GOVERNMENT OF DUBAI

هيئـــة المعـرفـــة و التنـميـــة البشريـــة
KNOWLEDGE & HUMAN DEVELOPMENT AUTHORITY

PISA 2012

The Westminster School

PISA 2012 School Report

www.khda.gov.ae

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Introduction

The Knowledge and Human Development Authority (KHDA) follows an integrated approach of monitoring schools performance that uses an internal benchmarking based on best practices through school inspections, and external benchmarking through international assessments. This approach provides school leaders with extensive data that enable them to identify areas of strengths and improvement affecting their school development and their students' performance.

In 2012, a number of your students were among 4974 students from Dubai, who participated in the Programme for International Student Assessment (PISA) along with 510,000 other students from 65 economies. Together, they were representing about 28 million 15-year-olds globally. PISA 2012 is the second participation for Dubai, which first participated in this international assessments in 2009. This report provides your school's individual results in PISA 2012.

What is PISA?

PISA is large-scale assessment carried out every three years by the Organisation of Economic Cooperation and Development (OECD). It aims to evaluate the quality of student achievement internationally by testing the skills and knowledge of 15-year-old students in three main areas: Reading, Mathematics and Science. PISA develops tests which are not directly linked to the school curriculum. The tests are designed to assess to what extent students at this important phase can apply their knowledge to real-life situations and be equipped for full participation in society. In addition, to testing students' skills, participating students and their principals answer questionnaires to provide information about the students' backgrounds, school and learning experiences and about the broader school system and learning environment.

In each cycle of PISA, one domain is the major focus, with a large amount of the assessment time being devoted to this domain compared to the other two domains. In 2009, Reading was the main domain, while in 2012 Mathematics was the main domain. PISA 2012 allowed an in-depth analysis of mathematical literacy and the reporting of results by content and processes subscales.

In PISA, students take a test that lasts 2 hours. The tests are a mixture of open-ended and multiple-choice questions that are organised in groups based on a passage setting out a real-life situation. Students take different combinations of different tests.

Purpose of this report

The purpose of this report is to provide you with a detailed analysis on the performance of your students in PISA 2012. This report is an important tool for school leaders and subject coordinators to use in reviewing curriculum, instruction and self-evaluation plans. The different information included and discussed in this report will help school leaders to identify shortcomings in the academic performance of their students against international benchmarks. Hence, this report is an important tool not only to assist school leaders in planning, but in identifying priorities and addressing gaps in student academic performance. Through school inspections, KHDA will be monitoring how well school leaders use international assessment reports in their self-evaluation plans, and in improving their provision to raise students' attainment.

Overview of this report

The UAE National Agenda, to raise the standards of education and the achievements, in PISA and TIMSS, of students in Dubai, is at the heart of this report. It describes the performance of your 15 year old students in PISA 2012 and compares this with the performance of your 15 year olds in 2009. On the basis of these outcomes, each school has been given targets for PISA 2015 and 2018 so that the UAE can work towards its aspirations for 2021.

The report provides extensive information on the performance of your students in every domain. It describes differences between the performances of girls and boys and, where applicable, between Emirati students and expatriate students. The results of students in your school are compared with other schools teaching the same curriculum in Dubai, with all schools in Dubai and with the performance of students in schools in the home country of the curriculum, where this is appropriate.

The report contains an analysis of the school data against the PISA proficiency levels. It tells you what your 15 year old students could do in 2012 and what they should be able to do in 2015. There are examples of PISA questions and some background information from the PISA student survey.

Section 1: National Agenda

At the beginning of 2014, H.H. Sheikh Mohammed Bin Rashid launched the UAE National Agenda, which includes a set of educational targets that pave the way towards the next phase of educational development in the UAE. The educational targets cover a wide range of areas affecting the quality of education and student achievement across the different phases. Two of the major targets are concerned with the UAE ranking in PISA and TIMSS (Trends in International Mathematics and Science Study):

The UAE will be among the **20 highest** performing countries in **PISA** in **2021**
The UAE will be among the **15 highest** performing countries in **TIMSS** in **2021**

The PISA and TIMSS National Agenda targets indicate the high aspirations of the UAE to become a leading country in education. Although schools in Dubai have improved in the past 6 years, it is time for school leaders to take this improvement to a higher level. School leaders must aspire to make their schools high performing educational institutions in Dubai, and also outstanding learning entities whose students are achieving similar to students in the best educational systems in the world. Only when school leaders embrace this vision, will Dubai and the UAE be making further improvements in PISA and TIMSS, and will eventually celebrate in 2021 by being among the highest performing countries in those two important international assessments.

Your school National Agenda individual targets

In order to work towards achieving PISA targets in the UAE National Agenda, KHDA has set individual targets for all private schools in Dubai. Using PISA 2012 results, every school has a target for moving to the next achievement level in PISA. Three targets for all the domains in PISA are described in the table below according to the different achievement levels in PISA. Although, the individual targets are high, the detailed information presented in this report should provide school leaders with a full understanding of their students' performances in PISA. Therefore, it is important that school leaders use all the data presented in the different sections of this report to plan for meeting these targets.

Your school individual National Agenda targets for PISA			
Year / Target	Mathematics	Reading	Science
Current 2012 scores	509	518	525
Year 2015 target	529	543	550
Year 2018 target	549	563	575

KHDA will be monitoring schools' performance against their National Agenda targets through school inspections. The 2018 targets will be reviewed when PISA 2015 results are announced. This means that the PISA 2018 targets might be revised for some schools to make sure that the targets of this cycle are achievable and representative of the school performance.

From the start of the 2014 school inspection cycle, inspectors will be looking closely at each school's actions to improve on the 2012 PISA scores. Inspectors will evaluate the extent to which schools have modified their curricula to address shortfalls, and how teaching methods have been adapted to engage students in aspects of their learning that are in need of improvement. Inspectors will evaluate the validity of each school's assessment methods so that progress towards targets can be accurately and reliably measured. Inspectors will also look specifically at the progress students are making towards targets in mathematics, reading and science. They will also identify any differences in the progress of girls and boys and between Emirati and expatriate students.

Section 2: Achievement in PISA 2012

This section is the main section of your individual reports. It provides details about your students' performance in the main and the sub domains, their achievements according to PISA proficiency levels and in the mathematical subscales. It also examines performance by gender and compares the performance of your Emirati students (if applicable) with their peers.

Your school's sample in PISA 2012

In order to understand the achievement of your students, it is important to understand the student sample in your school. PISA is a sample survey and, as such, a random sample of students was selected to represent the population of 15-year-old students in Dubai. Therefore the sample selected in your school represented a significant proportion of students in the school though not the entire cohort at age 15.

Number of students assessed in PISA 2012 in your school	65

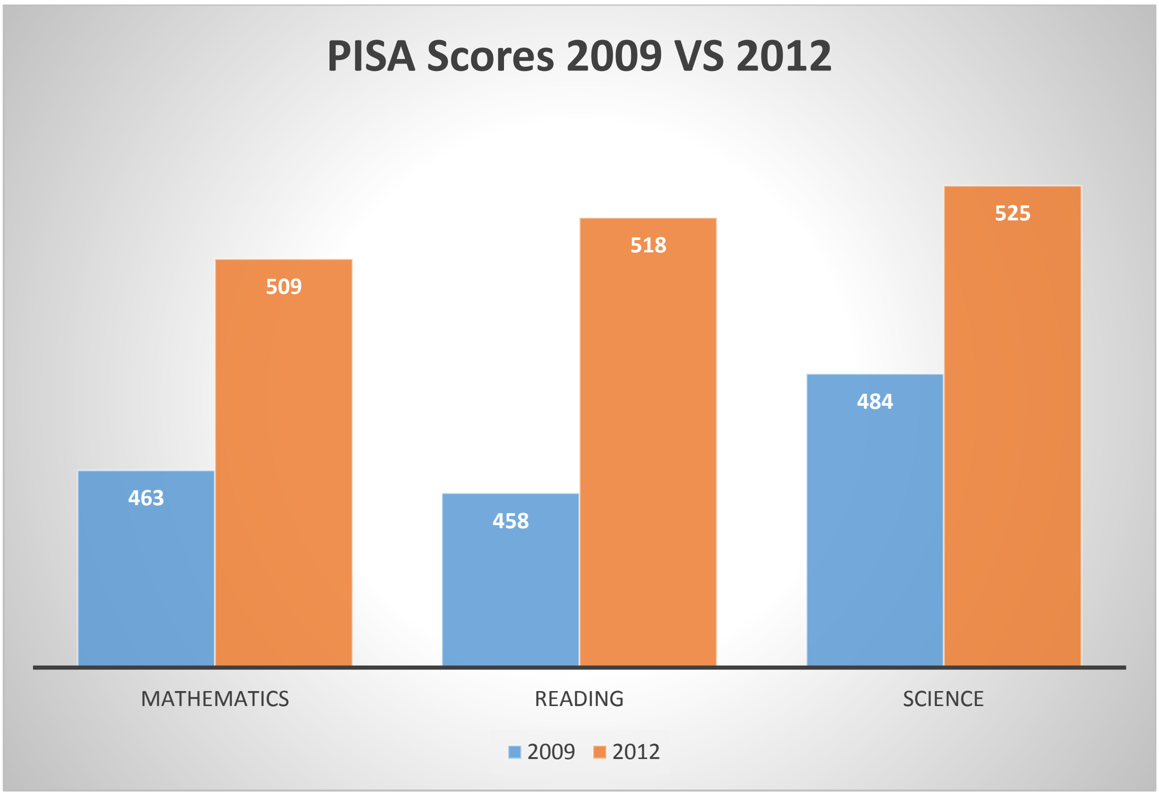
What was the overall achievement of your students in PISA 2012?

The table below presents the overall achievement of your students. It compares their achievements with the overall average of other schools offering the same curricula. It also gives the Dubai average and the average of your curriculum home country if applicable (e.g. US curriculum vs. United States of America average in PISA).

Average scores – PISA 2012				
Average score	Mathematics	Reading	Science	OECD Average
Your school	509	518	525	500 points
	Higher than OECD Scaled Average	Higher than OECD Scaled Average	Significantly Higher than OECD Scaled Average	
Schools teaching a UK curriculum in Dubai	510	510	526	
Dubai	464	468	474	
Singapore	573	542	551	

How well did your students do in PISA 2012 compared to PISA 2009?

The chart below compares your students' scores in PISA 2012 with their scores in PISA 2009 in mathematics, science and reading.



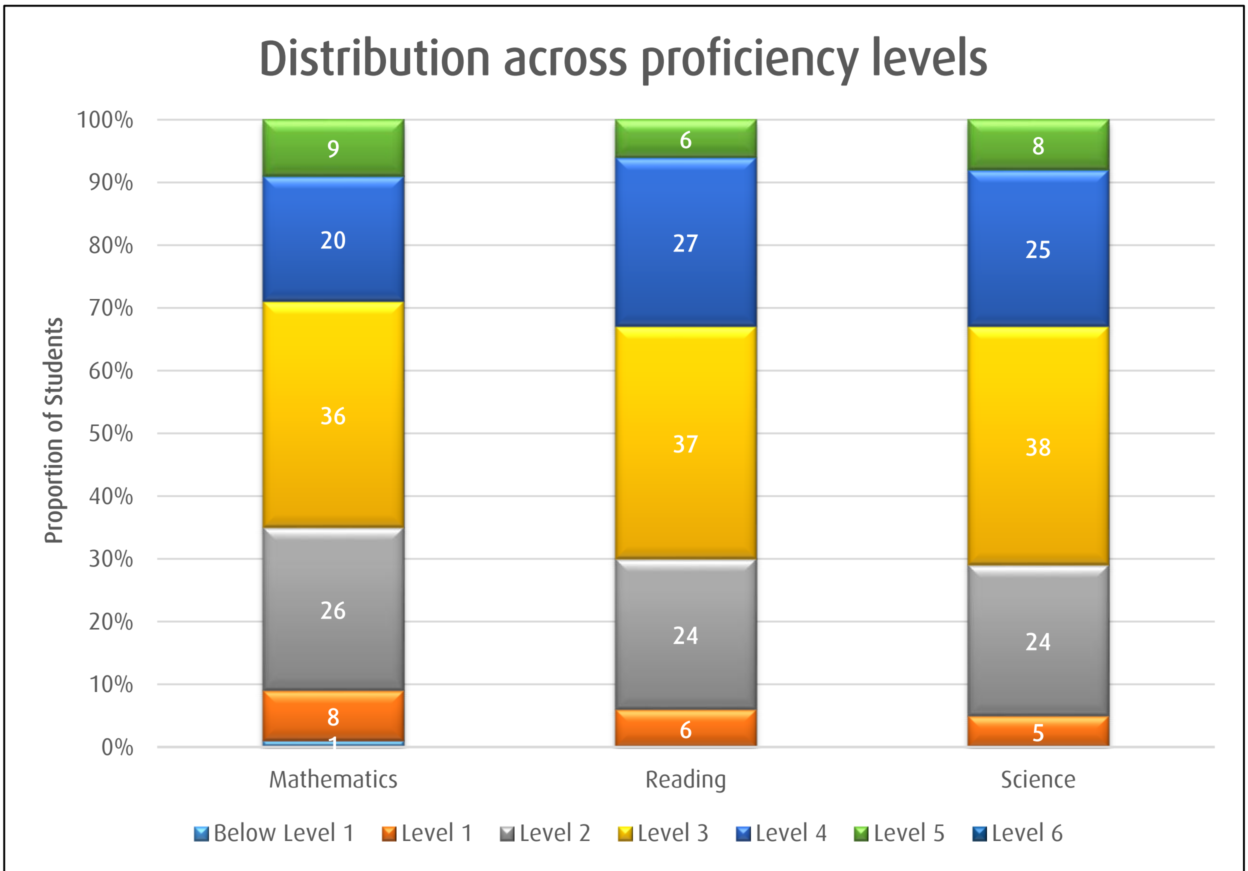
The 15-year-old students in your school scored higher in PISA 2012 than the 15-year-old students did in PISA 2009. The scores moved from Level 2 to Level 3. In PISA 2012, the average scores were 36 points from reaching Level 4 in mathematics, 35 points from reaching Level 4 in reading and 34 points short of reaching Level 4 in science.

How well did your students achieve against PISA proficiency levels?

In addition to measuring average achievement, data from PISA are also described in terms of proficiency levels that outline the knowledge and skills that are expected of students by age 15. There are six proficiency levels (Level 1 to Level 6) for mathematics and science in PISA 2012. The reading domain has seven proficiency levels with the additional level used to describe students who would have previously been rated as "below Level 1". The descriptions of the levels of each domain are included in the Appendix I.

The main purpose of the proficiency levels is to understand the distribution of your students in every domain; in other words how many high achievers, intermediate and low achievers you have in your school. The chart below shows the distribution of your students across each of the OECD proficiency levels. Students whose scores fell in Levels 5 and 6 were considered to be top performers in contrast to those whose scores fell in Level 1 and below, who were considered to be 'at risk' students.

Before you read this chart: Make sure that you have the descriptions of the PISA Proficiency Levels in Appendix I with you in order to understand and this chart.

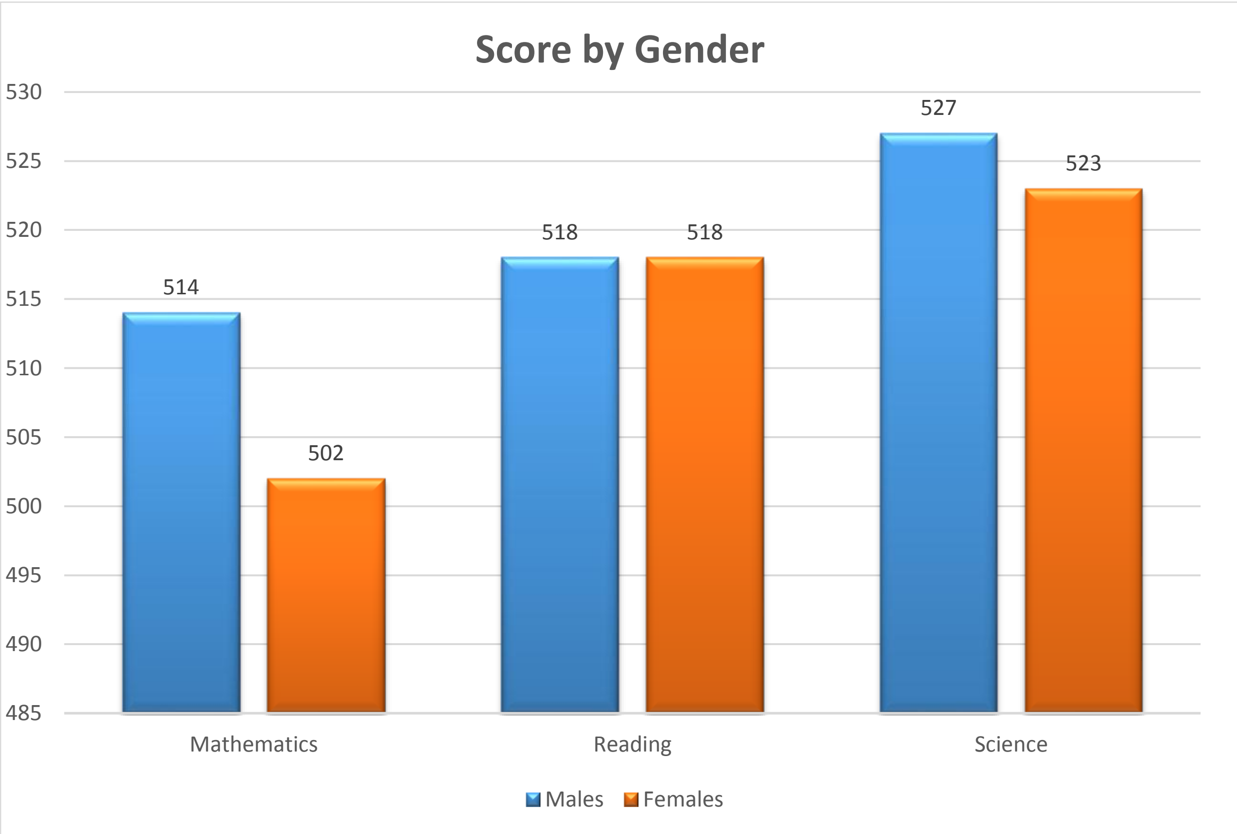


The chart above demonstrates the following:
In mathematics, reading and science, 9%, 6% and 8% respectively of your students were top performers.
In mathematics, reading and science, 65%, 70% and 71% respectively of your students achieved Level 3 and above.
In mathematics, reading and science, 9%, 6% and 5% respectively of your students were classified 'at risk' and therefore the lowest performers.

How did achievement at your school vary by gender?

This bar chart shows the difference between the overall achievement scores of female and male students at your school.

Gender	Number of students
Female students	30
Male students	35



Results from your school showed a slight gender gap in mathematics and science performance in favour of boys. There was a difference of 12 points in mathematics which narrowed to 4 points in science. The reading results were identical.

How well did your students achieve in content and processes subscales?

As described in the introduction; in every cycle of PISA one of the three domains (mathematics, reading and science) becomes the main domain. In addition to the overall achievement results, as outlined in the first part of this section, PISA framework provides more analysis in the main domain. In PISA 2012, mathematics is the main domain. Hence, PISA 2012 framework defines mathematics as mathematical literacy that combines content knowledge with an understanding of processes required in different areas within mathematics. The PISA 2012 framework emphasises the wide recognition of the need to identify such a set of general mathematical capabilities, to complement the role of specific content knowledge in mathematics learning. In this framework, mathematics proficiency means the capacity of individuals to formulate, employ and interpret mathematics in a variety of contexts. Individuals are not considered either to possess or lack mathematical literacy. Instead, mathematical literacy is considered to be a continuum along which individuals develop the capacity to reason mathematically and use mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. Therefore, in addition to evaluating content knowledge and mathematical processes, PISA collects information on interest in mathematics and its application in numerous contexts. This section provides you with information on the performance of your students in the mathematics content and processes subscales.

Mathematics content subscales

The PISA mathematical literacy assessment framework describes how mathematical content knowledge is organised into four content categories. These broad categories are based on the mathematical phenomena that involve different kinds of mathematical thinking and relate to mathematics curricula in schools. The four content categories are:

Change and relationships: emphasis is on relationships among objects and the mathematical processes associated with changes in those relationships. An item that involves thinking about the relationships among the variables speed, distance and time in relation to travel would be an example of an item classified in this category.

Space and shape: emphasis is on spatial reasoning among objects, and measurement and other geometric aspects of the spatial world. An example of this item category is spatial reasoning and working with measurements and area calculations with a model of a real-world object.

Quantity: emphasis is on comparisons and calculations based on quantitative relationships and numeric properties of objects and phenomena. An example of an item classified in this category involves reasoning about quantities of given properties of different objects (selecting values that meet a number of numerical conditions, statements set within a financial context, choosing the smallest decimal number in a set of numbers in context) and calculations with given quantities.

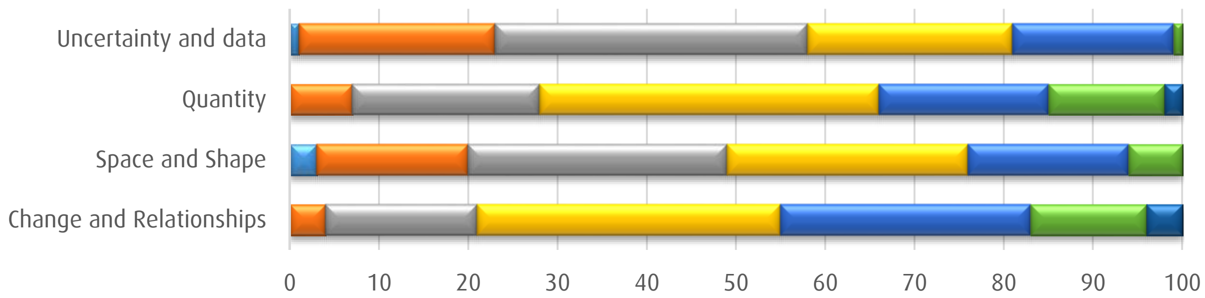
Uncertainty and data: emphasis is on interpreting and working with data and with different data presentation forms, and problems involving probabilistic reasoning. A question that involves interpreting a bar chart is an example of an item that would be classified in this category.

Mathematics content subscales in your school

The table below describes the performance of your students in every content subscale. If your school's score in any of the content areas appears in red, it means it is below the OECD scaled average of that particular content area. The opposite is true if the number appears in green:

	Content subscales			
Average scores	Change and Relationships	Space and Shape	Quantity	Uncertainty and Data
Your students	536	489	522	475
Singapore	580	580	569	559
OECD	500			

Distribution of proficiency levels by content subscale



	Change and Relationships	Space and Shape	Quantity	Uncertainty and data
Below level 1		3		1
Level 1	4	17	7	22
Level 2	17	29	21	35
Level 3	34	27	38	23
Level 4	28	18	19	18
Level 5	13	6	13	1
Level 6	4		2	

Proportion of Students

Based on their results in the chart and the table above, the following tables describe what your students can do in every content subscale, and they should do in PISA 2015:

Change and Relationships
What your students can do: Your students were able to: ✓ solve problems that involved working with information from two related representations (text, graph, table, formulae), requiring some interpretation. ✓ use reasoning in familiar contexts. ✓ show some ability to communicate their arguments. ✓ make a straightforward modification to a given functional model to fit a new situation. ✓ use a range of calculation procedures to solve problems, including ordering data, time difference calculations, substitution of values into a formula, or linear interpolation.
What they should be able to do in PISA 2015: Your students should be able to: ➢ understand and work with multiple representations, including algebraic models of real-world situations. ➢ reason about simple functional relationships between variables, going beyond individual data points to identifying simple underlying patterns. ➢ use some flexibility in interpretation and reasoning about functional relationships (for example, in exploring distance-time-speed relationships). ➢ modify a functional model or graph to fit a specified change to the situation. ➢ communicate the resulting explanations and arguments.

Space and Shape
What your students can do: Your students were able to: ✓ solve problems that involved elementary visual and spatial reasoning in familiar contexts, such as calculating a distance or a direction from a map or a GPS device. ✓ link different representations of familiar objects or appreciate properties of objects under some simple specified transformation. ✓ devise simple strategies and apply basic properties of triangles and circles. ✓ use appropriate supporting calculation techniques, such as scale conversions needed to analyse distances on a map.
What they should be able to do in PISA 2015: Your students should be able to: ➢ solve problems by using basic mathematical knowledge, such as angle and side-length relationships in triangles in a way that involves multistep, visual and spatial reasoning, and argumentation in unfamiliar contexts. ➢ link and integrate different representations, for example to analyse the structure of a three-dimensional object based on two different perspectives of it. ➢ compare objects using geometric properties.

Quantity
What your students can do: Your students were able to: ✓ use basic problem-solving processes, including devising a simple strategy to test scenarios, understand and work within given constraints, use trial and error and use simple reasoning in familiar contexts. ✓ interpret a text description of a sequential calculation process and implement the process correctly. ✓ identify and extract data presented directly in textual explanations of unfamiliar data. ✓ interpret text and diagrams describing a simple pattern. ✓ perform calculations, including working with large numbers, calculations with speed and time and conversion of units (for example from an annual rate to a daily rate). ✓ understand place value involving mixed 2- and 3-decimal values, including working with prices. ✓ order a small series of (4) decimal values. ✓ calculate percentages of up to 3-digit numbers. ✓ apply calculation rules given in natural language.
What they should be able to do in PISA 2015: Your students should be able to: ➢ interpret complex instructions and situations. ➢ relate text-based numerical information to a graphic representation. ➢ identify and use quantitative information from multiple sources. ➢ deduce system rules from unfamiliar representations. ➢ formulate a simple numeric model ➢ set up comparison models; and explain their results. ➢ carry out accurate and more complex or repeated calculations, such as adding 13 given times in hour/minute format. ➢ carry out time calculations using given data on distance and speed of a journey.

- perform simple division of large multiples in context.
- carry out calculations involving a sequence of steps.
- apply accurately a given numeric algorithm involving a number of steps.
- perform calculations involving proportional reasoning, divisibility or percentages in simple models of complex situations.

Uncertainty and Data
What your students can do: Your students were able to: ✓ identify, extract and comprehend statistical data presented in a simple and familiar form such as a simple table, a bar graph or pie chart. ✓ identify, understand and use basic descriptive statistical concepts and probability theory in familiar contexts, such as tossing coins or rolling dice. ✓ interpret data in simple representations, and apply suitable procedures to calculate given contextual data to the problem represented.
What they should be able to do in PISA 2015: Your students should be able to: ➢ interpret and work with data and statistical information from a single representation that may include multiple data sources, such as a graph representing several variables, or from two related data representations, such as a simple data table and graph. ➢ work with and interpret descriptive statistical concepts and apply probability conventions in contexts such as coin tossing or lotteries. ➢ draw conclusions from data, such as calculating or using simple measures of centre and spread. ➢ perform basic statistical and probability reasoning in simple contexts.

Mathematics processes subscales

Three mathematical processes have been defined in PISA:

1. **Formulating:** emphasis is on transforming the problem in context into a mathematical problem. In a problem about travelling on a bus, the process of a student recognising the elements of speed, distance and time (and the relationship between these elements as an essential step in solving the problem) is an example of formulating situations mathematically.
2. **Employing:** emphasis is on mathematical reasoning and recognising which mathematical tools will assist with the mathematical problem. In a problem about travelling on a bus, substituting values (such as time and distance) into a formula to calculate speed is an example of this mathematical process.
3. **Interpreting:** emphasis is on interpreting the mathematical results of the original problem to obtain the results in context. In a problem about travelling on a bus, the process of a student evaluating the results in relation to the original problem is an example of this mathematical process.

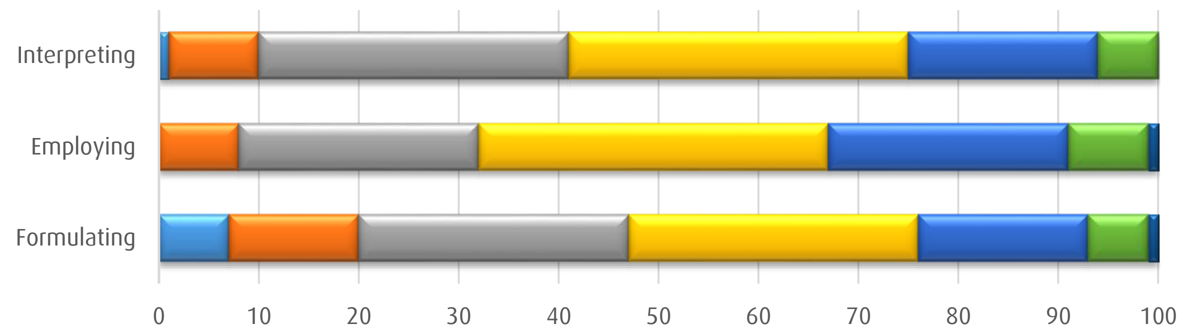
Mathematics processes subscales in your school

The definition of mathematical literacy refers to an individual's capacity to *formulate* situations mathematically; *employ* mathematical concepts, facts, procedures, and reasoning; and *interpret*, apply and evaluate mathematical outcomes. The three words, 'formulate', 'employ' and 'interpret', provide a useful and meaningful structure for organising the mathematical **processes** that describe what individuals do to connect the context of a problem with the mathematics and thus solve the problem. The PISA 2012 mathematics survey, for the first time, reported results according to these mathematical processes.

The table below describes the performance of your students in every process subscale. If your school's score in any of the processes subscales appears in red, it means it is below the OECD scaled average of that particular process. The opposite is true if the number appears in green:

	Processes subscales		
Average scores	Formulating	Employing	Interpreting
Your students	488	518	501
Singapore	582	574	555
OECD Scaled Average	500		

Distribution of proficiency levels by processes subscale



	Formulating	Employing	Interpreting
Below level 1	7		1
Level 1	13	8	9
Level 2	27	24	31
Level 3	29	35	34
Level 4	17	24	19
Level 5	6	8	6
Level 6	1	1	

Proportion of Students

Based on their results in the chart and the table above, the following tables describe what your students can do in every process subscale, and they should do in PISA 2015:

<table>
<tr><th>Formulating</th></tr>
<tr><td>

What your students can do:

Your students were able to:

- ✓ identify and extract information and data from text, tables, graphs, maps or other representations, and make use of them to express a relationship mathematically, including interpreting or adapting simple algebraic expressions related to an applied context.
- ✓ transform a textual description of a simple functional relationship into a mathematical form, for example with unit costs or payment rates.
- ✓ form a strategy involving two or more steps to link problem elements or to explore mathematical characteristics of the elements.
- ✓ apply reasoning with geometric concepts and skills to analyse patterns or identify properties of shapes or a specified map location, or to identify information needed to carry out some pertinent calculations, including calculations involving the use of simple proportional models and reasoning, where the relevant data and information was immediately accessible.
- ✓ understand and link probabilistic statements to formulate probability calculations in contexts, such as in a manufacturing process or a medical test.

</td></tr>
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What they should be able to do in PISA 2015:

Your students should be able to:

- ➢ link information and data from related representations (for example, a table and a map, or a spread sheet and a graphing tool) and apply a sequence of reasoning steps in order to formulate the mathematical expression needed to carry out a calculation or otherwise to solve a contextual problem.
- ➢ formulate a linear equation from a text description of a process, for example in a sales context, and formulate and apply cost comparisons to compare prices of sale items.

</td></tr>
</table>

- identify which of given graphical representations corresponds to a given description of a physical process.
- specify a sequential calculation process in mathematical terms.
- identify geometrical features of a situation and use their geometric knowledge and reasoning to analyse a problem, for example to estimate areas or to link a contextual geometric situation involving similarity to the corresponding proportional reasoning.
- combine multiple decision rules needed to understand or implement a calculation where different constraints apply.
- formulate algebraic expressions when the contextual information is reasonably straight-forward, for example to connect distance and speed information in time calculations.

Employing

What your students can do

Your students were able to:

- ✓ use spatial reasoning skills, such as symmetry properties of a figure. They recognised patterns presented in graphical form, or used angle facts to solve a geometric problem.
- ✓ connect two different mathematical representations, such as data in a table and in a graph, or an algebraic expression with its graphical representation, enabling them, for example, to understand the effect of changing data in one representation on the other.
- ✓ handle percentages, fractions and decimal numbers and worked with proportional relationships.

What they should be able to do in PISA 2015:

Your students should be able to:

- ➢ identify relevant data and information from contextual material and use it to perform such tasks as calculating distances, using proportional reasoning to apply a scale factor, converting different units to a common scale, or relating different graph scales to each other.
- ➢ work flexibly with distance-time-speed relationships, and should be able to carry out a sequence of arithmetic calculations.
- ➢ use algebraic formulations, and follow a straightforward strategy and describe it.

Interpreting

What your students can do

Your students were able to:

- ✓ use reasoning, including spatial reasoning, to support their interpretations of mathematical information in order to make inferences about features of the context.
- ✓ combine reasoning steps systematically to make various connections between mathematical and contextual material or when required to focus on different aspects of a context. For example where a graph showed two data series or a table contained data on two variables that must be actively related to each other to support a conclusion.
- ✓ test and explore alternative scenarios, using reasoning to interpret the possible effects of changing some of the variables under observation.
- ✓ use appropriate calculation steps to assist their analysis of data and support the formation of conclusions and interpretations, including calculations involving proportions and proportional reasoning, and in situations where systematic analysis across several related cases was needed.
- ✓ interpret and analyse relatively unfamiliar data presentations to support their conclusions.

What they should be able to do in PISA 2015:

Your students should to be able to:

- apply appropriate reasoning steps, possibly multiple steps, to extract information from a complex mathematical situation and interpret complicated mathematical objects, including algebraic expressions.
- interpret complex graphical representations to identify data or information that answers a question.
- perform a calculation or data manipulation (for example, in a spread sheet) to generate additional data needed to decide whether a constraint (such as a measurement condition or a size comparison) is met.
- interpret simple statistical or probabilistic statements in such contexts as public transport, or health and medical test interpretation, to link the meaning of the statements to the underlying contextual issues.
- conceptualise a change needed to a calculation procedure in response to a changed constraint.
- analyse two data samples, for example relating to a manufacturing process, to make comparisons and draw and express conclusions.

Section 3: sample questions

Below is a sample of two passages similar to the ones your students actually had on the exam. **It covers content areas and processes subscales your students underperformed in**. Questions are not provided in sequential order. Classification is indicated under each question. For a full list of questions please refer to the separate release document.

CLIMBING MOUNT FUJI

Mount Fuji is a famous dormant volcano in Japan.

Question 1: CLIMBING MOUNT FUJI

Mount Fuji is only open to the public for climbing from 1 July to 27 August each year. About 200 000 people climb Mount Fuji during this time.

On average, about how many people climb Mount Fuji each day?

A 340

B 710

C 3400

D 7100

E 7400

CLIMBING MOUNT FUJI SCORING 1	
Description	Identify an average daily rate given a total number and a specific time period (dates provided)
Mathematical content area	**Quantity**
Context	Societal
Process	**Formulate**
Correct Answer	C

Question 2: CLIMBING MOUNT FUJI

The Gotemba walking trail up Mount Fuji is about 9 kilometres (km) long.

Walkers need to return from the 18 km walk by 8 pm.

Toshi estimates that he can walk up the mountain at 1.5 kilometres per hour on average, and down at twice that speed. These speeds take into account meal breaks and rest times.

Using Toshi's estimated speeds, what is the latest time he can begin his walk so that he can return by 8 pm?

CLIMBING MOUNT FUJI SCORING 2	
Description	Calculate the start time for a trip given two different speeds, a total distance to travel and a finish time
Mathematical content area	**Change and relationships**
Context	Societal
Process	**Formulate**
Correct Answer	11 (am) [with or without am, or an equivalent way of writing time, for example, 11:00]

Question 3: CLIMBING MOUNT FUJI

Toshi wore a pedometer to count his steps on his walk along the Gotemba trail.

His pedometer showed that he walked 22 500 steps on the way up.

Estimate Toshi's average step length for his walk up the 9 km Gotemba trail. Give your answer in centimetres (cm).

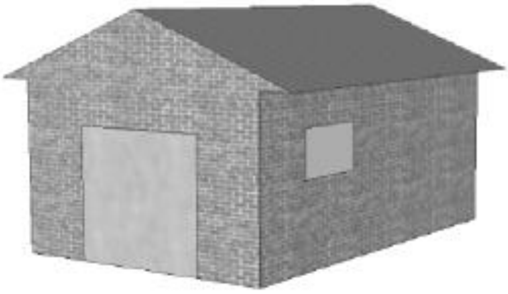
Answer: .... cm

CLIMBING MOUNT FUJI SCORING 3	
Description	Divide a length given in km by a specific number and express the quotient in cm
Mathematical content area	**Quantity**
Context	Societal
Process	**Employ**
Correct Answer	40

GARAGE

A garage manufacturer's "basic" range includes models with just one window and one door.

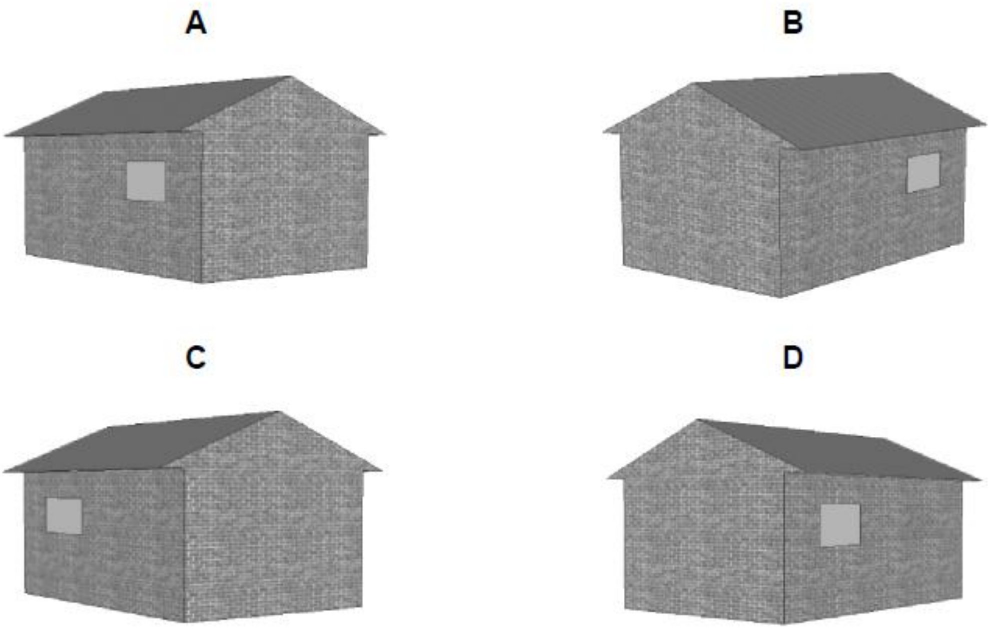
George chooses the following model from the "basic" range. The position of the window and the door are shown here.



Question 1: GARAGE

The illustrations below show different "basic" models as viewed from the back. Only one of these illustrations matches the model above chosen by George.

Which model did George choose? Circle A, B, C or D.

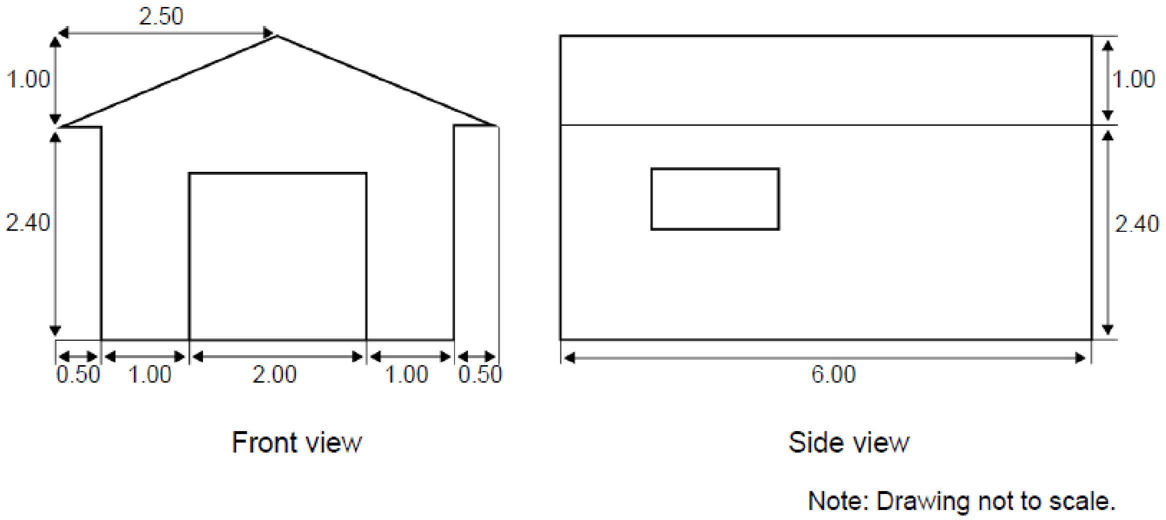


GARAGE SCORING 1

Description	Use space ability to identify a 3D view corresponding to another given 3D view
Mathematical content area	**Space and Shape**
Context	Occupational
Process	**Interpret**
Correct Answer	C

Question 2: GARAGE

The two plans below show the dimensions, in metres, of the garage George chose.



The roof is made up of two identical rectangular sections.

Calculate the **total** area of the roof. Show your work.

. ...

....

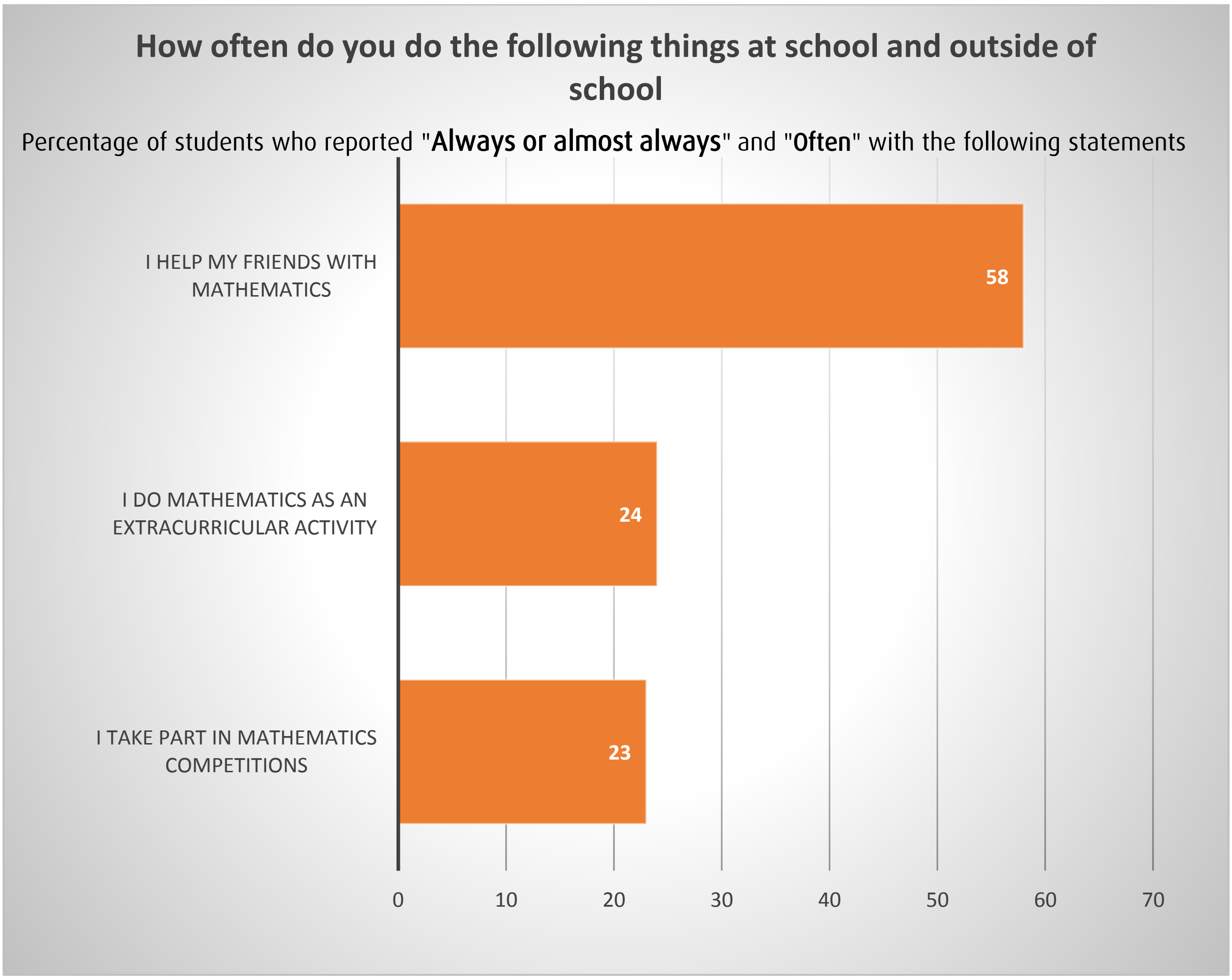
....

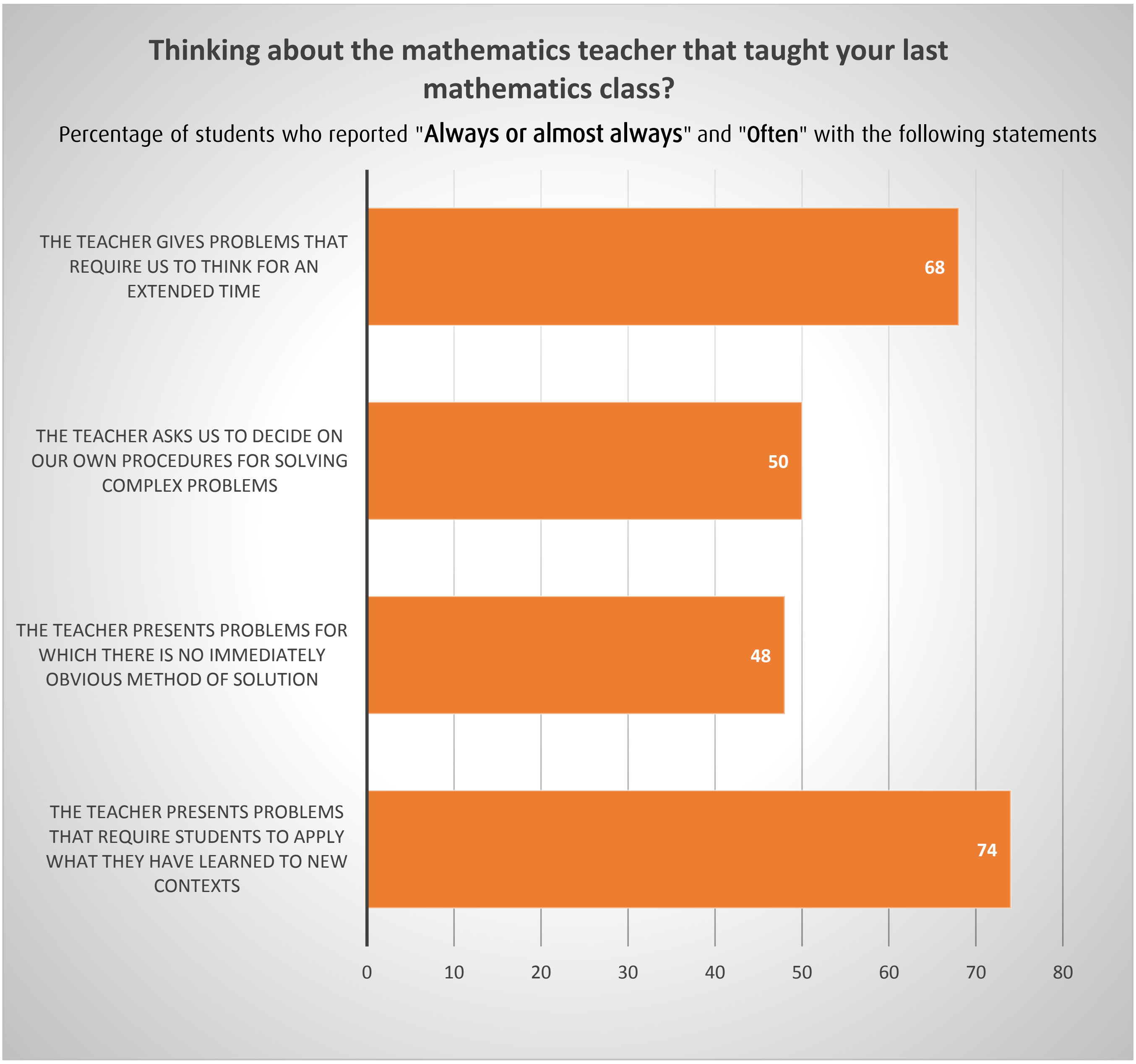
....

GARAGE SCORING 2	
Description	Interpret a plan and calculate the area of a rectangle using the Pythagorean theorem or measurement
Mathematical content area	**Space and Shape**
Context	Occupational
Process	**Employ**
Correct Answer	Any value from 31 to 33, either showing no working at all or supported by working that shows the use of the Pythagorean theorem (or including elements indicating that this method was used). *[Units (m^2) not required]*. $12\sqrt{7.25}$ m^2 $12 \times 2.69 = 32.28$ m^2 32.4 m^2

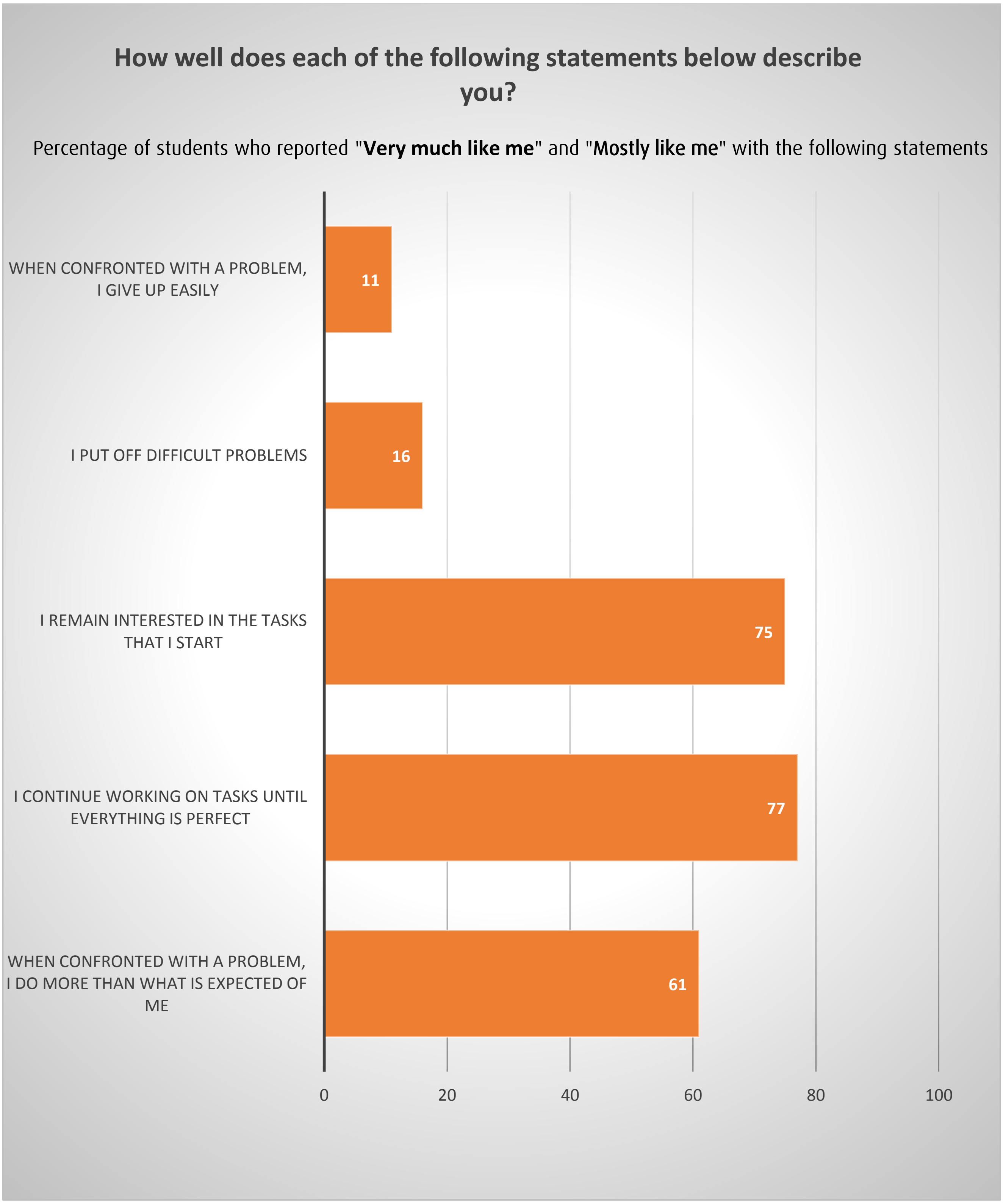
Section 4: What did your students have to say?

Students who sat for PISA 2012, answered a background questionnaire in addition to the test. The questionnaire took 30 minutes to complete. It sought information about the students themselves, their homes and their school and learning experiences. The questionnaire was divided into six sections encompassing seventy questions. In its effort to improve standards and bring to the school's attention certain concerns, KHDA has chosen few of these questions to share with you. Answers to these questions may be relevant to your students' performance. Teachers and school principals need to be able to identify issues that students have. Understanding the problems that students face in their learning should help schools to find suitable solutions. PISA results also indicated that personal drive, motivation and confidence are essential if students are to fulfil their potentials. Eighty five percent of students in Dubai indicated happiness with their schools. Schools can use this fact to ensure better results in the next PISA cycle.





Thinking about the mathematics teacher that taught your last mathematics class?
Percentage of students who reported "Always or almost always" and "Often" with the following statements
THE TEACHER GIVES PROBLEMS THAT REQUIRE US TO THINK FOR AN EXTENDED TIME
68
THE TEACHER ASKS US TO DECIDE ON OUR OWN PROCEDURES FOR SOLVING COMPLEX PROBLEMS
50
THE TEACHER PRESENTS PROBLEMS FOR WHICH THERE IS NO IMMEDIATELY OBVIOUS METHOD OF SOLUTION
48
THE TEACHER PRESENTS PROBLEMS THAT REQUIRE STUDENTS TO APPLY WHAT THEY HAVE LEARNED TO NEW CONTEXTS
74
0
10
20
30
40
50
60
70
80


How well does each of the following statements below describe you?
Percentage of students who reported "Very much like me" and "Mostly like me" with the following statements
WHEN CONFRONTED WITH A PROBLEM, I GIVE UP EASILY
11
I PUT OFF DIFFICULT PROBLEMS
16
I REMAIN INTERESTED IN THE TASKS THAT I START
75
I CONTINUE WORKING ON TASKS UNTIL EVERYTHING IS PERFECT
77
WHEN CONFRONTED WITH A PROBLEM, I DO MORE THAN WHAT IS EXPECTED OF ME
61
0
20
40
60
80
100

Section 5: Findings from the global and the local levels

PISA results including test scores and background questionnaires collected from students and principals revealed what is possible in education by showing what students in the highest-performing and most rapidly improving education systems can do. The findings allow policy makers around the world to:

- gauge the knowledge and skills of students in their own countries in comparison with those in other countries,
- set policy targets against measurable goals achieved by other education systems,
- and learn from policies and practices applied elsewhere.

Findings from the global level

▪ Germany, Turkey and Mexico saw significant improvements in both mathematics performance and socio-economic equity between 2003 and 2012
▪ Of the 65 countries who particpated in the PISA exam, 45 improved at least in one subject
▪ Across OECD, 13% of students were top performers (Level 5 or 6). They could develop and work with models for complex situations, and work strategically with advanced thinking and reasoning skills
▪ OECD countries invest over USD 230 billion each year in mathematics education in schools. While this is a major investment, the returns are many times larger
▪ The survey shows that poor mathematics skills severely limit people's access to better-paying and more-rewarding jobs
▪ Boys performed better than girls in mathematics in 37 out of the 65 countries and economies that participated in PISA 2012, and girls outperformed boys in 5 countries
▪ Countries with large proportions of truants performed worse in mathematics
▪ Countries where students had stronger beliefs in their abilities performed better in mathemactics

▪ Greater self-value among girls could shrink the gender gap in mathematics performance, particularly among the highest-performing students
▪ Students who enjoyed learning mathematics performed better
▪ Students who believed that learning mathematics was useful performed better
▪ Better teacher-student relations were strongly associated with greater student engagement at school
▪ In 33 countries, schools where a higher proportion of principals reported that teacher shortages hindered learning tended to show lower performance
▪ Students who attended pre-primary school performed better
▪ Adequacy of physical infrastructure was unrelated to performance in exams
▪ The difference in mathematics performances within countries is generally big, (over 300 points) – the equivalent of more than seven years of schooling –often separating the highest and the lowest performers in a country.
▪ Homework had a larger and more significant impact on test scores.

Findings from the local level

▪ In the United Arab Emirates, the average performance in reading of 15-year-olds was 442 points, compared to an average of 496 points in OECD countries. Girls performed better than boys with a statistically significant difference of 55 points (OECD average: 38 points higher for girls).
▪ On average, 15-year-olds scored 434 points in mathematics, the main topic of PISA 2012, compared to an average of 494 points in OECD countries. Girls performed better than boys with a non statistically significant difference of 5 points (OECD average: 11 points higher for boys).
▪ In science literacy, 15-year-olds in the United Arab Emirates scored 448 points compared to an average of 501 points in OECD countries. Girls performed better than boys with a statistically significant difference of 28 points (OECD average: only 1 point higher for boys).
▪ 13.6% of Dubai students performed below Level 1 in mathematics compared to 6.8% who performed at Level 5 and above.
▪ 14.6% of Dubai male students performed below Level 1 in mathematics compared to 8.6% who performed at Level 5 and above
▪ 12.7% of Dubai female students performed below Level 1 in mathematics compared to only 5% who performed at Level 5 and above
▪ 54.5% of students in the UAE stated that they were exposed to the mathematics task "solving an equation like 2(x + 3) = (x + 3)(x – 3)"
▪ Only 23.2% of students in the UAE stated that they were exposed to the mathematics task "understanding scientific tables presented in an article"
▪ Only 30% of the students in the UAE claimed they were exposed to mathematics problems relating to real-life contexts
▪ Percentage of students who reported having skipped classes or days of school in the UAE was 34%

Appendix I

Descriptions of the PISA proficiency levels

Mathematics
Level 6 - 669
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.
Level 5 - 607
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.
Level 4 - 545
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, arguments and actions.

Level 3 – 482
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 2 – 420
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.
Level 1 – 358
Students below Level 1 may be able to perform very direct and straightforward mathematical tasks, such as reading a single value from a well-labelled chart or table where the labels on the chart match the words in the stimulus and question, so that the selection criteria are clear and the relationship between the chart and the aspects of the context depicted are evident, and performing arithmetic calculations with whole numbers by following clear and well-defined instructions.

Reading
Level 6 - 708
Tasks at Level 6 typically require the student 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 student to deal with unfamiliar ideas in the presence of prominent competing information, and to generate abstract categories for interpretations.
Level 5 - 626
Tasks at Level 5 that involve retrieving information require the student to locate and organise several pieces of deeply embedded information, inferring which information in the text is relevant. Reflective tasks require critical evaluation or hypotheses, drawing on specialised knowledge. Both interpreting 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.
Level 4 - 553
Tasks at Level 4 that involve retrieving information require the student 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 the student to use formal or public knowledge to hypothesise about or critically evaluate a text. The student must demonstrate an accurate understanding of long or complex texts whose content or form may be unfamiliar.
Level 3 - 480
Tasks at Level 3 require the student to locate, and in some cases recognise the relationship between, several pieces of information that must meet multiple conditions. Interpreting tasks at this level require the student 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. The student needs 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 obstacles in the text, such as ideas that are contrary to expectation or negatively worded.

Level 2 - 407
Some tasks at Level 2 require the student to locate one or more pieces of information that may have to be inferred and may have 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 student must make low-level inferences. Tasks at this level may involve comparisons or contrasts based on a single feature in the text.
Level 1 - 335
Tasks at Level 1a require the student to locate one or more independent pieces of explicitly stated information, recognise the main theme or author's intent in a text about a familiar topic, or make a simple connection between information in the text and common, everyday knowledge. The required information in the text is usually prominent and there is little, if any, competing information. The student is explicitly directed to consider relevant factors in the task and in the text.
Level 1b - 262
Tasks at Level 1b require the student 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 student, such as repetition of information, pictures or familiar symbols. There is minimal competing information. In tasks requiring interpretation, the student may need to make simple connections between adjacent pieces of information.

Science
Level 6 - 708
At Level 6, students can consistently identify, explain and apply scientific knowledge and knowledge about science 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 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.
Level 5 - 633
At Level 5, students can identify the scientific components of many complex life situations, apply both scientific concepts and knowledge about science 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.
Level 4 – 559
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.
Level 3 - 484
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.

Level 2 - 409
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.
Level 1 - 335
At Level 1, students have such 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.
Below Level 1
Students who score below Level 1 – usually do not succeed at the most basic levels of science that PISA measures. Such students will have serious difficulties in using science to benefit from further education and learning opportunities and in participating in life situations related to science and technology.

Appendix II

Content topics for guiding the assessment of mathematical literacy for 15-year-old students

- The four content categories of change and relationships, space and shape, quantity and uncertainty and data serve as the foundation for identifying this range of content, yet there is not a one-to-one mapping of content topics to these categories. For example, proportional reasoning comes into play in such varied contexts as making measurement conversions, analysing linear relationships, calculating probabilities and examining the lengths of sides in similar shapes.
- The following content is intended to reflect the centrality of many of these concepts to all four content categories and reinforce the coherence of mathematics as a discipline. It intends to be illustrative of the content topics included in PISA 2012, rather than an exhaustive listing:
- Functions: The concept of function, emphasising but not limited to linear functions, their properties, and a variety of descriptions and representations of them. Commonly used representations are verbal, symbolic, tabular and graphical.
- Algebraic expressions: Verbal interpretation of and manipulation with algebraic expressions, involving numbers, symbols, arithmetic operations, powers and simple roots.
- Equations and inequalities: Linear and related equations and inequalities, simple second-degree equations, and analytic and non-analytic solution methods.
- Co-ordinate systems: Representation and description of data, position and relationships.
- Relationships within and among geometrical objects in two and three dimensions: Static relationships such as algebraic connections among elements of figures (e.g. the Pythagorean Theorem as defining the relationship between the lengths of the sides of a right triangle), relative position, similarity and congruence, and dynamic relationships involving transformation and motion of objects, as well as correspondences between two- and three-dimensional objects.
- Measurement: Quantification of features of and among shapes and objects, such as angle measures, distance, length, perimeter, circumference, area and volume.
- Numbers and units: Concepts, representations of numbers and number systems, including properties of integer and rational numbers, relevant aspects of irrational numbers, as well as

quantities and units referring to phenomena such as time, money, weight, temperature, distance, area and volume, and derived quantities and their numerical description.
• Arithmetic operations: The nature and properties of these operations and related notational conventions.
• Percent, ratios and proportions: Numerical description of relative magnitude and the application of proportions and proportional reasoning to solve problems.
• Counting principles: Simple combinations and permutations.
• Estimation: Purpose-driven approximation of quantities and numerical expressions, including significant digits and rounding.
• Data collection, representation and interpretation: Nature, genesis and collection of various types of data, and the different ways to represent and interpret them.
• Data variability and its description: Concepts such as variability, distribution and central tendency of data sets, and ways to describe and interpret these in quantitative terms.
• Samples and sampling: Concepts of sampling and sampling from data populations, including simple inferences based on properties of samples.
• Chance and probability: Notion of random events, random variation and its representation, chance and frequency of events, and basic aspects of the concept of probability.

Contact Information

For more information about Dubai's participation in PISA 2012, please check Dubai's PISA report:

http://www.khda.gov.ae/CMS/WebParts/TextEditor/Documents/PISA_2012_Report_EN.pdf

How to contact us:

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