity</i>				<i>uncertainty and data</i>			
	<i>all</i>	<i>boys</i>	<i>girls</i>	<i>diff (b-g)</i>	<i>all</i>	<i>boys</i>	<i>girls</i>	<i>diff (b-g)</i>
Scotland	501	506	495	11*	504	510	498	12*
England	495	502	489	14*	503	511	497	14*
Northern Ireland	491	495	487	8	496	501	491	10
Wales	465	470	460	10*	483	487	478	9*
OECD average	495	501	490	11*	493	497	489	9*

* statistically significant difference Differences have been calculated using unrounded mean scores.

Table 7.12 Mean scores of boys and girls in the mathematics content areas of change and relationships and space and shape

	<i>change and relationships</i>				<i>space and shape</i>			
	<i>all</i>	<i>boys</i>	<i>girls</i>	<i>diff (b-g)</i>	<i>all</i>	<i>boys</i>	<i>girls</i>	<i>diff (b-g)</i>
Scotland	497	506	487	19*	482	492	471	21*
England	498	506	490	15*	477	484	471	13*
Northern Ireland	486	491	479	12	463	467	460	7
Wales	470	476	463	13*	444	449	439	10*
OECD average	493	498	487	11*	490	497	482	15*

* statistically significant difference Differences have been calculated using unrounded mean scores.

Table 7.13 Mean scores of boys and girls in the mathematics process subscales

	<i>formulate</i>				<i>employ</i>				<i>interpret</i>			
	<i>all</i>	<i>boys</i>	<i>girls</i>	<i>diff (b-g)</i>	<i>all</i>	<i>boys</i>	<i>girls</i>	<i>diff (b-g)</i>	<i>all</i>	<i>boys</i>	<i>girls</i>	<i>diff (b-g)</i>
Scotland	490	499	481	18*	496	504	488	16*	510	516	504	12*
England	491	497	485	12	493	499	487	12*	502	509	495	14*
Northern Ireland	479	484	474	10	486	491	481	10	496	500	491	8
Wales	457	463	452	11*	466	470	461	9*	483	489	477	12*
OECD average	492	499	484	16*	493	498	489	9*	497	502	492	9*

* statistically significant difference Differences have been calculated using unrounded mean scores.

7.1.5 Summary

This section has reviewed performance across the UK in mathematics. It shows that there were some significant differences in performance between the four countries of the UK. Scores overall and across the different subscales in Wales were lower than those in the rest of the UK and these differences were significant. The mean score in Northern Ireland was significantly lower than that

in Scotland, but there were no significant differences between Scotland and England, or between Northern Ireland and England.

The difference between the achievement of the highest attaining and the lowest attaining pupils in England and Northern Ireland was above the OECD average; this difference was more pronounced in England. England had a higher proportion of high scoring pupils than the rest of the UK and Scotland had the lowest proportion of low scoring pupils. Wales had a higher proportion of low attaining pupils and fewer high attaining pupils than the other parts of the UK.

In England, Scotland and Wales boys outperformed girls in mathematics. In Northern Ireland boys had a higher overall mean score than girls, but this difference was not statistically significant. The gender gaps in these countries were similar to the OECD average; however they were smaller than in many other countries.

7.2 Science

This section compares the findings outlined in Chapter 4 with the comparable findings for the other parts of the UK.

Science was a minor domain in the PISA 2012 survey.

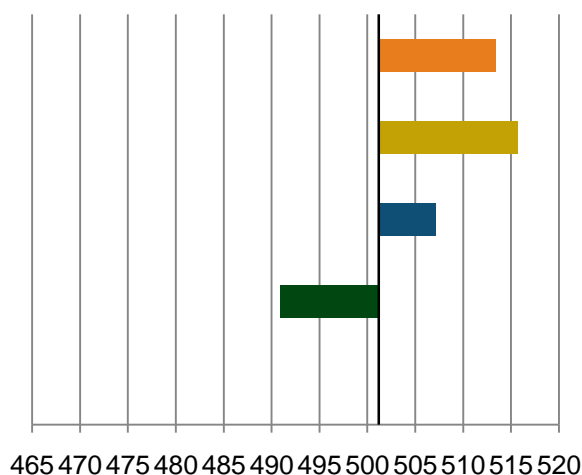
7.2.1 Mean scores in science

Table 7.14 below shows the mean scores in England, Wales, Northern Ireland and Scotland for science and indicates any significant differences between countries. Full data can be found in Appendix C2.

The highest attainment for science was in England, followed by Scotland and then Northern Ireland. However, the scores were very similar and there were no significant differences between these three countries. The lowest attainment was in Wales, where the mean score for science was significantly lower than in the rest of the UK.

Table 7.14 Mean scores for science

	<i>Mean</i>	S	E	NI	W	OECD
Scotland	513		NS	NS	S	S
England	516	NS		NS	S	S
Northern Ireland	507	NS	NS		S	NS
Wales	491	S	S	S		S
OECD average	501	S	S	NS	S	



S = significantly different

NS = no significant difference

7.2.2 Distribution of performance in science

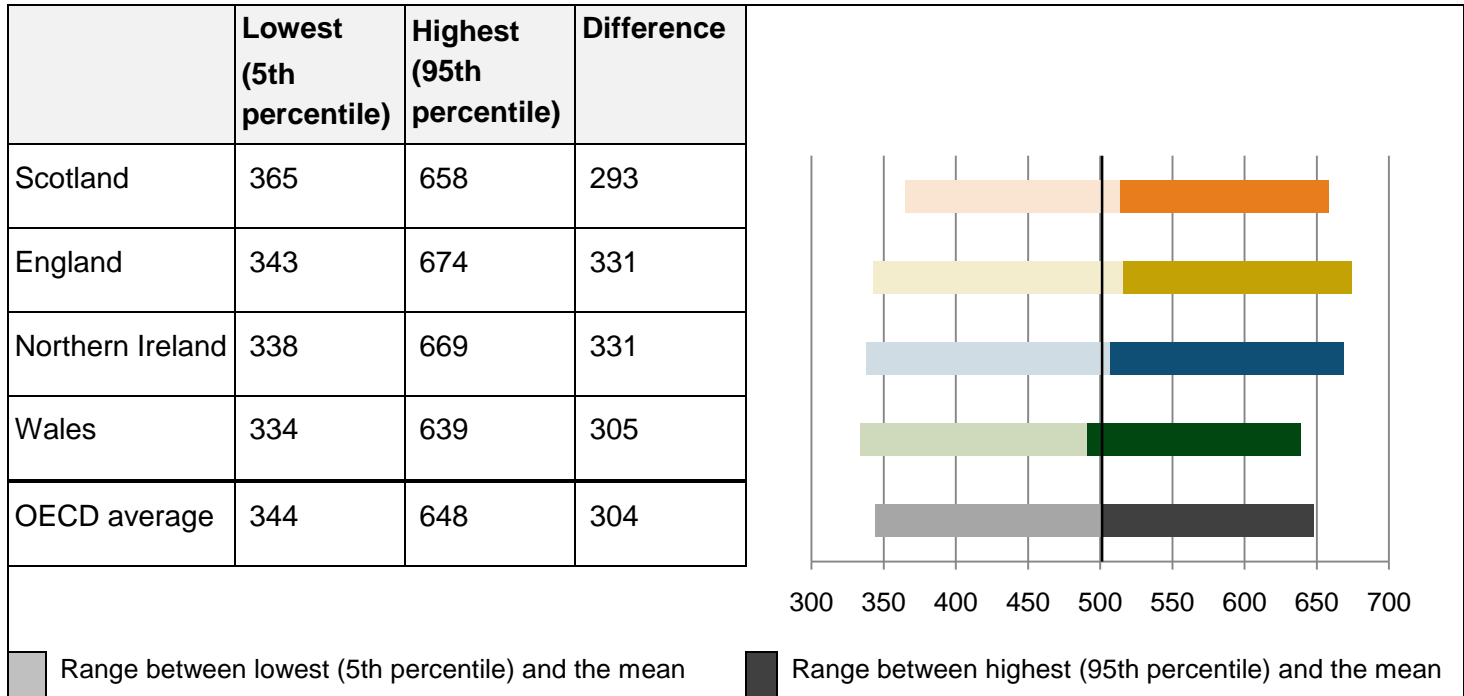
Table 7.15 shows the scores of pupils in each country at the 5th and the 95th percentiles, along with the OECD average score at each of these percentiles. The table indicates the range of scores in each country and also shows the difference in score points at the two percentiles. Full data can be found in Appendix C2.

The mean score achieved by Scotland's lowest achieving pupils was 28 points above the OECD average at the 5th percentile. The means in each of the other UK countries were much closer to the OECD average. The lowest achieving pupils were in Wales, where the mean score at the 5th percentile was slightly lower than the OECD average. Northern Ireland was similar to and England slightly higher than the OECD average.

At the 95th percentile, England's highest achieving pupils had the highest mean score, 19 score points above the OECD average, followed by those in Northern Ireland (14 points above the OECD average). In Scotland the score of the highest achievers in science was similar to the OECD average, while the score of the highest achievers in Wales was 16 score points below it.

Looking at the range of performance, as shown by the difference in score points between the highest and lowest achievers, the largest gaps were in England and Northern Ireland and the smallest in Scotland, as low achievers here scored highly compared with those in the other UK countries.

Table 7.15 Scores of highest and lowest achieving pupils in science



Differences have been calculated using unrounded scores.

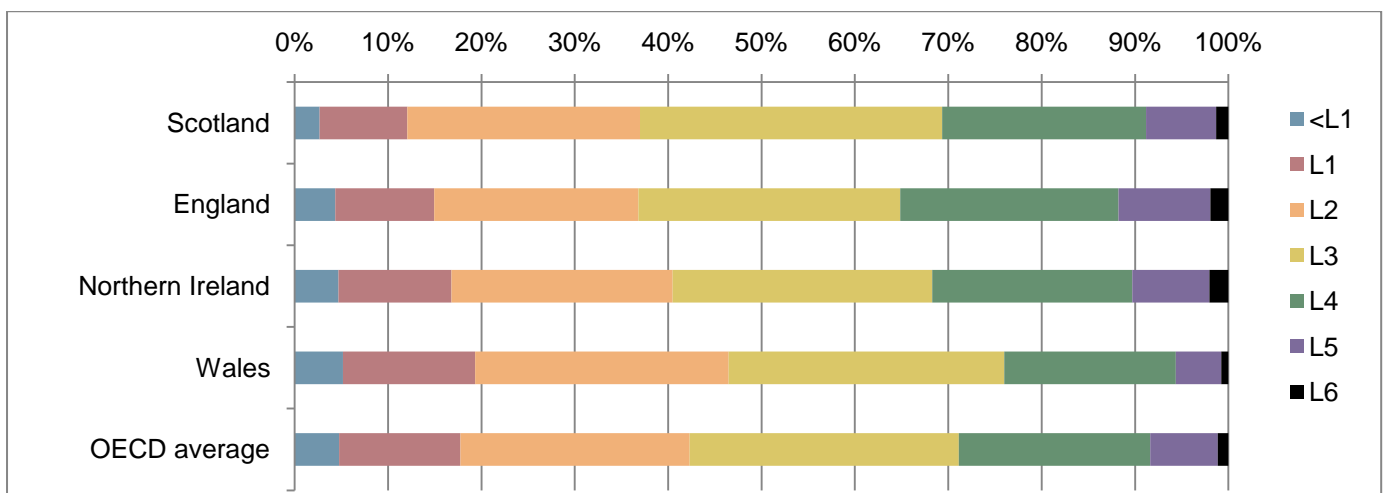
7.2.3 Percentages at each science level

Figure 7.2 shows the percentages of pupils at each of the six levels of science attainment, along with the percentages below Level 1. This indicates that all parts of the UK have some pupils at the top and bottom of the achievement range, but that the percentages vary in each case.

England had the largest percentage of pupils (11.7) at the two highest levels of attainment (Levels 5 and 6), followed by Northern Ireland (10.3); both are higher than the OECD average of 8.4 per cent at these levels. Scotland's proportion at the higher levels (8.8) is similar to the OECD average, but in Wales the proportion of high achievers was lower at 5.7 per cent.

At the other end of the scale, Scotland had the lowest proportion (12.1 per cent) of low attaining pupils at Level 1 and below for science. England had 14.9 per cent of pupils working at the lowest levels of proficiency, Northern Ireland 16.8 per cent and Wales 19.4 per cent. This compares with an OECD average of 17.8 per cent.

Figure 7.2 Percentages at PISA science levels



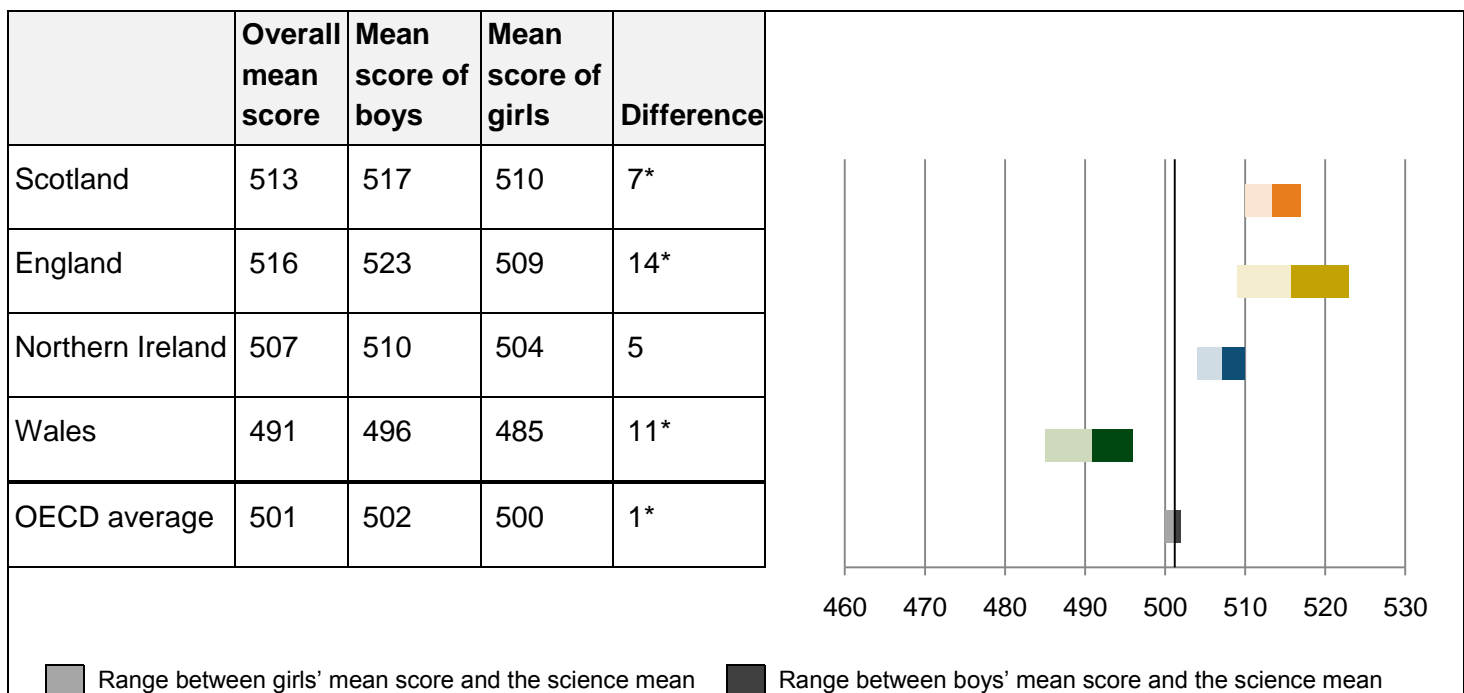
Full information on the percentages at each level is presented in Appendices C4 and C5.

Level descriptions showing full details of the expected performance at each PISA level are in Appendix C3. It should be noted that the PISA levels are not the same as levels used in any of the educational systems of the UK.

7.2.4 Gender differences in science

Table 7.16 shows the mean scores of boys and girls, and the differences in their mean scores. Full data can be found in Appendix C2.

Table 7.16 Mean scores of boys and girls for science



* Statistically significant difference

Differences have been calculated using unrounded mean scores.

Boys' scores were higher than girls' in science in all four of the UK countries. These differences between boys and girls were statistically significant in England, Wales and Scotland, but not significantly different in Northern Ireland. In all cases the differences were larger than the OECD average. The difference between the performance of boys and girls in science was much larger in the UK than across the OECD in general, particularly in England and Wales, where boys scored 14 and 11 points higher respectively, compared with an OECD average of one score point.

7.2.5 Summary

This section has reviewed performance across the UK in science. It shows that there were some significant differences between the four countries of the UK in terms of overall attainment.

Scotland had the lowest range of attainment and the scores of their lowest achieving pupils were much higher than those in the rest of the UK or the OECD on average.

Scores in Wales were lower than those in the rest of the UK and these differences were significant. There were no significant differences between Scotland, England and Northern Ireland.

The difference between the achievement of the highest attaining and the lowest attaining pupils in England and Northern Ireland was above the OECD average. Wales had a higher proportion of low attaining pupils than the other parts of the UK and had fewer high attaining pupils.

In England, Scotland and Wales boys outperformed girls in science. In Northern Ireland boys had a higher overall mean score than girls but this difference was not statistically significant. Among other participating countries there was no clear pattern of gender difference.

The difference between the performance of boys and girls in science was much larger in the UK than across the OECD in general, particularly in England and Wales, where boys scored 14 and 11 points higher, compared with an OECD average of one point.

7.3 Reading

This section compares the findings outlined in Chapter 5 with the comparable findings for the other parts of the UK.

Reading was a minor domain in the PISA 2012 survey.

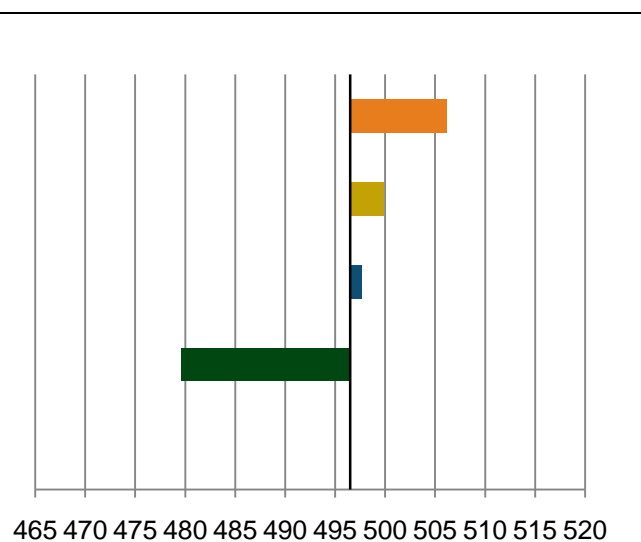
7.3.1 Mean scores for reading

Table 7.17 below shows the mean scores of England, Wales, Northern Ireland and Scotland for reading, and indicates some significant differences between the countries. Full data can be found in Appendix D2.

The mean reading scores achieved in England, Scotland and Northern Ireland were very similar, with no significant differences. The lowest attainment in reading was seen in Wales, where the mean score was significantly lower than the rest of the UK, and the OECD generally.

Table 7.17 Mean scores for reading

	Mean	S	E	NI	W	OECD
Scotland	506		NS	NS	S	S
England	500	NS		NS	S	NS
Northern Ireland	498	NS	NS		S	NS
Wales	480	S	S	S		S
OECD average	496	S	NS	NS	S	



S = significantly different

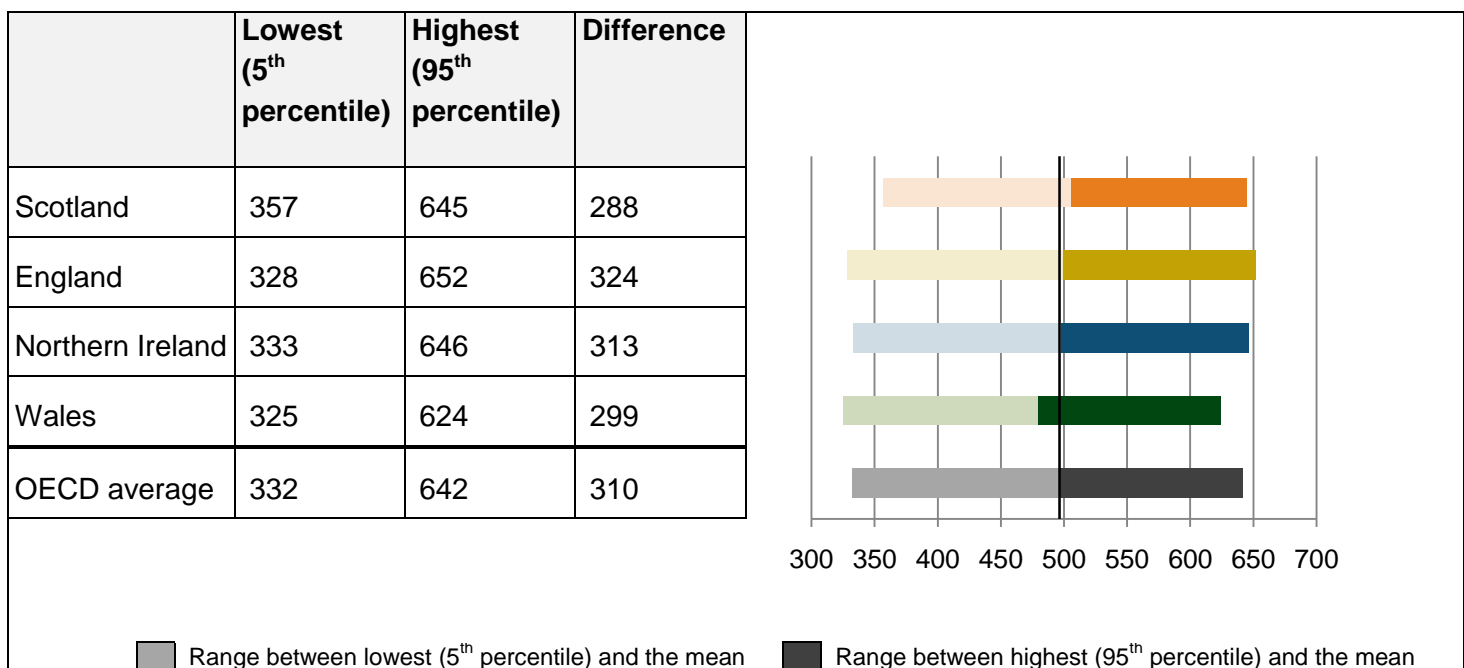
NS = no significant difference

7.3.2 Distribution of performance in reading

Table 7.18 shows the scores of pupils in each country at the 5th and 95th percentiles, along with the OECD average score at each of these percentiles. The table indicates the range of scores in each country and also shows the difference in score points at the two percentiles. Full data can be found in Appendix D2.

Looking at the range of performance as shown by the difference in score points between the highest and lowest achievers, the largest performance range was in England and the smallest in Scotland.

Table 7.18 Scores of highest and lowest achieving pupils in reading



Differences have been calculated using unrounded scores.

Table 7.18 shows that the lowest attaining pupils in Scotland achieved higher scores than the lowest attaining pupils in England, Wales and Northern Ireland. At the 95th percentile, the highest scoring pupils were in England, followed by Northern Ireland and Scotland. The lowest scores at both percentiles were in Wales, both of which were lower than the OECD average, as was the score for the lowest achievers in England.

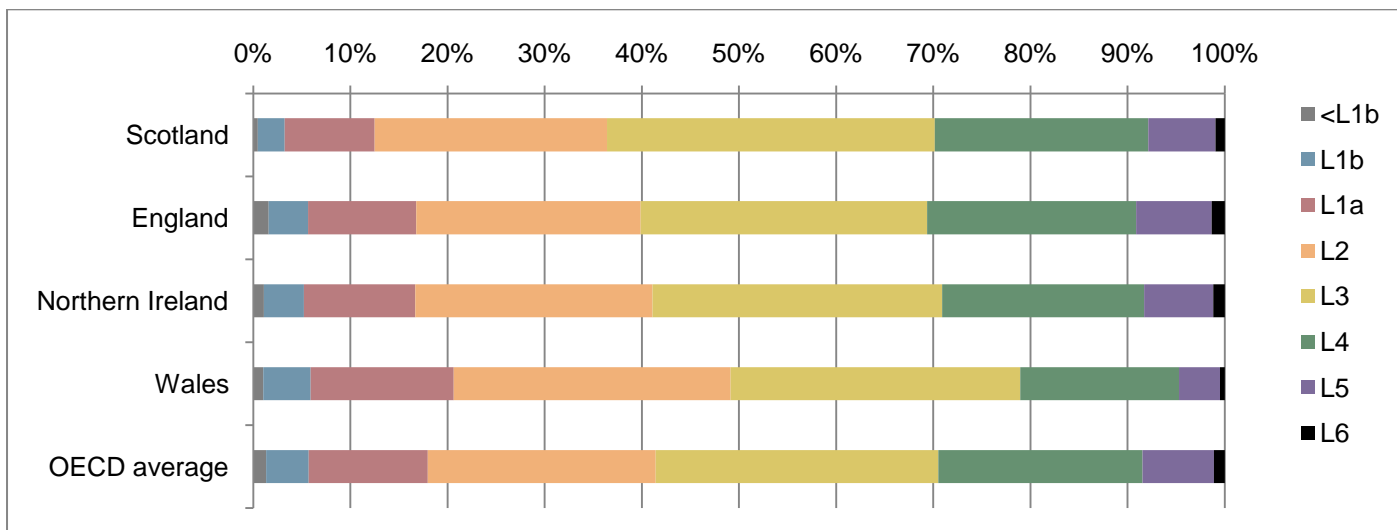
7.3.3 Percentages at each reading level

Figure 7.3 shows the percentages of pupils at each of the seven PISA levels of reading attainment, along with the percentages below Level 1b.

The information in this figure adds to that discussed above and shows that both England and Northern Ireland had a slightly higher proportion of pupils than Scotland at the top two levels (Levels 5 and 6), but also higher proportions below Level 1a. Scotland had the lowest percentage of pupils at Level 1a or below, while Wales had the lowest percentage at Levels 5 and 6. This pattern is consistent with findings from the 2006 and 2009 surveys.

Full data can be found in Appendices D4 and D5. Level descriptions showing full details of the expected performance at each PISA level are in Appendix D3. It should be noted that the PISA levels are not the same as levels used in any of the educational systems of the UK.

Figure 7.3 Percentages at PISA reading levels

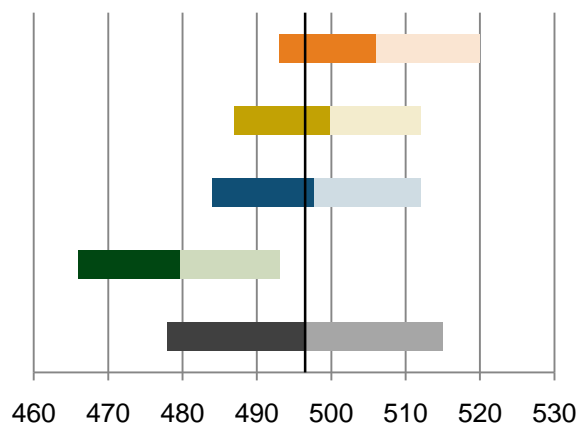


7.3.4 Gender differences in reading

Table 7.19 shows the mean scores of boys and girls, and the difference in their mean scores. Full data can be found in Appendix D2. In all constituent countries of the UK and across the OECD on average, girls had significantly higher mean scores than boys.

Table 7.19 Mean scores of boys and girls for reading

	Overall mean score	Mean score of boys	Mean score of girls	Difference
Scotland	506	493	520	27*
England	500	487	512	24*
Northern Ireland	498	484	512	27*
Wales	480	466	493	27*
OECD average	496	478	515	38*



Legend: Range between boys' mean score and the reading mean Range between girls' mean score and the reading mean

* Statistically significant difference
Differences have been calculated using unrounded mean scores

7.3.5 Summary

This section has reviewed performance across the UK in reading. It shows that there were some significant differences between the four countries of the UK in terms of overall attainment.

Scotland had the narrowest range of attainment and the scores of their lowest achieving pupils were much higher than those in the rest of the UK or the OECD on average.

Scores in Wales were significantly lower than those in the rest of the UK and the OECD average. There were no significant differences between Scotland, England or Northern Ireland. Scotland's overall mean was significantly higher than the OECD average, while England's and Northern Ireland's were not.

The spread of achievement in England and Northern Ireland was wider than the OECD average; for Scotland and Wales the spread was narrower than the OECD average. Wales had a higher proportion of low attaining pupils than the other parts of the UK and a lower proportion of high attaining pupils.

In each of the UK countries, girls outperformed boys in reading, as they did in every participating country.

7.4 Schools and pupils

This section looks at similarities and differences in findings from the School and Student Questionnaires between England, Wales, Northern Ireland and Scotland.

7.4.1 School differences

When principals were asked about the management of their schools, the responses of principals in Scotland differed from those of principals in the rest of the UK. The role of school governing bodies was much smaller in Scotland, while the role of local authorities in dismissing teachers, formulating budgets and establishing assessment policies was greater. Principals in Scotland also had less of a role in salary matters and formulating the school budget than their colleagues in the rest of the UK.

There was some variation across UK countries in the leadership behaviours reported by principals. Differences greater than 30 per cent were seen for two behaviours that were asked about in the School Questionnaire; 60 per cent of principals in England reported that they conduct informal observations in classrooms at least once a week, while in Northern Ireland this was reported by only 13 per cent of principals. Weekly evaluations of staff were reported by 12 per cent of principals in Northern Ireland, while 44 per cent of principals in England said this was the case.

In England only four per cent of principals said that truancy hindered learning to some extent or a lot. Principals in Wales, Northern Ireland and Scotland reported that it was a greater problem, with the largest proportion (23 per cent) being reported by principals in Scotland. Principals in Scotland were also more likely to report problems with pupils skipping classes (than principals in England

and Northern Ireland) and with pupils lacking respect and disrupting classes (compared with principals in England).

For the question asking about issues hindering the school's capacity to provide instruction, there were a number of differences in the proportions of responses between UK countries. In particular, more issues were reported in Northern Ireland than in other parts of the UK. Most notably, principals in Northern Ireland reported greater shortages or inadequacy of computers for instruction (58 per cent), instructional space, e.g. classrooms (38 per cent), and school buildings and grounds (62 per cent) than principals in England, Scotland and Wales. Another considerable difference was seen between Scotland and the other UK countries concerning a lack of qualified teachers of subjects (other than mathematics, science or reading). In Scotland, 36 per cent of teachers said that this shortage hindered instruction in their schools; in England this was just seven per cent (with figures of 16 and 18 per cent in Wales and Northern Ireland respectively).

There were a number of differences among the UK countries in responses to questions about the purposes for which pupils in Years 10 and 11 (or equivalent) were assessed. The greatest difference was seen for the purpose of making judgements about teachers' effectiveness. While assessments were used by 63 per cent of schools in Northern Ireland for this purpose, this compared with over three quarters of schools in Wales and Scotland, and 86 per cent in England.

There were only small differences between UK countries for questions relating to principals' perceptions of teacher morale, discipline issues in mathematics lessons as viewed by pupils, and pupils' opinions of their relationships with their teachers.

7.4.2 Pupil differences

The amount of variation between countries in the UK was low for a number of the issues explored in the Student Questionnaire. These included: pupils' sense of belonging at school; perceived control of success in mathematics (and self-responsibility for failing in mathematics); conscientiousness and perseverance; openness to problem solving; beliefs about friends' and parents' views on mathematics; confidence in tackling mathematics problems; mathematics behaviours at school and outside of school; and views on the supportiveness of teachers.

For the questions looking at attitudes to school, there was little difference between the UK countries. One point of difference was that more pupils in Northern Ireland and Scotland than in Wales were positive about the usefulness of school; pupils in Wales were less likely to disagree with the statement "School has done little to prepare me for adult life when I leave school".

There were few differences between UK countries in the proportions of pupils saying they enjoy mathematics, or understand that it is important. The biggest difference was seen for pupils in England, who were more likely to say that they look forward to their mathematics lessons compared with pupils in Northern Ireland (52 and 42 per cent respectively).

There was little variation between countries in the measure of pupils' anxiety and self-concept in relation to mathematics. However, pupils in Northern Ireland were more likely than those in England to report that they often worry that it will be difficult for them in mathematics classes (57 per cent in Northern Ireland compared with 46 per cent in England).

When asked about instructional strategies used by teachers in their mathematics lessons, pupil responses in the different UK countries did not indicate a high level of variation. However, for the statement “The teacher gives different work to classmates who have difficulties learning and/or to those who can advance faster”, there were differences. The percentages indicate that there is less variation in the work given within classes in Northern Ireland and Wales than in Scotland and England. Pupils in England also agreed more frequently than those in Northern Ireland and in Scotland with the statement “The teacher sets clear goals for our learning”. A similar difference between England and Northern Ireland was found for the statement “The teacher tells me about how well I am doing in my mathematics class”.

7.4.2.1 Differences in pupils’ socio-economic status

The mean scores for UK countries on the PISA index of economic, social and cultural status (ESCS) all indicate that on average pupils in the PISA samples in the UK have a higher socio-economic status than the average across OECD countries (the index is set to a mean of zero across OECD countries). The means for England and Northern Ireland were both 0.29, with 0.19 for Wales and 0.13 for Scotland. Appendix E reports the mathematics scores of pupils in each quarter of the index, and shows that pupils in the top quarter of the index in Wales performed at a similar level to those in the third quarter in England.

The change in score for each unit of the index varies around the OECD average for the UK countries, as shown in Appendix E. Across the OECD, a change of one standard deviation on the ESCS Index is related to a predicted difference in score of 39 points. For England and Northern Ireland (with differences of 41 and 45 points respectively) socio-economic background is seen to have a greater effect than the average in OECD countries. In contrast, Scotland and Wales (with differences of 37 and 35 points respectively) show an effect of socio-economic background which is lower than the OECD average.

Looking at the amount of variance in scores which can be explained by socio-economic background gives a better picture of the interaction between mathematics scores and the ESCS Index. This shows the extent to which pupils in each country are able to overcome the predicted effects of socio-economic background. Across the OECD on average, 15 per cent of the variance in scores can be explained by socio-economic background. Of the UK countries, only Northern Ireland has a variance greater than the OECD average (at 17 per cent), while Wales has the lowest percentage (10 per cent). This suggests that socio-economic background has the least impact on performance in mathematics in Wales, whereas it has the biggest impact in Northern Ireland.

7.5 Summary

Across mathematics, science and reading, there were no significant differences between Scotland, England and Northern Ireland, with the exception of mathematics, where Scotland scored significantly higher than Northern Ireland. In all subjects, scores for Wales were significantly below those of other UK countries and the OECD average.

The widest spread of attainment in all three subjects was found in England. England also had the highest proportion of pupils working at Levels 5 and above, and their high achievers (at the 95th

percentile) scored more highly than those in other UK countries in all subjects. Scotland had the lowest proportion of pupils working at Level 1⁴ or below in all three subjects, and their low achievers scored more highly in all subjects.

Scotland had the lowest percentage of pupils at Level 1 or below, while Wales had the lowest percentage at Levels 5 and above. This pattern is consistent with findings from the 2006 and 2009 surveys.

Gender differences followed similar patterns in each of the UK countries, except that in Northern Ireland boys did not significantly outperform girls in mathematics and science.

Mathematics

In mathematics there were some significant differences in performance between the four countries of the UK. Scores in Wales were lower and significantly different from those in the rest of the UK, and the mean score in Northern Ireland was significantly lower than that in Scotland. However, there were no significant differences between Scotland and England or between Northern Ireland and England.

The difference between the achievement of the highest attaining and the lowest attaining pupils in England and Northern Ireland was above the OECD average; this difference was more pronounced in England. Wales had a slightly higher number of low attaining pupils compared with the other parts of the UK, and had fewer high attaining pupils.

In England, Scotland and Wales boys outperformed girls in mathematics. In Northern Ireland boys had a higher overall mean score than girls, but this difference was not statistically significant. The gender gaps in these countries were similar to the OECD average; however they were smaller than in many other countries.

Science

In science there were no significant differences between England, Scotland and Northern Ireland, but the mean score in Wales was significantly lower. The spread of attainment was less in Scotland than in the other parts of the UK. Boys outperformed girls in all parts of the UK and this gender gap was statistically significant in all UK countries except Northern Ireland.

Reading

In reading there were no significant differences between England, Scotland and Northern Ireland, but the mean score in Wales was significantly lower. The spread of attainment between the highest and lowest scoring pupils was widest in England and narrowest in Scotland. Girls outperformed boys in all parts of the UK, as they did in every other country in the PISA survey.

Schools and pupils

Principals in England, Wales and Northern Ireland generally reported similar leadership behaviours, although more principals in England reported informal observations in classrooms and weekly evaluations of staff, and fewer reported these in Northern Ireland.

⁴ Level 1a for reading

In terms of management, principals in Scotland reported greater involvement of local authorities in dismissing teachers, formulating budgets and establishing assessment policies, and less involvement of governing bodies compared with other UK countries.

Principals in Scotland were most likely to report that truancy hindered learning, or to report problems with pupils skipping classes or disrupting classes. Principals in Northern Ireland reported greater shortages or inadequacy of computers for instruction, instructional space (e.g. classrooms), and school buildings and grounds than those in England, Scotland and Wales.

In Scotland, 36 per cent of teachers reported a shortage of qualified subject teachers, other than in mathematics, science or reading; this was at least twice as many as in other UK countries.

Differences between the responses of pupils in the different UK countries were minimal. Slightly more pupils in Wales felt that school had done little to prepare them for adult life. Pupils in England were more likely to say that they looked forward to mathematics lessons. Pupils in Northern Ireland were more likely to report that they often worried about mathematics classes.

Pupil perceptions of instructional strategies indicated that pupils in England and Scotland felt their teachers were more likely to give differentiated work to classmates of different abilities than in other UK countries, and pupils in England were more likely to report that their teacher set clear learning goals.

The mean scores for UK countries on the PISA index of economic, social and cultural status (ESCS) all indicate that on average pupils in the PISA samples in the UK have a higher socio-economic status than the average across OECD countries. However, only in Northern Ireland did the figures indicate that more disadvantaged pupils have significantly less chance of performing as well as their more advantaged peers, compared with their counterparts across the OECD on average.

References

- Bradshaw, J., Sturman, L., Vappula, H., Ager, R. and Wheeler, R. (2007). *Student Achievement in Northern Ireland: Results in Science, Mathematics and Reading Among 15-Year-Olds from the OECD PISA 2006 Study* (OECD Programme for International Student Assessment). Slough: NFER [online]. Available: <https://www.nfer.ac.uk/media/2035/npc04.pdf> [9 March, 2023].
- Bradshaw, J., Ager, R., Burge, B. and Wheeler, R. (2010). PISA 2009: Achievement of 15-Year-Olds in Northern Ireland. Slough: NFER [online]. Available: <https://www.nfer.ac.uk/media/2038/npdz03.pdf> [9 March, 2023].
- Mullis, I., Martin, M., Foy, P. and Drucker, K. (2012). *PIRLS 2011 International Results in Reading*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College [online]. Available: http://timss.bc.edu/pirls2011/downloads/P11_IR_FullBook.pdf [21 November, 2013].
- Mullis, I.V.S., Martin, M.O., Foy, P. and Drucker, K.T. (2012). *PIRLS 2011 International Results in Reading*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College [online]. Available: <http://timss.bc.edu/pirls2011/international-results-pirls.html> [21 November, 2013].
- OECD (2013). 'PISA 2012 mathematics framework.' In: *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy*. Paris: OECD Publishing [online]. Available: http://www.oecd.org/pisa/pisaproducts/PISA%202012%20framework%20e-book_final.pdf [22 November, 2013].
- OECD (2013). *PISA 2012 Results: Ready to Learn: Student Engagement, Attitudes and Motivation (Volume III)*. Paris: OECD. (forthcoming)
- OECD (forthcoming). *PISA 2012 Technical Report*. Paris: OECD.
- Sturman, L., Burge, B., Cook, R. and Weaving, H. (2012). *TIMSS 2011: Mathematics and Science Achievement in England*. Slough: NFER [online]. Available: <http://www.nfer.ac.uk/nfer/publications/TMEZ01/TMEZ01.pdf> [21 November, 2013].
- Sturman, L., Twist, L., Burge, B., Sizmur, J., Bartlett, S., Cook, R., Lynn, L. and Weaving, H. (2012). *PIRLS and TIMSS 2011 in Northern Ireland: Reading, Mathematics and Science*. Slough: NFER [online]. Available: <http://www.nfer.ac.uk/nfer/publications/PRTI01/PRTI01.pdf> [21 November, 2013].

Appendix A Background to the survey

The Programme for International Student Assessment (PISA) is a survey of educational achievement organised by the Organisation for Economic Co-operation and Development (OECD). The following sections outline the development of the survey, what PISA measures, how to interpret the PISA scales, how PISA is administered and details of the PISA sample in Northern Ireland. These sections outline some of the detailed international requirements that countries must meet in order to ensure confidence in the findings.

A1 The development of the survey

The Australian Council for Educational Research (ACER) led the international consortium that designed and implemented the PISA 2012 survey on behalf of the OECD. The 2012 survey built on the experiences of the three previous cycles. By using standardised survey procedures and tests, the survey aims to collect data from around the world that can be compared despite differences in language and culture.

The framework and specification for the survey were agreed internationally by the PISA Governing Board, which comprises of representatives from each participating country, and both the international consortium and participating countries submitted test questions for inclusion in the survey. After the questions were reviewed by an expert panel (convened by the international PISA consortium), countries were invited to comment on their difficulty, cultural appropriateness, and curricular and non-curricular relevance.

A field trial was carried out in every participating country in 2011 and the outcomes of this were used to finalise the contents and format of the tests and questionnaires for the main survey in 2012.

In England, Wales and Northern Ireland, pupils sat the two-hour assessment in November 2012 under test conditions, following the standardised procedures implemented by all countries. In Scotland, the PISA survey was carried out earlier in 2012. With the focus in this round on mathematics, around two-thirds of the questions were on this subject. A proportion of the questions used in the two-hour test were ones used in previous cycles. This provides continuity between cycles that can act as a measure of change. Further details on the test administration are included in A4 below.

Strict international quality standards are applied to all stages of the PISA survey to ensure equivalence in translation and adaptation of instruments, sampling procedures and survey administration in all participating countries.

A2 What PISA measures

This section briefly describes the purposes of the assessment of mathematics, science and reading in PISA 2012. Full details of the framework for the assessment of each subject are in OECD 2012.

A2.1 Mathematics

Mathematics was the main focus in the 2012 and 2003 PISA surveys.

PISA aims to assess pupils' ability to put their mathematical knowledge to functional use in different situations in adult life, rather than to assess what is taught in participating countries. Although PISA does not aim to assess mastery of a curriculum, further analysis of PISA items against the Key Stage 3 and Key Stage 4 curricula in England has shown a good match between the PISA processes and concepts in mathematics and the range of knowledge, skills and understanding in the English National Curriculum (Burdett and Sturman, 2012). It is therefore likely that, even given the differences between the Key Stage 3 and 4 curricula for mathematics in England and Northern Ireland, there will be a similar good match with the mathematics curricula followed by pupils in Northern Ireland.

PISA defines this ability as:

an individual's capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. It assists individuals in recognising the role that mathematics plays in the world and to make the well-founded judgements and decisions needed by constructive, engaged and reflective citizens. (OECD, 2013)

In order to demonstrate this capacity, pupils need to have factual knowledge of mathematics, skills to carry out mathematical operations and methods, and an ability to combine these elements creatively in response to external situations.

PISA recognises the limitations of using a timed assessment in collecting information about something as complex as mathematics in this large-scale survey. It aims to tackle this by having a balanced range of questions that assess different elements of the pupil's mathematical processing ability. This is the process through which a pupil interprets a problem as mathematical and draws on his/her mathematical knowledge and skills to provide a sensible solution to the problem.

PISA prefers context-based questions which require the pupil to engage with the situation and decide how to solve the problem. Most value is placed on tasks that could be met in the real world, in which a person would authentically use mathematics and appropriate mathematical tools, such as a ruler or calculator in a paper based assessment, to solve these problems. Some more abstract questions that are purely mathematical are also included in the PISA survey.

Pupils were asked to show their responses to questions in different ways. About a third of the questions were open response which required the pupils to develop their own responses. These

questions tended to assess broad mathematical constructs. A question in this category typically accepted several different responses as correct and worthy of marks. The rest of the questions were either multiple choice or simple open response questions, with approximately the same number of each. These questions, which tended to assess lower-order skills, had only one correct response. Some examples of PISA mathematics questions are included in Chapter 2.

A2.2 Science

Science was the main focus in PISA 2006 and a minor domain in 2012. It will be the main focus of PISA 2015.

The survey aims to measure not just science as it may be defined within the curriculum of participating countries, but the scientific understanding which is needed in adult life. PISA defines this as the capacity to identify questions, acquire new knowledge, explain scientific phenomena, and draw evidence-based conclusions about science-related issues (OECD, 2007). Those with this capacity also understand the characteristic features of science as a form of human knowledge and enquiry, are aware of how science and technology shape their lives and environments, and are willing and able to engage in science-related issues and with the ideas of science, as a reflective citizen. Therefore, PISA assessments measure not only scientific knowledge, but also scientific competencies and understanding of scientific contexts.

Scientific knowledge constitutes the links that aid understanding of related phenomena. In PISA, while the scientific concepts are familiar (relating to physics, chemistry, biological sciences and earth and space sciences), pupils are asked to *apply* them to the content of the test items and not simply to recall facts.

Scientific competencies are centred on the ability to acquire, interpret and act upon evidence. Three processes are identified in PISA: firstly, identifying scientific issues; secondly, explaining phenomena scientifically; and, thirdly, using scientific evidence.

Scientific contexts concern the application of scientific knowledge and the use of scientific processes. This covers personal, social and global contexts.

The science questions in PISA 2012 were of three types: open constructed response items which required pupils to write longer answers; short open response which required answers of a few words; or closed response (e.g. multiple choice). Approximately a third were of the longer open constructed type which required pupils to develop and explain their response. Such questions were generally two or three mark items.

Although PISA does not aim to assess mastery of a curriculum, further analysis of PISA items against the Key Stage 3 and Key Stage 4 curricula in England has shown a good match between the content areas in PISA science and the range of knowledge, skills and understanding in the English National Curriculum (Burdett and Sturman, 2012). It is therefore likely that, even given the differences between the Key Stage 3 and 4 curricula for mathematics in England and Northern Ireland, there will be a similar good match with the mathematics curricula followed by pupils in Northern Ireland.

A2.3 Reading

Reading was the main focus in the first PISA study in 2000 and also in 2009. It was a minor domain in PISA 2012.

Reading in PISA focuses on the ability of pupils to use information from texts in situations which they encounter in their life. Reading in PISA is defined as ‘understanding, using, reflecting on and engaging with written texts, in order to achieve one’s goals, to develop one’s knowledge and potential, and to participate in society’ (OECD, 2009).

The concept of reading in PISA is defined by three dimensions: the format of the reading material, the type of reading task or reading aspects, and the situation or the use for which the text was constructed.

The first dimension, the text format, divides the reading material or texts into continuous and non-continuous texts. Continuous texts are typically composed of sentences which are organised into paragraphs. Non-continuous texts are not organised in this type of linear format and may require, for example, interpretation of tables or diagrams. Such texts require a different reading approach to that needed with continuous text.

The second dimension is defined by three reading aspects: retrieval of information, interpretation of texts and reflection on and evaluation of texts. Tasks in which pupils retrieve information involve finding single or multiple pieces of information in a text. In interpretation tasks pupils are required to construct meaning and draw inferences from written information. The third type of task requires pupils to reflect on and evaluate texts. In these tasks pupils need to relate information in a text to their prior knowledge, ideas and experiences.

The third dimension is that of situation or context. The texts in the PISA assessment are categorised according to their content and the intended purpose of the text. There are four situations: reading for private use (personal), reading for public use, reading for work (occupational) and reading for education.

The reading items included in PISA 2012 were of three types: open constructed response, short open response or closed response (e.g. multiple choice). Approximately half the questions were of the open response type, while the rest were closed response. Approximately a third were of the longer open constructed type which required pupils to develop and explain their response. Such questions were generally two or three mark questions. The remainder of the open response questions required only short answers.

A3 What the scales mean

PISA uses proficiency levels to describe the types of skills that pupils are likely to demonstrate and the tasks that they are able to complete. Test questions that focus on simple tasks are categorised at lower levels whereas those that are more demanding are categorised at higher levels. The question categorisations are based on both quantitative and qualitative analysis, taking into account question difficulty as well as expert views on the specific cognitive demands of each individual question. All PISA questions have been categorised in this manner.

Pupils described as being at a particular level not only demonstrate the knowledge and skills associated with that level but also the proficiencies required at lower levels. For example, all pupils proficient at Level 3 are also considered to be proficient at Levels 1 and 2. The proficiency level of a pupil is the highest level at which they answer more than half of the questions correctly.

The table below shows the score points for each level in each subject.

	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Science	below 335	335-410	410-484	484-559	559-633	633-708	above 708
Mathematics	below 358	358-420	420-482	482-545	545-607	607-669	above 669

	Below Level 1b	Level 1b	Level 1a	Level 2	Level 3	Level 4	Level 5	Level 6
Reading	below 262	262-335	335-407	407-480	480-553	553-626	626-698	above 698

Every cycle of PISA focuses on a different subject and no one pupil is presented with all PISA questions. Instead, statistical methods are used to estimate the likelihood that the pupil would be able to answer correctly the questions which they have not actually done.

The mean score for each subject scale was set to 500 among OECD countries in the PISA cycle when the subject was the major domain for the first time. Thus, the reading scale was set to 500 in its first year in 2000. Similarly the mathematics scale was set to 500 in 2003 and the science scale was set to a mean of 500 in 2006. The method by which these scales are derived is explained further in Appendix F and in the PISA Technical Report (OECD, forthcoming).

As with any repeated measurement that uses samples, the mean will vary slightly from year to year without necessarily indicating any real change in the global level of skills.

A4 Survey administration

The survey administration was carried out internationally on behalf of OECD by a consortium led by the Australian Council for Educational Research (ACER). The consortium worked with the PISA National Centre within each country, through the National Project Manager (NPM). For England, Wales, Northern Ireland and Scotland, the National Foundation for Educational Research (NFER) was the PISA National Centre.

National Centres were responsible for making local adaptations to instruments and manuals and for translation where necessary. NFER made appropriate adaptations to all PISA instruments and

accompanying documentation. All materials were translated into Welsh and pupils in Wales were asked to choose the language in which they wished to complete tests and questionnaires.

National Centres were also responsible for supplying the information necessary for sampling to be carried out. School samples were selected by the PISA consortium, while pupil samples within schools were selected by NFER using software supplied by the consortium.

Test items were organised into 13 test booklets with items repeated across booklets. Approximately half the total test items assessed mathematics while the others were divided between science and reading. All pupils were assessed in mathematics, which was the main focus of PISA 2012. Random sub-samples of pupils were also assessed in science and reading, with approximately 70 per cent of pupils taking the tests in each. In addition to the tests, there was a School Questionnaire and three Student Questionnaires. Each pupil completed one questionnaire. All Student Questionnaires contained a set of core questions that asked about pupils' backgrounds. The remaining questions were divided into three sets of questions and pupils answered two of the three sets of questions.

Tests and questionnaires were generally administered to pupils in a single session, with a two-hour period for the tests and approximately half an hour, in addition, for completion of the Student Questionnaire. The total length of a survey session was around three and a half hours. The survey was administered by test administrators employed and trained by NFER. In England, students that participated in the problem solving assessment usually returned for one hour in the afternoon to carry out the assessment. Results for English pupils in problem solving will be reported in 2014.

In each country participating in PISA, the minimum number of participating schools was 150, and the minimum number of pupils 4500. In the case of the UK and of some other countries, the number exceeds this. In some cases this is due to the need to over-sample some parts of the country. In the case of the UK, for example, larger samples were drawn for Wales, Scotland and Northern Ireland than would be required for a representative UK sample. This was to make it possible to provide separate PISA results for the four constituent parts of the UK. In some countries additional samples were drawn for other purposes, for example to enable reporting of results for a sub-group such as a separate language group. In very small countries with less than 150 schools the survey was completed as a school census with all secondary schools included.

The pupils included in the PISA survey are generally described as '15-year-olds', but there is a small amount of leeway in this definition depending on the time of testing. In the case of England, Wales and Northern Ireland the sample consisted of pupils aged from 15 years and two months to 16 years and two months at the beginning of the testing period.

Countries were required to carry out the survey during a six-week period between March and August 2012. However England, Wales and Northern Ireland were permitted to test outside this period because of the problems for schools caused by the overlap with the GCSE preparation and examination period. In England, Wales and Northern Ireland the survey took place in November-December 2012.

A5 The PISA sample

Countries must follow strict international sampling procedures to ensure comparability of countries' samples. The first stage of sampling was agreement of the school stratification variables to be used for each country. Table A.1 shows the variables which were used for sampling of schools in Northern Ireland for PISA 2012.

Table A.1 Stratification variables for Northern Ireland

Variables	Levels
School type	Maintained selective Maintained non-selective Independent
Region	Belfast Western North Eastern South Eastern Southern
Gender	Male Female Mixed

Countries are allowed to exempt schools from the sampling frame if it is expected that the majority of pupils would not be eligible to participate in PISA (see below). In Northern Ireland, special schools were excluded from the sampling frame on this basis.

Following agreement of the sampling plan and the establishment of population estimates in the age group, the list of all eligible schools and their populations was sent to the PISA consortium. The consortium carried out the school sampling then sent the list of selected schools back to NFER.

The schools which had been selected in the sample were then invited to participate, and those which agreed were asked to supply details of all pupils who would be in Year 12 at the time of the beginning of the PISA survey period in November 2012. In addition they were asked to supply details of any who were born in the relevant period but were in other year groups.

When the pupil data was obtained from schools, the Keyquest software supplied by the PISA consortium was used to randomly select 30 pupils within each school from those who met the PISA age definition.

The PISA study has strict sampling requirements regarding both the participation rate which is acceptable and the replacement of schools which decline. Within each country three separate samples are selected, the first being the main sample and the other two back-up samples. In the back-up samples each school is a replacement for a specific school in the main sample. So, if a main sample school declines to participate, there are two other schools which can be used as replacements for that school. In Northern Ireland, for PISA 2012, there were 103 schools in the

main sample, with 76 and 55 schools in the first and second back-up samples respectively. There were fewer schools in the back-up samples than the main sample due to the overall number of secondary schools in Northern Ireland.

School recruitment is an issue to which particular attention has to be given in PISA. According to the PISA sampling rules, an acceptable school response in the main sample is 85 per cent. If the response from the main sample meets this percentage, replacement of non-participating schools is not necessary. If the response from the main sample is below this percentage, but above 65 per cent, it is still possible to achieve an acceptable response by using replacement schools from the back-up samples. However, the target then moves upwards – for example, with a main sample response of 70 per cent, the after-replacement target is 94 per cent.

There is also a response rate requirement for pupils within each school. It is possible for pupils to be excluded from participation and not counted within the total because they have special needs such that they could not participate, because they have limited language skills, or because they are no longer at the school. The remaining pupils are deemed eligible for PISA participation, and at least 50 per cent of these must participate for the school to be counted as a participating school.

In Northern Ireland, a total of 89 schools and 2224 pupils took part in PISA 2012. The required pupil participation rate, of at least 50 per cent of sampled pupils, was achieved in all schools. The final response rate for Northern Ireland was 83.5 per cent of main sample schools and 88.3 per cent after replacement.

The international response rate for the United Kingdom is calculated based on the results for England, Wales, Northern Ireland and Scotland, with weighting according to the population in each country as well as school size. The school response rate for the England, Wales and Northern Ireland combined sample was 78.5 per cent of main sample schools, and 88.3 per cent after replacement. This fully met the PISA 2012 participation requirements and so NFER were not required to carry out non-response bias analysis.

The final response requirement was for the total number of participating pupils, and the target here was for 80 per cent overall. Across England, Wales and Northern Ireland, the pupil response rate target was met with a final weighted response rate of 86.4 per cent. A total of 396 schools and 9714 pupils participated across England, Wales and Northern Ireland. This is a good response rate and means that UK findings are regarded by PISA as fully comparable with other countries.

Appendix B

B1 Significant differences in mean scores on the mathematics scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	613	(3.3)	^
<i>Singapore</i>	573	(1.3)	^
<i>Hong Kong-China</i>	561	(3.2)	^
<i>Chinese Taipei</i>	560	(3.3)	^
Korea	554	(4.6)	^
<i>Macao-China</i>	538	(1.0)	^
Japan	536	(3.6)	^
<i>Liechtenstein</i>	535	(4.0)	^
Switzerland	531	(3.0)	^
Netherlands*	523	(3.5)	^
Estonia*	521	(2.0)	^
Finland*	519	(1.9)	^
Canada	518	(1.8)	^
Poland*	518	(3.6)	^
Belgium*	515	(2.1)	^
Germany*	514	(2.9)	^
<i>Vietnam</i>	511	(4.8)	^
Austria*	506	(2.7)	^
Australia	504	(1.6)	^
Republic of Ireland*	501	(2.2)	^
Slovenia*	501	(1.2)	^
Denmark*	500	(2.3)	^
New Zealand	500	(2.2)	^
Czech Republic*	499	(2.9)	^
Scotland	498	(2.6)	^
England	495	(3.9)	NS
France*	495	(2.5)	^
United Kingdom*	494	(3.3)	^
OECD Average	494	(0.5)	^
Iceland	493	(1.7)	NS
<i>Latvia*</i>	491	(2.8)	NS
Luxembourg*	490	(1.1)	NS
Norway	489	(2.7)	NS
Portugal*	487	(3.8)	NS
Northern Ireland	487	(3.1)	^
Italy*	485	(2.0)	NS
Spain*	484	(1.9)	NS
<i>Russian Federation</i>	482	(3.0)	NS
Slovak Republic*	482	(3.4)	NS
United States	481	(3.6)	NS
<i>Lithuania*</i>	479	(2.6)	v
Sweden*	478	(2.3)	v
Hungary*	477	(3.2)	v
<i>Croatia*</i>	471	(3.5)	v
Wales	468	(2.2)	v
Israel	466	(4.7)	v
Greece*	453	(2.5)	v
<i>Serbia</i>	449	(3.4)	v
Turkey	448	(4.8)	v
<i>Romania*</i>	445	(3.8)	v
<i>Cyprus</i>	440	(1.1)	v
<i>Bulgaria*</i>	439	(4.0)	v
<i>United Arab Emirates</i>	434	(2.4)	v
<i>Kazakhstan</i>	432	(3.0)	v
Chile	423	(3.1)	v
Mexico	413	(1.4)	v

Key	
^	significantly higher
NS	no significant difference
v	significantly lower
OECD countries (not italicised)	
<i>Countries not in OECD (italicised)</i>	
*EU countries	

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

B2 Mean score, variation and gender differences in student performance on the mathematics scale

	All students				Gender differences						Percentiles										Difference between 5th and 95th percentile		
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th		75th		90th			95th	
	Mean score	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.		Score	S.E.
Australia	504	(1.6)	96	(1.2)	510	(2.4)	498	(2.0)	12	(3.1)	348	(2.9)	382	(2.3)	437	(2.0)	571	(2.3)	630	(3.0)	663	(3.4)	315
Austria*	506	(2.7)	92	(1.7)	517	(3.9)	494	(3.3)	22	(4.9)	353	(4.1)	384	(3.9)	440	(3.2)	572	(3.5)	624	(3.8)	654	(4.3)	301
Belgium*	515	(2.1)	102	(1.4)	518	(2.8)	512	(2.6)	6	(3.4)	343	(4.5)	378	(4.0)	444	(3.1)	589	(2.4)	646	(2.7)	677	(2.9)	335
Bulgaria*	439	(4.0)	94	(2.2)	438	(4.7)	440	(4.2)	-2	(4.1)	290	(5.7)	320	(4.8)	372	(4.7)	503	(5.2)	565	(5.6)	597	(6.2)	307
Canada	518	(1.8)	89	(0.8)	523	(2.1)	513	(2.1)	10	(2.0)	370	(2.8)	402	(2.4)	457	(2.1)	580	(2.3)	633	(2.3)	663	(2.7)	293
Chile	423	(3.1)	81	(1.5)	436	(3.8)	411	(3.1)	25	(3.6)	299	(4.1)	323	(3.7)	365	(3.5)	476	(4.2)	532	(4.2)	563	(4.1)	264
Chinese Taipei	560	(3.3)	116	(1.9)	563	(5.4)	557	(5.7)	5	(8.9)	363	(5.6)	402	(4.8)	478	(4.8)	645	(3.4)	703	(4.9)	738	(5.1)	375
Croatia*	471	(3.5)	88	(2.5)	477	(4.4)	465	(3.7)	12	(4.1)	334	(4.2)	360	(3.3)	408	(3.6)	531	(4.5)	589	(7.3)	623	(8.8)	289
Cyprus	440	(1.1)	93	(0.8)	440	(1.5)	440	(1.6)	0	(2.2)	287	(2.8)	320	(2.6)	376	(1.6)	503	(2.0)	561	(2.1)	595	(3.1)	308
Czech Republic*	499	(2.9)	95	(1.6)	505	(3.7)	493	(3.6)	12	(4.6)	344	(6.4)	377	(4.9)	432	(3.9)	566	(3.3)	621	(3.6)	653	(4.0)	309
Denmark*	500	(2.3)	82	(1.3)	507	(2.9)	493	(2.3)	14	(2.3)	363	(4.6)	393	(4.0)	444	(3.3)	556	(2.7)	607	(3.1)	635	(4.2)	272
England	495	(3.9)	96	(2.0)	502	(5.0)	489	(4.5)	13	(5.5)	335	(5.7)	370	(6.0)	430	(5.0)	562	(4.2)	618	(4.9)	652	(5.8)	316
Estonia*	521	(2.0)	81	(1.2)	523	(2.6)	518	(2.2)	5	(2.6)	389	(3.5)	417	(3.0)	465	(2.7)	576	(2.7)	626	(3.2)	657	(4.1)	268
Finland*	519	(1.9)	85	(1.2)	517	(2.6)	520	(2.2)	-3	(2.9)	376	(4.5)	409	(3.3)	463	(2.5)	577	(2.4)	629	(3.1)	657	(3.2)	281
France*	495	(2.5)	97	(1.7)	499	(3.4)	491	(2.5)	9	(3.4)	350	(5.0)	365	(4.7)	429	(2.7)	565	(3.4)	621	(3.5)	652	(3.7)	321
Germany*	514	(2.9)	96	(1.6)	520	(3.0)	507	(3.4)	14	(2.8)	353	(5.4)	385	(4.7)	447	(3.6)	583	(3.6)	637	(3.8)	667	(4.1)	314
Greece*	453	(2.5)	88	(1.3)	457	(3.3)	449	(2.6)	8	(3.2)	308	(4.6)	338	(3.8)	393	(3.6)	513	(2.8)	567	(3.1)	597	(3.7)	289
Hong Kong-China	561	(3.2)	96	(1.9)	568	(4.6)	553	(3.9)	15	(5.7)	391	(5.9)	430	(6.2)	499	(4.7)	629	(3.5)	679	(4.2)	709	(4.3)	318
Hungary*	477	(3.2)	94	(2.4)	482	(3.7)	473	(3.6)	9	(3.7)	327	(4.6)	358	(4.2)	411	(3.3)	540	(4.8)	603	(6.4)	637	(7.9)	310
Iceland	493	(1.7)	92	(1.3)	490	(2.3)	496	(2.3)	-6	(3.0)	339	(4.1)	372	(2.8)	431	(2.6)	557	(3.0)	612	(3.3)	641	(3.7)	302
Israel	466	(4.7)	105	(1.8)	472	(7.8)	461	(3.5)	12	(7.6)	292	(7.3)	328	(5.7)	393	(5.1)	541	(5.3)	603	(6.0)	639	(6.1)	347
Italy*	485	(2.0)	93	(1.1)	494	(2.4)	476	(2.2)	18	(2.5)	333	(2.6)	366	(2.2)	421	(2.3)	550	(2.7)	607	(3.0)	639	(3.4)	306
Japan	536	(3.6)	94	(2.2)	545	(4.6)	527	(3.6)	18	(4.3)	377	(6.1)	415	(5.1)	473	(4.2)	603	(4.4)	657	(5.1)	686	(5.5)	309
Kazakhstan	432	(3.0)	71	(1.8)	432	(3.4)	432	(3.3)	0	(2.9)	319	(3.1)	343	(2.5)	383	(2.8)	478	(4.4)	527	(5.7)	554	(6.0)	235
Korea	554	(4.6)	99	(2.1)	562	(5.8)	544	(5.1)	18	(6.2)	386	(7.4)	425	(5.8)	486	(4.8)	624	(5.1)	679	(6.0)	710	(7.5)	323
Latvia*	491	(2.8)	82	(1.5)	489	(3.4)	493	(3.2)	-4	(3.6)	360	(4.8)	387	(4.4)	434	(3.3)	546	(3.8)	597	(3.7)	626	(4.6)	266
Liechtenstein	535	(4.0)	95	(3.7)	546	(6.0)	523	(5.8)	23	(8.8)	370	(16.8)	403	(11.2)	470	(8.0)	606	(5.0)	656	(9.2)	680	(12.5)	310
Lithuania*	479	(2.6)	89	(1.4)	479	(2.8)	479	(3.0)	0	(2.4)	334	(3.9)	364	(3.5)	418	(3.1)	540	(3.3)	596	(3.5)	627	(4.0)	293
Luxembourg*	490	(1.1)	95	(0.9)	502	(1.5)	477	(1.4)	25	(2.0)	334	(3.3)	363	(3.0)	422	(1.5)	558	(1.6)	613	(2.2)	644	(2.3)	310
Macao-China	538	(1.0)	94	(0.9)	540	(1.4)	537	(1.3)	3	(1.9)	379	(3.9)	415	(2.8)	476	(1.7)	605	(1.7)	657	(2.3)	685	(2.4)	306
Mexico	413	(1.4)	74	(0.7)	420	(1.6)	406	(1.4)	14	(1.2)	295	(1.8)	320	(1.9)	362	(1.6)	462	(1.7)	510	(2.0)	539	(2.1)	245
Netherlands*	523	(3.5)	92	(2.1)	528	(3.6)	518	(3.9)	10	(2.8)	367	(4.8)	397	(5.5)	457	(5.1)	591	(4.3)	638	(3.7)	665	(4.0)	297
New Zealand	500	(2.2)	100	(1.2)	507	(3.2)	492	(2.9)	15	(4.3)	340	(4.9)	371	(3.6)	428	(3.2)	570	(2.8)	632	(3.0)	665	(4.4)	325
Northern Ireland	487	(3.1)	93	(2.0)	492	(5.0)	481	(5.4)	10	(8.3)	332	(6.9)	365	(6.2)	422	(3.7)	553	(4.2)	609	(5.5)	638	(3.9)	305
Norway	489	(2.7)	90	(1.3)	490	(2.8)	488	(3.4)	2	(3.0)	341	(5.1)	373	(3.9)	428	(2.9)	552	(3.3)	604	(3.4)	638	(5.1)	297
Poland*	518	(3.6)	90	(1.9)	520	(4.3)	516	(3.8)	4	(3.4)	373	(3.9)	402	(2.8)	454	(3.3)	580	(4.9)	636	(6.0)	669	(7.1)	296
Portugal*	487	(3.8)	94	(1.4)	493	(4.1)	481	(3.9)	11	(2.5)	333	(4.5)	363	(4.2)	421	(5.0)	554	(4.3)	610	(3.9)	640	(4.1)	307
Republic of Ireland*	501	(2.2)	85	(1.3)	509	(3.3)	494	(2.6)	15	(3.8)	359	(5.0)	391	(3.6)	445	(3.2)	559	(2.4)	610	(2.5)	640	(3.2)	280
Romania*	445	(3.8)	81	(2.2)	447	(4.3)	443	(4.0)	4	(3.6)	322	(3.9)	344	(3.5)	386	(3.8)	497	(4.8)	553	(6.1)	588	(7.4)	266
Russian Federation	482	(3.0)	86	(1.6)	481	(3.7)	483	(3.1)	-2	(3.0)	341	(4.2)	371	(3.9)	423	(3.1)	540	(3.6)	595	(4.7)	626	(5.3)	285
Scotland	498	(2.6)	86	(1.6)	506	(3.0)	491	(3.2)	14	(3.3)	358	(4.8)	388	(4.7)	439	(3.5)	558	(3.1)	611	(3.7)	640	(4.8)	282
Serbia	449	(3.4)	91	(2.2)	453	(4.1)	444	(3.7)	9	(3.9)	306	(4.4)	335	(4.1)	386	(3.7)	508	(4.4)	567	(5.8)	603	(6.7)	296
Shanghai-China	613	(3.3)	101	(2.3)	616	(4.0)	610	(3.4)	6	(3.3)	435	(6.9)	475	(5.8)	546	(4.4)	685	(3.5)	737	(3.5)	765	(5.6)	331
Singapore	573	(1.3)	105	(0.9)	572	(1.9)	575	(1.8)	-3	(2.5)	393	(3.6)	432	(3.6)	501	(2.7)	650	(1.9)	707	(2.3)	737	(2.5)	344
Slovak Republic*	482	(3.4)	101	(2.5)	486	(4.1)	477	(4.1)	9	(4.5)	314	(6.7)	352	(6.2)	413	(4.2)	553	(4.7)	613	(5.3)	647	(6.7)	334
Slovenia*	501	(1.2)	92	(1.0)	503	(2.0)	499	(2.0)	3	(3.1)	357	(3.9)	384	(2.5)	434	(2.0)	566	(2.1)	624	(2.9)	655	(4.3)	298
Spain*	484	(1.9)	88	(0.7)	492	(2.4)	476	(2.0)	16	(2.2)	339	(3.6)	370	(3.1)	424	(2.6)	546	(2.1)	597	(2.4)	626	(2.0)	287
Sweden*	478	(2.3)	92	(1.3)	477	(3.0)	480	(2.4)	-3	(3.0)	329	(4.4)	359	(3.6)	415	(2.9)	543	(2.7)	596	(2.9)	627	(3.6)	298
Switzerland	531	(3.0)	94	(1.5)	537	(3.5)	524	(3.1)	13	(2.7)	374	(3.9)	408	(3.3)	466	(3.4)	597	(3.6)	651	(4.3)	681	(4.7)	308
Turkey	448	(4.8)	91	(3.1)	452	(5.1)	444	(5.7)	8	(4.7)	313	(4.3)	339	(3.3)	382	(3.6)	507	(8.0)	577	(9.7)	614	(9.4)	302
United Arab Emirates	434	(2.4)	90	(1.2)	432	(3.8)	436	(3.0)	-5	(4.7)	297	(3.0)	323	(2.5)	370	(2.9)	494	(2.9)	555	(3.9)	591	(3.4)	294
United Kingdom*	494	(3.3)	95	(1.7)	500	(4.2)	488	(3.8)	12	(4.7)	336	(4.7)	371	(5.0)	429	(4.2)	560	(3.7)	616	(4.1)	648	(5.1)	312
United States	481	(3.6)	90	(1.3)	484	(3.8)	479	(3.9)	5	(2.8)	339	(4.2)	368	(3.9)	418	(3.7)	543	(4.4)	600	(4.3)	634	(5.4)	295
Vietnam	511	(4.8)	86	(2.7)	517	(5.6)	507	(4.7)	10	(3.0)	371	(8.1)	401	(7.4)	454	(5.3)	568	(5.5)	623	(6.8)	654	(7.9)	283
Wales	468	(2.2)	85	(1.3)	473	(2.6)	464	(2.9)	9	(3.4)	329	(4.9)	360	(3.6)	410	(2.7)	526	(2.8)	578	(3.4)	610	(5.0)	281
OECD average	494	(0.5)	92	(0.3)	499	(0.6)	489	(0.5)	11	(0.6)	343	(0.8)	375	(0.7)	430	(0.6)	558	(0.6)	614	(0.7)	645	(0.8)	301

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold

B3 Mean performance on each mathematics content category sub-scale

	Mean Score									
	Overall mathematics score		Quantity		Uncertainty and data		Change and relationships		Space and shape	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
Australia	504	(1.6)	500	(1.9)	508	(1.5)	509	(1.7)	497	(1.8)
Austria*	506	(2.7)	510	(2.9)	499	(2.7)	506	(3.4)	501	(3.1)
Belgium*	515	(2.1)	519	(2.0)	508	(2.5)	513	(2.6)	509	(2.4)
Bulgaria*	439	(4.0)	443	(4.3)	432	(3.9)	434	(4.5)	442	(4.3)
Canada	518	(1.8)	515	(2.2)	516	(1.8)	525	(2.0)	510	(2.1)
Chile	423	(3.1)	421	(3.3)	430	(2.9)	411	(3.5)	419	(3.2)
Chinese Taipei	560	(3.3)	543	(3.1)	549	(3.2)	561	(3.5)	592	(3.8)
Croatia*	471	(3.5)	480	(3.7)	468	(3.5)	468	(4.2)	460	(3.9)
Cyprus	440	(1.1)	439	(1.1)	442	(1.1)	440	(1.2)	436	(1.1)
Czech Republic*	499	(2.9)	505	(3.0)	488	(2.8)	499	(3.5)	499	(3.4)
Denmark*	500	(2.3)	502	(2.4)	505	(2.4)	494	(2.7)	497	(2.5)
England	495	(3.9)	495	(4.5)	503	(3.6)	498	(4.1)	477	(4.1)
Estonia*	521	(2.0)	525	(2.2)	510	(2.0)	530	(2.3)	513	(2.5)
Finland*	519	(1.9)	527	(1.9)	519	(2.4)	520	(2.6)	507	(2.1)
France*	495	(2.5)	496	(2.6)	492	(2.7)	497	(2.7)	489	(2.7)
Germany*	514	(2.9)	517	(3.1)	509	(3.0)	516	(3.8)	507	(3.2)
Greece*	453	(2.5)	455	(3.0)	460	(2.6)	446	(3.2)	436	(2.6)
Hong Kong-China	561	(3.2)	566	(3.4)	553	(3.0)	564	(3.6)	567	(4.0)
Hungary*	477	(3.2)	476	(3.4)	476	(3.3)	481	(3.5)	474	(3.4)
Iceland	493	(1.7)	496	(1.9)	496	(1.8)	487	(1.9)	489	(1.5)
Israel	466	(4.7)	480	(5.2)	465	(4.7)	462	(5.3)	449	(4.8)
Italy*	485	(2.0)	491	(2.0)	482	(2.0)	477	(2.1)	487	(2.5)
Japan	536	(3.6)	518	(3.6)	528	(3.5)	542	(4.0)	558	(3.7)
Kazakhstan	432	(3.0)	428	(3.5)	414	(2.6)	433	(3.2)	450	(3.9)
Korea	554	(4.6)	537	(4.1)	538	(4.2)	559	(5.2)	573	(5.2)
Latvia*	491	(2.8)	487	(2.9)	478	(2.8)	496	(3.4)	497	(3.3)
Liechtenstein	535	(4.0)	538	(4.1)	526	(3.9)	542	(4.0)	539	(4.5)
Lithuania*	479	(2.6)	483	(2.8)	474	(2.7)	479	(3.2)	472	(3.1)
Luxembourg*	490	(1.1)	495	(1.0)	483	(1.0)	488	(1.0)	486	(1.0)
Macao-China	538	(1.0)	531	(1.1)	525	(1.1)	542	(1.2)	558	(1.4)
Mexico	413	(1.4)	414	(1.5)	413	(1.2)	405	(1.6)	413	(1.6)
Netherlands*	523	(3.5)	532	(3.6)	532	(3.8)	518	(3.9)	507	(3.5)
New Zealand	500	(2.2)	499	(2.4)	506	(2.6)	501	(2.5)	491	(2.4)
Northern Ireland	487	(3.1)	491	(3.7)	496	(3.4)	486	(3.8)	463	(3.6)
Norway	489	(2.7)	492	(2.9)	497	(3.0)	478	(3.1)	480	(3.3)
Poland*	518	(3.6)	519	(3.5)	517	(3.5)	509	(4.1)	524	(4.2)
Portugal*	487	(3.8)	481	(4.0)	486	(3.8)	486	(4.1)	491	(4.2)
Republic of Ireland*	501	(2.2)	505	(2.6)	509	(2.5)	501	(2.6)	478	(2.6)
Romania*	445	(3.8)	443	(4.5)	437	(3.3)	446	(3.9)	447	(4.1)
Russian Federation	482	(3.0)	478	(3.0)	463	(3.3)	491	(3.4)	496	(3.9)
Scotland	498	(2.6)	501	(3.0)	504	(2.6)	497	(3.1)	482	(3.1)
Serbia	449	(3.4)	456	(3.7)	448	(3.3)	442	(4.1)	446	(3.9)
Shanghai-China	613	(3.3)	591	(3.2)	592	(3.0)	624	(3.6)	649	(3.6)
Singapore	573	(1.3)	569	(1.2)	559	(1.5)	580	(1.5)	580	(1.5)
Slovak Republic*	482	(3.4)	486	(3.5)	472	(3.6)	474	(4.0)	490	(4.1)
Slovenia*	501	(1.2)	504	(1.2)	496	(1.2)	499	(1.1)	503	(1.4)
Spain*	484	(1.9)	491	(2.3)	487	(2.3)	482	(2.0)	477	(2.0)
Sweden*	478	(2.3)	482	(2.5)	483	(2.5)	469	(2.8)	469	(2.5)
Switzerland	531	(3.0)	531	(3.1)	522	(3.2)	530	(3.4)	544	(3.1)
Turkey	448	(4.8)	442	(5.0)	447	(4.6)	448	(5.0)	443	(5.5)
United Arab Emirates	434	(2.4)	431	(2.7)	432	(2.4)	442	(2.6)	425	(2.4)
United Kingdom*	494	(3.3)	494	(3.8)	502	(3.0)	496	(3.4)	475	(3.5)
United States	481	(3.6)	478	(3.9)	488	(3.5)	488	(3.5)	463	(4.0)
Vietnam	511	(4.8)	509	(5.5)	519	(4.5)	509	(5.1)	507	(5.1)
Wales	468	(2.2)	465	(2.3)	483	(2.7)	470	(2.5)	444	(2.6)
OECD average	494	(0.5)	495	(0.5)	493	(0.5)	493	(0.6)	490	(0.5)

OECD countries (not italicised)

14 countries with scores below 430 omitted

Countries not in OECD (italicised)

*EU countries

	Difference from overall mean			
	Quantity	Uncertainty and data	Change and relationships	Space and shape
Australia	-4	4	5	-8
Austria*	5	-7	1	-5
Belgium*	4	-7	-1	-6
Bulgaria*	4	-7	-4	3
Canada	-3	-2	7	-8
Chile	-1	8	-12	-4
Chinese Taipei	-16	-11	1	32
Croatia*	9	-3	-3	-11
Cyprus	-1	3	0	-3
Czech Republic*	-11	0	0	0
Denmark*	2	5	-6	-3
England	0	8	3	-18
Estonia*	4	-10	9	-8
Finland*	8	0	2	-12
France*	1	-3	2	-6
Germany*	4	-5	2	-6
Greece*	2	7	-7	-17
Hong Kong-China	4	-8	3	6
Hungary*	-2	-1	4	-3
Iceland	4	3	-6	-4
Israel	13	-1	-4	-17
Italy*	5	-3	-9	2
Japan	-18	-8	6	21
Kazakhstan	-4	-18	1	18
Korea	-16	-16	5	19
Latvia*	-3	-12	6	6
Liechtenstein	3	-9	7	4
Lithuania*	4	-5	0	-7
Luxembourg*	5	-7	-2	-3
Macao-China	-8	-13	4	20
Mexico	0	0	-9	-1
Netherlands*	9	9	-5	-16
New Zealand	-1	6	1	-9
Northern Ireland	-4	9	-1	-23
Norway	3	7	-12	-10
Poland*	1	-1	-8	7
Portugal*	-6	-1	-1	4
Republic of Ireland*	4	7	0	-24
Romania*	-1	-8	1	3
Russian Federation	-4	-19	9	14
Scotland	2	6	-2	-17
Serbia	7	-1	-7	-3
Shanghai-China	-22	-21	11	36
Singapore	-5	-14	7	6
Slovak Republic*	5	-10	-7	8
Slovenia*	3	-5	-2	2
Spain*	7	2	-3	-7
Sweden*	3	4	-9	-10
Switzerland	0	-9	-1	13
Turkey	-6	-1	0	-5
United Arab Emirates	-3	-2	8	-9
United Kingdom*	0	8	2	-19
United States	-4	7	7	-18
Vietnam	-2	8	-2	-4
Wales	-4	14	1	-25
OECD average	1	-1	-1	-4

B4 Mean performance on each mathematics process sub-scale

	Mean Score							
	Overall mathematics score		Formulate		Employ		Interpret	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
Australia	504	(1.6)	498	(1.9)	500	(1.7)	514	(1.7)
Austria*	506	(2.7)	499	(3.2)	510	(2.5)	509	(3.3)
Belgium*	515	(2.1)	512	(2.4)	516	(2.1)	513	(2.4)
Bulgaria*	439	(4.0)	437	(4.2)	439	(4.1)	441	(4.2)
Canada	518	(1.8)	516	(2.2)	517	(1.9)	521	(2.0)
Chile	423	(3.1)	420	(3.2)	416	(3.3)	433	(3.1)
Chinese Taipei	560	(3.3)	578	(4.0)	549	(3.1)	549	(3.0)
Croatia*	471	(3.5)	453	(4.0)	478	(3.7)	477	(3.5)
Cyprus	440	(1.1)	437	(1.2)	443	(1.1)	436	(1.3)
Czech Republic*	499	(2.9)	495	(3.4)	504	(2.9)	494	(3.0)
Denmark*	500	(2.3)	502	(2.4)	495	(2.4)	508	(2.5)
England	495	(3.9)	491	(4.4)	493	(3.6)	502	(4.2)
Estonia*	521	(2.0)	517	(2.3)	524	(2.1)	513	(2.1)
Finland*	519	(1.9)	519	(2.4)	516	(1.8)	528	(2.2)
France*	495	(2.5)	483	(2.8)	496	(2.3)	511	(2.5)
Germany*	514	(2.9)	511	(3.4)	516	(2.8)	517	(3.2)
Greece*	453	(2.5)	448	(2.3)	449	(2.7)	467	(3.1)
Hong Kong-China	561	(3.2)	568	(3.7)	558	(3.1)	551	(3.4)
Hungary*	477	(3.2)	469	(3.6)	481	(3.2)	477	(3.1)
Iceland	493	(1.7)	500	(1.7)	490	(1.6)	492	(1.9)
Israel	466	(4.7)	465	(4.7)	469	(4.6)	462	(5.2)
Italy*	485	(2.0)	475	(2.2)	485	(2.1)	498	(2.1)
Japan	536	(3.6)	554	(4.2)	530	(3.5)	531	(3.5)
Kazakhstan	432	(3.0)	442	(3.8)	433	(3.2)	420	(2.6)
Korea	554	(4.6)	562	(5.1)	553	(4.3)	540	(4.2)
Latvia*	491	(2.8)	488	(3.0)	495	(2.8)	486	(3.0)
Liechtenstein	535	(4.0)	535	(4.4)	536	(3.7)	540	(4.1)
Lithuania*	479	(2.6)	477	(3.1)	482	(2.7)	471	(2.8)
Luxembourg*	490	(1.1)	482	(1.0)	493	(0.9)	495	(1.1)
Macao-China	538	(1.0)	545	(1.4)	536	(1.1)	530	(1.0)
Mexico	413	(1.4)	409	(1.7)	413	(1.4)	413	(1.3)
Netherlands*	523	(3.5)	527	(3.8)	518	(3.4)	526	(3.6)
New Zealand	500	(2.2)	496	(2.5)	495	(2.2)	511	(2.5)
Northern Ireland	487	(3.1)	479	(3.8)	486	(3.1)	496	(3.5)
Norway	489	(2.7)	489	(3.1)	486	(2.7)	499	(3.1)
Poland*	518	(3.6)	516	(4.2)	519	(3.5)	515	(3.5)
Portugal*	487	(3.8)	479	(4.3)	489	(3.7)	490	(4.0)
Republic of Ireland*	501	(2.2)	492	(2.4)	502	(2.4)	507	(2.5)
Romania*	445	(3.8)	445	(4.1)	446	(4.1)	438	(3.1)
Russian Federation	482	(3.0)	481	(3.6)	487	(3.1)	471	(2.9)
Scotland	498	(2.6)	490	(3.3)	496	(2.8)	510	(2.7)
Serbia	449	(3.4)	447	(3.8)	451	(3.4)	445	(3.4)
Shanghai-China	613	(3.3)	624	(4.1)	613	(3.0)	579	(2.9)
Singapore	573	(1.3)	582	(1.6)	574	(1.2)	555	(1.4)
Slovak Republic*	482	(3.4)	480	(4.1)	485	(3.4)	473	(3.3)
Slovenia*	501	(1.2)	492	(1.5)	505	(1.2)	498	(1.4)
Spain*	484	(1.9)	477	(2.2)	481	(2.0)	495	(2.2)
Sweden*	478	(2.3)	479	(2.7)	474	(2.5)	485	(2.4)
Switzerland	531	(3.0)	538	(3.1)	529	(2.9)	529	(3.4)
Turkey	448	(4.8)	449	(5.2)	448	(5.0)	446	(4.6)
United Arab Emirates	434	(2.4)	426	(2.7)	440	(2.4)	428	(2.4)
United Kingdom*	494	(3.3)	489	(3.7)	492	(3.1)	501	(3.5)
United States	481	(3.6)	475	(4.1)	480	(3.5)	489	(3.9)
Vietnam	511	(4.8)	497	(5.1)	523	(5.1)	497	(4.5)
Wales	468	(2.2)	457	(2.4)	466	(2.2)	483	(2.6)
OECD average	494	(0.5)	492	(0.5)	493	(0.5)	497	(0.5)

OECD countries (not italicised)

14 countries with scores below 430 omitted

Countries not in OECD (italicised)

	Difference from overall mean		
	Formulate	Employ	Interpret
	Australia	-6	-4
Austria*	-6	4	3
Belgium*	-2	1	-2
Bulgaria*	-2	0	2
Canada	-2	-2	3
Chile	-3	-6	10
Chinese Taipei	19	-11	-11
Croatia*	-19	6	6
Cyprus	-3	3	-4
Czech Republic*	-4	5	-5
Denmark*	2	-5	8
England	-5	-2	6
Estonia*	-3	4	-8
Finland*	0	-3	9
France*	-12	1	16
Germany*	-3	2	3
Greece*	-5	-4	14
Hong Kong-China	7	-3	-10
Hungary*	-8	4	0
Iceland	7	-3	0
Israel	-2	2	-5
Italy*	-10	0	13
Japan	18	-6	-5
Kazakhstan	10	1	-12
Korea	8	-1	-14
Latvia*	-3	5	-4
Liechtenstein	0	1	5
Lithuania*	-1	3	-8
Luxembourg*	-8	3	5
Macao-China	7	-2	-9
Mexico	-4	0	0
Netherlands*	4	-4	3
New Zealand	-4	-5	11
Northern Ireland	-7	-1	9
Norway	0	-3	9
Poland*	-2	1	-3
Portugal*	-8	2	3
Republic of Ireland*	-9	1	5
Romania*	0	1	-6
Russian Federation	-1	5	-11
Scotland	-9	-3	11
Serbia	-2	2	-3
Shanghai-China	12	0	-34
Singapore	8	1	-18
Slovak Republic*	-1	4	-8
Slovenia*	-9	4	-3
Spain*	-8	-3	11
Sweden*	1	-4	7
Switzerland	7	-2	-2
Turkey	1	0	-2
United Arab Emirates	-8	6	-6
United Kingdom*	-5	-2	7
United States	-6	-1	8
Vietnam	-14	12	-15
Wales	-11	-3	15
OECD average	-2	-1	3

*EU countries

B5 Mean score, variation and gender differences in student performance on the mathematics sub-scale quantity

	All students				Gender differences						Percentiles										Difference between 5th and 95th percentile		
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th		75th		90th			95th	
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.		Score	S.E.
Australia	500	(1.9)	104	(1.3)	505	(2.7)	495	(2.2)	10	(3.1)	330	(2.8)	367	(2.2)	429	(2.0)	572	(2.7)	634	(3.1)	669	(3.5)	339
Austria*	510	(2.9)	91	(1.7)	519	(3.6)	502	(3.8)	17	(4.8)	358	(5.1)	391	(3.9)	446	(3.8)	576	(3.6)	627	(3.9)	656	(5.3)	298
Belgium*	519	(2.0)	104	(1.4)	524	(2.8)	513	(2.5)	11	(3.4)	341	(4.6)	381	(4.0)	447	(3.1)	594	(2.5)	650	(2.4)	681	(2.5)	340
Bulgaria*	443	(4.3)	102	(2.8)	442	(5.1)	443	(4.7)	-1	(4.6)	280	(7.1)	313	(5.6)	373	(4.5)	513	(5.7)	576	(5.8)	612	(8.3)	332
Canada	515	(2.2)	99	(1.0)	520	(2.5)	511	(2.4)	9	(2.3)	349	(3.0)	386	(3.1)	448	(2.3)	585	(2.6)	643	(3.1)	676	(3.2)	327
Chile	421	(3.3)	90	(1.6)	433	(4.0)	411	(3.4)	22	(3.6)	280	(4.4)	310	(4.2)	359	(4.0)	482	(4.2)	541	(4.0)	575	(4.3)	296
Chinese Taipei	543	(3.1)	108	(1.8)	548	(4.8)	540	(5.0)	8	(7.5)	357	(5.9)	396	(5.1)	470	(4.6)	622	(3.2)	677	(3.1)	707	(3.5)	350
Croatia*	480	(3.7)	93	(2.5)	488	(4.6)	472	(4.0)	15	(4.5)	332	(4.3)	363	(3.8)	414	(3.5)	543	(5.3)	603	(7.4)	637	(8.3)	305
Cyprus	439	(1.1)	100	(1.1)	439	(1.8)	438	(1.8)	1	(2.7)	276	(3.0)	310	(2.5)	370	(2.1)	508	(3.3)	568	(2.4)	604	(3.4)	329
Czech Republic*	505	(3.0)	101	(2.0)	510	(3.5)	500	(4.0)	10	(4.5)	336	(6.5)	373	(5.8)	438	(4.4)	576	(3.5)	633	(3.6)	668	(4.5)	333
Denmark*	502	(2.4)	91	(1.3)	510	(3.2)	495	(2.4)	15	(3.0)	354	(4.3)	387	(3.8)	441	(2.9)	565	(2.9)	619	(3.7)	648	(3.2)	295
England	495	(4.5)	103	(2.2)	502	(5.7)	489	(4.8)	14	(5.6)	324	(8.9)	361	(8.0)	425	(6.5)	569	(4.3)	627	(4.2)	661	(4.6)	337
Estonia*	525	(2.2)	86	(1.2)	528	(2.6)	521	(2.5)	7	(2.6)	382	(4.6)	415	(3.2)	466	(2.8)	583	(2.6)	636	(3.3)	667	(4.4)	285
Finland*	527	(1.9)	87	(1.0)	525	(2.6)	528	(2.1)	-3	(2.8)	382	(4.0)	415	(2.9)	469	(2.5)	586	(2.3)	638	(3.3)	669	(3.8)	287
France*	496	(2.6)	103	(1.8)	501	(3.7)	492	(2.7)	9	(3.8)	324	(6.0)	362	(4.9)	425	(2.9)	570	(3.1)	628	(3.6)	661	(4.5)	337
Germany*	517	(3.1)	100	(1.9)	524	(3.3)	510	(3.6)	14	(2.9)	348	(6.4)	384	(5.1)	449	(4.0)	588	(3.4)	643	(4.1)	674	(4.2)	325
Greece*	455	(3.0)	97	(1.6)	461	(4.0)	450	(3.1)	10	(3.8)	295	(5.0)	330	(4.4)	388	(4.0)	523	(3.4)	579	(3.7)	613	(4.6)	318
Hong Kong-China	566	(3.4)	101	(2.0)	570	(4.4)	561	(4.2)	9	(5.1)	383	(7.5)	430	(6.0)	501	(4.9)	637	(3.4)	688	(4.2)	718	(3.6)	335
Hungary*	476	(3.4)	99	(2.2)	480	(3.8)	472	(3.9)	8	(3.8)	314	(5.9)	350	(4.3)	406	(4.0)	545	(5.0)	606	(6.5)	641	(5.9)	327
Iceland	496	(1.9)	102	(1.5)	494	(2.6)	499	(2.5)	-5	(3.4)	322	(4.9)	362	(4.7)	429	(2.5)	567	(3.2)	627	(3.6)	661	(3.3)	339
Israel	480	(5.2)	116	(2.1)	486	(8.6)	473	(3.8)	13	(8.2)	284	(9.1)	327	(6.2)	398	(6.1)	563	(5.9)	629	(6.1)	667	(6.5)	383
Italy*	491	(2.0)	101	(1.0)	499	(2.5)	482	(2.3)	17	(2.7)	321	(3.2)	360	(2.7)	423	(2.2)	561	(2.5)	619	(2.6)	652	(2.8)	331
Japan	518	(3.6)	94	(2.2)	527	(4.5)	508	(3.5)	19	(4.0)	359	(7.4)	395	(5.2)	456	(4.2)	584	(4.0)	638	(4.2)	670	(4.7)	311
Kazakhstan	428	(3.5)	79	(2.1)	429	(3.7)	427	(4.1)	2	(3.5)	305	(3.4)	331	(3.0)	373	(2.8)	479	(5.0)	533	(6.3)	564	(6.9)	259
Korea	537	(4.1)	94	(2.0)	543	(5.0)	531	(5.0)	12	(5.9)	377	(7.1)	416	(6.1)	477	(4.6)	604	(4.3)	654	(4.9)	682	(6.1)	305
Latvia*	487	(2.9)	84	(1.5)	487	(3.5)	487	(3.3)	0	(3.5)	350	(6.3)	381	(4.3)	430	(3.2)	546	(3.5)	596	(4.0)	624	(4.3)	275
Liechtenstein	538	(4.1)	100	(3.6)	548	(6.3)	527	(6.4)	22	(9.7)	364	(13.9)	398	(13.3)	467	(8.5)	615	(6.0)	660	(9.9)	686	(10.9)	322
Lithuania*	483	(2.8)	93	(1.4)	484	(3.1)	482	(3.2)	3	(2.8)	331	(4.5)	363	(4.2)	420	(3.6)	547	(3.4)	605	(3.7)	637	(4.6)	306
Luxembourg*	495	(1.0)	100	(0.9)	506	(1.5)	483	(1.3)	23	(2.0)	326	(3.8)	362	(2.9)	424	(2.0)	567	(1.6)	623	(2.2)	656	(2.9)	330
Macao-China	531	(1.1)	92	(1.0)	533	(1.5)	528	(1.4)	5	(1.9)	375	(2.8)	411	(2.7)	469	(1.9)	595	(1.8)	646	(1.9)	675	(3.6)	300
Mexico	414	(1.5)	87	(0.9)	422	(1.7)	406	(1.7)	16	(1.4)	271	(2.8)	304	(2.2)	355	(1.7)	472	(1.9)	526	(2.2)	559	(2.3)	288
Netherlands*	532	(3.6)	97	(2.3)	537	(3.8)	527	(4.0)	10	(3.1)	365	(7.0)	398	(6.0)	463	(5.0)	604	(3.7)	653	(3.1)	682	(3.4)	317
New Zealand	499	(2.4)	103	(1.3)	506	(3.3)	492	(3.1)	14	(4.4)	331	(4.3)	365	(3.9)	426	(3.3)	572	(2.8)	634	(3.4)	667	(4.1)	337
Northern Ireland	491	(3.7)	100	(2.6)	495	(5.6)	487	(5.9)	8	(8.8)	324	(6.4)	360	(5.4)	422	(5.4)	561	(4.9)	620	(5.3)	653	(7.7)	328
Norway	492	(2.9)	95	(1.6)	494	(3.0)	491	(3.5)	3	(3.2)	335	(6.1)	372	(4.5)	429	(3.5)	556	(3.2)	613	(3.5)	648	(4.4)	313
Poland*	519	(3.5)	89	(1.6)	521	(4.1)	516	(3.7)	5	(3.4)	375	(4.4)	406	(3.8)	457	(3.5)	579	(4.5)	634	(5.3)	664	(6.6)	289
Portugal*	481	(4.0)	96	(1.5)	487	(4.4)	475	(4.1)	12	(2.6)	321	(5.7)	355	(5.8)	415	(4.9)	550	(4.2)	604	(3.9)	636	(4.2)	315
Republic of Ireland*	505	(2.6)	92	(1.4)	512	(3.7)	498	(3.0)	14	(4.4)	350	(4.6)	386	(4.6)	443	(3.2)	569	(3.0)	624	(3.1)	653	(3.6)	303
Romania*	443	(4.5)	94	(2.5)	444	(5.2)	442	(4.8)	2	(4.3)	298	(5.0)	327	(4.7)	376	(4.6)	505	(5.6)	567	(7.2)	605	(7.6)	307
Russian Federation	478	(3.0)	93	(1.6)	478	(3.5)	478	(3.2)	0	(3.2)	326	(4.9)	360	(3.9)	417	(3.7)	540	(4.2)	598	(5.0)	632	(5.8)	306
Scotland	501	(3.0)	92	(1.7)	506	(3.5)	495	(3.5)	11	(3.4)	348	(6.4)	383	(5.7)	438	(4.4)	565	(3.5)	620	(3.7)	650	(5.3)	302
Serbia	456	(3.7)	97	(2.6)	460	(4.3)	452	(4.3)	8	(4.4)	303	(6.0)	334	(4.9)	390	(4.4)	521	(4.6)	582	(5.6)	619	(8.4)	317
Shanghai-China	591	(3.2)	98	(2.4)	596	(3.8)	586	(3.5)	9	(3.3)	419	(7.2)	460	(5.8)	528	(4.5)	658	(3.2)	710	(4.2)	741	(6.3)	322
Singapore	569	(1.2)	104	(0.9)	566	(1.8)	572	(1.7)	-6	(2.4)	390	(3.5)	428	(2.9)	500	(1.9)	642	(2.1)	699	(2.2)	731	(3.6)	341
Slovak Republic*	486	(3.5)	105	(2.2)	492	(4.1)	481	(4.2)	11	(4.5)	312	(7.9)	350	(5.8)	414	(4.8)	560	(4.3)	621	(4.2)	658	(5.3)	346
Slovenia*	504	(1.2)	94	(1.0)	508	(1.8)	500	(2.1)	7	(3.0)	351	(3.9)	382	(2.4)	438	(2.3)	570	(2.1)	629	(2.7)	661	(3.8)	310
Spain*	491	(2.3)	101	(1.0)	501	(2.7)	481	(2.4)	20	(2.3)	321	(3.8)	360	(4.0)	423	(3.3)	562	(2.2)	618	(2.0)	651	(2.9)	330
Sweden*	482	(2.5)	97	(1.3)	478	(3.1)	485	(2.9)	-7	(3.2)	320	(4.9)	357	(4.0)	417	(3.2)	549	(3.1)	607	(3.1)	639	(3.9)	320
Switzerland	531	(3.1)	96	(1.4)	536	(3.8)	526	(3.0)	10	(3.0)	369	(4.5)	404	(3.3)	467	(3.3)	598	(3.8)	652	(4.8)	684	(4.5)	315
Turkey	442	(5.0)	97	(3.0)	449	(5.5)	435	(5.7)	14	(5.1)	295	(5.0)	324	(4.0)	373	(4.0)	506	(8.0)	576	(9.3)	613	(8.6)	319
United Arab Emirates	431	(2.7)	101	(1.2)	428	(4.3)	434	(3.5)	-7	(5.5)	273	(2.8)	304	(3.2)	360	(3.0)	500	(3.6)	567	(4.0)	603	(3.9)	330
United Kingdom*	494	(3.8)	102	(1.9)	501	(4.8)	488	(4.1)	13	(4.7)	325	(7.2)	362	(6.4)	424	(5.5)	567	(3.9)	625	(3.7)	658	(4.3)	334
United States	478	(3.9)	99	(1.7)	481	(4.3)	475	(4.1)	6	(3.1)	322	(5.5)	354	(5.5)	408	(4.0)	545	(4.9)	610	(5.1)	646	(5.5)	325
Vietnam	509	(5.5)	93	(2.7)	512	(6.2)	506	(5.4)	6	(3.0)	354	(9.4)	391	(8.5)	446	(5.8)	571	(6.1)	629	(6.7)	662	(8.5)	308
Wales	465	(2.3)	92	(1.3)	470	(2.8)	460	(2.9)	10	(3.3)	313	(4.8)	346	(3.9)	402	(3.1)	527	(2.5)	582	(3.6)	615	(4.1)	302
OECD average	495	(0.5)	97	(0.3)	501	(0.6)	490	(0.6)	11	(3.0)	334	(0.9)	369	(0.8)	429	(0.6)	563	(0.6)	620	(0.7)	653	(0.8)	320

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold

B6 Mean score, variation and gender differences in student performance on the mathematics sub-scale uncertainty and data

	All students				Gender differences					Percentiles										Difference between 5th and 95th percentile			
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th		75th		90th		95th		
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score		S.E.	Score	S.E.
Australia	508	(1.5)	97	(1.1)	511	(2.3)	504	(1.9)	7	(3.0)	349	(2.5)	384	(2.2)	441	(1.8)	575	(2.0)	633	(2.7)	666	(3.1)	316
Austria*	499	(2.7)	95	(1.9)	508	(3.6)	489	(3.6)	18	(4.7)	339	(7.0)	374	(4.8)	433	(3.8)	567	(3.0)	618	(3.1)	647	(3.9)	308
Belgium*	508	(2.5)	110	(2.3)	511	(3.2)	504	(2.9)	7	(3.5)	323	(7.8)	366	(5.4)	435	(3.3)	585	(2.8)	647	(3.4)	681	(3.2)	358
Bulgaria*	432	(3.9)	90	(2.4)	430	(4.7)	433	(4.2)	-3	(4.4)	285	(6.7)	318	(5.4)	370	(4.3)	493	(4.7)	549	(5.5)	581	(6.3)	296
Canada	516	(1.8)	90	(0.9)	521	(2.2)	512	(2.0)	9	(2.1)	367	(2.9)	401	(2.4)	456	(2.4)	579	(2.3)	632	(2.5)	661	(2.6)	294
Chile	430	(2.9)	76	(1.4)	440	(3.6)	421	(2.8)	19	(3.1)	309	(3.9)	335	(3.4)	378	(3.1)	481	(3.6)	531	(4.0)	561	(4.1)	252
Chinese Taipei	549	(3.2)	108	(2.1)	550	(5.0)	547	(5.6)	4	(8.5)	364	(6.6)	403	(4.7)	474	(4.4)	627	(3.9)	684	(4.6)	716	(4.7)	352
Croatia*	468	(3.5)	90	(2.2)	473	(4.3)	463	(3.8)	10	(4.2)	324	(4.3)	354	(3.4)	405	(3.4)	529	(4.7)	587	(6.4)	619	(7.0)	295
Cyprus	442	(1.1)	90	(1.1)	440	(1.7)	444	(1.8)	-4	(2.8)	292	(2.8)	326	(2.9)	381	(1.8)	504	(2.1)	557	(2.4)	589	(3.4)	297
Czech Republic*	488	(2.8)	92	(2.0)	493	(3.4)	483	(3.3)	11	(3.9)	338	(6.3)	371	(4.3)	426	(3.5)	551	(3.2)	606	(3.5)	638	(3.5)	301
Denmark*	505	(2.4)	84	(1.3)	512	(2.9)	498	(2.5)	14	(2.5)	363	(4.4)	396	(3.8)	448	(3.2)	564	(2.7)	613	(3.5)	641	(4.6)	278
England	503	(3.6)	98	(1.9)	511	(4.9)	497	(4.1)	14	(5.5)	340	(5.7)	377	(4.8)	437	(4.5)	572	(3.9)	628	(4.5)	662	(4.9)	322
Estonia*	510	(2.0)	81	(1.1)	513	(2.5)	507	(2.2)	6	(2.5)	378	(4.0)	408	(2.9)	456	(2.5)	565	(2.4)	615	(2.7)	645	(4.1)	267
Finland*	519	(2.4)	91	(1.4)	516	(2.9)	521	(2.6)	-5	(2.8)	367	(4.6)	403	(3.3)	460	(2.6)	580	(2.8)	634	(3.0)	664	(3.8)	297
France*	492	(2.7)	103	(1.8)	492	(3.7)	492	(2.8)	1	(3.7)	317	(6.7)	355	(4.2)	421	(3.7)	567	(3.3)	622	(4.0)	653	(3.4)	335
Germany*	509	(3.0)	101	(1.8)	516	(3.2)	502	(3.6)	14	(3.0)	340	(4.6)	376	(4.2)	439	(3.7)	581	(3.9)	639	(4.4)	669	(5.0)	329
Greece*	460	(2.6)	87	(1.4)	463	(3.5)	458	(2.7)	5	(3.6)	312	(4.4)	347	(4.3)	402	(3.5)	519	(3.1)	572	(3.3)	602	(3.5)	290
Hong Kong-China	553	(3.0)	91	(1.8)	559	(4.4)	547	(3.5)	12	(5.3)	392	(5.6)	430	(4.8)	494	(4.0)	617	(3.3)	666	(3.5)	694	(4.9)	302
Hungary*	476	(3.3)	94	(2.5)	479	(3.5)	472	(4.0)	7	(3.7)	318	(6.2)	353	(4.8)	412	(3.8)	541	(4.6)	599	(6.7)	632	(7.2)	313
Iceland	496	(1.8)	98	(1.7)	491	(2.4)	501	(2.5)	-11	(3.3)	329	(4.0)	365	(3.9)	430	(3.1)	565	(2.6)	620	(3.0)	652	(3.6)	323
Israel	465	(4.7)	108	(2.0)	471	(7.9)	459	(3.4)	11	(7.7)	283	(8.0)	323	(6.3)	391	(5.5)	542	(5.4)	605	(6.2)	641	(5.8)	358
Italy*	482	(2.0)	96	(1.1)	490	(2.4)	475	(2.2)	15	(2.5)	321	(2.9)	359	(2.7)	418	(2.4)	549	(2.4)	605	(2.6)	637	(2.8)	316
Japan	528	(3.5)	90	(2.0)	534	(4.6)	522	(3.4)	12	(4.2)	376	(6.3)	410	(5.1)	468	(4.4)	591	(4.1)	642	(4.6)	671	(4.9)	295
Kazakhstan	414	(2.6)	58	(1.3)	413	(3.0)	414	(2.9)	-1	(2.5)	318	(2.8)	339	(2.9)	374	(2.7)	453	(3.4)	490	(3.9)	511	(5.3)	193
Korea	538	(4.2)	97	(1.9)	546	(5.3)	528	(4.8)	18	(5.8)	374	(7.0)	413	(5.7)	473	(4.1)	606	(4.8)	661	(4.8)	690	(5.6)	316
Latvia*	478	(2.8)	79	(1.2)	477	(3.2)	480	(3.2)	-3	(3.1)	350	(5.4)	378	(3.4)	424	(2.9)	533	(3.5)	581	(2.9)	607	(5.1)	258
Liechtenstein	526	(3.9)	97	(3.3)	536	(6.1)	514	(5.7)	22	(9.0)	359	(11.8)	390	(12.6)	456	(9.1)	599	(5.9)	648	(8.6)	679	(11.4)	321
Lithuania*	474	(2.7)	91	(1.3)	472	(3.0)	475	(3.0)	-2	(2.6)	324	(4.0)	357	(3.7)	412	(3.4)	536	(3.2)	593	(4.4)	624	(4.5)	300
Luxembourg*	483	(1.0)	100	(1.0)	494	(1.5)	471	(1.4)	23	(2.1)	319	(3.4)	352	(2.5)	411	(2.0)	555	(1.6)	613	(2.2)	645	(2.6)	326
Macao-China	525	(1.1)	89	(0.9)	526	(1.6)	524	(1.5)	2	(2.2)	374	(2.7)	409	(2.3)	467	(1.6)	587	(1.9)	637	(2.1)	666	(2.3)	292
Mexico	413	(1.2)	67	(0.7)	417	(1.4)	409	(1.3)	9	(1.1)	303	(1.8)	328	(2.0)	368	(1.5)	457	(1.4)	499	(1.8)	524	(2.1)	221
Netherlands*	532	(3.8)	99	(2.6)	536	(4.0)	527	(4.4)	9	(3.3)	367	(7.4)	399	(6.3)	461	(5.2)	606	(4.7)	659	(4.2)	687	(4.1)	320
New Zealand	506	(2.6)	106	(1.6)	509	(3.9)	502	(3.1)	8	(4.7)	332	(5.3)	370	(4.5)	432	(3.2)	580	(3.3)	644	(3.8)	680	(4.5)	348
Northern Ireland	496	(3.4)	95	(2.3)	501	(5.2)	491	(5.5)	10	(8.2)	336	(7.1)	373	(5.6)	428	(4.9)	564	(4.2)	619	(5.5)	651	(5.9)	315
Norway	497	(3.0)	91	(2.1)	496	(3.2)	497	(3.5)	-1	(3.0)	345	(5.6)	381	(4.4)	437	(3.1)	558	(2.8)	613	(3.6)	644	(4.3)	299
Poland*	517	(3.5)	87	(1.9)	518	(4.0)	516	(3.8)	2	(3.4)	374	(3.6)	403	(3.7)	456	(3.4)	578	(3.8)	630	(5.8)	660	(6.8)	286
Portugal*	486	(3.8)	91	(1.5)	492	(4.1)	480	(3.8)	12	(2.4)	334	(5.2)	366	(4.4)	422	(5.5)	550	(4.0)	604	(3.7)	632	(3.9)	298
Republic of Ireland*	509	(2.5)	88	(1.4)	516	(3.7)	501	(2.9)	14	(4.3)	361	(5.9)	395	(4.4)	450	(3.5)	569	(2.7)	619	(2.5)	648	(3.2)	288
Romania*	437	(3.3)	76	(1.8)	437	(3.9)	436	(3.6)	1	(3.5)	314	(4.6)	340	(4.1)	384	(3.4)	487	(3.7)	536	(4.9)	567	(5.9)	253
Russian Federation	463	(3.3)	85	(1.5)	461	(3.8)	465	(3.4)	-5	(3.0)	323	(5.9)	355	(4.8)	406	(3.5)	521	(3.4)	572	(4.0)	601	(4.8)	279
Scotland	504	(2.6)	87	(1.7)	510	(2.9)	498	(3.5)	12	(3.5)	358	(6.3)	393	(4.8)	446	(3.7)	565	(3.0)	615	(3.0)	646	(4.4)	288
Serbia	448	(3.3)	86	(1.9)	454	(4.1)	443	(3.4)	12	(3.8)	310	(5.7)	341	(4.1)	391	(3.9)	505	(4.5)	559	(4.7)	592	(5.4)	283
Shanghai-China	592	(3.0)	96	(1.9)	594	(3.7)	590	(3.1)	4	(3.2)	427	(5.9)	464	(5.1)	528	(4.1)	660	(3.2)	712	(3.6)	741	(5.7)	314
Singapore	559	(1.5)	104	(0.8)	558	(2.0)	561	(2.0)	-4	(2.7)	384	(3.4)	421	(2.8)	487	(2.8)	634	(2.0)	692	(2.4)	725	(2.6)	341
Slovak Republic*	472	(3.6)	100	(2.5)	477	(4.2)	466	(4.0)	11	(4.2)	305	(7.7)	343	(5.9)	405	(4.8)	541	(4.4)	599	(4.7)	633	(5.8)	328
Slovenia*	496	(1.2)	92	(0.9)	495	(1.7)	497	(2.1)	-3	(2.9)	347	(3.1)	378	(2.3)	430	(2.0)	562	(2.2)	619	(2.4)	648	(3.2)	301
Spain*	487	(2.3)	94	(1.1)	495	(2.8)	478	(2.3)	16	(2.3)	329	(4.6)	367	(3.5)	425	(2.8)	552	(2.5)	605	(2.4)	635	(2.6)	307
Sweden*	483	(2.5)	93	(1.3)	482	(3.2)	483	(2.7)	-1	(3.1)	327	(5.8)	363	(3.4)	420	(3.2)	547	(3.4)	603	(3.2)	634	(4.1)	306
Switzerland	522	(3.2)	97	(1.6)	529	(3.6)	514	(3.3)	14	(2.8)	357	(4.7)	396	(3.6)	457	(3.4)	589	(3.9)	644	(4.3)	677	(4.4)	320
Turkey	447	(4.6)	91	(2.7)	452	(5.0)	443	(5.3)	9	(4.6)	307	(3.8)	336	(3.3)	383	(3.6)	506	(7.2)	573	(9.0)	610	(8.4)	303
United Arab Emirates	432	(2.4)	86	(1.1)	428	(3.7)	435	(3.1)	-7	(4.7)	296	(3.3)	324	(2.7)	372	(2.4)	489	(3.2)	546	(3.5)	581	(4.0)	286
United Kingdom*	502	(3.0)	97	(1.6)	509	(4.1)	496	(3.5)	13	(4.7)	341	(5.0)	378	(4.0)	436	(3.7)	570	(3.3)	626	(3.7)	659	(4.3)	318
United States	488	(3.5)	89	(1.5)	489	(3.8)	487	(3.8)	2	(2.8)	344	(4.9)	374	(3.9)	426	(4.1)	551	(4.2)	604	(4.3)	635	(4.6)	291
Vietnam	519	(4.5)	79	(2.4)	520	(5.1)	519	(4.1)	1	(2.6)	385	(8.4)	416	(6.8)	466	(5.9)	574	(3.9)	619	(4.8)	646	(6.7)	261
Wales	483	(2.7)	88	(1.3)	487	(3.2)	478	(3.2)	9	(3.4)	336	(4.8)	369	(3.9)	423	(3.8)	543	(2.9)	596	(4.1)	627	(4.4)	291
OECD average	493	(0.5)	93	(0.3)	497	(0.6)	489	(0.5)	9	(0.6)	338	(0.9)	373	(0.7)	430	(0.6)	558	(0.6)	613	(0.7)	644	(0.8)	306

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold

B7 Mean score, variation and gender differences in student performance on the mathematics sub-scale change and relationships

	All students				Gender differences					Percentiles										Difference between 5th and 95th percentile			
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th		75th		90th		95th		
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score		S.E.	Score	S.E.
Australia	509	(1.7)	104	(1.2)	515	(2.5)	503	(2.2)	12	(3.2)	339	(2.8)	375	(2.4)	437	(2.1)	581	(2.4)	645	(2.9)	680	(3.7)	341
Austria*	506	(3.4)	109	(2.7)	518	(4.8)	495	(4.1)	23	(5.8)	326	(7.2)	365	(5.2)	433	(4.6)	584	(4.7)	643	(4.6)	677	(6.7)	350
Belgium*	513	(2.6)	116	(3.2)	517	(3.6)	509	(2.9)	8	(4.1)	312	(7.9)	362	(5.6)	443	(3.5)	596	(2.5)	653	(2.6)	684	(2.9)	372
Bulgaria*	434	(4.5)	109	(2.5)	433	(5.3)	436	(4.9)	-2	(5.0)	263	(6.7)	299	(5.4)	358	(4.7)	507	(5.7)	579	(6.7)	620	(7.7)	358
Canada	525	(2.0)	94	(0.9)	532	(2.2)	518	(2.2)	14	(2.0)	367	(3.1)	403	(2.7)	461	(2.2)	591	(2.8)	647	(2.5)	679	(2.9)	312
Chile	411	(3.5)	95	(1.6)	428	(4.5)	396	(3.4)	32	(4.1)	263	(5.2)	293	(3.8)	345	(3.5)	475	(4.6)	537	(4.7)	574	(5.5)	310
Chinese Taipei	561	(3.5)	121	(2.2)	563	(5.7)	559	(5.8)	4	(9.0)	355	(6.4)	398	(5.7)	476	(5.0)	648	(3.7)	714	(5.2)	752	(5.4)	396
Croatia*	468	(4.2)	103	(2.8)	470	(5.1)	465	(4.6)	5	(4.9)	301	(5.9)	336	(5.5)	395	(4.5)	539	(5.5)	602	(7.3)	640	(9.0)	339
Cyprus	440	(1.2)	102	(1.0)	439	(1.9)	441	(1.8)	-2	(2.8)	272	(3.4)	310	(2.8)	371	(1.9)	509	(2.5)	572	(2.7)	608	(3.5)	336
Czech Republic*	499	(3.5)	112	(3.3)	503	(4.5)	496	(4.2)	7	(5.3)	317	(11.2)	364	(6.5)	430	(4.5)	576	(3.6)	636	(3.5)	674	(4.2)	357
Denmark*	494	(2.7)	91	(1.3)	502	(3.3)	486	(2.7)	16	(2.8)	345	(4.7)	377	(3.7)	432	(3.1)	557	(3.1)	613	(3.5)	643	(4.0)	298
England	498	(4.1)	100	(2.1)	506	(5.3)	490	(4.6)	15	(5.6)	333	(6.2)	368	(6.2)	430	(5.3)	568	(4.5)	628	(5.1)	662	(5.4)	329
Estonia*	530	(2.3)	84	(1.1)	533	(2.8)	527	(2.4)	6	(2.7)	394	(4.4)	422	(2.6)	472	(2.8)	587	(2.6)	639	(3.7)	669	(4.1)	276
Finland*	520	(2.6)	97	(2.3)	521	(3.2)	520	(2.8)	1	(3.0)	363	(5.9)	400	(3.5)	458	(2.7)	584	(2.5)	643	(3.4)	677	(4.4)	314
France*	497	(2.7)	107	(2.4)	503	(3.7)	491	(2.8)	11	(3.6)	313	(9.6)	355	(6.3)	425	(3.6)	572	(3.2)	632	(4.2)	667	(4.9)	354
Germany*	516	(3.8)	114	(3.4)	521	(3.9)	510	(4.2)	11	(3.0)	321	(8.4)	368	(6.6)	443	(4.4)	597	(3.7)	656	(4.2)	688	(5.4)	368
Greece*	446	(3.2)	101	(1.6)	448	(4.3)	444	(3.1)	4	(3.7)	278	(5.6)	317	(5.4)	378	(4.1)	515	(3.7)	574	(3.9)	609	(4.7)	331
Hong Kong-China	564	(3.6)	103	(2.2)	572	(5.0)	556	(4.3)	16	(5.9)	380	(7.9)	426	(7.1)	497	(4.9)	636	(3.6)	691	(4.0)	723	(5.3)	343
Hungary*	481	(3.5)	100	(2.7)	485	(4.0)	479	(4.0)	6	(3.8)	320	(6.9)	352	(5.5)	411	(3.9)	550	(4.9)	614	(7.0)	651	(7.3)	331
Iceland	487	(1.9)	100	(1.5)	485	(2.5)	488	(2.5)	-3	(3.4)	318	(5.0)	355	(4.4)	420	(3.0)	557	(2.7)	614	(3.2)	647	(3.6)	329
Israel	462	(5.3)	117	(2.4)	469	(8.9)	456	(4.0)	13	(8.6)	266	(9.1)	308	(7.4)	382	(6.3)	545	(5.5)	613	(6.0)	651	(6.6)	385
Italy*	477	(2.1)	100	(1.3)	486	(2.4)	467	(2.3)	19	(2.6)	310	(3.3)	348	(2.9)	410	(2.5)	546	(2.5)	604	(2.9)	638	(3.4)	328
Japan	542	(4.0)	107	(2.4)	553	(5.0)	531	(4.2)	22	(4.8)	362	(7.0)	404	(5.8)	470	(4.5)	618	(5.0)	680	(6.0)	715	(7.1)	353
Kazakhstan	433	(3.2)	84	(1.9)	429	(3.7)	437	(3.6)	-8	(3.6)	298	(3.0)	327	(3.3)	375	(2.7)	489	(4.4)	541	(6.1)	573	(6.4)	275
Korea	559	(5.2)	107	(2.7)	569	(6.6)	548	(5.4)	21	(6.5)	382	(8.4)	422	(6.2)	488	(5.1)	633	(5.7)	692	(7.0)	727	(9.0)	346
Latvia*	496	(3.4)	90	(1.8)	492	(4.0)	501	(3.6)	-9	(3.7)	347	(6.4)	381	(4.4)	434	(3.9)	558	(4.2)	613	(3.9)	642	(4.5)	295
Liechtenstein	542	(4.0)	104	(3.6)	552	(6.3)	531	(6.5)	21	(10.0)	363	(17.8)	400	(11.4)	469	(8.2)	621	(6.4)	675	(11.8)	703	(11.6)	340
Lithuania*	479	(3.2)	92	(1.6)	480	(3.5)	479	(3.3)	1	(2.5)	330	(5.0)	364	(4.2)	417	(3.5)	542	(3.6)	599	(4.1)	632	(4.9)	301
Luxembourg*	488	(1.0)	102	(1.0)	500	(1.5)	475	(1.3)	25	(1.9)	317	(3.4)	352	(2.6)	415	(2.0)	562	(1.9)	619	(2.3)	652	(3.0)	335
Macao-China	542	(1.2)	100	(1.1)	542	(1.7)	543	(1.5)	0	(2.0)	375	(3.5)	413	(2.5)	478	(1.7)	612	(2.1)	667	(2.8)	700	(3.5)	324
Mexico	405	(1.6)	87	(0.8)	410	(1.9)	399	(1.7)	11	(1.5)	264	(2.6)	295	(2.3)	347	(1.9)	462	(1.9)	516	(2.1)	549	(2.4)	285
Netherlands*	518	(3.9)	103	(3.2)	522	(4.3)	514	(4.2)	8	(3.4)	345	(10.0)	388	(6.5)	453	(5.2)	593	(4.0)	642	(3.7)	669	(3.7)	324
New Zealand	501	(2.5)	112	(1.6)	509	(3.6)	492	(3.5)	17	(5.0)	319	(5.1)	356	(4.1)	422	(3.5)	578	(3.7)	646	(4.1)	686	(4.7)	367
Northern Ireland	486	(3.8)	99	(2.3)	491	(5.6)	479	(5.8)	12	(8.4)	321	(7.4)	358	(6.2)	416	(5.1)	555	(5.1)	614	(6.3)	651	(5.6)	329
Norway	478	(3.1)	102	(1.3)	479	(3.2)	476	(3.8)	3	(3.4)	306	(5.2)	346	(4.7)	409	(3.4)	547	(3.4)	608	(4.1)	644	(4.7)	338
Poland*	509	(4.1)	100	(2.1)	510	(4.7)	509	(4.3)	1	(3.6)	347	(4.4)	380	(4.0)	440	(4.1)	578	(5.2)	641	(6.8)	677	(9.3)	330
Portugal*	486	(4.1)	98	(1.4)	490	(4.4)	482	(4.1)	9	(2.6)	323	(5.6)	356	(4.7)	417	(5.4)	556	(4.0)	615	(4.0)	645	(3.9)	323
Republic of Ireland*	501	(2.6)	87	(1.5)	508	(3.6)	494	(3.1)	13	(4.3)	355	(6.1)	389	(4.8)	443	(3.3)	561	(2.6)	613	(2.5)	642	(3.5)	287
Romania*	446	(3.9)	89	(2.4)	446	(4.7)	445	(4.1)	1	(3.9)	307	(4.4)	336	(4.6)	382	(3.9)	504	(5.0)	566	(6.8)	602	(7.1)	295
Russian Federation	491	(3.4)	93	(1.8)	489	(4.0)	493	(3.5)	-5	(3.1)	338	(5.5)	371	(4.7)	428	(4.0)	553	(3.8)	611	(5.0)	644	(6.3)	306
Scotland	497	(3.1)	93	(2.1)	506	(3.5)	487	(3.6)	19	(3.5)	344	(7.0)	380	(4.9)	434	(4.0)	561	(3.3)	618	(4.4)	650	(6.8)	306
Serbia	442	(4.1)	104	(2.7)	445	(4.9)	439	(4.6)	5	(4.7)	274	(7.6)	311	(5.7)	371	(4.9)	512	(4.4)	578	(6.3)	618	(6.5)	344
Shanghai-China	624	(3.6)	112	(2.4)	629	(4.4)	619	(3.9)	10	(3.9)	431	(6.7)	473	(6.5)	547	(5.4)	704	(3.6)	764	(4.1)	797	(5.3)	367
Singapore	580	(1.5)	114	(0.9)	581	(2.2)	580	(1.9)	1	(2.6)	387	(4.4)	428	(3.9)	502	(2.7)	662	(2.1)	725	(2.8)	759	(2.8)	373
Slovak Republic*	474	(4.0)	114	(2.9)	476	(4.9)	472	(4.5)	4	(4.9)	282	(9.2)	327	(6.9)	401	(5.5)	553	(4.6)	617	(4.8)	655	(6.7)	373
Slovenia*	499	(1.1)	100	(1.0)	501	(1.7)	497	(2.2)	4	(3.1)	338	(2.9)	372	(2.7)	429	(2.3)	570	(2.2)	632	(3.8)	667	(3.7)	329
Spain*	482	(2.0)	93	(0.8)	490	(2.5)	473	(2.1)	17	(2.2)	326	(3.0)	361	(3.1)	420	(2.9)	547	(2.1)	600	(1.9)	630	(1.9)	304
Sweden*	469	(2.8)	107	(1.6)	466	(3.6)	472	(3.1)	-5	(3.8)	291	(5.4)	331	(4.1)	397	(4.0)	544	(3.4)	606	(3.8)	641	(4.0)	350
Switzerland	530	(3.4)	103	(1.6)	536	(3.9)	524	(3.6)	12	(3.0)	359	(4.1)	396	(3.4)	459	(3.7)	602	(4.0)	661	(4.8)	695	(5.3)	336
Turkey	448	(5.0)	92	(3.1)	448	(5.4)	449	(5.7)	-1	(4.7)	310	(4.7)	336	(4.9)	383	(3.9)	508	(7.3)	575	(9.1)	612	(10.6)	301
United Arab Emirates	442	(2.6)	95	(1.2)	440	(4.2)	445	(3.0)	-4	(5.0)	294	(3.9)	325	(3.0)	376	(2.8)	505	(3.4)	570	(3.8)	607	(4.2)	313
United Kingdom*	496	(3.4)	99	(1.8)	504	(4.4)	489	(3.9)	15	(4.8)	333	(5.3)	368	(5.2)	429	(4.4)	565	(3.9)	626	(4.4)	659	(5.2)	326
United States	488	(3.5)	95	(1.4)	490	(3.9)	486	(3.9)	4	(3.2)	339	(4.2)	368	(4.0)	421	(4.1)	552	(4.2)	614	(4.3)	649	(5.1)	310
Vietnam	509	(5.1)	94	(2.7)	514	(5.9)	506	(4.9)	8	(3.2)	355	(8.0)	389	(7.1)	445	(6.1)	572	(5.7)	631	(6.6)	664	(6.7)	309
Wales	470	(2.5)	90	(1.3)	476	(3.0)	463	(3.0)	13	(3.3)	321	(4.8)	353	(4.9)	409	(3.3)	532	(2.9)	584	(3.7)	616	(5.2)	295
OECD average	493	(0.6)	101	(0.4)	498	(0.7)	487	(0.6)	11	(0.7)	325	(1.1)	362	(0.8)	424	(0.7)	563	(0.7)	622	(0.8)	657	(0.9)	332

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold

B8 Mean score, variation and gender differences in student performance on the mathematics sub-scale space and shape

	All students				Gender differences						Percentiles						Difference between 5th and 95th percentile						
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th			75th		90th		95th	
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.		Score	S.E.	Score	S.E.	Score	S.E.
Australia	497	(1.8)	102	(1.4)	506	(2.5)	486	(2.3)	20	(3.2)	334	(2.9)	368	(2.4)	425	(2.0)	564	(2.5)	630	(3.4)	669	(4.1)	335
Austria*	501	(3.1)	98	(2.2)	519	(4.5)	483	(3.4)	37	(5.4)	340	(4.6)	375	(4.1)	432	(3.7)	569	(3.8)	627	(5.2)	662	(7.1)	322
Belgium*	509	(2.4)	108	(1.5)	518	(3.0)	500	(2.8)	18	(3.5)	330	(4.5)	368	(4.2)	434	(3.6)	585	(2.9)	649	(3.1)	684	(3.1)	354
Bulgaria*	442	(4.3)	95	(2.2)	442	(5.0)	442	(4.6)	0	(4.2)	291	(5.4)	321	(5.8)	376	(4.9)	506	(5.2)	569	(5.4)	604	(6.4)	313
Canada	510	(2.1)	95	(0.9)	515	(2.4)	505	(2.3)	10	(2.2)	355	(2.9)	388	(2.6)	444	(2.3)	576	(2.7)	636	(3.2)	670	(3.1)	314
Chile	419	(3.2)	86	(1.5)	435	(3.8)	404	(3.2)	31	(3.5)	288	(4.3)	313	(3.7)	358	(3.3)	475	(4.3)	533	(4.5)	569	(4.7)	281
Chinese Taipei	592	(3.8)	136	(2.3)	596	(6.2)	589	(6.4)	7	(10.0)	362	(5.3)	407	(5.5)	494	(5.5)	693	(4.1)	764	(5.4)	803	(5.9)	441
Croatia*	460	(3.9)	88	(3.4)	468	(4.7)	452	(4.1)	15	(3.9)	328	(3.6)	354	(3.1)	399	(3.1)	516	(4.9)	575	(8.1)	615	(13.4)	287
Cyprus	436	(1.1)	92	(1.0)	439	(1.6)	433	(1.5)	6	(2.3)	289	(2.5)	320	(2.4)	373	(2.2)	498	(2.1)	555	(2.8)	592	(3.6)	303
Czech Republic*	499	(3.4)	102	(1.9)	509	(4.2)	487	(3.7)	22	(4.4)	331	(7.1)	369	(4.8)	428	(4.7)	569	(4.0)	630	(4.2)	666	(4.8)	335
Denmark*	497	(2.5)	84	(1.2)	504	(3.0)	490	(2.5)	14	(2.3)	357	(4.6)	388	(3.8)	441	(3.3)	553	(2.9)	604	(3.7)	633	(4.1)	276
England	477	(4.1)	100	(2.0)	484	(5.1)	471	(4.9)	13	(5.8)	314	(6.6)	348	(5.6)	408	(4.8)	544	(5.1)	607	(4.8)	643	(5.8)	329
Estonia*	513	(2.5)	94	(1.1)	515	(3.0)	510	(3.0)	4	(3.1)	364	(4.2)	395	(3.8)	449	(3.4)	575	(2.7)	634	(3.2)	671	(4.8)	307
Finland*	507	(2.1)	90	(1.3)	506	(2.7)	507	(2.3)	-1	(2.8)	361	(4.2)	393	(2.7)	446	(2.5)	567	(2.7)	624	(3.1)	658	(3.8)	297
France*	489	(2.7)	99	(1.9)	497	(3.6)	481	(2.9)	16	(3.4)	326	(4.4)	360	(3.7)	418	(3.7)	558	(3.7)	619	(4.4)	652	(5.4)	326
Germany*	507	(3.2)	98	(1.9)	515	(3.4)	499	(3.7)	16	(2.8)	346	(5.6)	379	(5.1)	440	(4.2)	575	(3.8)	633	(4.5)	667	(5.2)	321
Greece*	436	(2.6)	90	(1.4)	442	(3.3)	431	(2.8)	11	(3.3)	290	(5.6)	324	(3.4)	375	(3.0)	497	(3.3)	552	(3.9)	585	(4.3)	295
Hong Kong-China	567	(4.0)	107	(2.3)	576	(5.6)	555	(4.5)	21	(6.4)	382	(7.1)	422	(6.4)	495	(5.1)	642	(4.5)	701	(4.8)	734	(5.2)	352
Hungary*	474	(3.4)	96	(2.7)	482	(3.8)	465	(4.1)	17	(3.9)	325	(4.0)	354	(4.0)	406	(3.3)	536	(5.3)	604	(7.2)	643	(10.4)	318
Iceland	489	(1.5)	88	(1.3)	485	(2.0)	493	(2.2)	-8	(3.0)	339	(3.7)	373	(3.1)	430	(2.6)	549	(2.4)	604	(2.4)	634	(3.3)	295
Israel	449	(4.8)	105	(1.9)	456	(8.0)	443	(3.6)	13	(7.7)	278	(7.0)	314	(5.7)	376	(4.9)	522	(5.4)	586	(6.0)	622	(5.7)	344
Italy*	487	(2.5)	106	(1.4)	498	(2.8)	476	(2.7)	23	(2.6)	316	(2.8)	354	(2.8)	415	(2.5)	559	(3.5)	627	(3.9)	665	(4.2)	348
Japan	558	(3.7)	100	(2.4)	566	(4.6)	548	(4.0)	18	(4.7)	393	(6.2)	429	(4.9)	489	(4.2)	627	(4.8)	688	(5.2)	723	(6.3)	330
Kazakhstan	450	(3.9)	85	(2.3)	454	(4.2)	446	(4.3)	8	(3.5)	317	(4.3)	344	(3.9)	391	(3.3)	506	(5.4)	562	(6.6)	595	(8.2)	278
Korea	573	(5.2)	112	(2.4)	583	(6.6)	562	(5.9)	20	(7.0)	388	(7.1)	428	(5.6)	495	(5.3)	653	(6.2)	716	(7.5)	753	(8.6)	365
Latvia*	497	(3.3)	88	(1.5)	496	(3.8)	497	(3.6)	-1	(3.4)	356	(5.6)	386	(4.2)	437	(3.3)	556	(4.1)	611	(5.2)	645	(5.2)	289
Liechtenstein	539	(4.5)	99	(4.3)	550	(6.2)	527	(7.5)	23	(10.4)	373	(18.5)	406	(13.5)	475	(10.8)	611	(8.4)	667	(11.0)	695	(13.2)	322
Lithuania*	472	(3.1)	98	(1.7)	471	(3.3)	473	(3.5)	-2	(2.8)	313	(4.6)	347	(4.1)	404	(4.2)	539	(3.5)	600	(4.7)	637	(5.0)	324
Luxembourg*	486	(1.0)	96	(1.1)	503	(1.4)	469	(1.5)	34	(2.1)	332	(3.1)	364	(2.6)	418	(2.2)	554	(2.1)	612	(3.0)	645	(3.2)	312
Macao-China	558	(1.4)	109	(1.0)	561	(2.0)	554	(1.6)	7	(2.4)	375	(3.4)	416	(2.4)	485	(2.5)	635	(2.1)	697	(2.6)	732	(3.6)	358
Mexico	413	(1.6)	82	(0.9)	423	(1.9)	402	(1.7)	21	(1.4)	280	(3.1)	309	(2.4)	358	(1.9)	466	(1.9)	519	(2.4)	550	(2.3)	270
Netherlands*	507	(3.5)	94	(2.3)	515	(3.5)	499	(4.0)	16	(2.8)	350	(6.5)	385	(5.2)	442	(4.2)	573	(4.5)	628	(4.8)	660	(6.5)	310
New Zealand	491	(2.4)	100	(1.7)	504	(3.5)	477	(3.1)	27	(4.6)	334	(5.5)	366	(4.3)	421	(3.2)	558	(2.9)	624	(4.7)	663	(5.5)	330
Northern Ireland	463	(3.6)	99	(2.5)	467	(5.4)	460	(5.4)	7	(8.1)	304	(7.8)	340	(5.1)	397	(4.5)	529	(4.3)	591	(6.6)	626	(6.8)	322
Norway	480	(3.3)	102	(1.4)	481	(3.4)	478	(4.1)	3	(3.3)	312	(6.3)	351	(4.6)	412	(3.2)	548	(3.9)	610	(4.2)	647	(5.1)	335
Poland*	524	(4.2)	101	(2.2)	528	(4.9)	520	(4.4)	8	(3.8)	370	(4.0)	398	(3.4)	450	(3.6)	593	(6.0)	660	(6.8)	697	(7.8)	327
Portugal*	491	(4.2)	109	(1.9)	498	(4.6)	483	(4.4)	15	(2.9)	318	(6.7)	351	(5.5)	414	(4.5)	568	(4.7)	633	(4.6)	669	(5.1)	351
Republic of Ireland*	478	(2.6)	94	(1.4)	490	(3.7)	465	(3.0)	25	(4.3)	323	(4.9)	357	(4.2)	415	(3.4)	542	(2.8)	598	(2.8)	631	(3.9)	308
Romania*	447	(4.1)	91	(2.6)	452	(4.7)	443	(4.4)	10	(4.1)	306	(4.4)	335	(3.9)	383	(3.6)	505	(5.3)	567	(7.6)	607	(7.8)	300
Russian Federation	496	(3.9)	95	(2.1)	498	(4.6)	494	(3.8)	4	(3.1)	344	(3.9)	376	(3.7)	430	(4.2)	560	(5.1)	622	(6.2)	657	(7.9)	313
Scotland	482	(3.1)	95	(1.8)	492	(3.4)	471	(3.7)	21	(3.4)	328	(6.3)	361	(5.2)	417	(4.0)	546	(3.7)	606	(4.2)	642	(5.4)	315
Serbia	446	(3.9)	98	(2.5)	452	(4.5)	441	(4.2)	11	(3.9)	293	(5.4)	324	(5.0)	377	(4.3)	510	(4.6)	576	(6.8)	616	(9.0)	323
Shanghai-China	649	(3.6)	114	(2.5)	649	(4.4)	649	(3.7)	0	(3.8)	445	(8.2)	493	(7.1)	575	(5.6)	728	(3.1)	787	(4.3)	822	(5.3)	376
Singapore	580	(1.5)	117	(1.1)	577	(2.3)	582	(1.9)	-5	(3.0)	380	(4.1)	423	(3.6)	500	(2.1)	664	(2.5)	727	(2.8)	764	(3.5)	383
Slovak Republic*	490	(4.1)	109	(2.7)	496	(4.7)	482	(4.7)	15	(4.8)	311	(8.5)	351	(6.3)	416	(4.5)	564	(5.5)	632	(6.3)	670	(6.9)	359
Slovenia*	503	(1.4)	99	(1.2)	506	(2.0)	500	(2.2)	6	(3.1)	345	(3.8)	379	(2.8)	433	(2.1)	572	(3.2)	636	(4.2)	671	(3.1)	325
Spain*	477	(2.0)	94	(0.9)	486	(2.5)	468	(2.3)	18	(2.4)	324	(3.6)	357	(2.9)	412	(2.3)	542	(2.5)	599	(2.4)	631	(2.5)	308
Sweden*	469	(2.5)	94	(1.6)	470	(3.0)	467	(2.8)	3	(3.1)	313	(5.7)	348	(3.6)	405	(3.1)	533	(3.1)	590	(3.1)	623	(5.0)	310
Switzerland	544	(3.1)	101	(1.7)	554	(3.5)	535	(3.4)	19	(3.1)	375	(4.7)	413	(3.9)	475	(3.4)	614	(4.5)	675	(4.4)	711	(5.4)	336
Turkey	443	(5.5)	109	(3.8)	449	(5.8)	437	(6.8)	12	(6.1)	280	(5.3)	312	(3.9)	365	(4.1)	512	(9.2)	597	(12.2)	641	(12.1)	360
United Arab Emirates	425	(2.4)	97	(1.4)	424	(3.5)	425	(3.5)	-1	(5.0)	274	(3.7)	304	(3.1)	356	(2.7)	490	(3.1)	553	(4.0)	591	(3.9)	316
United Kingdom*	475	(3.5)	99	(1.8)	482	(4.3)	469	(4.2)	13	(5.0)	313	(5.5)	347	(4.6)	407	(4.1)	542	(4.1)	605	(4.3)	641	(4.9)	328
United States	463	(4.0)	96	(1.5)	467	(4.3)	460	(4.4)	7	(3.3)	314	(4.4)	342	(4.4)	396	(3.9)	527	(5.2)	591	(5.2)	631	(6.2)	317
Vietnam	507	(5.1)	99	(2.8)	519	(5.9)	496	(5.0)	23	(3.2)	346	(7.6)	382	(6.3)	439	(5.3)	573	(6.6)	637	(7.4)	674	(8.4)	328
Wales	470	(2.5)	90	(1.3)	476	(3.0)	463	(3.0)	13	(3.3)	321	(4.8)	353	(4.9)	409	(3.3)	532	(2.9)	584	(3.7)	616	(5.2)	295
OECD average	490	(0.5)	98	(0.3)	497	(0.7)	482	(0.6)	15	(0.7)	331	(0.9)	365	(0.7)	422	(0.6)	556	(0.7)	618	(0.8)	653	(1.0)	322

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold

B9 Mean score, variation and gender differences in student performance on the mathematics sub-scale formulating

	All students				Gender differences					Percentiles										Difference between 5th and 95th percentile			
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th		75th		90th		95th		
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score		S.E.	Score	S.E.
Australia	498	(1.9)	110	(1.5)	506	(2.8)	489	(2.3)	17	(3.5)	323	(3.3)	359	(2.6)	421	(1.8)	573	(2.7)	643	(3.8)	683	(4.7)	360
Austria*	499	(3.2)	105	(2.1)	515	(4.6)	484	(3.6)	32	(5.5)	328	(6.6)	365	(4.9)	425	(3.9)	575	(3.9)	635	(5.0)	668	(5.4)	341
Belgium*	512	(2.4)	111	(1.5)	520	(3.2)	505	(2.6)	15	(3.4)	328	(5.3)	367	(4.1)	435	(3.3)	591	(2.9)	656	(3.1)	692	(3.6)	365
Bulgaria*	437	(4.2)	99	(2.4)	439	(4.8)	434	(4.9)	5	(4.6)	282	(6.4)	313	(5.0)	368	(4.4)	503	(5.7)	567	(6.9)	607	(7.3)	325
Canada	516	(2.2)	101	(0.9)	522	(2.6)	510	(2.4)	13	(2.4)	350	(2.8)	385	(2.7)	446	(2.7)	587	(2.8)	648	(3.6)	685	(3.2)	334
Chile	420	(3.2)	88	(1.6)	434	(3.8)	406	(3.3)	29	(3.7)	284	(4.6)	311	(4.3)	359	(3.5)	477	(3.7)	535	(4.9)	573	(5.4)	289
Chinese Taipei	578	(4.0)	137	(2.4)	584	(6.3)	573	(6.9)	11	(10.5)	345	(6.7)	393	(6.2)	482	(6.0)	678	(4.1)	751	(5.5)	791	(6.7)	446
Croatia*	453	(4.0)	96	(3.0)	461	(5.1)	444	(4.2)	16	(4.7)	304	(3.7)	332	(3.5)	384	(3.2)	515	(5.1)	580	(8.6)	622	(13.0)	318
Cyprus	437	(1.2)	93	(0.9)	441	(1.6)	432	(1.8)	9	(2.5)	290	(3.2)	320	(2.3)	372	(1.9)	498	(2.0)	559	(2.5)	596	(4.0)	307
Czech Republic*	495	(3.4)	103	(2.6)	503	(4.3)	486	(3.8)	17	(4.4)	330	(7.5)	365	(5.1)	425	(4.2)	565	(3.6)	626	(4.6)	663	(4.3)	333
Denmark*	502	(2.4)	89	(1.3)	511	(2.8)	494	(2.6)	17	(2.5)	355	(4.9)	387	(4.3)	441	(3.3)	565	(2.7)	618	(3.7)	649	(4.2)	293
England	491	(4.4)	105	(2.3)	497	(5.6)	485	(5.2)	12	(6.2)	319	(7.7)	355	(7.6)	418	(6.0)	563	(4.7)	630	(5.9)	665	(5.8)	346
Estonia*	517	(2.3)	91	(1.1)	523	(2.9)	512	(2.4)	11	(2.7)	371	(3.5)	402	(3.9)	454	(2.8)	578	(3.0)	637	(3.1)	673	(4.2)	302
Finland*	519	(2.4)	97	(1.4)	520	(3.0)	518	(2.6)	2	(3.0)	359	(4.9)	393	(3.4)	453	(2.5)	585	(3.0)	645	(3.3)	678	(3.8)	319
France*	483	(2.8)	106	(2.0)	491	(3.8)	476	(3.0)	15	(3.9)	309	(5.7)	346	(4.1)	410	(3.3)	558	(3.8)	620	(4.1)	656	(6.0)	348
Germany*	511	(3.4)	105	(1.7)	520	(3.6)	501	(3.9)	19	(3.2)	337	(4.7)	372	(4.5)	438	(4.2)	586	(4.3)	647	(4.3)	681	(5.3)	344
Greece*	448	(2.3)	89	(1.6)	454	(3.2)	442	(2.6)	13	(3.4)	303	(5.3)	334	(3.8)	387	(3.4)	507	(2.9)	563	(3.7)	596	(3.9)	292
Hong Kong-China	568	(3.7)	115	(2.1)	579	(5.3)	557	(4.8)	22	(7.1)	369	(7.0)	415	(7.0)	493	(5.2)	649	(4.1)	711	(4.0)	744	(5.0)	375
Hungary*	469	(3.6)	101	(2.9)	478	(4.0)	461	(4.2)	17	(3.9)	312	(5.5)	344	(4.1)	398	(3.9)	536	(5.2)	605	(8.4)	645	(9.5)	332
Iceland	500	(1.7)	94	(1.2)	499	(2.4)	501	(2.4)	-1	(3.3)	344	(4.5)	377	(3.9)	436	(2.5)	565	(3.0)	623	(3.1)	654	(4.4)	309
Israel	465	(4.7)	109	(2.5)	472	(7.7)	457	(3.6)	15	(7.3)	284	(7.9)	323	(6.1)	388	(5.4)	541	(5.9)	605	(6.2)	643	(6.4)	359
Italy*	475	(2.2)	102	(1.2)	487	(2.6)	463	(2.4)	24	(2.6)	309	(3.0)	345	(2.6)	406	(2.4)	545	(2.7)	608	(3.4)	645	(3.5)	336
Japan	554	(4.2)	110	(2.7)	563	(5.2)	544	(4.4)	19	(4.9)	370	(7.5)	410	(6.6)	481	(5.2)	631	(4.7)	695	(5.8)	730	(6.5)	359
Kazakhstan	442	(3.8)	82	(2.1)	446	(4.1)	438	(4.2)	7	(3.3)	313	(3.7)	339	(3.9)	385	(3.8)	496	(5.0)	548	(6.3)	582	(7.5)	269
Korea	562	(5.1)	111	(2.4)	573	(6.5)	550	(5.8)	22	(7.0)	377	(7.5)	417	(6.0)	487	(5.2)	642	(6.2)	704	(6.9)	738	(8.5)	361
Latvia*	488	(3.0)	90	(1.6)	487	(4.0)	489	(3.4)	-2	(4.3)	343	(5.4)	373	(4.4)	426	(3.1)	549	(4.0)	606	(5.2)	639	(4.7)	296
Liechtenstein	535	(4.4)	101	(3.6)	548	(6.4)	520	(6.5)	28	(9.7)	362	(20.2)	395	(11.8)	467	(8.7)	608	(8.3)	665	(12.0)	698	(12.5)	337
Lithuania*	477	(3.1)	102	(1.6)	479	(3.3)	476	(3.6)	3	(2.9)	312	(5.3)	348	(4.4)	407	(4.1)	547	(3.9)	613	(5.0)	651	(6.1)	338
Luxembourg*	482	(1.0)	102	(1.0)	498	(1.4)	465	(1.5)	33	(2.1)	317	(3.4)	349	(2.5)	409	(2.0)	554	(1.9)	615	(2.5)	650	(3.4)	333
Macao-China	545	(1.4)	112	(1.2)	549	(1.7)	540	(2.2)	9	(2.7)	360	(3.2)	400	(3.7)	471	(2.2)	623	(2.4)	685	(2.6)	721	(3.4)	361
Mexico	409	(1.7)	86	(0.8)	419	(1.9)	400	(1.8)	20	(1.7)	270	(2.8)	301	(2.1)	351	(1.9)	466	(2.1)	521	(2.4)	555	(2.3)	285
Netherlands*	527	(3.8)	101	(2.4)	535	(3.8)	519	(4.2)	16	(2.8)	358	(5.6)	393	(5.0)	455	(5.2)	600	(4.9)	657	(5.4)	689	(6.3)	330
New Zealand	496	(2.5)	109	(1.4)	507	(3.6)	484	(3.3)	23	(4.8)	326	(4.2)	359	(3.6)	417	(2.9)	571	(3.3)	641	(4.7)	683	(5.4)	357
Northern Ireland	479	(3.8)	100	(2.4)	484	(5.4)	474	(5.8)	10	(8.2)	317	(7.2)	350	(6.5)	409	(5.8)	548	(4.5)	609	(5.8)	648	(7.4)	331
Norway	489	(3.1)	100	(1.5)	490	(3.1)	488	(3.7)	2	(3.2)	328	(5.4)	363	(4.5)	421	(3.7)	557	(3.4)	618	(4.2)	655	(4.8)	327
Poland*	516	(4.2)	102	(2.1)	522	(4.8)	509	(4.4)	13	(3.8)	353	(4.8)	387	(4.2)	443	(4.0)	585	(5.7)	650	(7.1)	687	(8.9)	334
Portugal*	479	(4.3)	107	(1.5)	487	(4.6)	471	(4.3)	17	(2.8)	304	(4.9)	339	(4.8)	401	(5.1)	554	(5.0)	619	(4.7)	655	(5.6)	351
Republic of Ireland*	492	(2.4)	95	(1.4)	502	(3.7)	482	(2.8)	20	(4.4)	335	(4.5)	369	(4.4)	427	(3.5)	557	(2.4)	615	(3.1)	650	(3.3)	314
Romania*	445	(4.1)	93	(2.7)	449	(4.7)	441	(4.2)	7	(3.8)	301	(4.9)	329	(3.6)	380	(4.0)	505	(5.5)	567	(7.4)	604	(8.1)	303
Russian Federation	481	(3.6)	95	(2.1)	484	(4.4)	479	(3.5)	5	(3.4)	327	(4.5)	358	(3.6)	416	(4.0)	546	(4.3)	605	(5.7)	639	(7.6)	311
Scotland	490	(3.3)	99	(2.1)	499	(3.6)	481	(4.2)	18	(4.0)	330	(7.4)	364	(5.4)	423	(5.3)	557	(3.7)	620	(5.1)	658	(5.6)	328
Serbia	447	(3.8)	98	(2.5)	453	(4.4)	441	(4.3)	12	(4.3)	294	(6.3)	326	(3.9)	379	(4.1)	509	(4.7)	576	(6.8)	617	(7.9)	323
Shanghai-China	624	(4.1)	119	(2.8)	629	(4.9)	620	(4.2)	8	(3.9)	413	(8.9)	462	(7.4)	547	(5.1)	710	(3.9)	769	(5.2)	807	(7.5)	394
Singapore	582	(1.6)	122	(1.3)	581	(2.2)	582	(2.1)	-1	(2.9)	374	(3.5)	419	(3.2)	496	(3.0)	670	(2.4)	737	(2.9)	773	(4.8)	398
Slovak Republic*	480	(4.1)	110	(2.7)	488	(4.8)	472	(4.7)	16	(4.8)	301	(8.4)	341	(6.2)	405	(4.4)	557	(5.6)	623	(6.0)	662	(7.3)	361
Slovenia*	492	(1.5)	104	(1.2)	496	(2.4)	488	(2.2)	8	(3.6)	328	(4.8)	360	(3.0)	418	(2.7)	565	(2.7)	630	(3.7)	667	(3.6)	340
Spain*	477	(2.2)	102	(1.1)	486	(2.8)	467	(2.3)	19	(2.6)	305	(4.5)	346	(3.7)	408	(2.9)	547	(2.4)	607	(2.9)	640	(2.9)	335
Sweden*	479	(2.7)	102	(1.5)	480	(3.4)	478	(2.9)	2	(3.3)	313	(6.0)	348	(3.9)	407	(3.3)	550	(2.9)	612	(3.8)	647	(4.0)	334
Switzerland	538	(3.1)	104	(1.6)	548	(3.5)	528	(3.4)	20	(3.1)	361	(4.2)	402	(3.8)	468	(3.7)	611	(3.8)	672	(4.2)	707	(4.5)	345
Turkey	449	(5.2)	96	(3.1)	454	(5.4)	444	(6.0)	10	(4.8)	307	(4.9)	334	(3.9)	380	(4.1)	512	(8.0)	583	(10.5)	622	(9.2)	315
United Arab Emirates	426	(2.7)	100	(1.4)	427	(3.7)	425	(3.6)	2	(4.9)	271	(3.2)	302	(2.7)	354	(3.0)	494	(3.4)	559	(4.5)	599	(3.8)	327
United Kingdom*	489	(3.7)	104	(2.0)	495	(4.6)	483	(4.4)	12	(5.3)	319	(6.2)	355	(6.2)	417	(5.0)	560	(4.0)	626	(5.2)	663	(4.6)	344
United States	475	(4.1)	98	(1.6)	479	(4.2)	471	(4.6)	8	(3.0)	323	(4.4)	352	(4.9)	406	(4.4)	540	(5.6)	606	(6.0)	645	(5.8)	322
Vietnam	497	(5.1)	98	(3.0)	507	(5.9)	489	(5.0)	18	(3.2)	336	(8.4)	373	(7.0)	432	(6.1)	561	(5.8)	624	(8.0)	661	(8.6)	325
Wales	470	(2.5)	90	(1.3)	476	(3.0)	463	(3.0)	13	(3.3)	321	(4.8)	353	(4.9)	409	(3.3)	532	(2.9)	584	(3.7)	616	(5.2)	295
OECD average	492	(0.5)	101	(0.3)	499	(0.7)	484	(0.6)	16	(0.7)	327	(0.9)	362	(0.8)	421	(0.6)	562	(0.7)	624	(0.8)	660	(0.9)	332

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold

B10 Mean score, variation and gender differences in student performance on the mathematics sub-scale employing

	All students				Gender differences				Percentiles										Difference between 5th and 95th percentile				
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th		75th			90th		95th	
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.		Score	S.E.	Score	S.E.
Australia	500	(1.7)	95	(1.1)	505	(2.3)	495	(2.0)	10	(2.9)	345	(3.1)	378	(2.2)	435	(1.9)	567	(2.1)	624	(2.6)	655	(3.2)	311
Austria*	510	(2.5)	87	(1.6)	520	(3.5)	499	(3.2)	20	(4.6)	366	(4.7)	397	(3.4)	448	(3.2)	572	(2.9)	621	(3.6)	649	(3.4)	283
Belgium*	516	(2.1)	101	(1.6)	521	(2.7)	510	(2.7)	11	(3.4)	342	(5.1)	380	(3.8)	446	(3.0)	590	(2.6)	644	(2.9)	673	(2.4)	331
Bulgaria*	439	(4.1)	96	(2.3)	437	(5.0)	441	(4.3)	-4	(4.4)	287	(5.7)	318	(5.1)	371	(4.8)	506	(5.1)	567	(6.2)	603	(7.1)	315
Canada	517	(1.9)	87	(0.9)	521	(2.1)	512	(2.2)	10	(2.2)	370	(2.9)	403	(2.6)	457	(2.3)	578	(2.1)	629	(2.3)	657	(2.9)	287
Chile	416	(3.3)	86	(1.5)	430	(4.1)	404	(3.3)	26	(3.8)	283	(4.4)	309	(4.1)	356	(3.7)	474	(4.3)	532	(4.6)	563	(4.3)	281
Chinese Taipei	549	(3.1)	110	(1.9)	551	(5.1)	547	(5.2)	4	(8.1)	359	(5.4)	398	(5.0)	473	(4.6)	630	(3.4)	683	(4.1)	715	(5.0)	355
Croatia*	478	(3.7)	91	(2.5)	481	(4.6)	474	(3.9)	7	(4.3)	334	(4.2)	363	(3.8)	413	(3.6)	538	(4.9)	597	(6.9)	633	(9.7)	299
Cyprus	443	(1.1)	91	(0.9)	443	(1.5)	443	(1.6)	0	(2.1)	295	(2.7)	327	(2.0)	381	(1.9)	505	(1.8)	561	(2.1)	594	(3.7)	299
Czech Republic*	504	(2.9)	94	(1.8)	509	(3.6)	498	(3.6)	12	(4.5)	349	(6.5)	384	(4.8)	440	(4.1)	569	(3.4)	623	(3.6)	656	(3.6)	307
Denmark*	495	(2.4)	81	(1.3)	500	(3.0)	489	(2.4)	12	(2.6)	360	(5.3)	390	(3.3)	438	(2.9)	551	(2.8)	599	(2.9)	626	(3.6)	266
England	493	(3.6)	95	(1.8)	499	(4.7)	487	(4.2)	12	(5.2)	335	(5.9)	369	(5.5)	428	(5.4)	559	(3.8)	615	(4.3)	647	(4.8)	313
Estonia*	524	(2.1)	79	(1.1)	527	(2.4)	522	(2.4)	4	(2.5)	394	(4.1)	423	(2.8)	471	(2.4)	578	(2.8)	628	(3.1)	656	(3.7)	262
Finland*	516	(1.8)	81	(0.9)	514	(2.5)	517	(1.9)	-3	(2.7)	380	(3.7)	411	(3.0)	463	(1.9)	571	(2.4)	619	(2.8)	646	(2.7)	266
France*	496	(2.3)	97	(1.8)	501	(3.3)	492	(2.5)	8	(3.5)	331	(6.1)	367	(4.6)	429	(2.7)	567	(3.4)	620	(3.8)	650	(3.4)	319
Germany*	516	(2.8)	95	(1.6)	521	(3.0)	510	(3.3)	11	(2.8)	354	(6.4)	389	(4.7)	451	(3.9)	584	(3.7)	636	(3.0)	663	(3.7)	309
Greece*	449	(2.7)	90	(1.4)	452	(3.6)	446	(2.9)	6	(3.4)	299	(5.8)	332	(3.8)	387	(3.6)	511	(3.8)	565	(3.0)	596	(4.0)	297
Hong Kong-China	558	(3.1)	89	(1.9)	563	(4.3)	552	(3.7)	11	(5.0)	396	(6.0)	438	(5.8)	501	(4.3)	620	(3.1)	666	(3.6)	690	(3.8)	294
Hungary*	481	(3.2)	95	(2.4)	486	(3.7)	477	(3.7)	8	(3.6)	327	(5.0)	359	(4.2)	415	(4.2)	547	(4.9)	608	(6.1)	640	(6.9)	312
Iceland	490	(1.6)	90	(1.1)	487	(2.2)	493	(2.2)	-7	(3.1)	340	(4.2)	372	(3.2)	429	(2.4)	553	(2.7)	604	(3.2)	635	(3.1)	295
Israel	469	(4.6)	105	(2.1)	473	(7.7)	464	(3.5)	9	(7.5)	292	(7.8)	330	(6.3)	397	(5.5)	544	(4.8)	603	(5.5)	636	(4.7)	344
Italy*	485	(2.1)	93	(1.2)	494	(2.4)	476	(2.3)	17	(2.5)	332	(2.5)	365	(2.7)	422	(2.2)	550	(2.6)	606	(3.0)	637	(3.1)	305
Japan	530	(3.5)	90	(2.1)	539	(4.4)	521	(3.5)	17	(4.1)	376	(6.1)	412	(5.2)	471	(4.1)	595	(4.2)	645	(4.0)	673	(4.8)	296
Kazakhstan	433	(3.2)	79	(2.1)	433	(3.5)	432	(3.6)	0	(3.2)	308	(3.4)	334	(3.9)	378	(2.9)	485	(4.5)	536	(6.0)	567	(6.9)	259
Korea	553	(4.3)	95	(2.0)	561	(5.5)	544	(4.9)	17	(6.0)	395	(6.5)	430	(5.2)	489	(4.5)	620	(5.0)	672	(5.6)	700	(6.8)	306
Latvia*	495	(2.8)	79	(1.5)	492	(3.3)	498	(3.2)	-6	(3.3)	364	(5.2)	393	(3.4)	441	(3.6)	550	(3.5)	598	(4.2)	626	(3.7)	262
Liechtenstein	536	(3.7)	94	(3.2)	545	(5.7)	527	(5.9)	18	(9.1)	374	(10.8)	407	(9.9)	469	(7.4)	608	(5.5)	654	(8.9)	685	(11.8)	311
Lithuania*	482	(2.7)	86	(1.4)	481	(2.9)	483	(3.0)	-1	(2.3)	341	(4.2)	371	(3.5)	423	(3.8)	542	(3.3)	594	(3.9)	623	(4.0)	282
Luxembourg*	493	(0.9)	93	(0.8)	505	(1.2)	481	(1.3)	24	(1.8)	340	(2.4)	371	(2.8)	426	(1.6)	560	(1.3)	614	(2.3)	642	(2.6)	302
Macao-China	536	(1.1)	90	(1.0)	537	(1.3)	535	(1.7)	2	(2.1)	386	(3.6)	421	(2.9)	478	(2.2)	598	(1.6)	646	(1.9)	672	(2.4)	286
Mexico	413	(1.4)	78	(0.9)	420	(1.5)	407	(1.6)	13	(1.3)	287	(2.5)	315	(2.0)	360	(1.6)	465	(1.7)	514	(2.0)	544	(2.1)	257
Netherlands*	518	(3.4)	88	(2.2)	522	(3.7)	515	(3.8)	8	(2.8)	367	(7.1)	398	(5.4)	457	(5.1)	584	(4.5)	628	(3.6)	650	(3.8)	284
New Zealand	495	(2.2)	100	(1.2)	502	(3.2)	488	(2.9)	14	(4.2)	335	(4.3)	367	(3.4)	424	(2.7)	566	(3.0)	626	(3.1)	660	(3.9)	325
Northern Ireland	486	(3.1)	93	(2.1)	491	(5.1)	481	(5.6)	10	(8.8)	334	(4.9)	364	(4.9)	420	(4.5)	552	(4.5)	609	(5.6)	638	(5.4)	305
Norway	486	(2.7)	89	(1.3)	487	(2.7)	486	(3.4)	2	(2.9)	341	(5.5)	374	(3.8)	426	(3.1)	548	(2.8)	600	(4.0)	632	(3.7)	291
Poland*	519	(3.5)	88	(1.7)	518	(4.1)	519	(3.7)	-1	(3.5)	377	(3.6)	406	(3.7)	456	(3.5)	580	(4.3)	636	(5.3)	666	(6.5)	289
Portugal*	489	(3.7)	94	(1.4)	493	(4.0)	484	(3.8)	9	(2.5)	330	(4.5)	364	(4.7)	422	(5.0)	556	(3.6)	610	(3.5)	640	(3.9)	310
Republic of Ireland*	502	(2.4)	84	(1.3)	509	(3.4)	496	(2.7)	13	(3.9)	360	(4.4)	394	(4.6)	447	(3.5)	561	(2.6)	609	(3.0)	637	(3.1)	276
Romania*	446	(4.1)	87	(2.3)	447	(4.6)	444	(4.4)	2	(3.7)	312	(4.2)	337	(4.1)	383	(4.4)	504	(5.2)	563	(7.0)	597	(7.2)	285
Russian Federation	487	(3.1)	87	(1.6)	485	(3.5)	489	(3.3)	-4	(2.9)	343	(4.3)	374	(4.1)	428	(3.3)	546	(3.8)	599	(4.7)	628	(5.0)	286
Scotland	496	(2.8)	89	(1.7)	504	(3.4)	488	(3.3)	16	(3.6)	347	(5.5)	380	(5.8)	436	(4.0)	558	(3.1)	611	(3.9)	640	(4.8)	292
Serbia	451	(3.4)	92	(2.3)	456	(4.1)	446	(3.8)	9	(4.1)	305	(4.9)	335	(4.8)	387	(3.9)	512	(4.1)	572	(5.4)	609	(6.8)	303
Shanghai-China	613	(3.0)	93	(2.2)	614	(3.6)	611	(3.2)	3	(3.1)	447	(6.5)	486	(6.5)	553	(4.7)	679	(2.7)	726	(2.8)	752	(3.6)	304
Singapore	574	(1.2)	98	(1.0)	571	(1.8)	577	(1.7)	-6	(2.4)	404	(3.1)	441	(2.7)	507	(2.2)	645	(1.8)	696	(1.8)	724	(3.8)	320
Slovak Republic*	485	(3.4)	101	(2.4)	489	(3.9)	481	(4.2)	7	(4.4)	316	(7.2)	355	(5.9)	418	(4.6)	556	(3.9)	614	(4.5)	645	(5.6)	330
Slovenia*	505	(1.2)	90	(1.0)	506	(2.0)	503	(2.0)	3	(3.1)	361	(3.4)	389	(2.6)	440	(2.5)	569	(2.0)	626	(3.3)	656	(3.9)	295
Spain*	481	(2.0)	87	(0.8)	488	(2.5)	474	(2.1)	14	(2.3)	336	(3.6)	367	(3.2)	422	(2.7)	544	(2.1)	592	(2.0)	619	(2.1)	283
Sweden*	474	(2.5)	90	(1.5)	471	(3.1)	476	(2.6)	-5	(2.9)	325	(4.6)	357	(4.2)	413	(2.9)	536	(3.3)	591	(3.5)	621	(3.4)	296
Switzerland	529	(2.9)	90	(1.5)	534	(3.3)	525	(3.0)	9	(2.7)	377	(4.1)	411	(3.1)	468	(3.1)	593	(4.0)	644	(4.3)	675	(4.5)	298
Turkey	448	(5.0)	94	(3.1)	451	(5.4)	445	(5.8)	6	(5.0)	308	(6.0)	333	(4.3)	380	(3.9)	510	(8.0)	582	(9.6)	616	(9.0)	308
United Arab Emirates	440	(2.4)	92	(1.2)	437	(3.7)	443	(3.1)	-6	(4.9)	297	(3.4)	325	(2.8)	374	(2.7)	502	(3.1)	563	(3.7)	597	(3.5)	300
United Kingdom*	492	(3.1)	94	(1.5)	498	(4.0)	486	(3.6)	12	(4.4)	335	(5.0)	368	(4.7)	427	(4.5)	557	(3.2)	613	(3.9)	645	(4.0)	310
United States	480	(3.5)	90	(1.4)	481	(3.8)	479	(3.7)	2	(2.8)	337	(3.9)	365	(4.0)	416	(3.5)	541	(4.2)	600	(4.8)	631	(5.3)	294
Vietnam	523	(5.1)	88	(2.6)	527	(5.9)	519	(4.9)	8	(3.1)	377	(8.8)	409	(7.7)	464	(5.6)	583	(5.7)	637	(7.0)	668	(7.8)	291
Wales	466	(2.2)	85	(1.3)	470	(2.7)	461	(2.7)	9	(3.2)	325	(4.0)	356	(4.1)	408	(3.1)	524	(3.0)	574	(3.3)	605	(3.9)	280
OECD average	493	(0.5)	91	(0.3)	498	(0.6)	489	(0.5)	9	(0.6)	343	(0.9)	375	(0.7)	431	(0.6)	557	(0.6)	611	(0.7)	641	(0.7)	298

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold

B11 Mean score, variation and gender differences in student performance on the mathematics sub-scale interpreting

	All students				Gender differences				Percentiles								Difference between 5th and 95th percentile						
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th			75th		90th		95th	
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.		Score	S.E.	Score	S.E.	Score	S.E.
Australia	514	(1.7)	101	(1.1)	519	(2.4)	509	(2.0)	9	(2.9)	348	(3.3)	384	(2.3)	445	(2.0)	584	(2.2)	645	(2.8)	680	(3.3)	332
Austria*	509	(3.3)	106	(2.0)	517	(4.5)	501	(4.1)	16	(5.6)	331	(5.8)	368	(4.9)	433	(4.6)	587	(3.9)	644	(4.6)	677	(5.2)	346
Belgium*	513	(2.4)	106	(1.5)	518	(3.2)	508	(2.6)	10	(3.5)	335	(4.6)	374	(3.5)	439	(3.6)	590	(2.8)	649	(3.2)	681	(2.9)	346
Bulgaria*	441	(4.2)	99	(2.4)	437	(5.1)	445	(4.4)	-8	(4.8)	282	(6.6)	314	(6.1)	372	(5.1)	510	(4.8)	570	(5.4)	604	(6.0)	322
Canada	521	(2.0)	93	(0.9)	526	(2.3)	517	(2.3)	9	(2.2)	366	(2.9)	401	(2.7)	459	(2.5)	585	(2.6)	641	(2.8)	672	(3.2)	306
Chile	433	(3.1)	82	(1.7)	444	(3.9)	422	(3.0)	22	(3.3)	305	(5.1)	331	(3.9)	376	(3.7)	488	(3.9)	540	(4.6)	572	(4.7)	267
Chinese Taipei	549	(3.0)	105	(1.8)	550	(4.7)	548	(4.9)	3	(7.4)	366	(5.3)	407	(5.1)	478	(4.0)	625	(3.4)	680	(3.8)	710	(4.8)	345
Croatia*	477	(3.5)	93	(2.1)	484	(4.2)	470	(3.8)	15	(4.0)	328	(4.1)	358	(4.2)	412	(3.5)	541	(4.5)	600	(6.1)	636	(6.8)	308
Cyprus	436	(1.3)	101	(1.1)	434	(1.8)	438	(1.8)	-4	(2.5)	269	(3.1)	305	(2.7)	367	(2.1)	505	(2.3)	565	(2.8)	601	(4.1)	332
Czech Republic*	494	(3.0)	103	(2.5)	498	(3.9)	490	(3.7)	9	(4.6)	327	(7.0)	367	(5.6)	427	(4.1)	564	(3.0)	622	(3.7)	656	(3.5)	329
Denmark*	508	(2.5)	90	(1.3)	515	(3.0)	501	(2.7)	14	(2.5)	359	(4.6)	391	(3.9)	447	(3.1)	570	(3.1)	624	(3.5)	653	(4.0)	294
England	502	(4.2)	103	(2.3)	509	(5.5)	495	(4.4)	14	(5.6)	331	(7.6)	369	(6.3)	432	(5.6)	573	(3.9)	634	(4.5)	669	(5.5)	338
Estonia*	513	(2.1)	87	(1.1)	515	(2.8)	511	(2.3)	4	(3.0)	372	(3.2)	401	(3.4)	454	(2.9)	571	(2.8)	625	(3.2)	656	(3.6)	284
Finland*	528	(2.2)	88	(1.1)	523	(3.0)	534	(2.1)	-11	(2.9)	379	(3.8)	415	(3.7)	471	(2.6)	588	(2.3)	639	(3.0)	669	(4.1)	290
France*	511	(2.5)	107	(2.0)	513	(3.7)	509	(2.8)	4	(4.0)	329	(5.9)	370	(4.9)	438	(3.6)	588	(3.7)	646	(3.8)	678	(4.4)	350
Germany*	517	(3.2)	105	(2.2)	522	(3.4)	511	(3.6)	12	(3.0)	338	(6.5)	376	(4.6)	445	(4.2)	592	(3.5)	650	(4.2)	680	(4.0)	342
Greece*	467	(3.1)	98	(1.8)	471	(4.0)	463	(3.1)	8	(3.7)	304	(5.6)	340	(4.6)	400	(4.1)	536	(3.6)	593	(4.3)	626	(4.4)	322
Hong Kong-China	551	(3.4)	93	(1.9)	557	(4.8)	545	(3.8)	12	(5.5)	385	(5.9)	425	(5.7)	492	(4.9)	616	(3.9)	666	(4.8)	696	(5.1)	311
Hungary*	477	(3.1)	100	(2.2)	479	(3.7)	475	(3.6)	4	(4.0)	307	(5.9)	344	(5.2)	410	(3.7)	547	(4.4)	605	(4.9)	638	(6.4)	331
Iceland	492	(1.9)	101	(1.2)	487	(2.6)	498	(2.5)	-11	(3.4)	321	(5.4)	360	(3.8)	424	(2.9)	563	(3.0)	619	(2.7)	653	(3.6)	331
Israel	462	(5.2)	114	(2.2)	470	(9.1)	453	(3.4)	17	(8.9)	272	(7.5)	312	(6.1)	381	(6.0)	542	(6.1)	610	(6.5)	648	(7.5)	376
Italy*	498	(2.1)	107	(1.2)	507	(2.7)	489	(2.5)	18	(3.0)	321	(3.1)	360	(3.1)	426	(2.6)	573	(2.7)	636	(3.1)	671	(3.0)	350
Japan	531	(3.5)	92	(2.0)	539	(4.5)	522	(3.4)	17	(4.2)	375	(6.1)	411	(4.7)	469	(4.3)	595	(3.9)	648	(4.6)	677	(5.1)	303
Kazakhstan	420	(2.6)	64	(1.3)	418	(3.1)	423	(2.8)	-5	(2.8)	317	(3.1)	339	(2.5)	377	(2.5)	463	(3.6)	504	(4.8)	528	(4.4)	210
Korea	540	(4.2)	98	(1.8)	545	(5.4)	535	(4.9)	10	(6.0)	373	(6.9)	412	(5.7)	476	(4.5)	609	(4.4)	662	(4.8)	693	(5.8)	320
Latvia*	486	(3.0)	89	(1.6)	486	(3.6)	487	(3.6)	-1	(3.8)	340	(5.7)	373	(4.2)	426	(3.2)	547	(3.6)	600	(3.9)	632	(4.7)	292
Liechtenstein	540	(4.1)	107	(3.6)	553	(6.4)	526	(6.4)	27	(10.1)	355	(18.4)	393	(9.7)	466	(10.1)	620	(7.0)	672	(10.5)	706	(16.9)	351
Lithuania*	471	(2.8)	91	(1.5)	470	(3.0)	471	(3.2)	-1	(2.6)	322	(3.7)	354	(4.2)	408	(3.4)	533	(3.8)	591	(4.0)	622	(4.7)	301
Luxembourg*	495	(1.1)	106	(0.9)	505	(1.6)	485	(1.5)	20	(2.3)	322	(4.3)	355	(3.0)	420	(1.9)	571	(1.6)	631	(2.2)	665	(3.0)	343
Macao-China	530	(1.0)	92	(0.9)	530	(1.4)	529	(1.5)	2	(2.0)	374	(3.7)	409	(2.4)	469	(2.0)	594	(2.0)	645	(2.5)	674	(3.0)	300
Mexico	413	(1.3)	73	(0.8)	418	(1.5)	408	(1.4)	10	(1.3)	294	(2.1)	321	(1.8)	365	(1.7)	461	(1.7)	506	(1.9)	533	(2.3)	239
Netherlands*	526	(3.6)	100	(2.5)	530	(3.8)	521	(4.0)	10	(2.9)	357	(7.4)	389	(5.6)	455	(5.6)	599	(4.1)	653	(3.6)	682	(4.9)	325
New Zealand	511	(2.5)	108	(1.4)	516	(3.7)	505	(3.1)	11	(4.7)	334	(4.7)	370	(4.0)	434	(3.5)	587	(3.3)	650	(3.6)	684	(4.1)	351
Northern Ireland	496	(3.5)	102	(2.4)	500	(5.2)	491	(5.8)	8	(8.4)	328	(8.3)	366	(6.0)	425	(4.5)	565	(4.1)	628	(6.0)	662	(6.3)	334
Norway	499	(3.1)	98	(1.6)	500	(3.2)	498	(3.7)	2	(3.1)	336	(5.8)	373	(4.1)	433	(3.6)	565	(3.1)	623	(3.9)	658	(4.3)	321
Poland*	515	(3.5)	89	(1.9)	517	(4.2)	513	(3.7)	3	(3.6)	368	(4.3)	400	(4.0)	452	(3.5)	577	(4.2)	630	(5.4)	662	(7.7)	293
Portugal*	490	(4.0)	94	(1.8)	496	(4.5)	484	(4.0)	12	(2.9)	333	(6.8)	369	(5.3)	425	(5.2)	557	(3.8)	612	(3.7)	642	(3.5)	308
Republic of Ireland*	507	(2.5)	91	(1.4)	515	(3.5)	498	(3.3)	17	(4.5)	353	(5.3)	389	(4.6)	446	(3.5)	569	(2.6)	622	(2.5)	654	(4.2)	301
Romania*	438	(3.1)	74	(1.9)	441	(3.8)	435	(3.4)	5	(3.4)	321	(4.4)	345	(3.8)	387	(3.4)	487	(3.8)	535	(4.6)	563	(6.4)	242
Russian Federation	471	(2.9)	89	(1.6)	469	(3.8)	473	(3.0)	-4	(3.4)	324	(4.8)	357	(4.0)	411	(3.7)	531	(3.5)	586	(3.9)	618	(4.6)	294
Scotland	510	(2.7)	90	(1.9)	516	(3.3)	504	(3.2)	12	(3.7)	360	(7.3)	396	(5.6)	449	(3.9)	571	(3.1)	626	(4.2)	658	(6.2)	298
Serbia	445	(3.4)	92	(2.2)	448	(4.3)	443	(3.5)	6	(4.1)	297	(6.2)	328	(5.6)	383	(3.9)	506	(4.4)	566	(5.0)	599	(6.7)	302
Shanghai-China	579	(2.9)	98	(2.0)	582	(3.5)	576	(3.2)	7	(3.3)	412	(6.2)	448	(4.8)	514	(4.2)	647	(3.4)	700	(4.1)	732	(6.0)	320
Singapore	555	(1.4)	106	(0.9)	553	(1.9)	557	(2.0)	-5	(2.9)	377	(3.5)	414	(2.3)	482	(2.1)	629	(2.4)	688	(2.1)	721	(3.4)	344
Slovak Republic*	473	(3.3)	103	(2.1)	478	(4.1)	468	(3.7)	9	(4.2)	304	(5.7)	339	(5.0)	402	(4.6)	545	(4.4)	606	(4.1)	639	(5.1)	335
Slovenia*	498	(1.4)	95	(0.9)	498	(2.1)	497	(2.1)	1	(3.2)	347	(3.5)	378	(2.6)	431	(2.6)	566	(2.5)	623	(2.2)	654	(4.2)	307
Spain*	495	(2.2)	98	(0.8)	505	(2.5)	485	(2.5)	21	(2.3)	330	(3.3)	367	(3.4)	429	(2.8)	564	(2.6)	619	(2.3)	652	(2.5)	321
Sweden*	485	(2.4)	99	(1.3)	484	(3.3)	486	(2.5)	-2	(3.4)	320	(5.1)	357	(3.8)	418	(3.1)	553	(3.2)	612	(3.1)	646	(3.1)	325
Switzerland	529	(3.4)	101	(1.5)	535	(3.9)	523	(3.5)	12	(2.8)	357	(4.9)	396	(3.9)	462	(3.5)	600	(4.3)	655	(4.9)	687	(5.3)	330
Turkey	446	(4.6)	95	(3.0)	451	(5.1)	442	(5.5)	9	(5.0)	304	(4.2)	332	(3.8)	380	(3.1)	506	(7.3)	576	(9.5)	616	(10.3)	312
United Arab Emirates	428	(2.4)	90	(1.2)	424	(4.1)	431	(3.0)	-7	(5.3)	286	(3.4)	315	(2.7)	365	(2.5)	487	(3.1)	548	(3.8)	583	(4.4)	297
United Kingdom*	501	(3.5)	102	(2.0)	508	(4.6)	494	(3.8)	14	(4.7)	333	(6.5)	370	(5.2)	432	(4.4)	571	(3.3)	632	(4.0)	666	(4.8)	333
United States	489	(3.9)	96	(1.6)	493	(4.4)	486	(3.9)	7	(3.0)	336	(5.1)	367	(5.1)	422	(4.3)	556	(4.6)	615	(4.0)	649	(5.3)	313
Vietnam	497	(4.5)	81	(2.3)	500	(5.2)	494	(4.3)	5	(2.7)	361	(6.9)	391	(6.4)	442	(5.6)	551	(4.9)	600	(5.9)	631	(6.6)	270
Wales	483	(2.6)	93	(1.4)	489	(3.3)	477	(3.1)	12	(3.8)	330	(5.0)	362	(4.5)	421	(3.5)	546	(3.2)	603	(4.6)	637	(4.5)	307
OECD average	497	(0.5)	98	(0.3)	502	(0.7)	492	(0.6)	9	(0.7)	335	(0.9)	370	(0.7)	430	(0.6)	565	(0.6)	622	(0.7)	655	(0.8)	320

OECD countries (not italicised)

Countries not in OECD (italicised)

EU countries

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold

B12 Significant differences in mean scores on the quantity scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	591	(3.2)	^
<i>Singapore</i>	569	(1.2)	^
<i>Hong Kong-China</i>	566	(3.4)	^
<i>Chinese Taipei</i>	543	(3.1)	^
<i>Liechtenstein</i>	538	(4.1)	^
Korea	537	(4.1)	^
Netherlands*	532	(3.6)	^
Switzerland	531	(3.1)	^
<i>Macao-China</i>	531	(1.1)	^
Finland*	527	(1.9)	^
Estonia*	525	(2.2)	^
Belgium*	519	(2.0)	^
Poland*	519	(3.5)	^
Japan	518	(3.6)	^
Germany*	517	(3.1)	^
Canada	515	(2.2)	^
Austria*	510	(2.9)	^
<i>Vietnam</i>	509	(5.5)	^
Republic of Ireland*	505	(2.6)	^
Czech Republic*	505	(3.0)	^
Slovenia*	504	(1.2)	^
Denmark*	502	(2.4)	^
Scotland	501	(3.0)	^
Australia	500	(1.9)	^
New Zealand	499	(2.4)	NS
Iceland	496	(1.9)	NS
France*	496	(2.6)	NS
England	495	(4.5)	NS
OECD Average	495	(0.5)	NS
Luxembourg*	495	(1.0)	NS
United Kingdom	494	(3.8)	
Norway	492	(2.9)	NS
Northern Ireland	491	(3.7)	
Spain*	491	(2.3)	NS
Italy*	491	(2.0)	NS
<i>Latvia</i> *	487	(2.9)	NS
Slovak Republic*	486	(3.5)	NS
<i>Lithuania</i> *	483	(2.8)	∨
Sweden*	482	(2.5)	NS
Portugal*	481	(4.0)	∨
<i>Croatia</i> *	480	(3.7)	NS
Israel	480	(5.2)	∨
United States	478	(3.9)	∨
<i>Russian Federation</i>	478	(3.0)	∨
Hungary*	476	(3.4)	∨
Wales	465	(2.3)	∨
<i>Serbia</i>	456	(3.7)	∨
Greece*	455	(3.0)	∨
<i>Romania</i> *	443	(4.5)	∨
<i>Bulgaria</i> *	443	(4.3)	∨
Turkey	442	(5.0)	∨
<i>Cyprus</i>	439	(1.1)	∨
<i>United Arab Emirates</i>	431	(2.7)	∨
<i>Kazakhstan</i>	428	(3.5)	∨
Chile	421	(3.3)	∨
Mexico	414	(1.5)	∨

Key	
^	significantly higher
NS	no significant difference
∨	significantly lower
OECD countries (not italicised)	
<i>Countries not in OECD (italicised)</i>	
*EU countries	

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

B13 Significant differences in mean scores on the uncertainty and data scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	592	(3.0)	^
<i>Singapore</i>	559	(1.5)	^
<i>Hong Kong-China</i>	553	(3.0)	^
<i>Chinese Taipei</i>	549	(3.2)	^
Korea	538	(4.2)	^
Netherlands*	532	(3.8)	^
Japan	528	(3.5)	^
<i>Liechtenstein</i>	526	(3.9)	^
<i>Macao-China</i>	525	(1.1)	^
Switzerland	522	(3.2)	^
<i>Vietnam</i>	519	(4.5)	^
Finland*	519	(2.4)	^
Poland*	517	(3.5)	^
Canada	516	(1.8)	^
Estonia*	510	(2.0)	^
Germany*	509	(3.0)	^
Republic of Ireland*	509	(2.5)	^
Belgium*	508	(2.5)	^
Australia	508	(1.5)	^
New Zealand	506	(2.6)	^
Denmark*	505	(2.4)	^
Scotland	504	(2.6)	NS
England	503	(3.6)	NS
United Kingdom	502	(3.0)	
Austria*	499	(2.7)	NS
Norway	497	(3.0)	NS
Northern Ireland	496	(3.4)	
Slovenia*	496	(1.2)	NS
Iceland	496	(1.8)	NS
OECD Average	493	(0.5)	NS
France*	492	(2.7)	NS
United States	488	(3.5)	NS
Czech Republic*	488	(2.8)	NS
Spain*	487	(2.3)	v
Portugal*	486	(3.8)	v
Luxembourg*	483	(1.0)	v
Wales	483	(2.7)	v
Sweden*	483	(2.5)	v
Italy*	482	(2.0)	v
<i>Latvia*</i>	478	(2.8)	v
Hungary*	476	(3.3)	v
<i>Lithuania*</i>	474	(2.7)	v
Slovak Republic*	472	(3.6)	v
<i>Croatia*</i>	468	(3.5)	v
Israel	465	(4.7)	v
<i>Russian Federation</i>	463	(3.3)	v
Greece*	460	(2.6)	v
<i>Serbia</i>	448	(3.3)	v
Turkey	447	(4.6)	v
<i>Cyprus</i>	442	(1.1)	v
<i>Romania*</i>	437	(3.3)	v
<i>United Arab Emirates</i>	432	(2.4)	v
<i>Bulgaria*</i>	432	(3.9)	v
Chile	430	(2.9)	v
<i>Kazakhstan</i>	414	(2.6)	v
Mexico	413	(1.2)	v

Key	
^	significantly higher
NS	no significant difference
v	significantly lower
OECD countries (not italicised)	
<i>Countries not in OECD (italicised)</i>	
*EU countries	

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

B14 Significant differences in mean scores on the change and relationships scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	624	(3.6)	^
<i>Singapore</i>	580	(1.5)	^
<i>Hong Kong-China</i>	564	(3.6)	^
<i>Chinese Taipei</i>	561	(3.5)	^
Korea	559	(5.2)	^
<i>Macao-China</i>	542	(1.2)	^
Japan	542	(4.0)	^
<i>Liechtenstein</i>	542	(4.0)	^
Estonia*	530	(2.3)	^
Switzerland	530	(3.4)	^
Canada	525	(2.0)	^
Finland*	520	(2.6)	^
Netherlands*	518	(3.9)	^
Germany*	516	(3.8)	^
Belgium*	513	(2.6)	^
<i>Vietnam</i>	509	(5.1)	^
Poland*	509	(4.1)	^
Australia	509	(1.7)	^
Austria*	506	(3.4)	^
Republic of Ireland*	501	(2.6)	^
New Zealand	501	(2.5)	^
Czech Republic*	499	(3.5)	^
Slovenia*	499	(1.1)	^
England	498	(4.1)	^
Scotland	497	(3.1)	^
France*	497	(2.7)	^
<i>Latvia</i> *	496	(3.4)	^
United Kingdom	496	(3.4)	□
Denmark*	494	(2.7)	NS
OECD Average	493	(0.6)	NS
<i>Russian Federation</i>	491	(3.4)	NS
United States	488	(3.5)	NS
Luxembourg*	488	(1.0)	NS
Iceland	487	(1.9)	NS
Portugal*	486	(4.1)	NS
Northern Ireland	486	(3.8)	
Spain*	482	(2.0)	NS
Hungary*	481	(3.5)	NS
<i>Lithuania</i> *	479	(3.2)	NS
Norway	478	(3.1)	NS
Italy*	477	(2.1)	∨
Slovak Republic*	474	(4.0)	∨
Wales	470	(2.5)	∨
Sweden*	469	(2.8)	∨
<i>Croatia</i> *	468	(4.2)	∨
Israel	462	(5.3)	∨
Turkey	448	(5.0)	∨
Greece*	446	(3.2)	∨
<i>Romania</i> *	446	(3.9)	∨
<i>United Arab Emirates</i>	442	(2.6)	∨
<i>Serbia</i>	442	(4.1)	∨
<i>Cyprus</i>	440	(1.2)	∨
<i>Bulgaria</i> *	434	(4.5)	∨
<i>Kazakhstan</i>	433	(3.2)	∨
Chile	411	(3.5)	∨
Mexico	405	(1.6)	∨

Key	
^	significantly higher
NS	no significant difference
∨	significantly lower
OECD countries (not italicised)	
<i>Countries not in OECD (italicised)</i>	
*EU countries	

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

B15 Significant differences in mean scores on the space and shape scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	649	(3.6)	^
<i>Chinese Taipei</i>	592	(3.8)	^
<i>Singapore</i>	580	(1.5)	^
Korea	573	(5.2)	^
<i>Hong Kong-China</i>	567	(4.0)	^
<i>Macao-China</i>	558	(1.4)	^
Japan	558	(3.7)	^
Switzerland	544	(3.1)	^
<i>Liechtenstein</i>	539	(4.5)	^
Poland*	524	(4.2)	^
Estonia*	513	(2.5)	^
Canada	510	(2.1)	^
Belgium*	509	(2.4)	^
Netherlands*	507	(3.5)	^
Germany*	507	(3.2)	^
<i>Vietnam</i>	507	(5.1)	^
Finland*	507	(2.1)	^
Slovenia*	503	(1.4)	^
Austria*	501	(3.1)	^
Czech Republic*	499	(3.4)	^
<i>Latvia</i> *	497	(3.3)	^
Denmark*	497	(2.5)	^
Australia	497	(1.8)	^
<i>Russian Federation</i>	496	(3.9)	^
Portugal*	491	(4.2)	^
New Zealand	491	(2.4)	^
OECD Average	490	(0.5)	^
Slovak Republic*	490	(4.1)	^
France*	489	(2.7)	^
Iceland	489	(1.5)	^
Italy*	487	(2.5)	^
Luxembourg*	486	(1.0)	^
Scotland	482	(3.1)	^
Norway	480	(3.3)	^
Republic of Ireland*	478	(2.6)	^
England	477	(4.1)	^
Spain*	477	(2.0)	^
United Kingdom	475	(3.5)	□
Hungary*	474	(3.4)	^
<i>Lithuania</i> *	472	(3.1)	NS
Sweden*	469	(2.5)	NS
United States	463	(4.0)	NS
Northern Ireland	463	(3.6)	
<i>Croatia</i> *	460	(3.9)	NS
<i>Kazakhstan</i>	450	(3.9)	∨
Israel	449	(4.8)	∨
<i>Romania</i> *	447	(4.1)	∨
<i>Serbia</i>	446	(3.9)	∨
Wales	444	(2.6)	∨
Turkey	443	(5.5)	∨
<i>Bulgaria</i> *	442	(4.3)	∨
Greece*	436	(2.6)	∨
<i>Cyprus</i>	436	(1.1)	∨
<i>United Arab Emirates</i>	425	(2.4)	∨
Chile	419	(3.2)	∨
Mexico	413	(1.6)	∨

Key

^ significantly higher

NS no significant difference

∨ significantly lower

OECD countries (not italicised)

Countries not in OECD (*italicised*)

*EU countries

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

B16 Significant differences in mean scores on the formulate scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	624	(4.1)	^
<i>Singapore</i>	582	(1.6)	^
<i>Chinese Taipei</i>	578	(4.0)	^
<i>Hong Kong-China</i>	568	(3.7)	^
Korea	562	(5.1)	^
Japan	554	(4.2)	^
<i>Macao-China</i>	545	(1.4)	^
Switzerland	538	(3.1)	^
<i>Liechtenstein</i>	535	(4.4)	^
Netherlands*	527	(3.8)	^
Finland*	519	(2.4)	^
Estonia*	517	(2.3)	^
Canada	516	(2.2)	^
Poland*	516	(4.2)	^
Belgium*	512	(2.4)	^
Germany*	511	(3.4)	^
Denmark*	502	(2.4)	^
Iceland	500	(1.7)	^
Austria*	499	(3.2)	^
Australia	498	(1.9)	^
<i>Vietnam</i>	497	(5.1)	^
New Zealand	496	(2.5)	^
Czech Republic*	495	(3.4)	^
Republic of Ireland*	492	(2.4)	^
Slovenia*	492	(1.5)	^
OECD Average	492	(0.5)	^
England	491	(4.4)	NS
Scotland	490	(3.3)	^
United Kingdom	489	(3.7)	□
Norway	489	(3.1)	^
<i>Latvia*</i>	488	(3.0)	NS
France*	483	(2.8)	NS
Luxembourg*	482	(1.0)	NS
<i>Russian Federation</i>	481	(3.6)	NS
Slovak Republic*	480	(4.1)	NS
Northern Ireland	479	(3.8)	
Sweden*	479	(2.7)	NS
Portugal*	479	(4.3)	NS
<i>Lithuania*</i>	477	(3.1)	NS
Spain*	477	(2.2)	NS
United States	476	(4.1)	NS
Italy*	475	(2.2)	NS
Hungary*	469	(3.6)	NS
Israel	465	(4.7)	v
Wales	457	(2.4)	v
<i>Croatia*</i>	453	(4.0)	v
Turkey	449	(5.2)	v
Greece*	448	(2.3)	v
<i>Serbia</i>	447	(3.8)	v
<i>Romania*</i>	445	(4.1)	v
<i>Kazakhstan</i>	442	(3.8)	v
<i>Bulgaria*</i>	437	(4.2)	v
Cyprus	437	(1.2)	v
<i>United Arab Emirates</i>	426	(2.7)	v
Chile	420	(3.2)	v
Mexico	409	(1.7)	v

Key	
^	significantly higher
NS	no significant difference
v	significantly lower
OECD countries (not italicised)	
<i>Countries not in OECD (italicised)</i>	
*EU countries	

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

B17 Significant differences in mean scores on the employ scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	613	(3.0)	^
<i>Singapore</i>	574	(1.2)	^
<i>Hong Kong-China</i>	558	(3.1)	^
Korea	553	(4.3)	^
<i>Chinese Taipei</i>	549	(3.1)	^
<i>Liechtenstein</i>	536	(3.7)	^
<i>Macao-China</i>	536	(1.1)	^
Japan	530	(3.5)	^
Switzerland	529	(2.9)	^
Estonia*	524	(2.1)	^
<i>Vietnam</i>	523	(5.1)	^
Poland*	519	(3.5)	^
Netherlands*	518	(3.4)	^
Canada	517	(1.9)	^
Germany*	516	(2.8)	^
Belgium*	516	(2.1)	^
Finland*	516	(1.8)	^
Austria*	510	(2.5)	^
Slovenia*	505	(1.2)	^
Czech Republic*	504	(2.9)	^
Republic of Ireland*	502	(2.4)	^
Australia	500	(1.7)	^
France*	496	(2.3)	^
Scotland	496	(2.8)	^
<i>Latvia*</i>	495	(2.8)	^
New Zealand	495	(2.2)	^
Denmark*	495	(2.4)	^
OECD Average	493	(0.5)	^
Luxembourg*	493	(0.9)	^
England	493	(3.6)	NS
United Kingdom	492	(3.1)	
Iceland	490	(1.6)	NS
Portugal*	489	(3.7)	NS
<i>Russian Federation</i>	487	(3.1)	NS
Norway	486	(2.7)	NS
Northern Ireland	486	(3.1)	
Italy*	485	(2.1)	NS
Slovak Republic*	485	(3.4)	NS
<i>Lithuania*</i>	482	(2.7)	NS
Spain*	481	(2.0)	NS
Hungary*	481	(3.2)	NS
United States	480	(3.5)	NS
<i>Croatia*</i>	478	(3.7)	NS
Sweden*	474	(2.5)	v
Israel	469	(4.6)	v
Wales	466	(2.2)	v
<i>Serbia</i>	451	(3.4)	v
Greece*	449	(2.7)	v
Turkey	448	(5.0)	v
<i>Romania*</i>	446	(4.1)	v
<i>Cyprus</i>	443	(1.1)	v
<i>United Arab Emirates</i>	440	(2.4)	v
<i>Bulgaria*</i>	439	(4.1)	v
<i>Kazakhstan</i>	433	(3.2)	v
Chile	416	(3.3)	v
Mexico	413	(1.4)	v

Key	
^	significantly higher
NS	no significant difference
v	significantly lower
OECD countries (not italicised)	
<i>Countries not in OECD (italicised)</i>	
*EU countries	

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

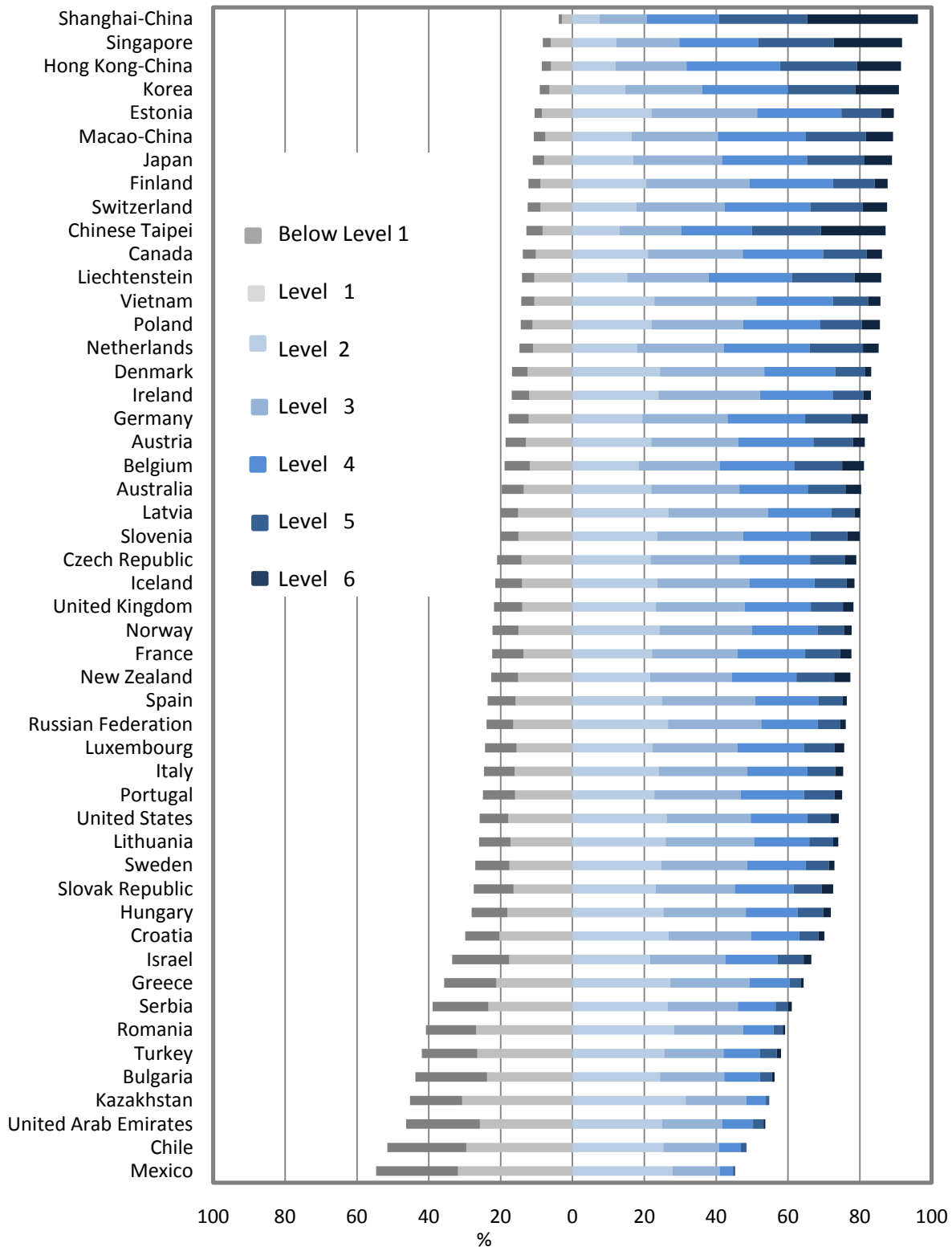
B18 Significant differences in mean scores on the interpret scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	579	(2.9)	^
<i>Singapore</i>	555	(1.4)	^
<i>Hong Kong-China</i>	551	(3.4)	^
<i>Chinese Taipei</i>	549	(3.0)	^
<i>Liechtenstein</i>	540	(4.1)	^
Korea	540	(4.2)	^
Japan	531	(3.5)	^
<i>Macao-China</i>	530	(1.0)	^
Switzerland	529	(3.4)	^
Finland*	528	(2.2)	^
Netherlands*	526	(3.6)	^
Canada	521	(2.0)	^
Germany*	517	(3.2)	^
Poland*	515	(3.5)	^
Australia	514	(1.7)	^
Belgium*	513	(2.4)	^
Estonia*	513	(2.1)	^
New Zealand	511	(2.5)	^
France*	511	(2.5)	^
Scotland	510	(2.7)	^
Austria*	509	(3.3)	^
Denmark*	508	(2.5)	^
Republic of Ireland*	507	(2.5)	^
England	502	(4.2)	NS
United Kingdom	501	(3.5)	
Norway	499	(3.1)	NS
Italy*	498	(2.1)	NS
Slovenia*	498	(1.4)	NS
<i>Vietnam</i>	497	(4.5)	NS
OECD Average	497	(0.5)	NS
Northern Ireland	496	(3.5)	
Spain*	495	(2.2)	NS
Luxembourg*	495	(1.1)	NS
Czech Republic*	494	(3.0)	NS
Iceland	492	(1.9)	NS
Portugal*	490	(4.0)	NS
United States	490	(3.9)	NS
<i>Latvia</i> *	486	(3.0)	v
Sweden*	485	(2.4)	v
Wales	483	(2.6)	v
<i>Croatia</i> *	477	(3.5)	v
Hungary*	477	(3.1)	v
Slovak Republic*	473	(3.3)	v
<i>Russian Federation</i>	471	(2.9)	v
<i>Lithuania</i> *	471	(2.8)	v
Greece*	467	(3.1)	v
Israel	462	(5.2)	v
Turkey	446	(4.6)	v
<i>Serbia</i>	445	(3.4)	v
<i>Bulgaria</i> *	441	(4.2)	v
<i>Romania</i> *	438	(3.1)	v
<i>Cyprus</i>	436	(1.3)	v
Chile	433	(3.1)	v
<i>United Arab Emirates</i>	428	(2.4)	v
<i>Kazakhstan</i>	420	(2.6)	v
Mexico	413	(1.3)	v

Key	
^	significantly higher
NS	no significant difference
v	significantly lower
OECD countries (not italicised)	
<i>Countries not in OECD (italicised)</i>	
*EU countries	

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

B19 Summary of the percentage of students at each level of proficiency on the mathematics scale



14 countries with scores below 430 omitted

Countries are ranked in descending order of the percentage of students at Levels 2, 3, 4, 5 and 6.

Source: OECD, PISA 2012 database, Table I.2.1a.

B20 Percentage of students at each level of proficiency on the mathematics scale

	Proficiency levels													
	Below Level 1		Level 1		Level 2		Level 3		Level 4		Level 5		Level 6	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Australia	6.1	(0.4)	13.5	(0.6)	21.9	(0.8)	24.6	(0.6)	19.0	(0.5)	10.5	(0.4)	4.3	(0.4)
Austria*	5.7	(0.6)	13.0	(0.7)	21.9	(0.9)	24.2	(0.8)	21.0	(0.9)	11.0	(0.7)	3.3	(0.4)
Belgium*	7.0	(0.6)	11.9	(0.6)	18.4	(0.6)	22.6	(0.7)	20.7	(0.6)	13.4	(0.5)	6.1	(0.4)
<i>Bulgaria*</i>	20.0	(1.5)	23.8	(0.9)	24.4	(1.1)	17.9	(0.9)	9.9	(0.8)	3.4	(0.5)	0.7	(0.2)
Canada	3.6	(0.3)	10.2	(0.4)	21.0	(0.6)	26.4	(0.6)	22.4	(0.5)	12.1	(0.5)	4.3	(0.3)
Chile	22.0	(1.4)	29.5	(1.0)	25.3	(1.0)	15.4	(0.8)	6.2	(0.6)	1.5	(0.2)	0.1	(0.0)
<i>Chinese Taipei</i>	4.5	(0.5)	8.3	(0.6)	13.1	(0.6)	17.1	(0.6)	19.7	(0.8)	19.2	(0.9)	18.0	(1.0)
<i>Croatia*</i>	9.5	(0.7)	20.4	(1.0)	26.7	(0.9)	22.9	(1.1)	13.5	(0.8)	5.4	(0.8)	1.6	(0.5)
<i>Cyprus</i>	19.0	(0.6)	23.0	(0.7)	25.5	(0.6)	19.2	(0.6)	9.6	(0.4)	3.1	(0.2)	0.6	(0.2)
Czech Republic*	6.8	(0.8)	14.2	(1.0)	21.7	(0.8)	24.8	(1.1)	19.7	(0.9)	9.6	(0.7)	3.2	(0.3)
Denmark*	4.4	(0.5)	12.5	(0.7)	24.4	(1.0)	29.0	(1.0)	19.8	(0.7)	8.3	(0.6)	1.7	(0.3)
England	8.0	(0.9)	13.7	(0.9)	22.8	(0.9)	24.5	(1.0)	18.7	(0.9)	9.3	(0.7)	3.1	(0.5)
Estonia*	2.0	(0.3)	8.6	(0.6)	22.0	(0.8)	29.4	(0.8)	23.4	(0.9)	11.0	(0.7)	3.6	(0.4)
Finland*	3.3	(0.4)	8.9	(0.5)	20.5	(0.7)	28.8	(0.8)	23.2	(0.8)	11.7	(0.6)	3.5	(0.3)
France*	8.7	(0.7)	13.6	(0.8)	22.1	(1.0)	23.8	(0.8)	18.9	(0.8)	9.8	(0.5)	3.1	(0.4)
Germany*	5.5	(0.7)	12.2	(0.8)	19.4	(0.8)	23.7	(0.8)	21.7	(0.7)	12.8	(0.7)	4.7	(0.5)
Greece*	14.5	(0.9)	21.2	(0.8)	27.2	(1.0)	22.1	(0.9)	11.2	(0.8)	3.3	(0.4)	0.6	(0.1)
<i>Hong Kong-China</i>	2.6	(0.4)	5.9	(0.6)	12.0	(0.8)	19.7	(1.0)	26.1	(1.1)	21.4	(1.0)	12.3	(0.9)
Hungary*	9.9	(0.8)	18.2	(1.0)	25.3	(1.2)	23.0	(1.0)	14.4	(0.9)	7.1	(0.7)	2.1	(0.5)
Iceland	7.5	(0.5)	14.0	(0.8)	23.6	(0.9)	25.7	(0.9)	18.1	(0.8)	8.9	(0.6)	2.3	(0.4)
Israel	15.9	(1.2)	17.6	(0.9)	21.6	(0.9)	21.0	(0.9)	14.6	(0.9)	7.2	(0.7)	2.2	(0.4)
Italy*	8.5	(0.4)	16.1	(0.5)	24.1	(0.5)	24.6	(0.6)	16.7	(0.5)	7.8	(0.4)	2.2	(0.2)
Japan	3.2	(0.5)	7.9	(0.7)	16.9	(0.8)	24.7	(1.0)	23.7	(0.9)	16.0	(0.9)	7.6	(0.8)
<i>Kazakhstan</i>	14.5	(0.9)	30.7	(1.4)	31.5	(0.9)	16.9	(1.1)	5.4	(0.8)	0.9	(0.3)	0.1	(0.0)
Korea	2.7	(0.5)	6.4	(0.6)	14.7	(0.8)	21.4	(1.0)	23.9	(1.2)	18.8	(0.9)	12.1	(1.3)
<i>Latvia*</i>	4.8	(0.5)	15.1	(1.0)	26.6	(1.3)	27.8	(0.9)	17.6	(0.9)	6.5	(0.6)	1.5	(0.3)
<i>Liechtenstein</i>	3.5	(1.3)	10.6	(1.8)	15.2	(2.5)	22.7	(2.8)	23.2	(3.0)	17.4	(3.2)	7.4	(1.9)
<i>Lithuania*</i>	8.7	(0.7)	17.3	(0.9)	25.9	(0.8)	24.6	(1.0)	15.4	(0.7)	6.6	(0.5)	1.4	(0.2)
Luxembourg*	8.8	(0.5)	15.5	(0.5)	22.3	(0.7)	23.6	(0.7)	18.5	(0.6)	8.6	(0.4)	2.6	(0.2)
<i>Macao-China</i>	3.2	(0.3)	7.6	(0.5)	16.4	(0.7)	24.0	(0.7)	24.4	(0.9)	16.8	(0.6)	7.6	(0.3)
Mexico	22.8	(0.7)	31.9	(0.6)	27.8	(0.5)	13.1	(0.4)	3.7	(0.2)	0.6	(0.1)	0.0	(0.0)
Netherlands*	3.8	(0.6)	11.0	(0.9)	17.9	(1.1)	24.2	(1.2)	23.8	(1.1)	14.9	(1.0)	4.4	(0.6)
New Zealand	7.5	(0.6)	15.1	(0.7)	21.6	(0.8)	22.7	(0.8)	18.1	(0.8)	10.5	(0.7)	4.5	(0.4)
Northern Ireland	8.6	(1.1)	15.5	(1.3)	23.8	(1.1)	24.3	(1.4)	17.5	(1.0)	8.1	(0.7)	2.2	(0.4)
Norway	7.2	(0.8)	15.1	(0.9)	24.3	(0.8)	25.7	(1.0)	18.3	(1.0)	7.3	(0.6)	2.1	(0.3)
Poland*	3.3	(0.4)	11.1	(0.8)	22.1	(0.9)	25.5	(0.9)	21.3	(1.1)	11.7	(0.8)	5.0	(0.8)
Portugal*	8.9	(0.8)	16.0	(1.0)	22.8	(0.9)	24.0	(0.8)	17.7	(0.9)	8.5	(0.7)	2.1	(0.3)
Republic of Ireland*	4.8	(0.5)	12.1	(0.7)	23.9	(0.7)	28.2	(0.9)	20.3	(0.8)	8.5	(0.5)	2.2	(0.2)
<i>Romania*</i>	14.0	(1.2)	26.8	(1.2)	28.3	(1.1)	19.2	(1.1)	8.4	(0.8)	2.6	(0.4)	0.6	(0.3)
<i>Russian Federation</i>	7.5	(0.7)	16.5	(0.8)	26.6	(1.0)	26.0	(1.0)	15.7	(0.8)	6.3	(0.6)	1.5	(0.3)
Scotland	4.9	(0.6)	13.3	(1.0)	24.8	(1.1)	27.2	(1.0)	18.8	(1.0)	8.5	(0.7)	2.4	(0.4)
<i>Serbia</i>	15.5	(1.2)	23.4	(0.9)	26.5	(1.1)	19.5	(1.0)	10.5	(0.7)	3.5	(0.5)	1.1	(0.3)
<i>Shanghai-China</i>	0.8	(0.2)	2.9	(0.5)	7.5	(0.6)	13.1	(0.8)	20.2	(0.8)	24.6	(1.0)	30.8	(1.2)
Singapore	2.2	(0.2)	6.1	(0.4)	12.2	(0.7)	17.5	(0.7)	22.0	(0.6)	21.0	(0.6)	19.0	(0.5)
Slovak Republic*	11.1	(1.0)	16.4	(0.9)	23.1	(1.1)	22.1	(1.1)	16.4	(1.1)	7.8	(0.6)	3.1	(0.5)
Slovenia*	5.1	(0.5)	15.0	(0.7)	23.6	(0.9)	23.9	(1.0)	18.7	(0.8)	10.3	(0.6)	3.4	(0.4)
Spain*	7.8	(0.5)	15.8	(0.6)	24.9	(0.6)	26.0	(0.6)	17.6	(0.6)	6.7	(0.4)	1.3	(0.2)
Sweden*	9.5	(0.7)	17.5	(0.8)	24.7	(0.9)	23.9	(0.8)	16.3	(0.7)	6.5	(0.5)	1.6	(0.3)
Switzerland	3.6	(0.3)	8.9	(0.6)	17.8	(1.1)	24.5	(1.0)	23.9	(0.8)	14.6	(0.8)	6.8	(0.7)
Turkey	15.5	(1.1)	26.5	(1.3)	25.5	(1.2)	16.5	(1.0)	10.1	(1.1)	4.7	(0.8)	1.2	(0.5)
<i>United Arab Emirates</i>	20.5	(0.9)	25.8	(0.8)	24.9	(0.7)	16.9	(0.6)	8.5	(0.5)	2.9	(0.3)	0.5	(0.1)
United Kingdom*	7.8	(0.8)	14.0	(0.8)	23.2	(0.8)	24.8	(0.8)	18.4	(0.8)	9.0	(0.6)	2.9	(0.4)
United States	8.0	(0.7)	17.9	(1.0)	26.3	(0.8)	23.3	(0.9)	15.8	(0.9)	6.6	(0.6)	2.2	(0.3)
<i>Vietnam</i>	3.6	(0.8)	10.6	(1.3)	22.8	(1.3)	28.4	(1.5)	21.3	(1.2)	9.8	(1.0)	3.5	(0.7)
Wales	9.6	(0.7)	19.4	(0.7)	27.5	(0.9)	25.1	(1.0)	13.1	(0.7)	4.3	(0.5)	1.0	(0.2)
OECD average	8.0	(0.1)	15.0	(0.1)	22.5	(0.1)	23.7	(0.2)	18.2	(0.1)	9.3	(0.1)	3.3	(0.1)

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

B21 Mean mathematics performance in PISA 2006, 2009 and 2012

	PISA 2006		PISA 2009		PISA 2012		Change between 2006 and 2012 (PISA 2012 - PISA 2006)		Change between 2009 and 2012 (PISA 2012 - PISA 2009)	
	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score dif.	S.E.
Australia	520	(2.2)	514	(2.5)	504	(1.6)	-16	(3.1)	-10	(3.4)
Austria*	505	(3.7)	m	m	506	(2.7)	0	(4.8)	m	m
Belgium*	520	(3.0)	515	(2.3)	515	(2.1)	-6	(3.9)	-1	(3.4)
<i>Bulgaria*</i>	413	(6.1)	428	(5.9)	439	(4.0)	25	(7.5)	11	(7.2)
Canada	527	(2.0)	527	(1.6)	518	(1.8)	-9	(3.1)	-9	(2.9)
Chile	411	(4.6)	421	(3.1)	423	(3.1)	11	(5.7)	2	(4.6)
<i>Chinese Taipei</i>	549	(4.1)	543	(3.4)	560	(3.3)	10	(5.5)	17	(5.0)
<i>Croatia*</i>	467	(2.4)	460	(3.1)	471	(3.5)	4	(4.5)	11	(4.9)
Czech Republic*	510	(3.6)	493	(2.8)	499	(2.9)	-11	(4.8)	6	(4.3)
Denmark*	513	(2.6)	503	(2.6)	500	(2.3)	-13	(3.8)	-3	(3.8)
<i>Dubai (UAE)</i>	m	m	453	(1.1)	464	(1.2)	m	m	11	(2.2)
England	495	(2.5)	493	(2.9)	495	(3.9)	0	(4.7)	2	(4.9)
Estonia*	515	(2.7)	512	(2.6)	521	(2.0)	6	(3.7)	8	(3.6)
Finland*	548	(2.3)	541	(2.2)	519	(1.9)	-30	(3.3)	-22	(3.3)
France*	496	(3.2)	497	(3.1)	495	(2.5)	-1	(4.3)	-2	(4.2)
Germany*	504	(3.9)	513	(2.9)	514	(2.9)	10	(5.0)	1	(4.3)
Greece*	459	(3.0)	466	(3.9)	453	(2.5)	-6	(4.1)	-13	(4.9)
<i>Hong Kong-China</i>	547	(2.7)	555	(2.7)	561	(3.2)	14	(4.4)	7	(4.5)
Hungary*	491	(2.9)	490	(3.5)	477	(3.2)	-14	(4.5)	-13	(4.9)
Iceland	506	(1.8)	507	(1.4)	493	(1.7)	-13	(2.9)	-14	(2.7)
Israel	442	(4.3)	447	(3.3)	466	(4.7)	25	(6.5)	20	(5.9)
Italy*	462	(2.3)	483	(1.9)	485	(2.0)	24	(3.4)	2	(3.1)
Japan	523	(3.3)	529	(3.3)	536	(3.6)	13	(5.1)	7	(5.1)
<i>Kazakhstan</i>	m	m	405	(3.0)	432	(3.0)	m	m	27	(4.5)
Korea	547	(3.8)	546	(4.0)	554	(4.6)	6	(6.1)	8	(6.3)
<i>Latvia*</i>	486	(3.0)	482	(3.1)	491	(2.8)	4	(4.3)	9	(4.4)
<i>Liechtenstein</i>	525	(4.2)	536	(4.1)	535	(4.0)	10	(6.0)	-1	(5.9)
<i>Lithuania*</i>	486	(2.9)	477	(2.6)	479	(2.6)	-8	(4.2)	2	(4.0)
Luxembourg*	490	(1.1)	489	(1.2)	490	(1.1)	0	(2.1)	1	(2.2)
<i>Macao-China</i>	525	(1.3)	525	(0.9)	538	(1.0)	13	(2.2)	13	(2.0)
Mexico	406	(2.9)	419	(1.8)	413	(1.4)	8	(3.5)	-5	(2.7)
Netherlands*	531	(2.6)	526	(4.7)	523	(3.5)	-8	(4.6)	-3	(6.1)
New Zealand	522	(2.4)	519	(2.3)	500	(2.2)	-22	(3.6)	-20	(3.5)
Northern Ireland	494	(2.8)	492	(3.1)	487	(3.1)	-7	(4.2)	-5	(4.4)
Norway	490	(2.6)	498	(2.4)	489	(2.7)	0	(4.1)	-9	(3.9)
Poland*	495	(2.4)	495	(2.8)	518	(3.6)	22	(4.6)	23	(4.8)
Portugal*	466	(3.1)	487	(2.9)	487	(3.8)	21	(5.1)	0	(5.0)
Republic of Ireland*	501	(2.8)	487	(2.5)	501	(2.2)	0	(3.9)	14	(3.7)
<i>Romania*</i>	415	(4.2)	427	(3.4)	445	(3.8)	30	(5.8)	17	(5.3)
<i>Russian Federation</i>	476	(3.9)	468	(3.3)	482	(3.0)	6	(5.1)	14	(4.7)
Scotland	506	(3.6)	499	(3.3)	498	(2.6)	-7	(4.5)	-1	(4.2)
<i>Serbia</i>	435	(3.5)	442	(2.9)	449	(3.4)	13	(5.1)	6	(4.7)
<i>Shanghai-China</i>	m	m	600	(2.8)	613	(3.3)	m	m	13	(4.6)
<i>Singapore</i>	m	m	562	(1.4)	573	(1.3)	m	m	11	(2.5)
Slovak Republic*	492	(2.8)	497	(3.1)	482	(3.4)	-10	(4.7)	-15	(4.9)
Slovenia*	504	(1.0)	501	(1.2)	501	(1.2)	-3	(2.2)	0	(2.3)
Spain*	480	(2.3)	483	(2.1)	484	(1.9)	4	(3.3)	1	(3.2)
Sweden*	502	(2.4)	494	(2.9)	478	(2.3)	-24	(3.6)	-16	(4.0)
Switzerland	530	(3.2)	534	(3.3)	531	(3.0)	1	(4.6)	-3	(4.7)
Turkey	424	(4.9)	445	(4.4)	448	(4.8)	24	(7.0)	3	(6.7)
<i>United Arab Emirates - Ex. Dubai</i>	m	m	411	(3.2)	423	(3.2)	m	m	12	(4.7)
United Kingdom*	495	(2.1)	492	(2.4)	494	(3.3)	-2	(4.2)	2	(4.4)
United States	474	(4.0)	487	(3.6)	481	(3.6)	7	(5.6)	-6	(5.3)
Wales	484	(2.9)	472	(3.0)	468	(2.2)	-16	(3.6)	-4	(3.7)

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

14 countries with scores below 430 omitted

Notes: Values that are statistically significant are indicated in bold

m indicates a missing value

For Costa Rica and Malaysia the change between PISA 2009 and PISA 2012 represents change between 2010 and 2012 because these countries implemented the PISA 2009 assessment in 2010 as part of PISA 2009+. In the United Arab Emirates, Dubai took the PISA 2009 assessment in 2009 and the rest of the United Arab Emirates in 2010 as part of PISA+. Results are thus reported separately.

B22 Mark schemes for the example PISA items

DVD Rental: a released quantity question from PISA 2012

Question 2: DVD RENTAL

PM977Q02 – 00 11 12 21 22 23 24 99

What is the minimum number of DVDs a member needs to rent so as to cover the cost of the membership fee? Show your work.

.....
.....
.....

Number of DVDs:

DVD RENTAL SCORING 2

QUESTION INTENT:

Description: Calculate and compare numbers in an everyday situation

Mathematical content area: Quantity

Context: Personal

Process: Formulate

Full Credit

Code 21: 15. *[Algebraic solution with correct reasoning].*

- $3.20x = 2.50x + 10$
 $0.70x = 10$
 $x = 10 / 0.70 = 14.2$ approximately
but whole number solution is required: 15 DVDs
- $3.20x > 2.50x + 10$ *[Same steps as previous solution but worked as an inequality].*

Code 22: 15. *[Arithmetical solution with correct reasoning].*

- For a single DVD, a member saves 0.70 zeds. Because a member has already paid 10 zeds at the beginning, they should at least save this amount for the membership to be worthwhile. $10 / 0.70 = 14.2\dots$ So 15 DVDs.

Code 23: 15. *[Solve correctly using systematic trial and error, where student chooses a number and finds the fee for members and non-members, and uses this to locate the correct number (15) for which a member pays less than a non-member].*

- 10 DVDs = 32 zeds non-members and 25 zeds + 10 zeds = 35 zeds for members.

Therefore try a higher number than 10. 15 DVDs is 54 zeds for non-members and $37.50 + 10 = 47.50$ zeds for members.

Therefore try a smaller value: 14 DVDs = 44.80 zeds for non-members and 35

+10 = 45 zeds for members.

Therefore 15 DVDs is the answer.

Code 24: 15. With other correct reasoning.

Partial Credit

Code 11: 15. No reasoning or working.

Code 12: Correct calculation but with incorrect rounding or no rounding to take into account context.

- 14
- 14.2
- 14.3
- 14.28 ...

No Credit

Code 00: Other responses.

Code 99: Missing.

Penguins: a released uncertainty and data question from PISA 2012

Based on the chart above, are the following statements about these three penguin types true or false?

Circle "True" or "False" for each statement.

Statement	Is the statement true or false?
In 2000, the average number of chicks raised per penguin couple was larger than 0.6.	True / False
In 2006, on average, less than 80% of penguin couples raised a chick.	True / False
By about 2015 these three penguin types will be extinct.	True / False
The average number of Magellanic penguin chicks raised per penguin couple decreased between 2001 and 2004.	True / False

UNIT PENGUINS SCORING 4

QUESTION INTENT:

Description: Analyse different statements concerning a given bar chart

Mathematical content area: Uncertainty and data

Context: Scientific

Process: Interpret

Full Credit

Code 1: Four correct responses: True, True, False, True in that order.

No Credit


Code 0: Other responses.

Code 9: Missing.

Question 4: SAILING SHIPS

Due to high diesel fuel costs of 0.42 zeds per litre, the owners of the ship *NewWave* are thinking about equipping their ship with a kite sail.

It is estimated that a kite sail like this has the potential to reduce the diesel consumption by about 20% overall.

Name: <i>NewWave</i>	
Type: freighter	
Length: 117 metres	
Breadth: 18 metres	
Load capacity: 12 000 tons	
Maximum speed: 19 knots	
Diesel consumption per year without a kite sail: approximately 3 500 000 litres	

The cost of equipping the *NewWave* with a kite sail is 2 500 000 zeds.

After about how many years would the diesel fuel savings cover the cost of the kite sail? Give calculations to support your answer.

.....

.....

.....

.....

.....

.....

.....

Number of years:.....

SAILING SHIPS SCORING 4

QUESTION INTENT:

Description: Solve a real world situation involving cost savings and fuel consumption

Mathematical content area: Change and relationships

Context: Scientific

Process: Formulate

Full Credit

Code 1: A solution from 8 to 9 years is provided with adequate (mathematical) calculations.

- Diesel consumption per year without a sail: 3.5 million litres, price 0.42 zed/litre, costs for diesel without a sail 1 470 000 zeds. If 20% is saved with the sail this results in a saving of $1\,470\,000 \times 0.2 = 294\,000$ zeds per year. Thus: $2\,500\,000 / 294\,000 \approx 8.5$, i.e.: After about 8 to 9 years, the sail becomes (financially) worthwhile.

No Credit

Code 0: Other responses.

Code 9: Missing.

Question 1: OIL SPILL

Using the map scale, estimate the area of the oil spill in square kilometres (km²).

Answer:km²

OIL SPILL SCORING 1

QUESTION INTENT:

Description: Estimation of an irregular area on a map, using a given scale

Mathematical content area: Space and shape

Context: Scientific

Process: Employ

Full Credit

Code 1: Answers in the range from 2200 to 3300.

No Credit

Code 0: Other responses.

Code 9: Missing.

Appendix C

C1 Significant differences in mean scores on the science scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	580	(3.0)	^
<i>Hong Kong-China</i>	555	(2.6)	^
<i>Singapore</i>	551	(1.5)	^
Japan	547	(3.6)	^
Finland*	545	(2.2)	^
Estonia*	541	(1.9)	^
Korea	538	(3.7)	^
<i>Vietnam</i>	528	(4.3)	^
Poland*	526	(3.1)	^
Canada	525	(1.9)	^
<i>Liechtenstein</i>	525	(3.5)	^
Germany*	524	(3.0)	^
<i>Chinese Taipei</i>	523	(2.3)	^
Netherlands*	522	(3.5)	^
Republic of Ireland*	522	(2.5)	^
Australia	521	(1.8)	^
<i>Macao-China</i>	521	(0.8)	^
England	516	(4.0)	NS
New Zealand	516	(2.1)	NS
Switzerland	515	(2.7)	NS
Slovenia*	514	(1.3)	NS
United Kingdom*	514	(3.4)	
Scotland	513	(3.0)	NS
Czech Republic*	508	(3.0)	NS
Northern Ireland	507	(3.9)	
Austria*	506	(2.7)	NS
Belgium*	505	(2.1)	NS
<i>Latvia*</i>	502	(2.8)	NS
OECD average	501	(1.5)	
France*	499	(2.6)	NS
Denmark*	498	(2.7)	NS
United States	497	(3.8)	NS
Spain*	496	(1.8)	v
<i>Lithuania*</i>	496	(2.6)	v
Norway	495	(3.1)	v
Hungary*	494	(2.9)	v
Italy*	494	(1.9)	v
<i>Croatia*</i>	491	(3.1)	v
Luxembourg*	491	(1.3)	v
Wales	491	(3.0)	v
Portugal*	489	(3.7)	v
<i>Russian Federation</i>	486	(2.9)	v
Sweden*	485	(3.0)	v
Iceland	478	(2.1)	v
Slovak Republic*	471	(3.6)	v
Israel	470	(5.0)	v
Greece*	467	(3.1)	v
Turkey	463	(3.9)	v
<i>United Arab Emirates</i>	448	(2.8)	v
<i>Bulgaria*</i>	446	(4.8)	v
Chile	445	(2.9)	v
<i>Serbia</i>	445	(3.4)	v
<i>Thailand</i>	444	(2.9)	v
<i>Romania*</i>	439	(3.3)	v
Cyprus	438	(1.2)	v
Mexico	415	(1.3)	v

Key	
^	significantly higher
NS	no significant difference
v	significantly lower
OECD countries (not italicised)	
<i>Countries not in OECD (italicised)</i>	
*EU countries	

14 countries with scores below 430 omitted
Simple comparison P-value = 5%

C2 Mean score, variation and gender differences in student performance on the science scale

	All students				Gender differences					Percentiles										Difference between 5th and 95th percentile			
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th		75th		90th		95th		
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score		S.E.	Score	S.E.
Australia	521	(1.8)	100	(1.0)	524	(2.5)	519	(2.1)	5	(3.0)	353	(3.5)	391	(2.6)	453	(2.1)	592	(2.5)	650	(2.7)	682	(2.9)	329
Austria*	506	(2.7)	92	(1.6)	510	(3.9)	501	(3.4)	9	(5.0)	350	(4.9)	383	(5.3)	442	(3.5)	571	(3.1)	623	(3.4)	650	(3.3)	300
Belgium*	505	(2.1)	101	(1.4)	505	(2.9)	506	(2.6)	0	(3.6)	326	(5.5)	369	(4.5)	439	(3.1)	579	(2.0)	630	(2.1)	658	(2.9)	332
<i>Bulgaria*</i>	446	(4.8)	102	(2.5)	437	(5.6)	457	(4.6)	-20	(4.5)	280	(7.5)	315	(5.3)	374	(5.6)	519	(5.1)	580	(6.1)	612	(6.2)	332
Canada	525	(1.9)	91	(0.9)	527	(2.4)	524	(2.0)	3	(2.1)	370	(3.3)	407	(2.7)	467	(2.1)	588	(2.4)	639	(2.5)	670	(3.3)	300
Chile	445	(2.9)	80	(1.5)	448	(3.7)	442	(2.9)	7	(3.3)	317	(4.1)	343	(3.8)	388	(3.3)	500	(3.6)	552	(3.7)	581	(3.7)	264
<i>Chinese Taipei</i>	523	(2.3)	83	(1.4)	524	(3.9)	523	(4.0)	1	(6.4)	379	(4.1)	411	(4.3)	469	(3.8)	582	(2.4)	626	(2.2)	652	(3.1)	273
Croatia*	491	(3.1)	85	(1.8)	490	(3.9)	493	(3.3)	-2	(3.8)	350	(4.9)	380	(4.0)	433	(3.3)	551	(4.2)	602	(5.2)	630	(5.9)	280
Cyprus	438	(1.2)	97	(1.1)	431	(1.8)	444	(1.7)	-13	(2.5)	274	(3.3)	313	(2.9)	373	(2.0)	503	(2.4)	561	(2.5)	594	(3.4)	320
Czech Republic*	508	(3.0)	91	(2.1)	509	(3.7)	508	(3.5)	1	(4.0)	356	(7.2)	392	(5.5)	449	(4.0)	572	(3.2)	622	(3.7)	650	(3.1)	294
Denmark*	498	(2.7)	93	(1.7)	504	(3.5)	493	(2.5)	10	(2.7)	338	(5.9)	378	(4.3)	438	(3.8)	563	(3.2)	615	(4.1)	644	(3.7)	306
England	516	(4.0)	101	(2.2)	523	(5.4)	509	(4.3)	14	(5.5)	343	(7.0)	384	(5.9)	449	(5.6)	587	(4.1)	642	(4.2)	674	(5.6)	331
Estonia*	541	(1.9)	80	(1.1)	540	(2.5)	543	(2.3)	-2	(2.7)	409	(3.0)	439	(3.3)	487	(2.7)	597	(2.6)	645	(3.1)	672	(4.5)	263
Finland*	545	(2.2)	93	(1.2)	537	(3.0)	554	(2.3)	-16	(3.0)	386	(5.7)	424	(3.9)	486	(2.8)	609	(2.4)	662	(2.9)	692	(2.6)	306
France*	499	(2.6)	100	(2.2)	498	(3.8)	500	(2.4)	-2	(3.7)	323	(7.8)	366	(6.0)	433	(3.4)	570	(3.0)	622	(4.1)	651	(4.7)	328
Germany*	524	(3.0)	95	(2.0)	524	(3.1)	524	(3.5)	-1	(3.0)	361	(5.6)	397	(4.8)	461	(3.8)	592	(3.1)	642	(3.9)	671	(3.7)	310
Greece*	467	(3.1)	88	(1.5)	460	(3.8)	473	(3.0)	-13	(3.1)	317	(5.2)	352	(5.1)	408	(4.5)	528	(3.5)	578	(3.6)	608	(4.1)	292
<i>Hong Kong-China</i>	555	(2.6)	83	(1.8)	558	(3.6)	551	(3.1)	7	(4.2)	403	(7.1)	446	(5.1)	505	(3.8)	613	(3.0)	655	(3.4)	679	(3.4)	276
Hungary*	494	(2.9)	90	(1.9)	496	(3.4)	493	(3.3)	3	(3.3)	345	(6.0)	376	(4.6)	432	(4.3)	558	(3.5)	610	(4.7)	639	(4.0)	294
Iceland	478	(2.1)	99	(1.5)	477	(2.7)	480	(2.9)	-3	(3.6)	310	(5.0)	348	(3.4)	413	(2.5)	548	(3.2)	603	(3.7)	635	(5.3)	325
Israel	470	(5.0)	108	(2.1)	470	(7.9)	470	(4.0)	-1	(7.6)	286	(8.7)	328	(6.4)	396	(5.7)	548	(5.7)	608	(5.4)	640	(5.1)	354
Italy*	494	(1.9)	93	(1.1)	495	(2.2)	492	(2.4)	3	(2.5)	336	(3.2)	371	(2.8)	431	(2.5)	559	(2.0)	611	(2.5)	641	(2.6)	305
Japan	547	(3.6)	96	(2.2)	552	(4.7)	541	(3.5)	11	(4.3)	379	(7.0)	421	(6.4)	485	(4.5)	614	(3.6)	664	(4.3)	693	(4.7)	314
Korea	538	(3.7)	82	(1.8)	539	(4.7)	536	(4.2)	3	(5.1)	396	(6.3)	431	(4.9)	485	(4.0)	595	(4.1)	639	(4.3)	664	(5.3)	268
Latvia*	502	(2.8)	79	(1.4)	495	(3.6)	510	(2.8)	-15	(3.6)	370	(5.5)	400	(4.5)	449	(3.2)	557	(3.6)	603	(3.2)	628	(4.7)	258
<i>Liechtenstein</i>	525	(3.5)	86	(4.1)	533	(5.8)	516	(5.7)	17	(9.1)	383	(11.1)	408	(10.0)	464	(8.4)	588	(8.2)	635	(9.3)	656	(12.2)	273
<i>Lithuania*</i>	496	(2.6)	86	(1.7)	488	(3.0)	503	(2.6)	-15	(2.3)	352	(6.3)	383	(4.0)	438	(3.2)	555	(3.0)	605	(3.6)	634	(3.8)	283
Luxembourg*	491	(1.3)	103	(1.0)	499	(1.7)	483	(1.7)	15	(2.2)	318	(3.6)	355	(3.1)	419	(2.2)	566	(1.9)	624	(2.9)	655	(2.9)	337
<i>Macao-China</i>	521	(0.8)	79	(0.7)	520	(1.3)	521	(1.2)	-1	(1.7)	383	(3.9)	416	(2.7)	469	(1.9)	575	(1.7)	619	(1.8)	643	(2.3)	260
Mexico	415	(1.3)	71	(0.9)	418	(1.5)	412	(1.3)	6	(1.1)	300	(2.6)	325	(2.1)	368	(1.6)	462	(1.5)	505	(1.9)	532	(2.1)	232
Netherlands*	522	(3.5)	95	(2.2)	524	(3.7)	520	(3.9)	3	(2.9)	357	(5.9)	393	(5.4)	458	(5.0)	591	(3.9)	641	(4.1)	667	(4.0)	310
New Zealand	516	(2.1)	105	(1.4)	518	(3.2)	513	(3.3)	5	(4.9)	339	(4.5)	377	(4.5)	444	(3.0)	591	(3.1)	649	(3.0)	682	(3.9)	343
Northern Ireland	507	(3.9)	101	(2.7)	510	(6.3)	504	(5.8)	5	(9.2)	338	(7.6)	375	(7.3)	438	(5.2)	578	(5.2)	635	(6.5)	669	(7.4)	331
Norway	495	(3.1)	100	(1.9)	493	(3.2)	496	(3.7)	-4	(3.2)	325	(6.6)	365	(5.2)	429	(3.7)	564	(3.3)	620	(3.4)	651	(3.9)	326
Poland*	526	(3.1)	86	(1.5)	524	(3.7)	527	(3.2)	-3	(3.0)	382	(4.7)	415	(4.0)	467	(3.3)	584	(4.0)	637	(5.0)	668	(4.9)	286
Portugal*	489	(3.7)	89	(1.6)	488	(4.1)	490	(3.8)	-2	(2.6)	337	(6.0)	372	(5.6)	430	(4.8)	551	(3.6)	602	(3.6)	630	(4.1)	293
Republic of Ireland*	522	(2.5)	91	(1.6)	524	(3.4)	520	(3.1)	4	(4.4)	366	(5.8)	404	(4.8)	462	(3.1)	586	(2.4)	637	(2.6)	666	(3.4)	300
<i>Romania*</i>	439	(3.3)	79	(2.0)	436	(3.7)	441	(3.5)	-5	(3.2)	316	(4.0)	340	(3.2)	383	(3.4)	492	(4.6)	543	(5.1)	573	(5.6)	257
<i>Russian Federation</i>	486	(2.9)	85	(1.3)	484	(3.5)	489	(2.9)	-6	(2.9)	347	(3.8)	377	(4.1)	428	(3.6)	544	(3.3)	596	(4.9)	627	(5.1)	280
Scotland	513	(3.0)	89	(2.0)	517	(3.3)	510	(3.6)	7	(3.3)	365	(6.9)	400	(4.5)	454	(3.7)	574	(3.2)	627	(4.2)	658	(5.3)	293
<i>Serbia</i>	445	(3.4)	87	(1.9)	443	(4.0)	447	(3.8)	-4	(3.9)	303	(5.6)	333	(5.2)	385	(4.5)	504	(3.5)	558	(3.9)	590	(5.8)	287
<i>Shanghai-China</i>	580	(3.0)	82	(1.8)	583	(3.5)	578	(3.1)	5	(2.7)	435	(6.2)	472	(5.4)	527	(3.7)	639	(3.2)	681	(3.2)	704	(3.3)	269
Singapore	551	(1.5)	104	(1.2)	551	(2.1)	552	(1.9)	-1	(2.6)	374	(4.0)	412	(3.2)	480	(2.6)	627	(2.6)	681	(3.4)	714	(3.2)	340
Slovak Republic*	471	(3.6)	101	(2.8)	475	(4.3)	467	(4.2)	7	(4.5)	300	(8.5)	339	(5.7)	403	(5.2)	542	(4.0)	599	(4.9)	632	(6.3)	332
Slovenia*	514	(1.3)	91	(1.2)	510	(1.9)	519	(1.9)	-9	(2.8)	364	(3.0)	397	(3.5)	451	(2.2)	578	(2.0)	631	(3.2)	661	(3.3)	297
Spain*	496	(1.8)	86	(0.9)	500	(2.3)	493	(1.9)	7	(2.1)	349	(3.9)	384	(3.1)	440	(2.3)	557	(1.8)	605	(2.0)	632	(2.0)	283
Sweden*	485	(3.0)	100	(1.5)	481	(3.9)	489	(2.8)	-7	(3.3)	314	(5.3)	354	(4.7)	419	(4.1)	554	(3.2)	611	(3.4)	643	(3.1)	328
Switzerland	515	(2.7)	91	(1.1)	518	(3.3)	512	(2.7)	6	(2.6)	358	(3.8)	394	(3.4)	455	(3.8)	579	(3.1)	630	(3.3)	658	(4.0)	300
Thailand	444	(2.9)	76	(1.7)	433	(3.3)	452	(3.4)	-19	(3.4)	323	(4.3)	349	(3.4)	392	(2.6)	494	(3.8)	544	(5.4)	575	(6.0)	252
Turkey	463	(3.9)	80	(1.9)	458	(4.5)	469	(4.3)	-10	(4.2)	339	(3.6)	363	(3.5)	407	(3.5)	518	(5.8)	573	(6.3)	602	(5.9)	263
<i>United Arab Emirates</i>	448	(2.8)	94	(1.1)	434	(4.1)	462	(3.7)	-28	(5.1)	299	(3.0)	328	(3.2)	382	(3.5)	512	(3.4)	605	(3.7)	632	(5.7)	306
United Kingdom*	514	(3.4)	100	(1.8)	521	(4.5)	508	(3.7)	13	(4.7)	344	(5.8)	384	(4.9)	448	(4.6)	584	(3.5)	639	(3.9)	672	(5.0)	327
United States	497	(3.8)	94	(1.5)	497	(4.1)	498	(4.0)	-2	(2.7)	344	(5.4)	377	(4.9)	431	(4.4)	563	(4.2)	619	(4.5)	652	(5.5)	308
Vietnam	528	(4.3)	77	(2.3)	529	(5.0)	528	(4.1)	1	(2.8)	398	(7.7)	428	(7.0)	478	(5.2)	580	(4.0)	625	(5.5)	652	(6.5)	254
Wales	491	(3.0)	94	(1.6)	496	(3.4)	485	(3.5)	11	(3.5)	334	(6.2)	370	(4.5)	428	(4.1)	556	(3.4)	609	(3.9)	639	(5.4)	305
OECD average	501	(0.5)	93	(0.3)	502	(0.6)	500	(0.5)	1	(0.6)	344	(0.9)	380	(0.8)	439	(0.6)	566	(0.6)	619	(0.6)	648	(0.7)	304

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold.

OECD countries (not italicised)

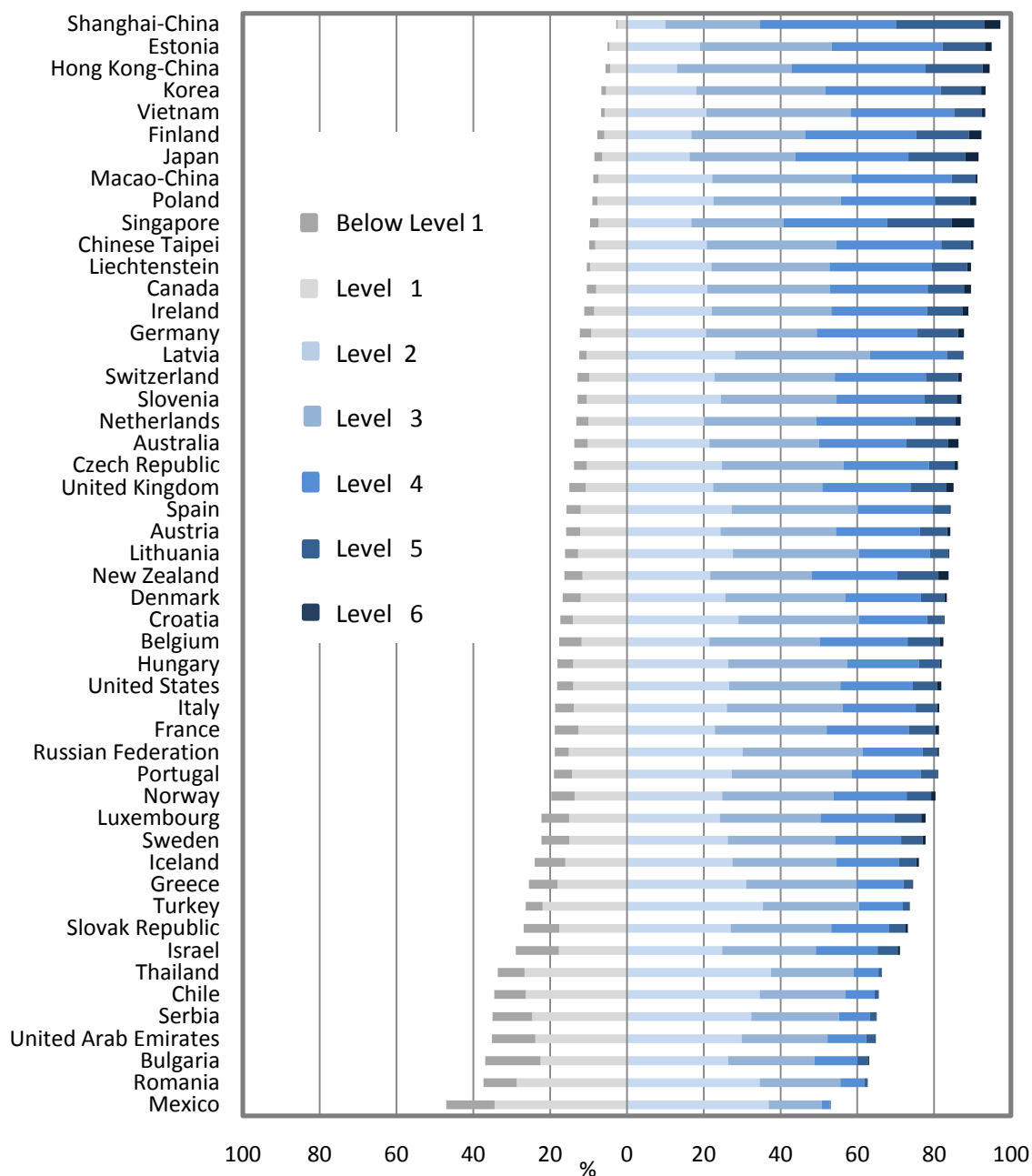
Countries not in OECD (italicised)

*EU countries

C3 Summary descriptions for the six levels of proficiency in science

Level	Characteristics of tasks
6	At Level 6, students can consistently identify, explain and apply scientific knowledge and <i>knowledge about science</i> in a variety of complex life situations. They can link different information sources and explanations and use evidence from those sources to justify decisions. They clearly and consistently demonstrate advanced scientific thinking and reasoning, and they demonstrate willingness to use their scientific understanding in support of solutions to unfamiliar scientific and technological situations. Students at this level can use scientific knowledge and develop arguments in support of recommendations and decisions that centre on personal, social or global situations.
5	At Level 5, students can identify the scientific components of many complex life situations, apply both scientific concepts and <i>knowledge about science</i> to these situations, and can compare, select and evaluate appropriate scientific evidence for responding to life situations. Students at this level can use well-developed inquiry abilities, link knowledge appropriately and bring critical insights to situations. They can construct explanations based on evidence and arguments based on their critical analysis.
4	At Level 4, students can work effectively with situations and issues that may involve explicit phenomena requiring them to make inferences about the role of science or technology. They can select and integrate explanations from different disciplines of science or technology and link those explanations directly to aspects of life situations. Students at this level can reflect on their actions and they can communicate decisions using scientific knowledge and evidence.
3	At Level 3, students can identify clearly described scientific issues in a range of contexts. They can select facts and knowledge to explain phenomena and apply simple models or inquiry strategies. Students at this level can interpret and use scientific concepts from different disciplines and can apply them directly. They can develop short statements using facts and make decisions based on scientific knowledge.
2	At Level 2, students have adequate scientific knowledge to provide possible explanations in familiar contexts or draw conclusions based on simple investigations. They are capable of direct reasoning and making literal interpretations of the results of scientific inquiry or technological problem solving.
1	At Level 1, students have such a limited scientific knowledge that it can only be applied to a few, familiar situations. They can present scientific explanations that are obvious and follow explicitly from given evidence.

C4 Summary of percentage of students at each level of proficiency on the science scale



14 countries with scores below 430 omitted

Countries are ranked in descending order of the percentage of students at Levels 2, 3, 4, 5 and 6.

Source: OECD, PISA 2012 database, Table I.5.1a.

C5 Percentage of students at each proficiency level on the science scale

	All students													
	Below Level 1		Level 1		Level 2		Level 3		Level 4		Level 5		Level 6	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Australia	3.4	(0.3)	10.2	(0.4)	21.5	(0.5)	28.5	(0.7)	22.8	(0.6)	10.9	(0.5)	2.6	(0.3)
Austria*	3.6	(0.5)	12.2	(0.9)	24.3	(1.0)	30.1	(0.9)	21.9	(0.8)	7.0	(0.6)	0.8	(0.2)
Belgium*	5.8	(0.5)	11.8	(0.6)	21.5	(0.7)	28.7	(0.7)	22.9	(0.6)	8.3	(0.4)	1.0	(0.1)
<i>Bulgaria*</i>	14.4	(1.3)	22.5	(1.2)	26.3	(1.1)	22.5	(1.1)	11.2	(0.8)	2.8	(0.5)	0.3	(0.1)
Canada	2.4	(0.2)	8.0	(0.4)	21.0	(0.7)	32.0	(0.5)	25.3	(0.6)	9.5	(0.5)	1.8	(0.2)
Chile	8.1	(0.8)	26.3	(1.1)	34.6	(1.1)	22.4	(1.0)	7.5	(0.6)	1.0	(0.1)	0.0	(0.0)
<i>Chinese Taipei</i>	1.6	(0.3)	8.2	(0.6)	20.8	(0.9)	33.7	(1.0)	27.3	(1.0)	7.8	(0.6)	0.6	(0.1)
Croatia*	3.2	(0.4)	14.0	(0.7)	29.1	(1.0)	31.4	(1.2)	17.6	(1.2)	4.3	(0.7)	0.3	(0.2)
Cyprus	14.4	(0.5)	23.7	(0.7)	30.3	(0.9)	21.3	(0.7)	8.4	(0.4)	1.8	(0.3)	0.2	(0.1)
Czech Republic*	3.3	(0.6)	10.5	(1.0)	24.7	(1.0)	31.7	(1.2)	22.2	(1.0)	6.7	(0.5)	0.9	(0.2)
Denmark*	4.7	(0.5)	12.0	(0.7)	25.7	(0.8)	31.3	(0.9)	19.6	(0.8)	6.1	(0.7)	0.7	(0.2)
England	4.3	(0.6)	10.6	(1.0)	21.9	(1.1)	28.0	(1.1)	23.4	(1.1)	9.8	(0.8)	1.9	(0.4)
Estonia*	0.5	(0.1)	4.5	(0.4)	19.0	(0.9)	34.5	(0.9)	28.7	(1.0)	11.1	(0.7)	1.7	(0.3)
Finland*	1.8	(0.3)	5.9	(0.5)	16.8	(0.7)	29.6	(0.8)	28.8	(0.7)	13.9	(0.6)	3.2	(0.4)
France*	6.1	(0.7)	12.6	(0.7)	22.9	(1.1)	29.2	(1.1)	21.3	(0.9)	6.9	(0.7)	1.0	(0.2)
Germany*	2.9	(0.5)	9.3	(0.7)	20.5	(0.8)	28.9	(0.9)	26.2	(1.0)	10.6	(0.8)	1.6	(0.3)
Greece*	7.4	(0.7)	18.1	(1.1)	31.0	(1.1)	28.8	(1.0)	12.2	(0.8)	2.3	(0.4)	0.2	(0.1)
<i>Hong Kong-China</i>	1.2	(0.2)	4.4	(0.5)	13.0	(0.7)	29.8	(1.1)	34.9	(1.0)	14.9	(0.9)	1.8	(0.4)
Hungary*	4.1	(0.6)	14.0	(1.0)	26.4	(1.1)	30.9	(1.2)	18.7	(1.0)	5.5	(0.7)	0.5	(0.2)
Iceland	8.0	(0.6)	16.0	(0.7)	27.5	(0.9)	27.2	(0.9)	16.2	(0.7)	4.6	(0.6)	0.6	(0.2)
Israel	11.2	(1.1)	17.7	(0.9)	24.8	(0.9)	24.4	(1.2)	16.1	(1.1)	5.2	(0.6)	0.6	(0.2)
Italy*	4.9	(0.3)	13.8	(0.5)	26.0	(0.6)	30.1	(0.7)	19.1	(0.6)	5.5	(0.4)	0.6	(0.1)
Japan	2.0	(0.4)	6.4	(0.6)	16.3	(0.8)	27.5	(0.9)	29.5	(1.1)	14.8	(0.9)	3.4	(0.5)
Korea	1.2	(0.2)	5.5	(0.6)	18.0	(1.0)	33.6	(1.1)	30.1	(1.2)	10.6	(0.9)	1.1	(0.4)
Latvia*	1.8	(0.4)	10.5	(0.9)	28.2	(1.2)	35.1	(1.0)	20.0	(1.0)	4.0	(0.5)	0.3	(0.1)
<i>Liechtenstein</i>	0.8	(0.7)	9.6	(1.9)	22.0	(3.9)	30.8	(3.8)	26.7	(2.6)	9.1	(1.5)	1.0	(1.0)
<i>Lithuania*</i>	3.4	(0.5)	12.7	(0.8)	27.6	(1.0)	32.9	(1.1)	18.3	(0.9)	4.7	(0.5)	0.4	(0.1)
Luxembourg*	7.2	(0.4)	15.1	(0.7)	24.2	(0.6)	26.2	(0.6)	19.2	(0.5)	7.0	(0.5)	1.2	(0.2)
<i>Macao-China</i>	1.4	(0.2)	7.4	(0.5)	22.2	(0.6)	36.2	(0.8)	26.2	(0.7)	6.2	(0.3)	0.4	(0.1)
Mexico	12.6	(0.5)	34.4	(0.6)	37.0	(0.6)	13.8	(0.5)	2.1	(0.2)	0.1	(0.0)	0.0	c
Netherlands*	3.1	(0.5)	10.1	(0.8)	20.1	(1.3)	29.1	(1.3)	25.8	(1.2)	10.5	(1.0)	1.3	(0.3)
New Zealand	4.7	(0.4)	11.6	(0.8)	21.7	(0.9)	26.4	(0.9)	22.3	(0.9)	10.7	(0.6)	2.7	(0.3)
Northern Ireland	4.7	(0.7)	12.1	(1.3)	23.7	(1.5)	27.8	(1.5)	21.4	(1.3)	8.3	(0.9)	2.0	(0.5)
Norway	6.0	(0.6)	13.6	(0.7)	24.8	(0.8)	28.9	(0.9)	19.0	(0.8)	6.4	(0.6)	1.1	(0.2)
Poland*	1.3	(0.3)	7.7	(0.7)	22.5	(1.0)	33.1	(0.9)	24.5	(1.0)	9.1	(0.8)	1.7	(0.4)
Portugal*	4.7	(0.7)	14.3	(1.1)	27.3	(1.0)	31.4	(1.3)	17.8	(1.1)	4.2	(0.5)	0.3	(0.1)
Republic of Ireland*	2.6	(0.4)	8.5	(0.8)	22.0	(1.2)	31.1	(1.0)	25.0	(0.9)	9.3	(0.6)	1.5	(0.3)
<i>Romania*</i>	8.7	(0.8)	28.7	(1.3)	34.6	(1.2)	21.0	(1.1)	6.2	(0.8)	0.9	(0.3)	0.0	c
<i>Russian Federation</i>	3.6	(0.4)	15.1	(1.0)	30.1	(1.1)	31.2	(0.9)	15.7	(1.0)	3.9	(0.5)	0.3	(0.2)
Scotland	2.7	(0.4)	9.4	(0.7)	24.9	(1.2)	32.4	(1.2)	21.8	(1.0)	7.5	(0.7)	1.3	(0.3)
<i>Serbia</i>	10.3	(1.0)	24.7	(1.2)	32.4	(1.2)	22.8	(1.1)	8.1	(0.6)	1.6	(0.4)	0.1	(0.1)
<i>Shanghai-China</i>	0.3	(0.1)	2.4	(0.4)	10.0	(0.9)	24.6	(0.9)	35.5	(1.1)	23.0	(1.1)	4.2	(0.6)
<i>Singapore</i>	2.2	(0.3)	7.4	(0.5)	16.7	(0.7)	24.0	(0.7)	27.0	(0.9)	16.9	(0.9)	5.8	(0.4)
Slovak Republic*	9.2	(0.9)	17.6	(1.1)	27.0	(1.3)	26.2	(1.6)	15.0	(1.0)	4.3	(0.6)	0.6	(0.2)
Slovenia*	2.4	(0.2)	10.4	(0.5)	24.5	(1.0)	30.0	(1.0)	23.0	(0.9)	8.4	(0.7)	1.2	(0.2)
Spain*	3.7	(0.3)	12.0	(0.5)	27.3	(0.6)	32.8	(0.6)	19.4	(0.5)	4.5	(0.3)	0.3	(0.1)
Sweden*	7.3	(0.6)	15.0	(0.8)	26.2	(0.8)	28.0	(0.8)	17.2	(0.8)	5.6	(0.4)	0.7	(0.1)
Switzerland	3.0	(0.3)	9.8	(0.6)	22.8	(0.8)	31.3	(0.7)	23.7	(0.9)	8.3	(0.7)	1.0	(0.2)
<i>Thailand</i>	7.0	(0.6)	26.6	(1.3)	37.5	(1.1)	21.6	(1.1)	6.4	(0.7)	0.9	(0.3)	0.1	(0.0)
Turkey	4.4	(0.5)	21.9	(1.3)	35.4	(1.4)	25.1	(1.3)	11.3	(1.3)	1.8	(0.3)	0.0	c
<i>United Arab Emirates</i>	11.3	(0.8)	23.8	(1.0)	29.9	(0.8)	22.3	(0.9)	10.1	(0.6)	2.3	(0.2)	0.3	(0.1)
United Kingdom*	4.3	(0.5)	10.7	(0.9)	22.4	(1.0)	28.4	(1.0)	23.0	(0.9)	9.3	(0.7)	1.8	(0.3)
United States	4.2	(0.5)	14.0	(1.1)	26.7	(1.1)	28.9	(1.1)	18.8	(1.1)	6.3	(0.6)	1.1	(0.2)
<i>Vietnam</i>	0.9	(0.3)	5.8	(0.9)	20.7	(1.4)	37.5	(1.5)	27.0	(1.5)	7.1	(0.9)	1.0	(0.3)
Wales	5.2	(0.6)	14.2	(0.8)	27.1	(1.3)	29.5	(1.3)	18.4	(0.9)	4.9	(0.6)	0.8	(0.2)
OECD average	4.8	(0.1)	13.0	(0.1)	24.5	(0.2)	28.8	(0.2)	20.5	(0.2)	7.2	(0.1)	1.2	(0.0)

14 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold.

c indicates there are too few observations or no observation to provide reliable estimates

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

C6 Mean science performance in PISA 2006, 2009 and 2012

	PISA 2006		PISA 2009		PISA 2012		Change between 2006 and 2012 (PISA 2012 - PISA 2006)		Change between 2009 and 2012 (PISA 2012 - PISA 2009)	
	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score dif.	S.E.
Australia	527	(2.3)	527	(2.5)	521	(1.8)	-5	(4.5)	-6	(3.7)
Austria*	511	(3.9)	m	m	506	(2.7)	-5	(5.9)	m	m
Belgium*	510	(2.5)	507	(2.5)	505	(2.1)	-5	(4.8)	-1	(3.8)
<i>Bulgaria*</i>	434	(6.1)	439	(5.9)	446	(4.8)	12	(8.5)	7	(7.8)
Canada	534	(2.0)	529	(1.6)	525	(1.9)	-9	(4.5)	-3	(3.2)
Chile	438	(4.3)	447	(2.9)	445	(2.9)	7	(6.3)	-3	(4.6)
<i>Chinese Taipei</i>	532	(3.6)	520	(2.6)	523	(2.3)	-9	(5.5)	3	(4.0)
<i>Croatia*</i>	493	(2.4)	486	(2.8)	491	(3.1)	-2	(5.3)	5	(4.7)
Czech Republic*	513	(3.5)	500	(3.0)	508	(3.0)	-5	(5.8)	8	(4.7)
Denmark*	496	(3.1)	499	(2.5)	498	(2.7)	3	(5.4)	-1	(4.2)
<i>Dubai (UAE)</i>	m	m	466	(1.2)	474	(1.4)	m	m	8	(2.7)
England	516	(2.7)	515	(3.0)	516	(4.0)	0	(4.8)	1	(5.0)
Estonia*	531	(2.5)	528	(2.7)	541	(1.9)	10	(4.7)	14	(3.9)
Finland*	563	(2.0)	554	(2.3)	545	(2.2)	-18	(4.6)	-9	(3.8)
France*	495	(3.4)	498	(3.6)	499	(2.6)	4	(5.5)	1	(4.9)
Germany*	516	(3.8)	520	(2.8)	524	(3.0)	8	(6.0)	4	(4.5)
Greece*	473	(3.2)	470	(4.0)	467	(3.1)	-7	(5.7)	-3	(5.5)
<i>Hong Kong-China</i>	542	(2.5)	549	(2.8)	555	(2.6)	13	(5.0)	6	(4.3)
Hungary*	504	(2.7)	503	(3.1)	494	(2.9)	-10	(5.3)	-8	(4.8)
Iceland	491	(1.6)	496	(1.4)	478	(2.1)	-13	(4.4)	-17	(3.2)
Israel	454	(3.7)	455	(3.1)	470	(5.0)	16	(7.1)	15	(6.2)
Italy*	475	(2.0)	489	(1.8)	494	(1.9)	18	(4.5)	5	(3.3)
Japan	531	(3.4)	539	(3.4)	547	(3.6)	15	(6.1)	7	(5.4)
Korea	522	(3.4)	538	(3.4)	538	(3.7)	16	(6.1)	0	(5.4)
<i>Latvia*</i>	490	(3.0)	494	(3.1)	502	(2.8)	13	(5.4)	8	(4.6)
<i>Liechtenstein</i>	522	(4.1)	520	(3.4)	525	(3.5)	3	(6.5)	5	(5.3)
<i>Lithuania*</i>	488	(2.8)	491	(2.9)	496	(2.6)	8	(5.1)	4	(4.4)
Luxembourg*	486	(1.1)	484	(1.2)	491	(1.3)	5	(3.9)	7	(2.7)
<i>Macao-China</i>	511	(1.1)	511	(1.0)	521	(0.8)	10	(3.8)	10	(2.4)
Mexico	410	(2.7)	416	(1.8)	415	(1.3)	5	(4.6)	-1	(3.0)
Netherlands*	525	(2.7)	522	(5.4)	522	(3.5)	-3	(5.7)	0	(6.8)
New Zealand	530	(2.7)	532	(2.6)	516	(2.1)	-15	(4.9)	-16	(3.9)
Northern Ireland	508	(3.3)	511	(4.4)	507	(3.9)	-1	(5.1)	-1	(5.9)
Norway	487	(3.1)	500	(2.6)	495	(3.1)	8	(5.6)	-5	(4.5)
Poland*	498	(2.3)	508	(2.4)	526	(3.1)	28	(5.3)	18	(4.4)
Portugal*	474	(3.0)	493	(2.9)	489	(3.7)	15	(6.0)	-4	(5.1)
Republic of Ireland*	508	(3.2)	508	(3.3)	522	(2.5)	14	(5.3)	14	(4.5)
<i>Romania*</i>	418	(4.2)	428	(3.4)	439	(3.3)	20	(6.4)	11	(5.1)
<i>Russian Federation</i>	479	(3.7)	478	(3.3)	486	(2.9)	7	(5.8)	8	(4.8)
Scotland	515	(4.0)	514	(3.5)	513	(3.0)	-1	(5.0)	-1	(4.6)
<i>Serbia</i>	436	(3.0)	443	(2.4)	445	(3.4)	9	(5.8)	2	(4.6)
<i>Shanghai-China</i>	m	m	575	(2.3)	580	(3.0)	m	m	6	(4.3)
<i>Singapore</i>	m	m	542	(1.4)	551	(1.5)	m	m	10	(2.9)
Slovak Republic*	488	(2.6)	490	(3.0)	471	(3.6)	-17	(5.7)	-19	(5.1)
Slovenia*	519	(1.1)	512	(1.1)	514	(1.3)	-5	(3.9)	2	(2.6)
Spain*	488	(2.6)	488	(2.1)	496	(1.8)	8	(4.7)	8	(3.4)
Sweden*	503	(2.4)	495	(2.7)	485	(3.0)	-19	(5.2)	-10	(4.5)
Switzerland	512	(3.2)	517	(2.8)	515	(2.7)	4	(5.4)	-1	(4.4)
<i>Thailand</i>	421	(2.1)	425	(3.0)	444	(2.9)	23	(5.1)	19	(4.6)
Turkey	424	(3.8)	454	(3.6)	463	(3.9)	40	(6.5)	10	(5.7)
<i>United Arab Emirates</i>	m	m	429	(3.3)	439	(3.8)	m	m	10	(5.4)
United Kingdom*	515	(2.3)	514	(2.5)	514	(3.4)	-1	(5.4)	0	(4.7)
United States	489	(4.2)	502	(3.6)	497	(3.8)	9	(6.7)	-5	(5.6)
Wales	505	(3.5)	496	(3.5)	491	(3.0)	-14	(4.6)	-5	(4.6)

14 countries with scores below 430 omitted

Notes: Values that are statistically significant are indicated in bold.

m indicates a missing value

For Costa Rica and Malaysia the change between PISA 2009 and PISA 2012 represents change between 2010 and 2012 because these countries implemented the PISA 2009 assessment in 2010 as part of PISA 2009+.

In the United Arab Emirates, Dubai took the PISA 2009 assessment in 2009 and the rest of the United Arab Emirates in 2010 as part of PISA+. Results are thus reported separately.

OECD countries (not italicised)

Countries not in OECD (italicised)

*EU countries

Appendix D

D1 Significant differences in mean scores on the reading scale

	Mean score		Significance
	Mean	S.E.	
<i>Shanghai-China</i>	570	(2.9)	^
<i>Hong Kong-China</i>	545	(2.8)	^
<i>Singapore</i>	542	(1.4)	^
Japan	538	(3.7)	^
Korea	536	(3.9)	^
Finland*	524	(2.4)	^
Republic of Ireland*	523	(2.6)	^
Canada	523	(1.9)	^
<i>Chinese Taipei</i>	523	(3.0)	^
Poland*	518	(3.1)	^
Estonia*	516	(2.0)	^
<i>Liechtenstein</i>	516	(4.1)	^
New Zealand	512	(2.4)	^
Australia	512	(1.6)	^
Netherlands*	511	(3.5)	^
Belgium*	509	(2.2)	^
Switzerland	509	(2.6)	^
<i>Macao-China</i>	509	(0.9)	^
<i>Vietnam</i>	508	(4.4)	NS
Germany*	508	(2.8)	^
Scotland	506	(3.0)	NS
France*	505	(2.8)	NS
Norway	504	(3.2)	NS
England	500	(4.2)	NS
United Kingdom*	499	(3.5)	
Northern Ireland	498	(3.9)	
United States	498	(3.7)	NS
OECD average	496	(0.5)	
Denmark*	496	(2.6)	NS
Czech Republic*	493	(2.9)	NS
Italy*	490	(2.0)	NS
Austria*	490	(2.8)	NS
<i>Latvia*</i>	489	(2.4)	NS
Hungary*	488	(3.2)	NS
Spain*	488	(1.9)	v
Luxembourg*	488	(1.5)	v
Portugal*	488	(3.8)	NS
Israel	486	(5.0)	NS
<i>Croatia*</i>	485	(3.3)	v
Sweden*	483	(3.0)	v
Iceland	483	(1.8)	v
Slovenia*	481	(1.2)	v
Wales	480	(2.7)	v
<i>Lithuania*</i>	477	(2.5)	v
Greece*	477	(3.3)	v
Turkey	475	(4.2)	v
<i>Russian Federation</i>	475	(3.0)	v
Slovak Republic*	463	(4.2)	v
<i>Cyprus</i>	449	(1.2)	v
<i>Serbia</i>	446	(3.4)	v
<i>United Arab Emirates</i>	442	(2.5)	v
Chile	441	(2.9)	v
<i>Thailand</i>	441	(3.1)	v
Costa Rica	441	(3.5)	v
<i>Romania*</i>	438	(4.0)	v
<i>Bulgaria*</i>	436	(6.0)	v
Mexico	424	(1.5)	v

Key
^ significantly higher
NS no significant difference
v significantly lower
OECD countries (not italicised)
Countries not in OECD (italicised)
*EU countries

13 countries with scores below 430 omitted
Simple comparison P-value = 5%

D2 Mean score, variation and gender differences in student performance on the reading scale

#	All students				Gender differences						Percentiles										Difference between 5th and 95th percentile		
	Mean score		Standard deviation		Boys		Girls		Difference (B - G)		5th		10th		25th		75th		90th			95th	
	Mean	S.E.	S.D.	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.		Score	S.E.
Australia	512	(1.6)	97	(1.0)	495	(2.3)	530	(2.0)	-34	(2.9)	347	(3.0)	386	(2.4)	448	(2.2)	579	(1.9)	634	(2.3)	664	(3.1)	318
Austria*	490	(2.8)	92	(1.8)	471	(4.0)	508	(3.4)	-37	(5.0)	329	(6.3)	365	(5.1)	427	(3.9)	557	(3.0)	603	(2.5)	629	(3.7)	300
Belgium*	509	(2.2)	103	(1.7)	493	(2.9)	525	(2.6)	-32	(3.4)	324	(6.5)	372	(4.3)	444	(3.2)	583	(2.7)	635	(2.3)	663	(2.6)	339
Bulgaria*	436	(6.0)	119	(2.8)	403	(6.3)	472	(5.6)	-70	(5.2)	233	(9.2)	275	(8.0)	353	(8.2)	523	(6.0)	585	(6.1)	619	(6.3)	386
Canada	523	(1.9)	92	(0.9)	506	(2.3)	541	(2.1)	-35	(2.1)	363	(3.3)	403	(2.8)	464	(2.3)	587	(2.2)	638	(2.6)	667	(2.7)	305
Chile	441	(2.9)	78	(1.4)	430	(3.8)	452	(2.9)	-23	(3.3)	310	(4.6)	339	(4.2)	388	(3.8)	496	(3.3)	541	(3.3)	567	(3.4)	258
Chinese Taipei	523	(3.0)	91	(1.8)	507	(4.3)	539	(4.3)	-32	(6.4)	361	(5.5)	399	(5.2)	467	(4.4)	587	(2.8)	633	(3.6)	659	(4.7)	298
Costa Rica	441	(3.5)	74	(1.6)	427	(3.9)	452	(3.5)	-25	(2.6)	315	(5.4)	344	(5.4)	391	(4.3)	490	(4.2)	536	(5.0)	563	(4.9)	247
Croatia*	485	(3.3)	86	(2.1)	461	(4.1)	509	(3.3)	-48	(4.0)	337	(5.9)	370	(5.1)	427	(4.4)	546	(3.8)	593	(4.9)	622	(5.1)	284
Cyprus	449	(1.2)	111	(1.3)	418	(1.9)	481	(1.9)	-64	(3.0)	249	(4.0)	297	(3.3)	378	(2.4)	528	(2.1)	583	(2.6)	616	(3.3)	366
Czech Republic*	493	(2.9)	89	(1.9)	474	(3.3)	513	(3.4)	-39	(3.7)	344	(6.0)	378	(4.7)	434	(3.7)	554	(3.6)	604	(3.8)	634	(4.3)	290
Denmark*	496	(2.6)	86	(2.2)	481	(3.3)	512	(2.6)	-31	(2.8)	347	(6.9)	385	(5.1)	442	(3.5)	555	(2.4)	602	(2.8)	629	(4.4)	281
England	500	(4.2)	98	(2.6)	487	(5.4)	512	(4.5)	-24	(5.4)	328	(8.5)	371	(8.3)	438	(5.8)	568	(3.8)	621	(4.5)	652	(5.2)	324
Estonia*	516	(2.0)	80	(1.2)	494	(2.4)	538	(2.3)	-44	(2.4)	381	(4.4)	412	(3.4)	463	(3.0)	571	(2.4)	618	(2.8)	645	(4.3)	263
Finland*	524	(2.4)	95	(1.3)	494	(3.1)	556	(2.4)	-62	(3.1)	360	(5.7)	399	(4.3)	463	(3.5)	590	(2.3)	639	(2.5)	669	(3.5)	309
France*	505	(2.8)	109	(2.3)	483	(3.8)	527	(3.0)	-44	(4.2)	312	(7.7)	358	(5.4)	435	(4.3)	584	(3.6)	639	(3.9)	669	(5.0)	357
Germany*	508	(2.8)	91	(1.7)	486	(2.9)	530	(3.1)	-44	(2.5)	346	(5.2)	384	(4.8)	447	(3.6)	574	(3.1)	621	(3.2)	646	(3.3)	300
Greece*	477	(3.3)	99	(2.1)	452	(4.1)	502	(3.1)	-50	(3.7)	302	(8.8)	346	(6.0)	416	(4.5)	545	(3.4)	597	(3.9)	626	(4.5)	325
Hong Kong-China	545	(2.8)	85	(1.8)	533	(3.8)	558	(3.3)	-25	(4.7)	391	(6.4)	430	(5.4)	493	(4.4)	604	(3.0)	648	(3.4)	672	(4.1)	281
Hungary*	488	(3.2)	92	(1.9)	468	(3.9)	508	(3.3)	-40	(3.6)	327	(6.0)	363	(5.2)	427	(4.6)	555	(3.3)	603	(3.9)	630	(4.7)	303
Iceland	483	(1.8)	98	(1.4)	457	(2.4)	508	(2.5)	-51	(3.3)	308	(5.7)	352	(4.1)	422	(2.9)	551	(2.9)	602	(2.4)	631	(3.2)	323
Israel	486	(5.0)	114	(2.5)	463	(8.2)	507	(3.9)	-44	(7.9)	282	(9.5)	329	(7.5)	414	(6.8)	568	(4.5)	624	(4.5)	656	(4.8)	374
Italy*	490	(2.0)	97	(0.9)	471	(2.5)	510	(2.3)	-39	(2.6)	317	(3.5)	359	(2.9)	427	(2.6)	559	(2.1)	609	(2.2)	636	(2.1)	319
Japan	538	(3.7)	99	(2.3)	527	(4.7)	551	(3.6)	-24	(4.1)	364	(7.7)	409	(6.5)	475	(4.8)	607	(3.8)	658	(4.4)	689	(5.1)	325
Korea	536	(3.9)	87	(2.0)	525	(5.0)	548	(4.5)	-23	(5.4)	382	(8.6)	424	(6.2)	483	(4.3)	596	(4.1)	640	(4.0)	665	(4.8)	282
Latvia*	489	(2.4)	85	(1.7)	462	(3.3)	516	(2.7)	-55	(4.0)	341	(5.9)	375	(5.6)	434	(3.0)	548	(2.9)	593	(2.8)	619	(4.1)	278
Liechtenstein	516	(4.1)	88	(4.2)	504	(6.2)	529	(5.8)	-24	(8.7)	360	(9.7)	391	(9.5)	452	(7.8)	584	(6.9)	630	(10.6)	649	(13.7)	288
Lithuania*	477	(2.5)	86	(1.5)	450	(2.8)	505	(2.6)	-55	(2.3)	331	(5.1)	363	(4.0)	419	(3.9)	538	(2.8)	585	(3.1)	612	(3.6)	281
Luxembourg*	488	(1.5)	105	(1.0)	473	(1.9)	503	(1.8)	-30	(2.0)	304	(3.8)	347	(2.7)	418	(2.4)	564	(2.2)	620	(2.3)	651	(2.4)	347
Macao-China	509	(0.9)	82	(0.7)	492	(1.4)	527	(1.1)	-36	(1.7)	366	(3.3)	400	(2.4)	457	(1.8)	566	(1.4)	611	(1.6)	637	(2.1)	270
Mexico	424	(1.5)	80	(1.0)	411	(1.7)	435	(1.6)	-24	(1.4)	288	(3.0)	319	(2.5)	370	(1.9)	479	(1.8)	525	(1.9)	552	(2.0)	264
Netherlands*	511	(3.5)	93	(3.0)	498	(4.0)	525	(3.5)	-26	(3.1)	349	(8.3)	386	(6.6)	451	(5.1)	579	(3.7)	625	(3.6)	650	(3.8)	300
New Zealand	512	(2.4)	106	(1.6)	495	(3.3)	530	(3.5)	-34	(5.0)	332	(4.7)	374	(4.9)	443	(3.2)	586	(3.1)	645	(4.0)	679	(4.9)	347
Northern Ireland	498	(3.9)	95	(2.7)	484	(5.4)	512	(5.2)	-27	(7.6)	333	(9.6)	373	(7.1)	436	(5.0)	565	(5.7)	618	(5.3)	646	(5.9)	313
Norway	504	(3.2)	100	(1.9)	481	(3.3)	528	(3.9)	-46	(3.3)	330	(8.1)	375	(4.8)	442	(4.0)	573	(3.4)	627	(3.9)	658	(4.2)	328
Poland*	518	(3.1)	87	(1.6)	497	(3.7)	539	(3.1)	-42	(2.9)	366	(5.9)	404	(4.6)	461	(3.2)	579	(3.6)	626	(4.8)	655	(6.2)	289
Portugal*	488	(3.8)	94	(1.9)	468	(4.2)	508	(3.7)	-39	(2.7)	320	(6.9)	362	(6.0)	429	(4.9)	554	(3.5)	604	(3.5)	631	(3.8)	311
Republic of Ireland*	523	(2.6)	86	(1.7)	509	(3.5)	538	(3.0)	-29	(4.2)	373	(7.1)	410	(5.7)	469	(3.6)	582	(2.7)	631	(3.2)	659	(3.2)	286
Romania*	438	(4.0)	90	(2.0)	417	(4.5)	457	(4.2)	-40	(4.1)	290	(5.3)	322	(4.4)	375	(4.4)	501	(5.5)	555	(5.3)	586	(6.3)	296
Russian Federation	475	(3.0)	91	(1.5)	455	(3.5)	495	(3.2)	-40	(3.0)	323	(4.8)	359	(4.5)	415	(4.0)	537	(3.9)	592	(4.2)	623	(5.1)	300
Scotland	506	(3.0)	87	(1.8)	493	(3.2)	520	(3.5)	-27	(3.4)	357	(7.2)	394	(5.1)	450	(3.9)	565	(3.6)	614	(3.8)	645	(4.8)	288
Serbia	446	(3.4)	93	(2.0)	423	(3.9)	469	(3.8)	-46	(3.8)	290	(6.0)	325	(5.5)	384	(4.4)	509	(4.1)	566	(4.6)	596	(5.6)	307
Shanghai-China	570	(2.9)	80	(1.8)	557	(3.3)	581	(2.8)	-24	(2.5)	431	(5.1)	463	(4.6)	518	(3.6)	626	(2.8)	667	(3.5)	690	(4.7)	259
Singapore	542	(1.4)	101	(1.2)	527	(1.9)	559	(1.9)	-32	(2.6)	369	(3.6)	408	(2.9)	475	(2.1)	614	(2.1)	668	(3.2)	698	(3.7)	329
Slovak Republic*	463	(4.2)	104	(3.3)	444	(4.6)	483	(5.1)	-39	(4.6)	274	(10.4)	321	(8.4)	396	(6.8)	538	(4.1)	591	(5.2)	620	(5.5)	346
Slovenia*	481	(1.2)	92	(0.9)	454	(1.7)	510	(1.8)	-56	(2.7)	324	(2.9)	362	(2.5)	420	(1.9)	548	(2.1)	598	(2.5)	626	(3.7)	301
Spain*	488	(1.9)	92	(1.1)	474	(2.3)	503	(1.9)	-29	(2.0)	327	(4.6)	367	(3.6)	430	(2.6)	552	(2.1)	601	(2.3)	630	(2.1)	303
Sweden*	483	(3.0)	107	(1.8)	458	(4.0)	509	(2.8)	-51	(3.6)	297	(6.5)	343	(5.4)	416	(4.3)	558	(3.3)	614	(4.2)	647	(4.2)	350
Switzerland	509	(2.6)	90	(1.1)	491	(3.1)	527	(2.5)	-36	(2.6)	352	(4.6)	388	(3.9)	451	(3.3)	573	(2.8)	622	(3.2)	648	(3.9)	296
Thailand	441	(3.1)	78	(1.8)	410	(3.6)	465	(3.3)	-55	(3.2)	310	(5.0)	341	(4.4)	389	(3.5)	494	(3.7)	541	(4.4)	569	(6.2)	259
Turkey	475	(4.2)	86	(2.4)	453	(4.6)	499	(4.3)	-46	(4.0)	335	(5.3)	365	(4.6)	417	(4.0)	534	(5.6)	588	(6.8)	620	(7.9)	285
United Arab Emirates	442	(2.5)	95	(1.1)	413	(3.9)	469	(3.2)	-55	(4.8)	281	(3.9)	316	(3.7)	376	(3.1)	508	(2.8)	562	(3.1)	595	(3.4)	314
United Kingdom*	499	(3.5)	97	(2.3)	487	(4.5)	512	(3.8)	-25	(4.6)	330	(7.4)	372	(7.0)	438	(4.8)	567	(3.4)	619	(3.8)	650	(4.3)	320
United States	498	(3.7)	92	(1.6)	482	(4.1)	513	(3.8)	-31	(2.6)	342	(7.2)	378	(4.8)	436	(4.5)	561	(3.9)	614	(4.0)	646	(4.7)	303
Vietnam	508	(4.4)	74	(2.6)	492	(5.0)	523	(4.0)	-31	(2.6)	379	(9.6)	411	(8.2)	462	(5.4)	559	(3.9)	599	(5.0)	623	(5.3)	245
Wales	480	(2.7)	90	(1.7)	466	(3.2)	493	(3.2)	-27	(3.5)	325	(6.3)	365	(4.7)	421	(3.7)	541	(3.2)	593	(3.9)	624	(4.6)	299
OECD average	496	(0.5)	94	(0.3)	478	(0.6)	515	(0.5)	-38	(0.6)	332	(1.1)	372	(0.9)	435	(0.7)	563	(0.6)	613	(0.6)	642	(0.7)	310

13 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold.

OECD countries (not italicised)

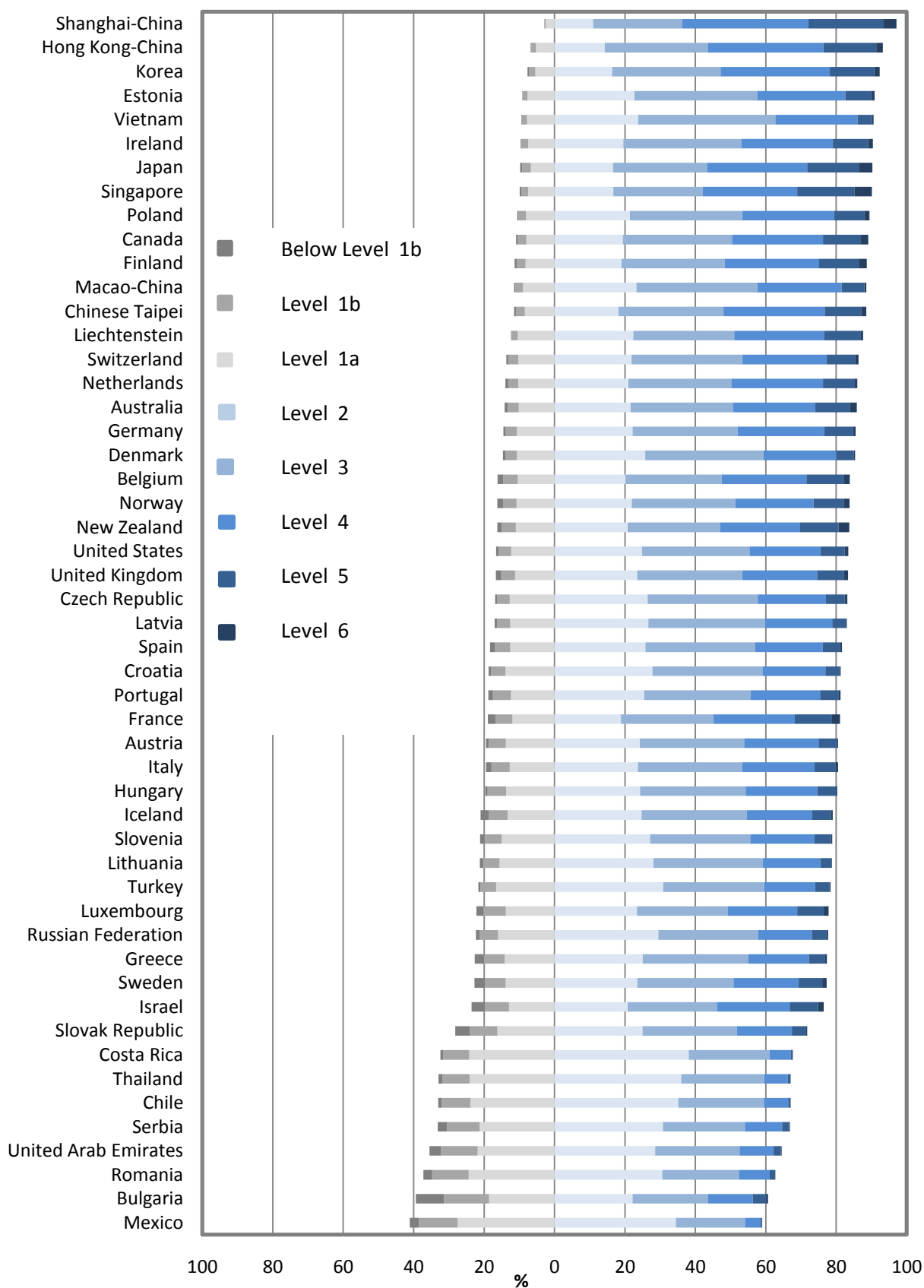
Countries not in OECD (italicised)

*EU countries

D3 Summary descriptions for the seven level of proficiency in reading

Level	Characteristics of tasks
6	Tasks at this level typically require the reader to make multiple inferences, comparisons and contrasts that are both detailed and precise. They require demonstration of a full and detailed understanding of one or more texts and may involve integrating information from more than one text. Tasks may require the reader to deal with unfamiliar ideas, in the presence of prominent competing information, and to generate abstract categories for interpretations. <i>Reflect and evaluate</i> tasks may require the reader to hypothesise about or critically evaluate a complex text on an unfamiliar topic, taking into account multiple criteria or perspectives, and applying sophisticated understandings from beyond the text. There is limited data about <i>access and retrieve</i> tasks at this level, but it appears that a salient condition is precision of analysis and fine attention to detail that is inconspicuous in the texts.
5	Tasks at this level that involve retrieving information require the reader to locate and organise several pieces of deeply embedded information, inferring which information in the text is relevant. Reflective tasks require critical evaluation or hypothesis, drawing on specialised knowledge. Both interpretative and reflective tasks require a full and detailed understanding of a text whose content or form is unfamiliar. For all aspects of reading, tasks at this level typically involve dealing with concepts that are contrary to expectations.
4	Tasks at this level that involve retrieving information require the reader to locate and organise several pieces of embedded information. Some tasks at this level require interpreting the meaning of nuances of language in a section of text by taking into account the text as a whole. Other interpretative tasks require understanding and applying categories in an unfamiliar context. Reflective tasks at this level require readers to use formal or public knowledge to hypothesise about or critically evaluate a text. Readers must demonstrate an accurate understanding of long or complex texts whose content or form may be unfamiliar.
3	Tasks at this level require the reader to locate, and in some cases recognise the relationship between, several pieces of information that must meet multiple conditions. Interpretative tasks at this level require the reader to integrate several parts of a text in order to identify a main idea, understand a relationship or construe the meaning of a word or phrase. They need to take into account many features in comparing, contrasting or categorising. Often the required information is not prominent or there is much competing information; or there are other text obstacles, such as ideas that are contrary to expectation or negatively worded. Reflective tasks at this level may require connections, comparisons, and explanations, or they may require the reader to evaluate a feature of the text. Some reflective tasks require readers to demonstrate a fine understanding of the text in relation to familiar, everyday knowledge. Other tasks do not require detailed text comprehension but require the reader to draw on less common knowledge.
2	Some tasks at this level require the reader to locate one or more pieces of information, which may need to be inferred and may need to meet several conditions. Others require recognising the main idea in a text, understanding relationships, or construing meaning within a limited part of the text when the information is not prominent and the reader must make low level inferences. Tasks at this level may involve comparisons or contrasts based on a single feature in the text. Typical reflective tasks at this level require readers to make a comparison or several connections between the text and outside knowledge, by drawing on personal experience and attitudes.
1a	Tasks at this level require the reader to locate one or more independent pieces of explicitly stated information; to recognise the main theme or author's purpose in a text about a familiar topic, or to make a simple connection between information in the text and common, everyday knowledge. Typically the required information in the text is prominent and there is little, if any, competing information. The reader is explicitly directed to consider relevant factors in the task and in the text.
1b	Tasks at this level require the reader to locate a single piece of explicitly stated information in a prominent position in a short, syntactically simple text with a familiar context and text type, such as a narrative or a simple list. The text typically provides support to the reader, such as repetition of information, pictures or familiar symbols. There is minimal competing information. In tasks requiring interpretation the reader may need to make simple connections between adjacent pieces of information.

D4 Summary of percentage of students at each level of proficiency on the reading scale



13 countries with scores below 430 omitted

Countries are ranked in descending order of the percentage of students at Levels 2, 3, 4, 5 and 6.

Source: OECD, PISA 2012 database, Table I.4.1a.

D5 Percentage of students at each level of proficiency on the reading scale

	Proficiency levels															
	Below Level 1b (less than 262.04 score points)		Level 1b (from 262.04 to less than 334.75 score points)		Level 1a (from 334.75 to less than 407.47 score points)		Level 2 (from 407.47 to less than 480.18 score points)		Level 3 (from 480.18 to less than 552.89 score points)		Level 4 (from 552.89 to less than 625.61 score points)		Level 5 (from 625.61 to less than 698.32 score points)		Level 6 (above 698.32 score points)	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Australia	0.9	(0.1)	3.1	(0.2)	10.2	(0.4)	21.6	(0.5)	29.1	(0.5)	23.3	(0.5)	9.8	(0.5)	1.9	(0.2)
Austria*	0.8	(0.2)	4.8	(0.6)	13.8	(0.8)	24.2	(0.9)	29.6	(0.9)	21.2	(0.9)	5.2	(0.6)	0.3	(0.1)
Belgium*	1.6	(0.3)	4.1	(0.4)	10.5	(0.6)	20.2	(0.6)	27.3	(0.7)	24.0	(0.6)	10.7	(0.5)	1.6	(0.2)
Bulgaria*	8.0	(1.1)	12.8	(1.2)	18.6	(1.1)	22.2	(1.2)	21.4	(1.1)	12.7	(1.0)	3.8	(0.6)	0.5	(0.2)
Canada	0.5	(0.1)	2.4	(0.2)	8.0	(0.4)	19.4	(0.6)	31.0	(0.7)	25.8	(0.6)	10.8	(0.5)	2.1	(0.2)
Chile	1.0	(0.2)	8.1	(0.8)	23.9	(1.1)	35.1	(1.1)	24.3	(1.1)	6.9	(0.6)	0.6	(0.1)	0.0	(0.0)
Chinese Taipei	0.6	(0.1)	2.5	(0.3)	8.4	(0.7)	18.1	(0.8)	29.9	(0.9)	28.7	(1.0)	10.4	(0.7)	1.4	(0.3)
Costa Rica	0.8	(0.2)	7.3	(1.0)	24.3	(1.2)	38.1	(1.4)	22.9	(1.4)	6.0	(0.8)	0.6	(0.2)	0.0	c
Croatia*	0.7	(0.2)	4.0	(0.6)	13.9	(1.0)	27.8	(1.1)	31.2	(1.2)	17.8	(1.1)	4.2	(0.7)	0.2	(0.1)
Cyprus	6.1	(0.3)	9.7	(0.4)	17.0	(0.6)	25.1	(0.8)	24.9	(0.7)	13.2	(0.6)	3.5	(0.3)	0.5	(0.1)
Czech Republic*	0.6	(0.3)	3.5	(0.6)	12.7	(0.9)	26.4	(1.3)	31.3	(1.2)	19.4	(1.1)	5.3	(0.5)	0.8	(0.2)
Denmark*	0.8	(0.3)	3.1	(0.4)	10.7	(0.8)	25.8	(0.9)	33.6	(0.8)	20.5	(0.9)	5.1	(0.6)	0.4	(0.1)
England	1.6	(0.3)	4.0	(0.6)	11.1	(0.9)	23.1	(1.2)	29.5	(1.2)	21.5	(1.3)	7.8	(0.7)	1.3	(0.3)
Estonia*	0.2	(0.1)	1.3	(0.3)	7.7	(0.6)	22.7	(0.9)	35.0	(1.1)	24.9	(1.1)	7.5	(0.7)	0.9	(0.2)
Finland*	0.7	(0.2)	2.4	(0.4)	8.2	(0.6)	19.1	(0.8)	29.3	(0.7)	26.8	(0.8)	11.3	(0.6)	2.2	(0.3)
France*	2.1	(0.4)	4.9	(0.4)	11.9	(0.7)	18.9	(0.8)	26.3	(0.8)	23.0	(0.7)	10.6	(0.6)	2.3	(0.4)
Germany*	0.5	(0.2)	3.3	(0.4)	10.7	(0.7)	22.1	(0.9)	29.9	(0.9)	24.6	(0.9)	8.3	(0.6)	0.7	(0.2)
Greece*	2.6	(0.4)	5.9	(0.6)	14.2	(0.8)	25.1	(1.1)	30.0	(1.0)	17.2	(1.2)	4.6	(0.6)	0.5	(0.1)
Hong Kong-China	0.2	(0.1)	1.3	(0.2)	5.3	(0.6)	14.3	(0.8)	29.2	(1.2)	32.9	(1.4)	14.9	(1.0)	1.9	(0.4)
Hungary*	0.7	(0.2)	5.2	(0.6)	13.8	(0.9)	24.3	(1.2)	29.9	(1.0)	20.4	(1.0)	5.3	(0.7)	0.4	(0.1)
Iceland	2.3	(0.3)	5.4	(0.5)	13.3	(0.6)	24.7	(0.9)	29.9	(1.1)	18.6	(1.1)	5.2	(0.4)	0.6	(0.2)
Israel	3.8	(0.6)	6.9	(0.7)	12.9	(1.0)	20.8	(0.9)	25.3	(0.8)	20.6	(1.0)	8.1	(0.8)	1.5	(0.3)
Italy*	1.6	(0.2)	5.2	(0.3)	12.7	(0.5)	23.7	(0.6)	29.7	(0.5)	20.5	(0.6)	6.1	(0.3)	0.6	(0.1)
Japan	0.6	(0.2)	2.4	(0.4)	6.7	(0.7)	16.6	(0.9)	26.7	(1.0)	28.4	(1.1)	14.6	(1.0)	3.9	(0.6)
Korea	0.4	(0.1)	1.7	(0.4)	5.5	(0.6)	16.4	(0.9)	30.8	(1.0)	31.0	(1.1)	12.6	(1.0)	1.6	(0.3)
Latvia*	0.7	(0.2)	3.7	(0.5)	12.6	(1.0)	26.7	(1.3)	33.1	(1.1)	19.1	(0.9)	3.9	(0.6)	0.3	(0.1)
Liechtenstein	0.0	c	1.9	(1.0)	10.5	(1.8)	22.4	(3.4)	28.6	(4.5)	25.7	(2.4)	10.4	(2.4)	0.6	c
Lithuania*	1.0	(0.2)	4.6	(0.5)	15.6	(1.1)	28.1	(1.1)	31.1	(0.9)	16.3	(0.8)	3.1	(0.3)	0.2	(0.1)
Luxembourg*	2.0	(0.2)	6.3	(0.3)	13.8	(0.8)	23.4	(0.7)	25.8	(0.6)	19.7	(0.6)	7.5	(0.3)	1.4	(0.2)
Macao-China	0.3	(0.1)	2.1	(0.2)	9.0	(0.4)	23.3	(0.6)	34.3	(0.7)	24.0	(0.6)	6.4	(0.5)	0.6	(0.2)
Mexico	2.6	(0.2)	11.0	(0.5)	27.5	(0.7)	34.5	(0.6)	19.6	(0.5)	4.5	(0.3)	0.4	(0.1)	0.0	(0.0)
Netherlands*	0.9	(0.5)	2.8	(0.5)	10.3	(0.9)	21.0	(1.3)	29.2	(1.3)	26.1	(1.4)	9.0	(0.7)	0.8	(0.2)
New Zealand	1.3	(0.3)	4.0	(0.5)	11.0	(0.7)	20.8	(0.8)	26.3	(1.1)	22.7	(1.1)	10.9	(0.6)	3.0	(0.4)
Northern Ireland	1.1	(0.3)	4.1	(0.7)	11.5	(1.3)	24.4	(1.4)	29.8	(1.5)	20.8	(1.3)	7.1	(0.8)	1.2	(0.3)
Norway	1.7	(0.3)	3.7	(0.4)	10.8	(0.7)	21.9	(1.0)	29.4	(1.4)	22.3	(1.2)	8.5	(0.6)	1.7	(0.3)
Poland*	0.3	(0.1)	2.1	(0.4)	8.1	(0.7)	21.4	(0.9)	32.0	(0.9)	26.0	(1.0)	8.6	(0.8)	1.4	(0.4)
Portugal*	1.3	(0.3)	5.1	(0.5)	12.3	(1.0)	25.5	(1.2)	30.2	(1.5)	19.7	(1.1)	5.3	(0.6)	0.5	(0.1)
Republic of Ireland*	0.3	(0.1)	1.9	(0.4)	7.5	(0.7)	19.6	(1.2)	33.4	(1.2)	26.0	(0.9)	10.1	(0.7)	1.3	(0.3)
Romania*	2.5	(0.4)	10.3	(0.8)	24.4	(1.3)	30.6	(1.1)	21.8	(1.2)	8.7	(0.9)	1.5	(0.4)	0.1	c
Russian Federation	1.1	(0.2)	5.2	(0.5)	16.0	(1.0)	29.5	(1.1)	28.3	(1.0)	15.3	(0.9)	4.2	(0.5)	0.5	(0.1)
Scotland	0.5	(0.2)	2.7	(0.5)	9.3	(0.9)	23.9	(1.2)	33.8	(1.3)	22.0	(1.0)	6.9	(0.6)	0.9	(0.3)
Serbia	2.6	(0.4)	9.3	(0.7)	21.3	(1.1)	30.8	(1.2)	23.3	(1.1)	10.5	(0.8)	2.0	(0.4)	0.2	(0.1)
Shanghai-China	0.1	(0.1)	0.3	(0.1)	2.5	(0.3)	11.0	(0.9)	25.3	(0.8)	35.7	(1.1)	21.3	(1.0)	3.8	(0.7)
Singapore	0.5	(0.1)	1.9	(0.3)	7.5	(0.4)	16.7	(0.7)	25.4	(0.7)	26.8	(0.8)	16.2	(0.7)	5.0	(0.4)
Slovak Republic*	4.1	(0.8)	7.9	(0.8)	16.2	(1.1)	25.0	(1.1)	26.8	(1.4)	15.7	(1.0)	4.1	(0.6)	0.3	(0.2)
Slovenia*	1.2	(0.1)	4.9	(0.4)	15.0	(0.7)	27.2	(0.8)	28.4	(0.9)	18.2	(0.6)	4.7	(0.5)	0.3	(0.1)
Spain*	1.3	(0.2)	4.4	(0.4)	12.6	(0.5)	25.8	(0.8)	31.2	(0.7)	19.2	(0.6)	5.0	(0.3)	0.5	(0.1)
Sweden*	2.9	(0.4)	6.0	(0.6)	13.9	(0.7)	23.5	(0.9)	27.3	(0.7)	18.6	(0.9)	6.7	(0.5)	1.2	(0.2)
Switzerland	0.5	(0.1)	2.9	(0.3)	10.3	(0.6)	21.9	(0.9)	31.5	(0.7)	23.8	(0.8)	8.2	(0.6)	1.0	(0.2)
Thailand	1.2	(0.3)	7.7	(0.8)	24.1	(1.0)	36.0	(1.1)	23.5	(1.1)	6.7	(0.8)	0.8	(0.2)	0.1	(0.0)
Turkey	0.6	(0.2)	4.5	(0.6)	16.6	(1.1)	30.8	(1.4)	28.7	(1.3)	14.5	(1.4)	4.1	(0.8)	0.3	(0.1)
United Arab Emirates	3.3	(0.3)	10.4	(0.6)	21.8	(0.7)	28.6	(0.7)	24.0	(0.8)	9.7	(0.6)	2.1	(0.3)	0.2	(0.1)
United Kingdom*	1.5	(0.3)	4.0	(0.5)	11.2	(0.8)	23.5	(1.0)	29.9	(1.1)	21.3	(1.1)	7.5	(0.6)	1.3	(0.2)
United States	0.8	(0.2)	3.6	(0.5)	12.3	(0.9)	24.9	(1.0)	30.5	(0.9)	20.1	(1.1)	6.9	(0.6)	1.0	(0.2)
Vietnam	0.1	(0.1)	1.5	(0.5)	7.8	(1.1)	23.7	(1.4)	39.0	(1.5)	23.4	(1.5)	4.2	(0.7)	0.4	(0.2)
Wales	1.0	(0.2)	4.9	(0.5)	14.7	(0.9)	28.5	(1.3)	29.8	(0.9)	16.3	(0.8)	4.2	(0.5)	0.5	(0.1)
OECD average	1.3	(0.1)	4.4	(0.1)	12.3	(0.1)	23.5	(0.2)	29.1	(0.2)	21.0	(0.2)	7.3	(0.1)	1.1	(0.0)

13 countries with scores below 430 omitted

Note: Values that are statistically significant are indicated in bold.

c indicates there are too few observations or no observation to provide reliable estimates

OECD countries (not italicised) Countries not in OECD (italicised) *EU countries

D6 Mean reading performance in PISA 2006, 2009 and 2012

	PISA 2006		PISA 2009		PISA 2012		Change between 2006 and 2012 (PISA 2012 - PISA 2006)		Change between 2009 and 2012 (PISA 2012 - PISA 2009)	
	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Score dif.	S.E.
Australia	513	(2.1)	515	(2.3)	512	(1.6)	-1	(6.2)	-3	(3.8)
Austria*	490	(4.1)	m	m	490	(2.8)	-1	(7.4)	m	m
Belgium*	501	(3.0)	506	(2.3)	509	(2.2)	8	(6.7)	3	(4.1)
<i>Bulgaria*</i>	402	(6.9)	429	(6.7)	436	(6.0)	34	(10.7)	7	(9.4)
Canada	527	(2.4)	524	(1.5)	523	(1.9)	-4	(6.4)	-1	(3.6)
Chile	442	(5.0)	449	(3.1)	441	(2.9)	-1	(8.0)	-8	(5.0)
<i>Chinese Taipei</i>	496	(3.4)	495	(2.6)	523	(3.0)	27	(7.2)	28	(4.8)
Costa Rica	m	m	443	(3.2)	441	(3.5)	m	m	-2	(5.4)
<i>Croatia*</i>	477	(2.8)	476	(2.9)	485	(3.3)	7	(7.1)	9	(5.1)
Czech Republic*	483	(4.2)	478	(2.9)	493	(2.9)	10	(7.5)	15	(4.8)
Denmark*	494	(3.2)	495	(2.1)	496	(2.6)	2	(6.9)	1	(4.3)
<i>Dubai (UAE)</i>	m	m	459	(1.1)	468	(1.3)	m	m	9	(3.1)
England	496	(2.7)	495	(2.8)	500	(4.2)	4	(4.9)	5	(5.0)
Estonia*	501	(2.9)	501	(2.6)	516	(2.0)	16	(6.6)	15	(4.2)
Finland*	547	(2.1)	536	(2.3)	524	(2.4)	-23	(6.4)	-12	(4.2)
France*	488	(4.1)	496	(3.4)	505	(2.8)	18	(7.5)	10	(5.2)
Germany*	495	(4.4)	497	(2.7)	508	(2.8)	13	(7.6)	10	(4.7)
Greece*	460	(4.0)	483	(4.3)	477	(3.3)	17	(7.6)	-6	(6.0)
<i>Hong Kong-China</i>	536	(2.4)	533	(2.1)	545	(2.8)	9	(6.7)	11	(4.4)
Hungary*	482	(3.3)	494	(3.2)	488	(3.2)	6	(7.2)	-6	(5.2)
Iceland	484	(1.9)	500	(1.4)	483	(1.8)	-2	(6.2)	-18	(3.5)
Israel	439	(4.6)	474	(3.6)	486	(5.0)	47	(8.8)	12	(6.7)
Italy*	469	(2.4)	486	(1.6)	490	(2.0)	21	(6.4)	4	(3.6)
Japan	498	(3.6)	520	(3.5)	538	(3.7)	40	(7.6)	18	(5.7)
Korea	556	(3.8)	539	(3.5)	536	(3.9)	-20	(7.8)	-3	(5.9)
<i>Latvia*</i>	479	(3.7)	484	(3.0)	489	(2.4)	9	(7.1)	5	(4.6)
<i>Liechtenstein</i>	510	(3.9)	499	(2.8)	516	(4.1)	5	(8.0)	16	(5.6)
<i>Lithuania*</i>	470	(3.0)	468	(2.4)	477	(2.5)	7	(6.8)	9	(4.3)
Luxembourg*	479	(1.3)	472	(1.3)	488	(1.5)	8	(5.9)	16	(3.3)
<i>Macao-China</i>	492	(1.1)	487	(0.9)	509	(0.9)	17	(5.8)	22	(2.9)
Mexico	410	(3.1)	425	(2.0)	424	(1.5)	13	(6.5)	-2	(3.6)
Netherlands*	507	(2.9)	508	(5.1)	511	(3.5)	4	(7.2)	3	(6.7)
New Zealand	521	(3.0)	521	(2.4)	512	(2.4)	-9	(6.8)	-9	(4.2)
Northern Ireland	495	(3.5)	499	(4.1)	498	(3.9)	2	(5.3)	-2	(5.7)
Norway	484	(3.2)	503	(2.6)	504	(3.2)	20	(7.2)	1	(4.9)
Poland*	508	(2.8)	500	(2.6)	518	(3.1)	11	(7.0)	18	(4.8)
Portugal*	472	(3.6)	489	(3.1)	488	(3.8)	15	(7.6)	-2	(5.5)
Republic of Ireland*	517	(3.5)	496	(3.0)	523	(2.6)	6	(7.1)	28	(4.7)
<i>Romania*</i>	396	(4.7)	424	(4.1)	438	(4.0)	42	(8.3)	13	(6.3)
<i>Russian Federation</i>	440	(4.3)	459	(3.3)	475	(3.0)	35	(7.7)	16	(5.2)
Scotland	499	(4.0)	500	(3.2)	506	(3.0)	7	(5.0)	6	(4.4)
<i>Serbia</i>	401	(3.5)	442	(2.4)	446	(3.4)	45	(7.4)	4	(5.0)
<i>Shanghai-China</i>	m	m	556	(2.4)	570	(2.9)	m	m	14	(4.5)
<i>Singapore</i>	m	m	526	(1.1)	542	(1.4)	m	m	16	(3.1)
Slovak Republic*	466	(3.1)	477	(2.5)	463	(4.2)	-4	(7.6)	-15	(5.5)
Slovenia*	494	(1.0)	483	(1.0)	481	(1.2)	-13	(5.8)	-2	(3.1)
Spain*	461	(2.2)	481	(2.0)	488	(1.9)	27	(6.3)	7	(3.8)
Sweden*	507	(3.4)	497	(2.9)	483	(3.0)	-24	(7.2)	-14	(4.9)
Switzerland	499	(3.1)	501	(2.4)	509	(2.6)	10	(6.9)	9	(4.4)
<i>Thailand</i>	417	(2.6)	421	(2.6)	441	(3.1)	24	(6.9)	20	(4.8)
Turkey	447	(4.2)	464	(3.5)	475	(4.2)	28	(8.2)	11	(6.1)
<i>United Arab Emirates</i>	m	m	423	(3.7)	432	(3.3)	m	m	9	(5.6)
United Kingdom*	495	(2.3)	494	(2.3)	499	(3.5)	4	(7.0)	5	(4.9)
United States	c	c	500	(3.7)	498	(3.7)	c	c	-2	(5.8)
Wales	481	(3.7)	476	(3.4)	480	(2.7)	-1	(4.6)	4	(4.3)

13 countries with scores below 430 omitted

Notes: Values that are statistically significant are indicated in bold.

m indicates a missing value

c indicates there are too few observations or no observation to provide reliable estimates

For Costa Rica and Malaysia the change between PISA 2009 and PISA 2012 represents change between 2010 and 2012 because these countries implemented the PISA 2009 assessment in 2010 as part of PISA 2009+.

In the United Arab Emirates, Dubai took the PISA 2009 assessment in 2009 and the rest of the United Arab Emirates in 2010 as part of PISA+. Results are thus reported separately.

OECD countries (not italicised) Countries not in OECD (italicised)

*EU countries

Appendix E

PISA index of economic, social and cultural status and performance in mathematics, by national quarters of the index

	PISA index of economic, social and cultural status (ESCS)										Performance on the mathematics scale, by national quarters of this index								Score point difference in mathematics associated with one unit increase in the ESCS	Increased likelihood of students in the bottom quarter of the ESCS index scoring in the bottom quarter of the mathematics performance distribution		Strength of the relationship between mathematics performance and the ESCS		
	All students		Bottom quarter		Second quarter		Third quarter		Top quarter		Bottom quarter		Second quarter		Third quarter		Top quarter			Ratio	%			
	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.				S.E.		
Iceland	0.78	(0.01)	-0.34	(0.02)	0.57	(0.02)	1.19	(0.02)	1.71	(0.01)	464	(2.9)	481	(3.2)	508	(3.4)	526	(3.7)	31	(2.1)	1.75	(0.11)	7.7	(1.0)
Norway	0.46	(0.02)	-0.56	(0.02)	0.27	(0.02)	0.79	(0.02)	1.35	(0.02)	459	(4.1)	479	(3.7)	504	(3.9)	522	(3.7)	32	(2.4)	1.83	(0.12)	7.4	(1.0)
Denmark*	0.43	(0.02)	-0.70	(0.03)	0.16	(0.04)	0.81	(0.03)	1.44	(0.02)	460	(3.4)	489	(3.4)	513	(2.9)	545	(3.4)	39	(1.7)	2.36	(0.16)	16.5	(1.4)
Canada	0.41	(0.02)	-0.75	(0.02)	0.16	(0.02)	0.79	(0.02)	1.44	(0.01)	486	(2.3)	509	(2.5)	529	(2.5)	558	(2.9)	31	(1.2)	1.84	(0.08)	9.4	(0.7)
Finland*	0.36	(0.02)	-0.68	(0.02)	0.13	(0.02)	0.73	(0.02)	1.28	(0.01)	488	(3.1)	509	(2.5)	529	(3.2)	555	(2.6)	33	(1.8)	1.89	(0.10)	9.4	(0.9)
United Arab Emirates	0.32	(0.02)	-0.82	(0.03)	0.19	(0.02)	0.67	(0.01)	1.26	(0.01)	391	(3.2)	427	(2.4)	454	(3.6)	466	(4.2)	33	(1.9)	2.09	(0.10)	9.8	(1.0)
Liechtenstein	0.30	(0.05)	-0.89	(0.08)	0.01	(0.06)	0.66	(0.07)	1.42	(0.06)	490	(9.4)	552	(11.4)	543	(12.0)	563	(11.5)	28	(5.8)	2.44	(0.46)	7.6	(3.1)
Northern Ireland	0.29	(0.02)	-0.76	(0.02)	-0.08	(0.03)	0.61	(0.04)	1.38	(0.02)	444	(4.6)	471	(5.4)	502	(4.6)	541	(5.4)	45	(3.0)	2.17	(0.17)	16.7	(1.9)
England	0.29	(0.02)	-0.76	(0.03)	0.02	(0.04)	0.62	(0.03)	1.27	(0.02)	460	(5.0)	478	(5.4)	511	(4.6)	546	(4.5)	41	(2.8)	1.88	(0.14)	12.4	(1.4)
Sweden*	0.28	(0.02)	-0.82	(0.02)	0.02	(0.02)	0.65	(0.02)	1.25	(0.01)	442	(2.9)	470	(3.9)	495	(3.4)	518	(3.9)	36	(1.9)	1.94	(0.11)	10.6	(1.1)
United Kingdom*	0.27	(0.02)	-0.78	(0.02)	0.00	(0.03)	0.61	(0.02)	1.26	(0.02)	458	(4.2)	477	(4.1)	508	(4.2)	545	(3.9)	41	(2.4)	1.86	(0.11)	12.5	(1.2)
Australia	0.25	(0.01)	-0.84	(0.02)	0.05	(0.02)	0.61	(0.01)	1.18	(0.01)	462	(2.2)	492	(2.0)	521	(2.9)	550	(2.6)	42	(1.3)	2.12	(0.09)	12.3	(0.8)
Netherlands*	0.23	(0.02)	-0.82	(0.03)	0.02	(0.03)	0.58	(0.02)	1.15	(0.02)	484	(5.2)	513	(3.9)	537	(4.8)	565	(5.1)	40	(3.1)	1.99	(0.14)	11.5	(1.7)
Germany*	0.19	(0.02)	-0.99	(0.03)	-0.16	(0.03)	0.52	(0.04)	1.42	(0.02)	467	(5.1)	502	(3.9)	540	(3.8)	569	(4.3)	43	(2.0)	2.40	(0.16)	16.9	(1.4)
Wales	0.19	(0.02)	-0.82	(0.02)	-0.12	(0.03)	0.50	(0.02)	1.19	(0.02)	436	(3.5)	461	(3.0)	473	(3.7)	512	(3.4)	35	(2.2)	1.80	(0.13)	10.4	(1.3)
United States	0.17	(0.04)	-1.14	(0.05)	-0.11	(0.04)	0.60	(0.04)	1.35	(0.04)	442	(3.9)	462	(4.5)	494	(5.4)	532	(4.7)	35	(1.7)	2.05	(0.16)	14.8	(1.3)
Switzerland	0.17	(0.02)	-1.00	(0.02)	-0.12	(0.03)	0.52	(0.03)	1.29	(0.02)	488	(4.0)	519	(4.0)	543	(3.9)	575	(4.6)	38	(1.8)	2.07	(0.12)	12.8	(1.2)
Israel	0.17	(0.03)	-0.98	(0.04)	-0.03	(0.04)	0.58	(0.03)	1.12	(0.02)	409	(5.3)	452	(5.5)	491	(6.3)	524	(5.6)	51	(2.6)	2.49	(0.18)	17.2	(1.5)
Belgium*	0.15	(0.02)	-1.05	(0.03)	-0.19	(0.03)	0.55	(0.02)	1.27	(0.02)	469	(4.0)	497	(3.2)	534	(2.9)	567	(2.9)	43	(1.9)	2.21	(0.12)	15.0	(1.3)
Scotland	0.13	(0.02)	-0.96	(0.02)	-0.18	(0.03)	0.49	(0.03)	1.18	(0.02)	463	(4.0)	487	(4.2)	504	(3.5)	546	(4.6)	37	(2.4)	1.95	(0.14)	12.9	(1.4)
Republic of Ireland*	0.13	(0.02)	-0.97	(0.02)	-0.19	(0.03)	0.48	(0.03)	1.20	(0.02)	462	(4.4)	489	(3.2)	512	(2.9)	545	(3.3)	38	(1.8)	2.11	(0.12)	14.6	(1.2)
Estonia*	0.11	(0.01)	-0.92	(0.02)	-0.23	(0.02)	0.44	(0.02)	1.16	(0.01)	496	(3.0)	508	(3.2)	523	(3.6)	558	(2.9)	29	(1.7)	1.62	(0.11)	8.6	(0.9)
Cyprus	0.09	(0.01)	-1.06	(0.02)	-0.28	(0.01)	0.43	(0.02)	1.25	(0.02)	398	(2.5)	428	(2.6)	448	(2.8)	492	(2.8)	38	(1.6)	2.01	(0.14)	14.1	(1.1)
Austria*	0.08	(0.02)	-0.97	(0.03)	-0.25	(0.02)	0.33	(0.03)	1.19	(0.03)	458	(4.2)	495	(4.2)	519	(3.8)	552	(4.2)	43	(2.2)	2.34	(0.16)	15.8	(1.5)
Luxembourg*	0.07	(0.01)	-1.42	(0.02)	-0.26	(0.02)	0.57	(0.02)	1.41	(0.01)	438	(2.9)	470	(2.7)	508	(2.6)	546	(2.7)	37	(1.2)	2.38	(0.14)	18.3	(1.1)
Slovenia*	0.07	(0.01)	-1.03	(0.01)	-0.31	(0.02)	0.39	(0.02)	1.22	(0.02)	458	(2.6)	486	(3.1)	511	(3.1)	552	(3.2)	42	(1.5)	2.04	(0.12)	15.6	(1.0)
New Zealand	0.04	(0.02)	-1.05	(0.02)	-0.22	(0.03)	0.39	(0.02)	1.04	(0.02)	445	(3.2)	493	(4.0)	514	(4.0)	559	(3.6)	52	(1.9)	2.61	(0.19)	18.4	(1.3)
Korea	0.01	(0.03)	-0.97	(0.03)	-0.23	(0.03)	0.33	(0.03)	0.92	(0.02)	516	(4.9)	538	(4.8)	567	(6.3)	595	(6.6)	42	(3.3)	1.77	(0.11)	10.1	(1.4)
OECD average	0.00	(0.00)	-1.15	(0.00)	-0.32	(0.00)	0.34	(0.01)	1.15	(0.00)	452	(0.7)	482	(0.6)	506	(0.7)	542	(0.8)	39	(0.4)	2.15	(0.02)	14.6	(0.2)
France*	-0.04	(0.02)	-1.10	(0.02)	-0.30	(0.02)	0.29	(0.02)	0.95	(0.01)	442	(3.5)	476	(3.1)	511	(4.2)	561	(4.0)	57	(2.2)	2.57	(0.16)	22.5	(1.3)
Italy*	-0.05	(0.01)	-1.29	(0.01)	-0.41	(0.02)	0.25	(0.02)	1.24	(0.02)	447	(2.4)	475	(2.6)	498	(2.6)	522	(2.8)	30	(1.2)	1.92	(0.08)	10.1	(0.6)
Greece*	-0.06	(0.03)	-1.34	(0.03)	-0.46	(0.03)	0.32	(0.04)	1.22	(0.02)	413	(3.8)	439	(3.9)	459	(3.5)	502	(3.7)	34	(1.8)	2.06	(0.17)	15.5	(1.5)
Czech Republic*	-0.07	(0.02)	-0.98	(0.02)	-0.37	(0.02)	0.16	(0.02)	0.93	(0.02)	450	(4.4)	486	(4.5)	508	(4.3)	552	(4.0)	51	(2.7)	2.27	(0.18)	16.2	(1.5)
Japan	-0.07	(0.02)	-0.99	(0.02)	-0.35	(0.02)	0.20	(0.02)	0.85	(0.02)	500	(5.2)	528	(4.1)	551	(4.3)	575	(5.9)	41	(3.9)	1.96	(0.13)	9.8	(1.6)
Russian Federation	-0.11	(0.02)	-1.10	(0.03)	-0.37	(0.03)	0.22	(0.03)	0.82	(0.02)	445	(4.8)	468	(4.3)	496	(3.6)	521	(5.1)	38	(3.2)	1.96	(0.16)	11.4	(1.7)
Lithuania*	-0.13	(0.02)	-1.34	(0.02)	-0.48	(0.03)	0.30	(0.03)	1.00	(0.02)	439	(3.7)	465	(3.6)	492	(4.2)	522	(3.5)	36	(1.8)	2.16	(0.12)	13.8	(1.2)
Slovak Republic*	-0.18	(0.03)	-1.25	(0.04)	-0.57	(0.02)	0.02	(0.04)	1.06	(0.03)	416	(6.6)	473	(3.8)	496	(4.4)	545	(6.2)	54	(2.9)	2.99	(0.22)	24.6	(2.1)
Spain*	-0.19	(0.03)	-1.50	(0.02)	-0.60	(0.03)	0.17	(0.03)	1.16	(0.03)	442	(2.8)	471	(2.4)	495	(2.8)	533	(2.5)	34	(1.1)	2.20	(0.11)	15.8	(1.0)

	PISA index of economic, social and cultural status (ESCS)										Performance on the mathematics scale, by national quarters of this index								Score point difference in mathematics associated with one unit increase in the ESCS		Increased likelihood of students in the bottom quarter of the ESCS index scoring in the bottom quarter of the mathematics performance distribution		Strength of the relationship between mathematics performance and the ESCS	
	All students		Bottom quarter		Second quarter		Third quarter		Top quarter		Bottom quarter		Second quarter		Third quarter		Top quarter							
	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Effect	S.E.	Ratio	S.E.	%	S.E.
Poland*	-0.21	(0.03)	-1.22	(0.02)	-0.69	(0.02)	-0.01	(0.05)	1.08	(0.03)	473	(3.6)	501	(4.0)	526	(5.2)	571	(6.3)	41	(2.4)	2.19	(0.17)	16.6	(1.7)
Hungary*	-0.25	(0.03)	-1.46	(0.04)	-0.65	(0.03)	0.09	(0.04)	1.01	(0.03)	422	(4.8)	464	(3.7)	487	(4.6)	539	(6.6)	47	(2.8)	2.74	(0.22)	23.1	(2.3)
Latvia*	-0.26	(0.03)	-1.39	(0.03)	-0.64	(0.04)	0.11	(0.04)	0.90	(0.02)	453	(4.4)	472	(3.4)	508	(4.7)	532	(4.7)	35	(2.1)	2.07	(0.18)	14.7	(1.7)
Singapore	-0.26	(0.01)	-1.46	(0.02)	-0.54	(0.02)	0.09	(0.02)	0.88	(0.02)	523	(2.9)	557	(3.1)	589	(3.1)	627	(2.8)	44	(1.4)	2.17	(0.12)	14.4	(0.9)
Bulgaria*	-0.28	(0.04)	-1.59	(0.06)	-0.67	(0.03)	0.10	(0.04)	1.06	(0.03)	384	(5.1)	424	(4.1)	449	(6.1)	501	(5.9)	42	(2.7)	2.52	(0.18)	22.3	(2.3)
Serbia	-0.30	(0.02)	-1.37	(0.02)	-0.70	(0.03)	-0.05	(0.03)	0.95	(0.03)	416	(4.4)	436	(3.7)	450	(4.7)	495	(5.0)	34	(2.4)	1.73	(0.12)	11.7	(1.4)
Kazakhstan	-0.32	(0.02)	-1.31	(0.02)	-0.57	(0.03)	0.02	(0.03)	0.60	(0.02)	405	(4.0)	427	(3.5)	437	(3.7)	458	(5.2)	27	(2.8)	1.81	(0.16)	8.0	(1.7)
Croatia*	-0.34	(0.02)	-1.35	(0.02)	-0.70	(0.02)	-0.14	(0.03)	0.84	(0.02)	438	(3.6)	459	(3.8)	472	(4.8)	517	(5.9)	36	(2.6)	1.78	(0.13)	12.0	(1.4)
Shanghai-China	-0.36	(0.04)	-1.63	(0.05)	-0.70	(0.04)	0.06	(0.04)	0.83	(0.03)	562	(6.3)	602	(4.7)	628	(3.8)	660	(5.3)	41	(2.7)	2.21	(0.15)	15.1	(1.9)
Chinese Taipei	-0.40	(0.02)	-1.47	(0.03)	-0.70	(0.03)	-0.11	(0.03)	0.68	(0.03)	497	(5.1)	546	(4.5)	572	(4.1)	626	(5.3)	58	(2.5)	2.46	(0.14)	17.9	(1.4)
Romania*	-0.47	(0.04)	-1.58	(0.05)	-0.80	(0.03)	-0.26	(0.04)	0.76	(0.05)	407	(4.5)	428	(3.8)	444	(4.0)	501	(7.7)	38	(2.9)	2.09	(0.15)	19.3	(2.4)
Portugal*	-0.48	(0.05)	-1.85	(0.03)	-1.06	(0.04)	-0.23	(0.07)	1.21	(0.07)	441	(4.5)	474	(4.9)	495	(4.8)	548	(5.2)	35	(1.6)	2.31	(0.14)	19.6	(1.8)
Chile	-0.58	(0.04)	-1.97	(0.05)	-1.02	(0.04)	-0.27	(0.05)	0.95	(0.03)	378	(4.0)	409	(3.9)	429	(3.6)	477	(5.4)	34	(1.6)	2.37	(0.16)	23.1	(1.9)
Hong Kong-China	-0.79	(0.05)	-2.00	(0.03)	-1.20	(0.05)	-0.46	(0.07)	0.50	(0.06)	532	(4.8)	554	(3.8)	567	(4.5)	600	(5.8)	17	(2.6)	1.70	(0.12)	7.5	(1.5)
Macao-China	-0.89	(0.01)	-1.91	(0.01)	-1.23	(0.01)	-0.68	(0.01)	0.28	(0.02)	521	(2.6)	535	(2.5)	543	(2.3)	558	(2.5)	17	(1.5)	1.36	(0.07)	2.6	(0.4)
Mexico	-1.11	(0.02)	-2.66	(0.02)	-1.65	(0.03)	-0.74	(0.03)	0.61	(0.03)	385	(1.9)	407	(1.9)	417	(1.9)	447	(2.4)	19	(0.8)	1.85	(0.07)	10.4	(0.8)
Turkey	-1.46	(0.04)	-2.74	(0.03)	-1.96	(0.03)	-1.21	(0.05)	0.07	(0.06)	412	(4.5)	436	(4.2)	447	(6.0)	498	(8.3)	32	(2.4)	1.84	(0.11)	14.5	(1.8)
Vietnam	-1.81	(0.05)	-3.08	(0.03)	-2.27	(0.03)	-1.63	(0.05)	-0.26	(0.09)	473	(6.1)	499	(5.0)	519	(5.7)	555	(8.2)	29	(2.6)	2.00	(0.16)	14.6	(2.3)

14 countries with mathematics mean scores below 430 omitted

Note: Values that are statistically significant are indicated in bold
OECD countries (not italicised)

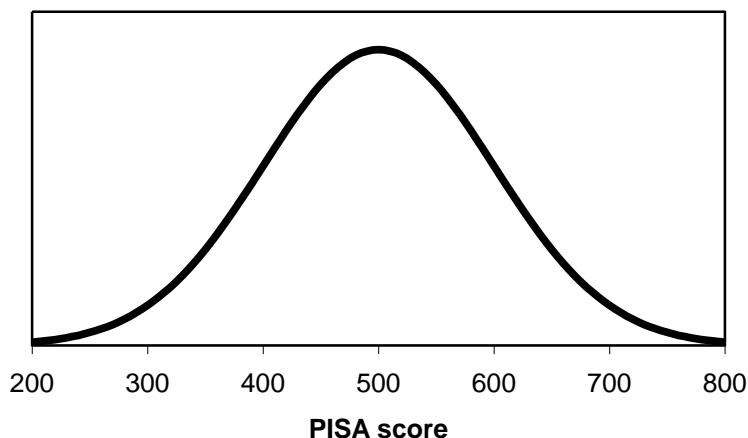
Countries not in OECD (italicised)

*EU countries

Appendix F

Notes on PISA International Scale Scores

PISA defines an international scale for each subject in such a way that, for each subject when it is first run as a major focus⁵, the 'OECD population' has a Normal distribution with a mean of 500 and standard deviation of 100. This is illustrated in the 'bell-shaped' curve below.



How the OECD population is defined is rather complex:

1. The sample of pupils within each OECD country is selected;
2. Their results are weighted in such a way that each country in the study (i.e. UK as a whole, not Northern Ireland) has an equal weight;
3. Pupils' scores are adjusted to have the above distribution within this hypothetical population.

Thus the important unit is the country, not the student – Russia and Hong Kong have the same weights in the scale, despite differences in size.

PISA scores are thus defined on a scale which does not relate directly to any other test measure. In particular, there is no easy or valid way to relate them to 'months of progress' or any measure of individual development.

⁵ This means that the mean of 500 for OECD countries relates to the year 2000 for Reading, 2003 for Mathematics and 2006 for Science.

NFER provides evidence for excellence through its independence and insights, the breadth of its work, its connections, and a focus on outcomes.

- independent
- insights
- breadth
- connections
- outcomes

© 2013 National Foundation for Educational Research

**National Foundation for
Educational Research**
The Mere, Upton Park
Slough, Berks SL1 2DQ

T: 01753 574123
F: 01753 691632
E: enquiries@nfer.ac.uk
www.nfer.ac.uk

NFER ref. PQUK

ISBN: 978-1-98666-97-0