

Examples of Mathematics Items used in PISA 2022 Assessment

All PISA assessments are computer-based and utilise interactive elements to enhance students' testing experience.

Unit: *Triangular Pattern*

In this unit's scenario, students are presented with a series of items related to a drawing a person has made of rows using alternating red and blue triangles. The stimulus shows the first four rows of the pattern, and this same image is repeated in the stimulus of all three items in the unit.

Item 2	Content Area	Change and Relationships
	Process	Formulate
	Difficulty	Level 2

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Triangular Pattern
Question 2 / 3

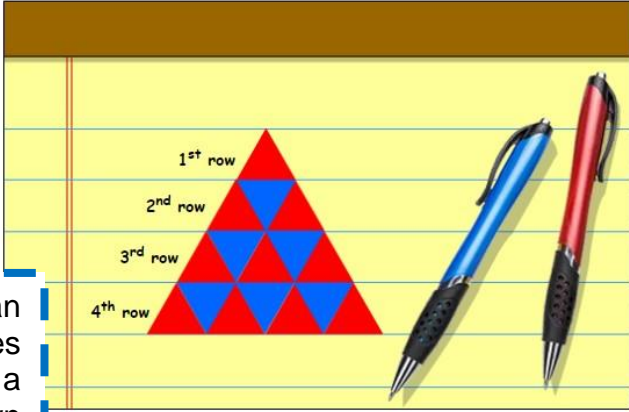
Refer to "Triangular Pattern" on the right. Click on a choice to answer the question.

If Alex were to extend the pattern to a fifth row, what would be the percentage of blue triangles in all five rows of the pattern?

40.0%
 50.0%
 60.0%
 66.7%

TRIANGULAR PATTERN

Alex drew the following pattern of red and blue triangles.
The first four rows of the pattern are shown below.



This item tests the ability to formulate an approach to solve a problem. It requires students to recognise and extend a pattern and decompose or break down the diagram into rows to compute the percentages. Pattern recognition and decomposition are aspects of computational thinking skills that students learn through mathematics.

Item 3	Content Area	Change and Relationships
	Process	Reasoning
	Difficulty	Level 5

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Triangular Pattern
Question 3 / 3

Refer to "Triangular Pattern" on the right. Click on a choice and then type an explanation to answer the question.

Alex is going to add more rows to his pattern.

He claims that the percentage of blue triangles in the pattern will always be less than 50%.

Is Alex correct?

Yes

No

Explain your answer.

TRIANGULAR PATTERN

Alex drew the following pattern of red and blue triangles.

The first four rows of the pattern are shown below.

This item requires students to reason that there will always be more red than blue triangles in the pattern (and hence the percentage of blue is less than 50%) without the need to derive a complex formula. This can be done in different ways – one way is to see that there is always one more red than blue in each row.

Unit: Solar System

In this unit's scenario, students need to determine which three planets have the average distances in Astronomical Units (au) between them that are shown in the model.

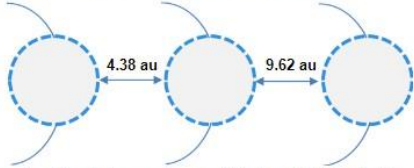
Item 1	Content Area	Quantity
	Process	Interpret/Evaluate
	Difficulty	Level 3

PISA 2022


Solar System
Question 1 / 2

Refer to "Solar System" on the right. Use drag and drop to answer the question.

The following model shows the average distances between three planets. (Planets and model not drawn to scale.)



Based on the distances given, which planets belong in the model? Drag the correct three planets in the correct order. To change an answer, first drag the previous planet out.



SOLAR SYSTEM

The table below shows the average distance from the Sun to the primary planets in Astronomical Units (au).

1 au is approximately 150 million kilometres.

Planet	Average distance from Sun in au
Mercury	0.39
Venus	0.72
Earth	1.00
Mars	1.52
Jupiter	5.20
Saturn	9.58
Uranus	19.20
Neptune	30.05

Students will need to drag-and-drop the planets into the model.

This item requires students to sense-make and interpret the information given, and evaluate the distance between planets using the distances of the planets from the Sun in the table.

Item 2	Content Area	Quantity
	Process	Employ
	Difficulty	Level 2

PISA 2022

Solar System
Question 2 / 2

Refer to "Solar System" on the right. Click on a choice to answer the question.

On average, approximately how many million kilometres from the Sun is the planet Neptune?

5 million km
 30 million km
 180 million km
 4500 million km

SOLAR SYSTEM

The table below shows the average distance from the Sun to the primary planets in Astronomical Units (au).

1 au is approximately 150 million kilometres.

Planet	Average distance from Sun in au
Mercury	0.39
Venus	0.72
Earth	1.00
Mars	1.52
Jupiter	5.20
Saturn	9.58
Uranus	19.20
Neptune	30.05

This item requires students to use proportional reasoning to convert an unfamiliar unit (i.e., Astronomical Unit) to a known unit, using information from the source.

Unit: Forested Area

Students are presented with some background information about the context of the unit – that the amount of forested area in a country can change over time.

Item 1	Content Area	Uncertainty and Data
	Process	Formulate
	Difficulty	Level 5

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Forested Area
 Question 1 / 4

▶ How to Use the Spreadsheet

Refer to "Forested Area" on the right. Use the spreadsheet to help you answer the question below. Select from the drop-down menus to answer each question.

In the table below, answer each question by selecting a country from the corresponding drop-down menu.

Question	Country
In terms of percentage points, which country had the greatest gain between 2005 and 2015?	Select ▼
Which country had no overall change between 2005 and 2015?	Select ▼
In terms of percentage points, which country had the greatest loss between 2005 and 2015?	Select ▼

FORESTED AREA

The spreadsheet below shows the amount of forested area as a percentage of the total land area in each of the 15 countries in this data set. Data are shown for the years 2005, 2010, and 2015.

Column A	Column B	Column C	Column D	Column E	Column F	Column G
Country	2005	2010	2015	↺ ×	↺ ×	↺ ×
Greece	29.11	30.28	31.45	2.34		
India	22.77	23.47	23.77	1.00		
United States	33.26	33.7	33.85	0.59		
Thailand	31.51	31.81	32.1	0.59		
Algeria	0.64	0.81	0.82	0.18		
Germany	32.66	32.73	32.76	0.10		
Lebanon	13.34	13.38	13.42	0.08		
Armenia	11.77	11.74	11.77	0.00		
Kazakhstan	1.24	1.23	1.23	-0.01		
South Korea	64.42	64.08	63.69	-0.73		
Peru	59.01	58.45	57.79	-1.22		
Portugal	36.52	35.89	35.25	-1.27		
Colombia	54.26	52.85	52.73	-1.53		
Senegal	45.05	44.01	42.97	-2.08		
Panama	64.33	63.21	62.11	-2.22		

Calculate

Column D ▼
Subtract ▼
Column B ▼
Run

Mean
Column ▼
Run
Clear All

This item requires students to identify the key information required for each question from the table before they are able to formulate a mathematical expression involving the relevant data columns. Using spreadsheet as an available computational tool, students can use a new column to generate the data needed to answer the three questions. Depending on the order of calculations that the student performs (e.g., Column B subtract Column D instead of what is shown), they need to interpret the differences correctly. Familiarity with spreadsheet environment will help students engage with the item.

Columns E, F, and G display results of students' entries at the calculation panel

Item 4	Content Area	Uncertainty and Data
	Process	Reasoning
	Difficulty	Level 6

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Forested Area
Question 4 / 4

▶ How to Use the Spreadsheet

Refer to "Forested Area" on the right. Use the spreadsheet to help you answer the question below. Click on a choice and then type an explanation to answer the question.

Helena claims that South Korea has more forested area than any other country in this list for the years shown.

Is her claim supported by the data in the spreadsheet?

Yes

No

Explain your answer.

FORESTED AREA

The spreadsheet below shows the amount of forested area as a percentage of the total land area in each of the 15 countries in this data set. Data are shown for the years 2005, 2010, and 2015.

Column A	Column B	Column C	Column D	Column E	Column F	Column G
Country	2005	2010	2015	↺ ✕	↺ ✕	↺ ✕
Algeria	0.64	0.81	0.82			
Armenia	11.77	11.74	11.77			
Colombia	54.26	52.85	52.73			
Germany	32.66	32.73	32.76			
Greece	29.11	30.28	31.45			
India	22.77	23.47	23.77			
Kazakhstan	1.24	1.23	1.23			
Lebanon	13.34	13.38	13.42			
Panama	64.33	63.21	62.11			
Peru	59.01	58.45	57.79			
Portugal	36.52	35.89	35.25			
Senegal	45.05	44.01	42.97			
South Korea	64.42	64.08	63.69			
Thailand	31.51	31.81	32.1			
United States	33.26	33.7	33.85			

Calculate

Column ▼
Operation ▼
Column ▼
Run

Mean
Column ▼
Run
Clear All

Students need to evaluate the claim by first understanding the limitations of what can be inferred from the available data. They would need to exercise reasoning supported by available data to determine if the claim is supported.