Programme for International Student Assessment (PISA)

Released Items

Teaching Resource Pack in Reading, Mathematics and Science for 15 year old students
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Introduction

The Programme for International Student Assessment (PISA), an initiative of the Organization for Economic Co-operation and Development (OECD), is an international survey held every three years which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students in Reading, Mathematics and Science.

In March 2014, 27 Maltese schools participated in the PISA 2015 Field Trial and in March 2015 all State, Church and Independent school students born in the year 1999 will sit for PISA 2015. In order to familiarise students for such assessment, the Research and Development Department is disseminating this Resource Pack which incorporates samples of released questions. The purpose of this Resource Pack is to be used as a teaching resource for students in their last years of secondary schooling. However, the Resource Pack is not intended to coach students for the test but to familiarise themselves with the types and styles of items. Teachers are also encouraged to model other questions according to their students’ needs and levels of ability.

Each question incorporates a level of difficulty, from level 1 to level 6. Descriptions of the levels for Reading, Science and Mathematics can be found on pages 2, 27 and 38 respectively.

This resource pack follows other information sources published by OECD and the Research and Development Department. Data and information has also been disseminated particularly through the PISA 2009+ Malta Report (2013), dissemination workshops (May – July 2013), as well as through meetings and training seminars for School Coordinators and Test Administrators. Further information regarding PISA may be accessed on www.research.gov.mt and http://www.oecd.org/pisa/
Guidelines for Question Format

Questions follow the indicated format:

Student’s Question

Teacher’s Notes

Question Intent and Text Format

Scoring Guide

Level of Difficulty

Additional Comments on the Question

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Question 1: RUNNERS

What does the author intend to show in this text?

A. That the quality of many sports shoes has greatly improved.
B. That it is best not to play football if you are under 12 years of age.
C. That young people are suffering more and more injuries due to their poor physical condition.
D. That it is very important for young sports players to wear good sports shoes.

Teacher’s Notes:

Question Intent: Integrate and Interpret
Text Format: Continuous

Scoring

Correct
Answer: D. That it is very important for young sports players to wear good sports shoes.

Incorrect
Other responses.

Comments

The easiest task in the unit is an interpreting task which requires the reader to recognize the article’s main idea in a text about a familiar topic. The author’s main message is not stated directly, or synonymously, so the task is classified as interpreting texts rather than retrieving information. There are at least two features that make this task easy. First, the required information is located in the introduction, which is a short section of text. Secondly, there is a good deal of redundancy, the main idea in the introduction being repeated several times throughout the text. Reading tasks tend to be relatively easy when the information they require the reader to use is either near the beginning of the text or repeated. This task meets both of these criteria. The question is intended to discover whether students can form a broad understanding.
The reading assessment seeks to measure the capacity to understand, use and reflect on written texts in order to achieve one’s goals, to develop one’s knowledge and potential, and to participate in society.

On the following pages are selections of questions that show what can be expected during the reading assessment. Questions in PISA cover a wide range of topics and levels of difficulty in order to allow the survey to measure the range of abilities of students as well as to draw comparisons internationally. The tasks are taken from PISA items released by the OECD for public use. Copyright remains with the OECD.

The **Question Intent** and the **Text Format** is indicated in the Teacher’s Notes for each question and are described in the table below:

<table>
<thead>
<tr>
<th>QUESTION INTENT</th>
<th>TEXT FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the reader's purpose and approach to the text?</td>
<td>How is the text presented?</td>
</tr>
<tr>
<td>• Access and retrieve information in the text</td>
<td>• Continuous texts (in sentences)</td>
</tr>
<tr>
<td>• Integrate and interpret what they read</td>
<td>• Non-continuous texts (in lists, like this one)</td>
</tr>
<tr>
<td>• Reflect and evaluate, standing back from a text and relating it to their own experience</td>
<td>• Mixed texts (combining these)</td>
</tr>
<tr>
<td></td>
<td>• Multiple texts</td>
</tr>
</tbody>
</table>
### Levels of difficulty for Reading

<table>
<thead>
<tr>
<th>Level</th>
<th>What students can typically do on the reading scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Students proficient at <strong>Level 6</strong> on the reading scale are highly skilled readers. They are capable of conducting fine-grained analysis of texts, which requires detailed comprehension of both explicit information and unstated implications; and capable of reflecting on and evaluating what they read at a more general level.</td>
</tr>
<tr>
<td>5</td>
<td>Students proficient at <strong>Level 5</strong> on the reading literacy scale can handle texts that are unfamiliar in either form or content. They can find information in such texts, demonstrate detailed understanding, and infer which information is relevant to the task. Using such texts, they are also able to evaluate critically and build hypotheses, draw on specialised knowledge and accommodate concepts that may be contrary to expectations.</td>
</tr>
<tr>
<td>4</td>
<td>Students proficient at <strong>Level 4</strong> on the reading literacy scale are capable of difficult reading tasks, such as locating embedded information, construing meaning from nuances of language and critically evaluating a text.</td>
</tr>
<tr>
<td>3</td>
<td>Students proficient at <strong>Level 3</strong> on the reading literacy scale are capable of reading tasks of moderate complexity, such as locating multiple pieces of information, making links between different parts of a text, and relating it to familiar everyday knowledge.</td>
</tr>
<tr>
<td>2</td>
<td>Students proficient at <strong>Level 2</strong> on the reading literacy scale are capable of tasks such as locating information that meets several conditions, making comparisons or contrasts around a single feature, working out what a well-defined part of a text means even when the information is not prominent, and making connections between the text and personal experience.</td>
</tr>
<tr>
<td>1a</td>
<td>Students proficient at <strong>Level 1a</strong> on the reading literacy scale are capable of locating pieces of explicitly stated information that is rather prominent in the text, recognising a main idea in a text about a familiar topic, and recognising the connection between information in such a text and their everyday experience.</td>
</tr>
<tr>
<td>1b</td>
<td>Students proficient at <strong>Level 1b</strong> on the reading literacy scale can find explicitly stated information in short, simple texts with a familiar style and content. They can make low-level inferences such as recognising a causal connection across two sentences even when it is not stated.</td>
</tr>
</tbody>
</table>

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1 *Levels of difficulty as defined by PISA and the assessment of student’s ability*
Question R1: Runners

The first text is a piece of expository prose from a French-Belgian magazine produced for adolescent students. It is classed as belonging to the educational situation. One of the reasons for its selection as part of the PISA 2000 reading instrument is its subject, which was considered of great interest for the PISA population of 15-year-olds. The article includes an attractive cartoon-like illustration and is broken up by catchy sub-headings. Within the continuous text format category, it is an example of expository writing in that it provides an outline of a mental construct, laying out a set of criteria for judging the quality of running shoes in terms of their fitness for young athletes.

The tasks within this unit cover all three aspects – retrieving information, interpreting texts and reflection and evaluation - but all are relatively easy, falling within Level 1.

Feel Good in your Runners

For 14 years the Sports Medicine Centre of Lyon (France) has been studying the injuries of young sports players and sports professionals. The study has established that the best course is prevention … and good shoes.

<table>
<thead>
<tr>
<th>Knocks, falls, wear and tear...</th>
<th>Protect, support, stabilize, absorb</th>
<th>Dry feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eighteen percent of sports players aged 8 to 12 already have heel injuries. The cartilage of a footballer’s ankle does not respond well to shocks, and 25% of professionals have discovered for themselves that it is an especially weak point. The cartilage of the delicate knee joint can also be irreparably damaged if care is not taken right from childhood (10–12 years of age), this can cause premature osteoarthritis. The hip does not escape damage either and, particularly when tired, players run the risk of fractures as a result of falls or collisions. According to the study, footballers who have been playing for more than ten years have bony outgrowths either on the tibia or on the heel. This is what is known as “footballer’s foot”, a deformity caused by shoes with soles and ankle parts that are too flexible.</td>
<td>If a shoe is too rigid, it restricts movement. If it is too flexible, it increases the risk of injuries and sprains. A good sports shoe should meet four criteria: Firstly, it must provide exterior protection: resisting knocks from the ball or another player, coping with unevenness in the ground, and keeping the foot warm and dry even when it is freezing cold and raining. It must support the foot, and in particular the ankle joint, to avoid sprains, swelling and other problems, which may even affect the knee. It must also provide players with good stability so that they do not slip on a wet ground or skid on a surface that is too dry. Finally, it must absorb shocks, especially those suffered by volleyball and basketball players who are constantly jumping.</td>
<td>To avoid minor but painful conditions such as blisters or even splits or athlete’s foot (fungal infections), the shoe must allow evaporation of perspiration and must prevent outside dampness from getting in. The ideal material for this is leather, which can be water-proofed to prevent the shoe from getting soaked the first time it rains.</td>
</tr>
</tbody>
</table>
Use the article to answer the questions below.

**Question 1: RUNNERS**

What does the author intend to show in this text?

A. That the quality of many sports shoes has greatly improved.
B. That it is best not to play football if you are under 12 years of age.
C. That young people are suffering more and more injuries due to their poor physical condition.
D. That it is very important for young sports players to wear good sports shoes.

---

**Teacher's Notes:**

*Question intent: Integrate and interpret*

*Text format: Continuous*

**Scoring**

*Correct*

Answer: D. That it is very important for young sports players to wear good sports shoes.

*Incorrect*

Other responses.

**Comments**

The easiest task in the unit is an interpreting task which requires the reader to recognize the article’s main idea in a text about a familiar topic. The author’s main message is not stated directly, or synonymously, so the task is classified as interpreting texts rather than retrieving information. There are at least two features that make this task easy. First, the required information is located in the introduction, which is a short section of text. Secondly, there is a good deal of redundancy, the main idea in the introduction being repeated several times throughout the text. Reading tasks tend to be relatively easy when the information they require the reader to use is either near the beginning of the text or repeated. This task meets both of these criteria. The question is intended to discover whether students can form a broad understanding.
Question 2: RUNNERS

According to the article, why should sports shoes not be too rigid?

Teacher’s Notes:

Question intent: Access and retrieve

Text format: Continuous

Scoring

Correct

Answers which refer to restriction of movement.

Incorrect

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.

Comments

The second task is classified as retrieving information in terms of aspect. It requires readers to locate a piece of explicitly stated information that satisfies one single criterion. The reader can directly match the word ‘rigid’ in the question with the relevant part of the text, rather than near the beginning as in the previous task, it is quite prominent because it is near the beginning of one of the three sections marked by sub-headings.
Question 3: RUNNERS

One part of the article says, “A good sports shoe should meet four criteria.”

What are these criteria?

Teacher’s Notes:

Question intent: Access and retrieve

Text format: Continuous

Scoring

Correct

Answers which refer to the four criteria in italics in the text. Each reference may be a direct quotation, a paraphrase or an elaboration of the criterion. Criteria may be given in any order.

The four criteria are:

i. To provide exterior protection
ii. To support the foot
iii. To provide good stability
iv. To absorb shocks

Incorrect

Other responses.
Question 4: RUNNERS

Look at this sentence from near the end of the article. It is presented here in two parts:

“To avoid minor but painful conditions such as blisters or even (first part) splits or athlete's foot (fungal infections),…”

“…the shoe must allow evaporation of perspiration and must (second part) prevent outside dampness from getting in.”

What is the relationship between the first and second parts of the sentence?

The second part

A  contradicts the first part.
B  repeats the first part.
C  illustrates the problem described in the first part.
D  gives the solution to the problem described in the first part.

Teacher's Notes:

Question intent: Reflect and evaluate

Text format: Continuous

Scoring

Correct

Answer: D - Gives the solution to the problem described in the first part.

Incorrect

Other responses.
The stimulus for this unit consists of two letters posted on the Internet, originally from Finland. The tasks simulate typical literacy activities, since as readers we often synthesise, and compare and contrast ideas from two or more different sources.

The subject of Graffiti was expected to be interesting for 15-year-olds: the implied debate between the writers as to whether graffiti makers are artists or vandals would represent a real issue in the minds of the test-takers.

The four tasks from the Graffiti unit used to measure reading proficiency in PISA 2000 range in difficulty from Level 2 to Level 4 and address the aspects of interpreting texts and reflection and evaluation.

The two letters below come from the internet and are about graffiti. Graffiti is illegal painting and writing on walls and elsewhere. Refer to the letters to answer the questions below.

**GRAFFITI**

I’m simmering with anger as the school wall is cleaned and repainted for the fourth time to get rid of graffiti. Creativity is admirable but people should find ways to express themselves that do not inflict extra costs upon society. Why do you spoil the reputation of young people by painting graffiti where it’s forbidden? Professional artists do not hang their paintings in the streets, do they? Instead they seek funding and gain fame through legal exhibitions.

In my opinion buildings, fences and park benches are works of art in themselves. It’s really pathetic to spoil this architecture with graffiti and what’s more, the method destroys the ozone layer. Really, I can’t understand why these criminal artists bother as their “artistic works” are just removed from sight over and over again.

*Helga*

There is no accounting for taste. Society is full of communication and advertising. Company logos, shop names. Large intrusive posters on the streets. Are they acceptable? Yes, mostly. Is graffiti acceptable? Some people say yes, some no.

Who pays the price for graffiti? Who is ultimately paying the price for advertisements? Correct. The consumer.

Have the people who put up billboards asked your permission? No. Should graffiti painters do so then? Isn’t it all just a question of communication – your own name, the names of gangs and large works of art in the street?

Think about the striped and chequered clothes that appeared in the stores a few years ago. And ski wear. The patterns and colours were stolen directly from the flowery concrete walls. It’s quite amusing that these patterns and colours are accepted and admired but that graffiti in the same style is considered dreadful.

Times are hard for art.

*Sophia*
**Question 1: GRAFFITI**

The purpose of each of these letters is to

A. explain what graffiti is.
B. present an opinion about graffiti.
C. demonstrate the popularity of graffiti.
D. tell people how much is spent removing graffiti.

**Teacher’s Notes:**

**Question intent:** Integrate and interpret

**Text format:** Continuous

**Scoring**

**Correct**

Answer: B. Present an opinion about graffiti.

**Incorrect**

Other responses.

**Comments**

This Level 2 interpreting task requires students to identify the purpose that two shorts texts have in common by comparing the main ideas in each of them. The information is not prominent, and low-level inference is required. The intention of the question is to establish whether the student can form a broad understanding and recognize the purpose of the text. The reader needs to follow logical connections, synthesizing information from both texts in order to infer the authors' purposes. The need to compare and contrast the two letters makes this task more difficult than, for instance, a task which asks the purpose of a single letter only.
Question 2: GRAFFITI

Why does Sophia refer to advertising?

Teacher’s Notes:

Question intent: Integrate and interpret

Text format: Continuous

Scoring

Correct

Answers which recognize that a comparison is being drawn between graffiti and advertising, and are consistent with the idea that advertising is a legal form of graffiti.

OR

Answers which recognize that referring to advertising is a strategy to defend graffiti.

Incorrect

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.

Comments

This more difficult Interpreting task based on the Graffiti texts falls within Level 3, and requires students to follow an implicit logical link between sentences, in this case a comparison between advertising and graffiti. The relative difficulty of the task can be attributed to the fact that the comparison must be construed from a series of questions and challenges. In order to answer the question correctly, the student must recognize that a comparison is being drawn between graffiti and advertising. The answer must be consistent with the idea that advertising is a legal form of graffiti. Or the student must recognize that referring to advertising is a strategy to defend graffiti.
**Question 3: GRAFFITI**

Which of the two letter writers do you agree with? Explain your answer by using your own words to refer to what is said in one or both of the letters.

---

**Teacher's Notes:**

**Question intent:** Reflect and evaluate

**Text format:** Continuous

**Scoring**

**Correct**

Answers which explain student's point of view by referring to the content of one or both letters. May refer to the writer's general position (i.e. for or against) or to a detail of her argument. Interpretation of writer's argument must be plausible. Explanation may take the form of paraphrase of part of the text, but must not be wholly or largely copied without alteration or addition.

**Incorrect**

Support for own point of view is confined to a direct quotation (with or without quotation marks).

OR

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.
Question 4: GRAFFITI

We can talk about what a letter says (its content).

We can talk about the way a letter is written (its style).

Regardless of which letter you agree with, in your opinion, which do you think is the better letter? Explain your answer by referring to the way one or both letters are written.

Teacher’s Notes:

Question intent: Reflect and evaluate

Text format: Continuous

Scoring

Correct

Answers which explain opinion with reference to the style or form of one or both letters. They should refer to criteria such as style of writing, structure of argument, cogency of argument, tone, register used, strategies for persuading readers. Terms like “better arguments” must be substantiated.

Incorrect

Answers which judge in terms of agreement or disagreement with the writer’s position, or simply paraphrases content.

OR

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.

Comments

The most difficult task associated with the Graffiti texts falls within Level 4, and requires students to use formal knowledge to evaluate the writer’s craft by comparing the two letters. In the five-aspect categorisation, this task is classified as reflection on and evaluation of the form of a text, since to answer it, readers need to draw on their own understanding of what constitutes good writing.

The relative difficulty of the task suggests that many 15-year-olds are not practised on formal knowledge about structure and style to make critical evaluations of texts.
Question R3: The Gift

How many days, she wondered, had she sat like this, watching the cold brown water inch up the dissolving bluff. She could just faintly remember the beginning of the rain, driving in across the swamp from the south and beating against the shell of her house. Then the river itself started rising, slowly at first until at last it paused to turn back. From hour to hour it slithered up creeks and ditches and poured over low places. In the night, while she slept, it claimed the road and surrounded her so that she sat alone, her boat gone, the house like a piece of drift lodged on its bluff. Now even against the tarred planks of the supports the waters touched. And still they rose.

As far as she could see, to the treetops where the opposite banks had been, the swamp was an empty sea, awash with sheets of rain, the river lost somewhere in its vastness. Her house with its boat bottom had been built to ride just such a flood, if one ever came, but now it was old. Maybe the boards underneath were partly rotted away. Maybe the cable mooring the house to the great live oak would snap loose and let her go turning downstream, the way her boat had gone.

No one could come now. She could cry out but it would be no use, no one would hear. Down the length and breadth of the swamp others were fighting to save what little they could, maybe even their lives. She had seen a whole house go floating by, so quiet she was reminded of sitting at a funeral. She thought when she saw it she knew whose house it was. It had been bad seeing it drift by, but the owners must have escaped to higher ground. Later, with the rain and darkness pressing in, she had heard a panther scream upriver.

Now the house seemed to shudder around her like something alive. She reached out to catch a lamp as it tilted off the table by her bed and put it between her feet to hold it steady. Then creaking and groaning with effort the house struggled up from the clay, floated free, bobbing like a cork and swung out slowly with the pull of the river. She gripped the edge of the bed. Swaying from side to side, the house moved to the length of its mooring. There was a jolt and a complaining of old timbers and then a pause. Slowly the current released it and let it swing back, rasping across its resting place. She caught her breath and sat for a long time feeling the slow pendulous sweeps. The dark sifted down through the incessant rain, and head on arm, she slept holding on to the bed.

Sometime in the night the cry awoke her, a sound so anguished she was on her feet before she was awake. In the dark she stumbled against the bed. It came from out there, from the river. She could hear something moving, something large that made a dredging, sweeping sound. It could be another house. Then it hit, not head on but glancing and sliding down the length of her house. It was a tree. She listened as the branches and leaves cleared themselves and went on downstream, leaving only the rain and the lappings of the flood, sounds so constant now that they seemed a part of the silence. Huddled on the bed, she was almost asleep again when another cry sounded, this time so close it could have been in the room. Staring into the dark, she eased back on the bed until her hand caught the cold shape of the rifle. Then crouched on the pillow, she cradled the gun across her knees. “Who’s there?” she called.

The answer was a repeated cry, but less shrill, tired sounding, then the empty silence closing in. She drew back against the bed. Whatever was there she could hear it moving about on the porch. Planks creaked and she could distinguish the sounds of objects being knocked over. There was a scratching on the wall as if it would tear its way in. She knew now what it was, a big cat, deposited by the uprooted tree that had passed her. It had come
with the flood, a gift.

Unconsciously she pressed her hand against her face and along her tightened throat. The rifle rocked across her knees. She had never seen a panther in her life. She had heard about them from others and heard their cries, like suffering, in the distance. The cat was scratching on the wall again, rattling the window by the door. As long as she guarded the window and kept the cat hemmed in by the wall and water, caged, she would be all right. Outside, the animal paused to rake his claws across the rusted outer screen. Now and then, it whined and growled.

When the light filtered down through the rain at last, coming like another kind of dark, she was still sitting on the bed, stiff and cold. Her arms, used to rowing on the river, ached from the stillness of holding the rifle. She had hardly allowed herself to move for fear any sound might give strength to the cat. Rigid, she swayed with the movement of the house. The rain still fell as if it would never stop. Through the grey light, finally, she could see the rain-pitted flood and far away the cloudy shape of drowned treetops. The cat was not moving now. Maybe he had gone away. Laying the gun aside she slipped off the bed and moved without a sound to the window. It was still there, crouched at the edge of the porch, staring up at the live oak, the mooring of her house, as if gauging its chances of leaping to an overhanging branch. It did not seem so frightening now that she could see it, its coarse fur napped into twigs, its sides pinched and ribs showing. It would be easy to shoot it where it sat, its long tail whipping back and forth. She was moving back to get the gun when it turned around. With no warning, no crouch or tensing of muscles, it sprang at the window, shattering a pane of glass. She fell back, stifling a scream, and taking up the rifle, she fired through the window. She could not see the panther now, but she had missed. It began to pace again. She could glimpse its head and the arch of its back as it passed the window.

Shivering, she pulled back on the bed and lay down. The lulling constant sound of the river and the rain, the penetrating chill, drained away her purpose. She watched the window and kept the gun ready. After waiting a long while she moved again to look. The panther had fallen asleep, its head on its paws, like a housecat. For the first time since the rains began she wanted to cry, for herself, for all the people, for everything in the flood. Sliding down on the bed, she pulled the quilt around her shoulders. She should have got out when she could, while the roads were still open or before her boat was washed away. As she rocked back and forth with the sway of the house a deep ache in her stomach reminded her she hadn’t eaten. She couldn’t remember for how long. Like the cat, she was starving. Easing into the kitchen, she made a fire with the few remaining sticks of wood. If the flood lasted she would have to burn the chair, maybe even the table itself. Taking down the remains of a smoked ham from the ceiling, she cut thick slices of the brownish red meat and placed them in a skillet. The smell of the frying meat made her dizzy. There were stale biscuits from the last time she had cooked and she could make some coffee. There was plenty of water.

While she was cooking her food, she almost forgot about the cat until it whined. It was hungry too. “Let me eat,” she called to it, “and then I’ll see to you.” And she laughed under her breath. As she hung the rest of the ham back on its nail the cat growled a deep throaty rumble that made her hand shake.

After she had eaten, she went to the bed again and took up the rifle. The house had risen so high now it no longer scraped across the bluff when it swung back from the river. The food had warmed her. She could get rid of the cat while light still hung in the rain. She crept slowly to the window. It was still there, mewing, beginning to move about the porch. She stared at it a long time, unafraid. Then without thinking what she was doing, she laid the gun aside and started around the edge of the bed to the kitchen. Behind her the cat was moving,
fretting. She took down what was left of the ham and making her way back across the swaying floor to the window she shoved it through the broken pane. On the other side there was a hungry snarl and something like a shock passed from the animal to her. Stunned by what she had done, she drew back to the bed. She could hear the sounds of the panther tearing at the meat. The house rocked around her.

The next time she awoke she knew at once that everything had changed. The rain had stopped. She felt for the movement of the house but it no longer swayed on the flood. Drawing her door open, she saw through the torn screen a different world. The house was resting on the bluff where it always had. A few feet down, the river still raced on in a torrent, but it no longer covered the few feet between the house and the live oak. And the cat was gone. Leading from the porch to the live oak and doubtless on into the swamp were tracks, indistinct and already disappearing into the soft mud. And there on the porch, gnawed to whiteness, was what was left of the ham.

Use the story “The Gift” on the previous pages to answer the questions which follow. (Note that line numbers are given in the margin of the story to help you find parts which are referred to in the questions.)

**Question 1: THE GIFT**

Here is part of a conversation between two people who read “The Gift”:

I think the woman in the story is heartless and cruel.

How can you say that? I think she’s a very compassionate person.

Give evidence from the story to show how each of these speakers could justify their point of view.

*Speaker 1*

____________________________________________________________________

*Speaker 2*

____________________________________________________________________
Teacher’s Notes:

Question intent: Reflect and evaluate

Text format: Continuous

Scoring

**Fully Correct:** Answers scored as “Correct” for Speaker 1 AND Speaker 2

(Speaker 1 – “heartless and cruel”)

**Correct**

Answers which provide evidence from the story to support the idea that the woman is heartless and cruel. May refer to her intention to shoot the panther, or to the fact that she actually shoots at the panther. May use quotation or close paraphrase from the story.

**Incorrect**

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.

(Speaker 2 – “compassionate”)

**Correct**

Answers which provide evidence from the story to support the idea that the woman is compassionate. May refer to her action in feeding the panther, or to suggestions about her capacity for compassion towards the panther or more generally. May use quotation or close paraphrase from the story.

**Incorrect**

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.
Comments

As the easiest among the reflection and evaluation tasks associated with The Gift, this task requires students to make comparisons and connections between the text and outside knowledge, drawing on their personal experience and attitudes. In order to gain credit for this task, a connection has to be made between the behaviour of a character in the story and personal values, by drawing on ideas about compassion and cruelty and using evidence from the text.

This task is marked using the full-credit / partial credit rule, and therefore yields two levels of difficulty. To receive partial credit (Level 2), the student needs to find evidence of either compassion or cruelty in the story. For full credit (Level 3), the student needs to find evidence of both compassion and cruelty. The full-credit score reflects the ability to deal with contrary concepts or ambiguities, a capacity associated with proficiency higher than that typically found at Level 2.
**Quest 2: THE GIFT**

What is the woman's situation at the beginning of the story?

A  She is too weak to leave the house after days without food.
B  She is defending herself against a wild animal.
C  Her house has been surrounded by flood waters.
D  A flooded river has swept her house away.

**Teacher's Notes:**

**Question intent:** Interpreting text

**Text format:** Continuous

**Scoring**

*Correct*

Answer C. Her house has been surrounded by flood waters.

*Incorrect*

Other responses.
**Question 3: THE GIFT**

Here are some of the early references to the panther in the story.

“the cry awoke her, a sound so anguished…” (line 32)

“The answer was a repeated cry, but less shrill, tired sounding…” (line 44)

“She had…heard their cries, like suffering, in the distance.” (lines 52–53)

Considering what happens in the rest of the story, why do you think the writer chooses to introduce the panther with these descriptions?

**Teacher’s Notes:**

**Question intent: Interpreting text**

**Text format: Continuous**

**Scoring**

**Fully Correct**

Answers which recognize that the descriptions are intended to evoke pity. Reference to writer’s intention or effect on the reader may be stated or implied. Reference to what happens in the rest of the story may be stated or implied. May suggest that:

the descriptions quoted link the panther with the woman (or humans generally) in suffering;

OR

the descriptions quoted prepare for the woman’s later compassionate behavior towards the panther;

OR

the panther is presented as an object of compassion.
**Partially correct**

Answers which refer to possible intentions (or effects) of the quoted descriptions, other than that of evoking pity. Comment is consistent with comprehension of the text. Reference to writer’s intention or effect on the reader may be stated or implied. References to what happens in the rest of the story may be stated or implied. May refer to:

the intention/effect of creating suspense or mystery (Note that such terms as “frightening” and “scary” are considered to show lack of comprehension of the quoted descriptions; and “interesting”, “easy to read” and “clear” are not considered to be adequately specific); OR the idea that the panther is presented from the woman’s point of view.

Answers which refer to the literal information given in the quoted descriptions. Comment is consistent with comprehension of the text. Reference to writer’s intention or effect on the reader may be stated or implied. References to what happens in the rest of the story may be stated or implied. May refer to:

the realistic depiction of the panther;

OR

the way the descriptions fit with the literal setting and situation.

**Incorrect**

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.

**Comments**

For full credit, the task requires the reader to construe the meaning of language containing nuances while dealing with ideas that are contrary to expectation. The reader needs to negotiate a text whose discourse structure is not clearly marked, in order to discern the relationship of specific parts of the text (indicated in the question) to its implicit theme.

The text deliberately creates ambiguity through ideas that are contrary to expectation. Although the main response of the woman when she realize there is a panther nearby is fear, the carefully chosen descriptions of the panther’s cries – ‘anguished’, ‘tired-sounding’ and ‘suffering’- suggest pathos rather than threat. This hint, near the beginning of the story, is important for a full understanding of the woman’s ‘unexpected’ behavior at the end, and hence to an understanding of the story’s implicit theme. Thus, to receive full credit, students must recognize that the descriptions are intended to evoke pity.

Partial credit is given for answers that treat the text at a more straightforward level, linking the phrases high-lighted in the question with the plot. Students may refer to possible intentions (or effects) of the quoted descriptions, other than that of evoking pity. At this level the task is to follow implicit logical links between sentences by inferring that the panther is crying because it is hungry. A second kind of response receiving partial credit brings together different parts of the text so as to identify a main idea. This kind of response identifies the atmosphere of the story at this point. Students may refer to the literal information given in the quoted descriptions.
Question 4: THE GIFT

"Then creaking and groaning with effort the house struggled up …" (line 24)

What happened to the house in this part of the story?

A  It fell apart.
B  It began to float.
C  It crashed into the oak tree.
D  It sank to the bottom of the river.

Teacher’s Notes:

Question intent: Access and retrieve

Text format: Continuous

Scoring

Correct

Answer B. It began to float.

Incorrect

Other responses.

Comments

For this task, the reader needs to locate a piece of explicitly stated information in a short section of text and match it to one of four alternatives stated in the question.

Although the whole text is long, for this task the section of text that the reader needs to refer to is short and is very clearly marked in the question by being quoted directly. The correct answer, ‘It began to float’ uses a word directly matching a word closely following the quoted section: ‘Then creaking and groaning with effort the house struggled up from the clay, floated free…’
Question 5: THE GIFT

What does the story suggest was the woman’s reason for feeding the panther?

Teacher's Notes:

Question intent: Integrate and interpret

Text format: Continuous

Scoring

Correct

Recognizes the implication that the woman is motivated by pity or empathy towards the panther. May also mention that the woman does not consciously understand her own motivation. OR

Recognizes that the story does not explicitly explain the woman’s motivation and/or that she does not consciously understand it. OR

Recognizes the panther’s physical need for food or help, without referring to the woman’s motivation.

Incorrect

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.
Question 6: THE GIFT

When the woman says, “and then I’ll see to you” (line 92) she means that she is

A  sure that the cat won’t hurt her.
B  trying to frighten the cat.
C  intending to shoot the cat.
D  planning to feed the cat.

Teacher’s Notes:

Question intent: Integrate and interpret

Text format: Continuous

Scoring

Correct

Answer C. intending to shoot the cat.

Incorrect

Other responses.

Comments

This task requires a high level of text-based inference in order to construe the meaning of a section of text in context, dealing with ambiguities and that may be contrary to expectation. The reader needs to infer psychological meaning, following thematic links over several paragraphs, in deciding which of the four alternatives is the best answer.
**Question 7: THE GIFT**

Do you think that the last sentence of “The Gift” is an appropriate ending?

Explain your answer, demonstrating your understanding of how the last sentence relates to the story’s meaning.

---

**Teacher’s Notes:**

**Question intent:** Reflect and evaluate

**Text format:** Continuous

**Scoring**

**Fully Correct**

Answers which go beyond a literal interpretation of the story while interpreting it in a way which is consistent with accurate literal comprehension. Evaluates the ending in terms of thematic completeness, by relating the last sentence to central relationships, issues or metaphors in the story. Answer may refer, for example, to the relationship between the panther and the woman; to survival; or to a gift or thanks. Opinion about appropriateness may be stated or implied.

Answers which go beyond a literal interpretation of the story while interpreting it in a way which is consistent with accurate literal comprehension. Evaluates the ending in terms of style or mood, by relating the last sentence to the general style or mood of the rest of the story. Opinion about appropriateness may be stated or implied.

**Partially Correct**

Answers which respond at a literal level, in a way which is consistent with accurate literal comprehension of the story. Evaluates the ending in terms of narrative sequence, by relating the last sentence to explicit events, (e.g. the cat having eaten the meat; the visit of the panther to the house; the subsiding of the flood). Opinion about appropriateness may be stated or implied.

**Incorrect**

Answers which show inaccurate comprehension of the material or are implausible or irrelevant.
The science assessment seeks to measure an individual's scientific knowledge and use of that knowledge to identify questions, to acquire new knowledge, to explain scientific phenomena, and to draw evidence based conclusions about science related issues, understanding of the characteristic features of science as a form of human knowledge and enquiry, awareness of how science and technology shape our material, intellectual, and cultural environments, and willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.

On the following pages are selections of questions that show what can be expected during the science assessment. Questions in PISA cover a wide range of topics and levels of difficulty in order to allow the survey to measure the range of abilities of students as well as to draw comparisons internationally. The tasks are taken from PISA items released by the OECD for public use. Copyright remains with the OECD.
## Levels of difficulty for Science

<table>
<thead>
<tr>
<th>Level</th>
<th>What students can typically do on the science scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>At <strong>Level 6</strong>, 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 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.</td>
</tr>
<tr>
<td>5</td>
<td>At <strong>Level 5</strong>, 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.</td>
</tr>
<tr>
<td>4</td>
<td>At <strong>Level 4</strong>, 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.</td>
</tr>
<tr>
<td>3</td>
<td>At <strong>Level 3</strong>, 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.</td>
</tr>
<tr>
<td>2</td>
<td>At <strong>Level 2</strong>, 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.</td>
</tr>
<tr>
<td>1</td>
<td>At <strong>Level 1</strong>, students have such a limited scientific knowledge it can only be applied to a few, familiar situations. They can present scientific explanations that are obvious and follow explicitly from given evidence.</td>
</tr>
</tbody>
</table>

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2 Levels of difficulty as defined by PISA and the assessment of student’s ability
Regular but moderate physical exercise is good for our health.

What happens when muscles are exercised? Circle “Yes” or “No” for each statement.

<table>
<thead>
<tr>
<th>Does this happen when muscles are exercised?</th>
<th>Yes or No?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscles get an increased flow of blood.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Fats are formed in the muscles.</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>

**Teacher’s Notes:**

**Scoring**

**Full Credit:** Both correct: Yes, No, in that order.

**Comment:**

For this question, to gain credit a student has to correctly recall knowledge about the operation of muscles and about the formation of fat in the body, i.e. students must have knowledge of the science fact that active muscles get an increased flow of blood and that fats are not formed when muscles are exercised. This enables the student to accept the first explanation of this complex multiple-choice question and reject the second explanation. The two simple factual explanations contain in the question are not related to each other. Each is accepted or rejected as an effect of the excercise of muscles and the knowledge has widespread currency. Consequently the question is located at Level 1.
THE HISTORY OF VACCINATION

Mary Montagu was a beautiful woman. She survived an attack of smallpox in 1715 but she was left covered with scars. While living in Turkey in 1717, she observed a method called inoculation that was commonly used there. This treatment involved scratching a weak type of smallpox virus into the skin of healthy young people who then became sick, but in most cases only with a mild form of the disease.

Mary Montagu was so convinced of the safety of these inoculations that she allowed her son and daughter to be inoculated.

In 1796, Edward Jenner used inoculations of a related disease, cowpox, to produce antibodies against smallpox. Compared with the inoculation of smallpox, this treatment had less side effects and the treated person could not infect others. The treatment became known as vaccination.

Question 1: MARY MONTAGU

What kinds of diseases can people be vaccinated against?

A. Inherited diseases like haemophilia.
B. Diseases that are caused by viruses, like polio.
C. Diseases from the malfunctioning of the body, like diabetes.
D. Any sort of disease that has no cure.

Teacher’s Notes:

Scoring

Full Credit: B. Diseases that are caused by viruses, like polio.

Comments

To gain credit the student must recall a specific piece of knowledge that vaccination helps prevent diseases, the cause for which is external to normal body components. This fact is then applied in the selection of the correct explanation and the rejection of other explanations. The term “virus” appears in the stimulus text and provides a hint for students. This lowered the difficulty of the question. Recalling an appropriate, tangible scientific fact and its application in a relatively simple context locates the question at Level 2.
Question 3: MARY MONTAGU

Give one reason why it is recommended that young children and old people, in particular, should be vaccinated against influenza (flu).

Teacher’s Notes:

Scoring

Full Credit:
Responses referring to young and/or old people having weaker immune systems than other people, or similar. For example:

- These people have less resistance to getting sick.
- The young and old can’t fight off disease as easily as others.
- They are more likely to catch the flu.
- If they get the flu the effects are worse in these people.
- Because organisms of young children and older people are weaker.
- Old people get sick more easily.

Comments

This question requires the student to identify why young children and old people are more at risk of the effects of influenza than others in the population. Directly, or by inference, the reason is attributed to young children and old people having weaker immune systems. The issue is community control of disease, so the setting is social. A correct explanation involves applying several pieces of knowledge that are well established in the community. The question stem also provides a cue to the groups having different resistance to disease. This puts the question at Level 3.
Question S3: The Greenhouse Effect

Read the texts and answer the questions that follow.

THE GREENHOUSE EFFECT: FACT OR FICTION?

Living things need energy to survive. The energy that sustains life on the Earth comes from the Sun, which radiates energy into space because it is so hot. A tiny proportion of this energy reaches the Earth.

The Earth’s atmosphere acts like a protective blanket over the surface of our planet, preventing the variations in temperature that would exist in an airless world.

Most of the radiated energy coming from the Sun passes through the Earth’s atmosphere. The Earth absorbs some of this energy, and some is reflected back from the Earth’s surface. Part of this reflected energy is absorbed by the atmosphere.

As a result of this the average temperature above the Earth’s surface is higher than it would be if there was no atmosphere. The Earth’s atmosphere has the same effect as a greenhouse, hence the term greenhouse effect.

The greenhouse effect is said to have become more pronounced during the twentieth century.

It is a fact that the average temperature of the Earth’s atmosphere has increased. In newspapers and periodicals the increased carbon dioxide emission is often stated as the main source of the temperature rise in the twentieth century.

A student named André becomes interested in the possible relationship between the average temperature of the Earth’s atmosphere and the carbon dioxide emission on the Earth.
In a library he comes across the following two graphs.

André concludes from these two graphs that it is certain that the increase in the average temperature of the Earth’s atmosphere is due to the increase in the carbon dioxide emission.
Question 1: GREENHOUSE

Another student, Jeanne, disagrees with André’s conclusion. She compares the two graphs and says that some parts of the graphs do not support his conclusion.

Give an example of a part of the graphs that does not support André’s conclusion. Explain your answer.

Teacher’s Notes:

Scoring:

Full Credit:

Refers to one particular part of the graphs in which the curves are not both descending or both climbing and gives the corresponding explanation. For example:

- In 1900–1910 (about) CO2 was increasing, whilst the temperature was going down.
- The temperature in the 1800s is much the same but the first graph keeps climbing.
- Between 1950 and 1980 the temperature didn’t increase but the CO2 did.
- From 1940 until 1975 the temperature stays about the same but the carbon dioxide emission shows a sharp rise.
- In 1940 the temperature is a lot higher than in 1920 and they have similar carbon dioxide emissions.

Partial Credit:

Mentions a correct period, without any explanation. For example:

- 1930–1933.
- before 1910.

Mentions only one particular year (not a period of time), with an acceptable explanation. For example:

- In 1980 the emissions were down but the temperature still rose.
Gives an example that doesn’t support André’s conclusion but makes a mistake in mentioning the period. [Note: There should be evidence of this mistake – e.g. an area clearly illustrating a correct answer is marked on the graph and then a mistake made in transferring this information to the text.] For example:

- Between 1950 and 1960 the temperature decreased and the carbon dioxide emission increased.

Refers to differences between the two curves, without mentioning a specific period. For example:

- At some places the temperature rises even if the emission decreases.
- Earlier there was little emission but nevertheless high temperature.
- When there is a steady increase in graph 1, there isn’t an increase in graph 2, it stays constant. [Note: It stays constant “overall”,]
- Because at the start the temperature is still high where the carbon dioxide was very low.

Refers to an irregularity in one of the graphs. For example:

- It is about 1910 when the temperature had dropped and went on for a certain period of time.
- In the second graph there is a decrease in temperature of the Earth’s atmosphere just before 1910.
- Indicates difference in the graphs, but explanation is poor. For example:
- In the 1940s the heat was very high but the carbon dioxide very low. [Note: The explanation is very poor, but the difference that is indicated is clear.]

**Comments**

An example from GREENHOUSE centres on the competency using scientific evidence and asks students to identify a portion of a graph that does not provide evidence supporting a conclusion. This question requires the student to look for specific differences that vary from positively correlated general trends in these two graphical datasets.

Students must locate a portion where curves are not both ascending or descending and provide this finding as part of a justification for a conclusion. As a consequence it involves a greater amount of insight and analytical skill than is required for Question 3. Rather than a generalisation about the relation between the graphs, the student is asked to accompany the nominated period of difference with an explanation of that difference in order to gain full credit.

The ability to effectively compare the detail of two datasets and give a critique of a given conclusion locates the full credit question at Level 5 of the scientific literacy scale. If the student understands what the question requires of them and correctly identifies a difference in the two graphs, but is unable to explain this difference, the student gains partial credit for the question and is identified at Level 4 of the scientific literacy scale.
Question 2: GREENHOUSE

André persists in his conclusion that the average temperature rise of the Earth’s atmosphere is caused by the increase in the carbon dioxide emission. But Jeanne thinks that his conclusion is premature. She says: “Before accepting this conclusion you must be sure that other factors that could influence the greenhouse effect are constant”.

Name one of the factors that Jeanne means.

Teacher’s Notes:

Scoring

Full Credit:

Gives a factor referring to the energy/radiation coming from the Sun. For example:
• The sun heating and maybe the earth changing position.
• Energy reflected back from Earth. [Assuming that by “Earth” the student means “the ground”.

Gives a factor referring to a natural component or a potential pollutant. For example:
• Water vapour in the air.
• Clouds.
• The things such as volcanic eruptions.
• Atmospheric pollution (gas, fuel).
• The amount of exhaust gas.
• CFC’s.
• The number of cars.
• Ozone (as a component of air). [Note: for references to depletion, use Code 03.]
Question 3 of GREENHOUSE is an example of Level 6 and of the competency explaining phenomena scientifically. In this question, students must analyse a conclusion to account for other factors that could influence the greenhouse effect. This question combines aspects of the two competencies identifying scientific issues and explaining phenomena scientifically.

The student needs to understand the necessity of controlling factors outside the change and measured variables and to recognise those variables. The student must possess sufficient knowledge of "Earth systems" to be able to identify at least one of the factors that should be controlled. The latter criterion is considered the critical scientific skill involved so this question is categorised as explaining phenomena scientifically. The effects of this environmental issue are global, which defines the setting.

As a first step in gaining credit for this question the student must be able to identify the change and measured variables and have sufficient understanding of methods of investigation to recognise the influence of other factors. However, the student also needs to recognise the scenario in context and identify its major components. This involves a number of abstract concepts and their relationships in determining what “other” factors might affect the relationship between the Earth’s temperature and the amount of carbon dioxide emissions into the atmosphere. This locates the question near the boundary between Level 5 and 6 in the explaining phenomena scientifically category.
The mathematics assessment seeks to measure the student’s capacity to analyse, reason and communicate effectively as they pose, solve and interpret mathematical problems in a variety of situations that involve quantity, space, probability and other mathematical concepts. In particular, the maths assessment focuses on the following areas and concepts:

- Quantity
- Space and shape
- Change and relationships
- Uncertainty

On the following pages are selections of questions that show what can be expected during the maths assessment. Questions in PISA cover a wide range of topics and levels of difficulty in order to allow the survey to measure the range of abilities of students as well as to draw comparisons internationally. Details of the level of difficulty and what proportion of students answered the question correctly are included for reference. The tasks are taken from PISA items released by the OECD for public use. Copyright remains with the OECD.
Levels of difficulty for Mathematics

<table>
<thead>
<tr>
<th>Level</th>
<th>What students can typically do on the science scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>At Level 6 students can conceptualise, generalise and utilise information based on their investigations and modelling of complex problem situations. They can link different information sources and representations and flexibly translate between 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 attacking novel situations. Students at this level can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, and the appropriateness of these to the original situations.</td>
</tr>
<tr>
<td>5</td>
<td>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, appropriately linked representations, symbolic and formal characterisations, and insight pertaining to these situations. They can reflect on their actions and formulate and communicate their interpretations and reasoning.</td>
</tr>
<tr>
<td>4</td>
<td>At Level 4 students can work effectively with explicit models for 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 utilize well-developed skills and reason flexibly, with some insight, in these contexts. They can construct and communicate explanations and arguments based on their interpretations, arguments and actions.</td>
</tr>
<tr>
<td>3</td>
<td>At Level 3 students can execute clearly described procedures, including those that require sequential decisions. They can select and apply simple problem-solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They can develop short communications reporting their interpretations, results and reasoning.</td>
</tr>
<tr>
<td>2</td>
<td>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. They are capable of direct reasoning and literal interpretations of the results.</td>
</tr>
<tr>
<td>1</td>
<td>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 to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are obvious and follow immediately from the given stimuli.</td>
</tr>
</tbody>
</table>

3 Levels of difficulty as defined by PISA and the assessment of student’s ability
Question M1: Exchange Rate

Mei-Ling from Singapore was preparing to go to South Africa for 3 months as an exchange student. She needed to change some Singapore dollars (SGD) into South African rand (ZAR).

Mei-Ling found out that the exchange rate between Singapore dollars and South African rand was:

1 SGD = 4.2 ZAR

Mei-Ling changed 3000 Singapore dollars into South African rand at this exchange rate.

How much money in South African rand did Mei-Ling get?

Answer: ..................................................

Teacher’s Notes:

Scoring

Full Credit: 12 600 ZAR (unit not required).

Comments

This short open-constructed response item is situated in a public context. Experience in using exchange rates may not be common to all students, but the concept can be seen as belonging to skills and knowledge for citizenship. The mathematics content is restricted to just one of the four basic operations: multiplication. This places the item in the quantity area, and more specifically, in operations with numbers. As far as the competencies are concerned, a very limited form of mathematisation is needed for understanding a simple text and linking the given information to the required calculation. All the required information is explicitly presented. Thus the competency needed to solve this problem can be described as the performance of a routine procedure and/or application of a standard algorithm. The combination of a familiar context, a clearly defined question and a routine procedure places the item at Level 1.
Question M2: Staircase

The diagram below illustrates a staircase with 14 steps and a total height of 252 cm:

What is the height of each of the 14 steps?

Height: ..................................................... cm.

Teacher’s Notes:

Scoring

Full Credit: 18

Comments

This short open-constructed response item is situated in a daily life context for carpenters and is therefore classified as having an occupational context. One does not need to be a carpenter to understand the relevant information; it is clear that an informed citizen should be able to interpret and solve a problem like this that uses two different representation modes: language, including numbers, and a graphical representation. But the illustration serves a simple and non-essential function: students know what stairs look like. This item is noteworthy because it has redundant information (the depth is 400 cm) that is sometimes considered to be confusing by students; but such redundancy is common in real-world problem solving. The context of the stairs places the item in the space and shape content area, but the actual procedure to carry out is simple division. All the required information, and even more than that, is presented in a recognisable situation, and the students can extract the relevant information from a single source. In essence, the item makes use of a single representational mode, and with the application of a basic algorithm, this item fits, although barely, at Level 2.
Question M3: Growing Up

In 1998 the average height of both young males and young females in the Netherlands is represented in this graph.

According to this graph, on average, during which period in their life are females taller than males of the same age?

Answer: ..............................................
Teacher’s Notes:

Scoring

Full Credit: Responses giving the correct interval (from 11 to 13 years) or stating that girls are taller than boys when they are 11 and 12 years old.

Comments

This item, with its focus on age and height, lies in the change and relationships content area, and has a difficulty of 420 (Level 1). The students are asked to compare characteristics of two datasets, interpret these datasets and draw conclusions. The competencies needed to successfully solve the problem involve the interpretation and decoding of reasonably familiar and standard representations of well-known mathematical objects. Students need thinking and reasoning competencies to answer the question: “Where do the graphs have common points?” and argumentation and communication competencies to explain the role these points play in finding the desired answer. Students who score partial credit are able to show well-directed reasoning and/or insight, but they fail to come up with a full, comprehensive answer. They properly identify ages 11 and/or 12 and/or 13 as being part of an answer but fail to identify the continuum from 11 to 13 years. The item provides a good illustration of the boundary between Level 1 and Level 2. The full credit response to this item illustrates Level 3, as it has a difficulty of 525 score points. Students who score full credit not only show well-directed reasoning and/or insight, but they also come up with a full, comprehensive answer. Students who solve the problem successfully are adept at using graphical representations, making conclusions and communicating their findings.
Question M4: Exchange Rate

During these 3 months the exchange rate had changed from 4.2 to 4.0 ZAR per SGD.

Was it in Mei-Ling’s favour that the exchange rate now was 4.0 ZAR instead of 4.2 ZAR, when she changed her South African rand back to Singapore dollars? Give an explanation to support your answer.

Answer: ..................................................

Teacher’s Notes:

Scoring

Full Credit: Yes, with adequate explanation.

Comments

This open-constructed response item is situated in a public context. As far as the mathematics content is concerned students need to apply procedural knowledge involving number operations: multiplication and division, which along with the quantitative context, place the item in the quantity area. The competencies needed to solve the problem are not trivial. Students need to reflect on the concept of exchange rate and its consequences in this particular situation. The mathematisation required is of a rather high level, although all the required information is explicitly presented: not only is the identification of the relevant mathematics somewhat complex, but the reduction of it to a problem within the mathematical world also places significant demands on the student. The competency needed to solve this problem can be described as using flexible reasoning and reflection. Explaining the results requires some communication skills as well. The combination of familiar context, complex situation, non-routine problem and the need for reasoning, insight and communication places the item at Level 4.
The diagram below shows the results on a Science test for two groups, labelled as Group A and Group B. The mean score for Group A is 62.0 and the mean for Group B is 64.5. Students pass this test when their score is 50 or above.

Looking at the diagram, the teacher claims that Group B did better than Group A in this test. The students in Group A don’t agree with their teacher. They try to convince the teacher that Group B may not necessarily have done better.

Give one mathematical argument, using the graph, that the students in Group A could use.

Answer: ........................................
Teacher's Notes:

Scoring

Full credit:

One valid argument is given. Valid arguments could relate to the number of students passing, the disproportionate influence of the outlier, or the number of students with scores in the highest level.

- More students in Group A than in Group B passed the test.
- If you ignore the weakest Group A student, the students in Group A do better than those in Group B.
- More Group A students than Group B students scored 80 or over.

Comments

This open-constructed response item is situated in an educational context. The educational context of this item is one that all students are familiar with: comparing test scores. In this case a science test has been administered to two groups of students: A and B. The results are given to the students in two different ways: in words with some data embedded and by means of two graphs in one grid. Students must find arguments that support the statement that Group A actually did better than Group B, given the counter-argument of one teacher that Group B did better – on the grounds of the higher mean for Group B. The item falls into the content area of uncertainty. Knowledge of this area of mathematics is essential, as data and graphical representations play a major role in the media and in other aspects of daily experiences. The students have a choice of at least three arguments here: the first one is that more students in Group A pass the test; a second one is the distorting effect of the outlier in the results of Group A; and a final argument is that Group A has more students that scored 80 or above. Students who are successful have applied statistical knowledge in a problem situation that is somewhat structured and where the mathematical representation is partially apparent. They need reasoning and insight to interpret and analyse the given information, and they must communicate their reasons and arguments. Therefore the item clearly illustrates Level 5.
Question M6: Carpenter

A carpenter has 32 metres of timber and wants to make a border around a garden bed. He is considering the following designs for the garden bed.

Circle either “Yes” or “No” for each design to indicate whether the garden bed can be made with 32 metres of timber.

<table>
<thead>
<tr>
<th>Garden bed design</th>
<th>Using this design, can the garden bed be made with 32 metres of timber?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design A</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Design B</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Design C</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Design D</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>
**Teacher's Notes:**

**Scoring**

Full Credit: Yes, No, Yes, Yes, in that order.

**Comments**

This complex multiple-choice item is situated in an educational context, since it is the kind of quasi-realistic problem that would typically be seen in a mathematics class, rather than being a genuine problem likely to be met in an occupational setting. A small number of such problems have been included in PISA, though they are not typical. That being said, the competencies needed for this problem are certainly relevant and part of mathematical literacy. The item belongs to the space and shape content area. The students need the competence to recognise that the two-dimensional shapes A, C and D have the same perimeter, and therefore they need to decode the visual information and see similarities and differences. The students need to see whether or not a certain border-shape can be made with 32 metres of timber. In three cases this is rather evident because of the rectangular shapes. But the fourth is a parallelogram, requiring more than 32 metres. This use of geometrical insight, argumentation skills and some technical geometrical knowledge puts this item at Level 6.
Related Links

Research and Development Department:

www.research.gov.mt

PISA website:

http://www.oecd.org/pisa/

Additional PISA released items may be accessed at:

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Science:


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Ministry for Education and Employment

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