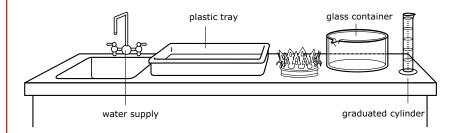
Content Domain	Main Topic	Cognitive Domain
PHYSICS	Forces and Motion	Reasoning and Analysis

Metal crown: procedure to find volume of crown

The scientists then needed to find the volume of the crown in order to determine its density. The following equipment and materials were available for them to use.



Describe a procedure that the scientists could use to find the volume of the crown using some or all of the equipment and materials shown above. You may use diagrams to help explain your procedure.

Item Number: S032711

Overall Percent Correct

Singapore Japan Japan Hong Kong, SAR Korea, Republic of Chinese Taipei Jordan Z7 Russian Federation Estonia Lithuania Slovak Republic Sweden Slovenia United States Belgium (Flemish) New Zealand Hungary Israel Australia Hongary Israel Australia International average Romania Latvia Netherlands Italy Malaysia Cyprus Bulgaria Serbia and Montenegro Norway Saudi Arabia Serbia and Montenegro Norway Saudi Arabia Bahrain Palestinian Nat'l Auth. Figypt Armenia Indonesia Lebanon Iran, Islamic Republic of Botherlands			
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Country average vs. International average:

Item Number: S032711

SCORING

Note: For full credit, responses must describe or diagram a procedure based on displacement and clearly identify how the volume of the crown is determined. Partial credit is given for procedures or diagrams that demonstrate knowledge of displacement without a complete description of the steps/ measurements to be made. Responses may also implicitly refer to other materials not indicated in the diagram (e.g., ruler, marker, etc.). Because it is not totally clear from the diagram what the relative size of the crown, beaker, and tray are, credit is given for procedures that use any of these materials for displacement even if the actual procedure might not be completely successful.

Correct Response

- Describes or diagrams a procedure based on displacement of water using measured water level differences:
- i) Adding water to the beaker (sink or tray) and marking the water level.
- ii) Placing the crown in the beaker (sink or tray) and marking the new water level.
- iii) Measuring the volume difference before/after adding the crown using the graduated cylinder
- Describes or diagrams a procedure based on displacement of water using measured overflow:
- i) Filling the beaker (or tray) with water.
- ii) Placing the crown in the beaker (or tray) and collecting the overflow.
- iii) Measuring the volume of the overflow using the graduated cylinder
- · Other fully correct.

Partially Correct Response

Describes or diagrams a partial procedure that includes displacement of water but with inadequate
or no description of the steps/measurements to determine the volume.

Examples: Put some water in the beaker and add the crown. Measure how much the level of water went up.

Add the crown to the beaker filled with water. See how much overflowed.

· Other partially correct.

Incorrect Response

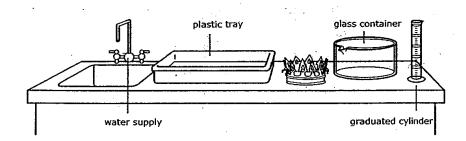
- Mentions putting the crown in the beaker (sink or tray) of water with no explicit mention that the
 water level will rise/overflow and no or incorrect procedure given for measuring the volume.
 Examples: Fill the beaker to the top with water and add the crown. You can get the volume that way.
- Other incorrect (including crossed out/erased, stray marks, illegible or off task).

Item Number: S032711

Student Responses

Correct Response:

The scientists then needed to find the volume of the crown in order to determine its density. The following equipment and materials were available for them to use.



Describe a procedure that the scientists could use to find the volume of the crown using some or all of the equipment and materials shown above. You may use diagrams to help explain your procedure.

@ F?11 glass container to the very Pm with anote @ Mace graduated cillinder under the spout

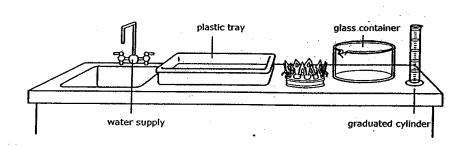
- 3) Place the crown carefully onto the gloss container (9) Measure how much water (10) onto the cylinder. (5) However much water spilled into the cylinder is the volume of the crown,

Item Number: S032711

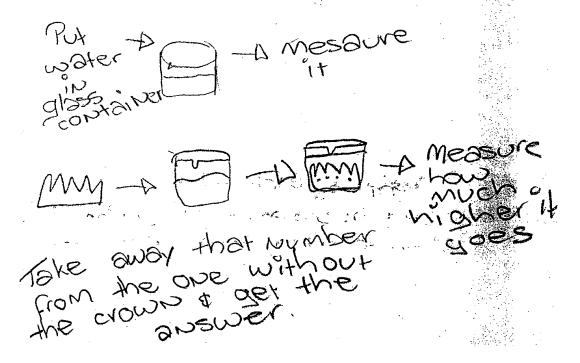
Student Responses (continued)

Partially Correct Response:

The scientists then needed to find the volume of the crown in order to determine its density. The following equipment and materials were available for them to use.



Describe a procedure that the scientists could use to find the volume of the crown using some or all of the equipment and materials shown above. You may use diagrams to help explain your procedure:

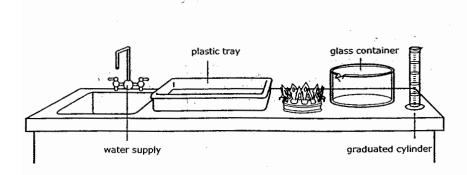


Item Number: S032711

Student Responses (continued)

Incorrect Response:

The scientists then needed to find the volume of the crown in order to determine its density. The following equipment and materials were available for them to use.



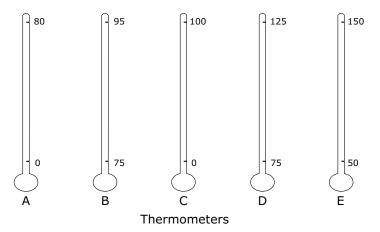
Describe a procedure that the scientists could use to find the volume of the crown using some or all of the equipment and materials shown above. You may use diagrams to help explain your procedure.

put the crown into the plastic they then weigh it.

Content Domain	Main Topic	Cognitive Domain
PHYSICS	Heat and Temperature	Reasoning and Analysis

Thermometer scale for boiling water

At different altitudes, the boiling point of water ranges from about 80° C to 100° C. Which of the Celsius thermometers shown below would give the most accurate measurement of the boiling point of water at different altitudes?



- (A) Thermometer A
- (B) Thermometer B
- (C) Thermometer C
- (D) Thermometer D
- (E) Thermometer E

Item Number: S022225

Correct Response:

D

Overall Percent Correct

Hong Kong, SAR	38	A
Korea, Republic of	33	A
Netherlands	33	A
Slovak Republic	33	A
Estonia	31	A
Chinese Taipei	30	A
Japan	29	_ _
Belgium (Flemish)	27	<u> </u>
Israel	27	<u> </u>
Lithuania	26	_
United States	26	_
Singapore	25	<u> </u>
Hungary	24	<u> </u>
Russian Federation	23	<u> </u>
Sweden	22	0
Slovenia	22	0
New Zealand	22	0
Australia	22	0
Latvia	22	0
Palestinian Nat'l Auth.	21	0
Egypt	21	0
Jordan	20	0
England	20	0
International average	20	J
Bulgaria	20	0
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Country average vs. International average:

Content Domain	Main Topic	Cognitive Domain
PHYSICS	Light	Conceptual Understanding

Seeing person in a dark room

A person in a dark room looking through a window can clearly see a person outside in the daylight. But a person outside cannot see the person inside. Why does this happen?

- (A) There is not enough light being reflected off the person in the room.
- (B) Light rays cannot pass through a window twice.
- © Outside light does not pass through windows.
- (D) Sunlight is not as intense as other sources of light.

Item Number: S012004

Correct Response:

Δ

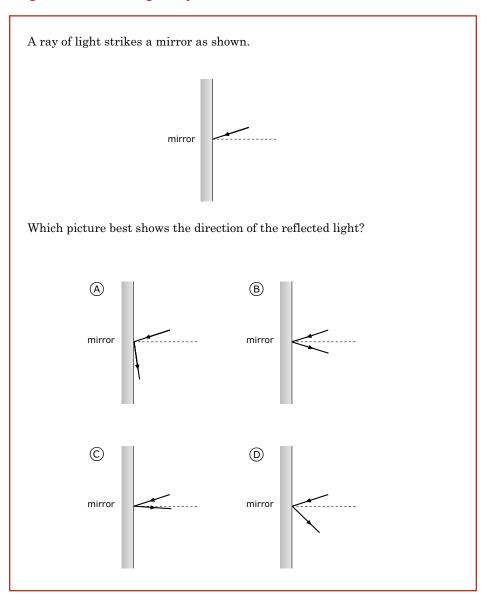
Overall Percent Correct

Singapore	87	A
England	83	A
Scotland	81	A
New Zealand	81	
Sweden	80	A
United States	79	
Lithuania	79	
Chinese Taipei	79	
Netherlands	79	
Korea, Republic of	78	
Australia	76	
Estonia	76	
Norway	75	
Israel	75	
Hong Kong, SAR	73	A
Latvia	72	A
Belgium (Flemish)	71	A
Slovenia	70	A
Romania	69	0
Hungary	69	0
Serbia and Montenegro	69	0
Indonesia	68	0
Italy	68	0
Moldova, Rep. of	68	0
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Iran, Islamic Republic of Bahrain	66 66	0
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Bahrain International average Philippines Jordan Cyprus Chile Japan Saudi Arabia Tunisia Macedonia, Republic of Slovak Republic Botswana Morocco Palestinian Nat'l Auth. Russian Federation Bulgaria Egypt Malaysia Ghana Armenia South Africa	66 66 66 65 62 61 61 60 60 59 59 58 57 57 52 50 47 44 42 42	0 0 • •

Country average vs. International average:

Content Domain	Main Topic	Cognitive Domain
PHYSICS	Light	Conceptual Understanding

Angle of reflected light ray



Item Number: S022058

Correct Response: B

Overall Percent Correct

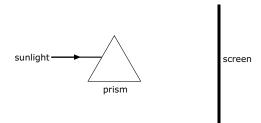
Estonia	83	
England	83	
Korea, Republic of	81	
Netherlands	81	
Japan	80	A
Singapore	79	
Armenia	76	
New Zealand	76	
Chinese Taipei	75	
Latvia	74	
Malaysia	72	
Cyprus	72	
Sweden	71	<u> </u>
Lithuania	71	_ _
Hong Kong, SAR	68	_ _
Belgium (Flemish)	67	<u> </u>
Scotland	67	0
Australia	66	0
Bulgaria	66	0
Hungary	66	0
International average	63	
Slovenia	63	0
Serbia and Montenegro	62	0
Iran, Islamic Republic of	62	0
Slovak Republic	62	0
Israel	61	0
Russian Federation	61	0
Macedonia, Republic of	61	0
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Indonesia	61	0
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Indonesia Palestinian Nat'l Auth. Romania United States Jordan Moldova, Rep. of Lebanon Norway	60 59 59 59 58 57	○▼
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Country average vs. International average:

Content Domain	Main Topic	Cognitive Domain
PHYSICS	Light	Conceptual Understanding

Sunlight through a glass prism

The diagram shows a ray of sunlight entering a glass prism.



Describe what will be seen on the screen.

(You may draw on the diagram to help explain your answer.)

Item Number: S032375

SCORING

Note: For full credit, responses must explicitly indicate that different colors are seen on the screen, either by textual description or by drawing on the diagram. A completely correct or complete sequence of colors is not required for full credit. Partial credit will be given for responses that show or describe refraction even if the appearance of the light beams on the screen is not fully described.

Correct Response

- · Describes or draws the visible color spectrum.
 - Examples: A spectrum of seven colors which is red, orange, yellow, green, blue, indigo, violet.
- Refers to a spectrum, rainbow, colors, etc. (no color spectrum shown)

Examples: I will see many colors on it like the rainbow.

All the colors of the color spectrum.

There will be seven colors.

· Other fully correct.

Partially Correct Response

- Describes or draws multiple refracted rays but with no explicit connection to color.
- Examples: There will be a lot of rays coming out the other side of the prism.

The light will spread out across that side of the prism and be seen on most of the screen.

Describes or draws only the refraction (bending) of light beam (no mention of color dispersion).
 Examples: The light inside the prism will bend.

The sunlight would go through at an angle.

· Other partially correct.

Incorrect Response

- Describes or draws a shadow or image of the prism (or similar).
 Examples: The prism will make a shadow on the screen.
- Refers only to seeing sunlight or light on the screen. [No mention of color dispersion or refraction.]
 Examples: Sunlight hitting the screen.

The screen will be bright because there is light falling on it.

· Other incorrect (including crossed out/erased, stray marks, illegible or off task).

Overall Percent Correct

Korea, Republic of	74	
Singapore	65	
Malaysia	53	
Hong Kong, SAR	49	
United States	49	
England	47	
Netherlands	45	
New Zealand	43	
Chinese Taipei	38	
Jordan	36	
Bahrain	34	
Armenia	33	
Palestinian Nat'l Auth.	33	
Lithuania	32	
Iran, Islamic Republic of	31	
Scotland	28	0
Sweden	25	0
Egypt	24	0
Hungary	24	0
Italy	24	0
International average	23	
Australia	22	0
Estonia	20	0
Romania	18	_
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Israel	17	
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Latvia Belgium (Flemish) Norway Slovenia Saudi Arabia Chile Russian Federation Philippines Japan Indonesia Lebanon Bulgaria Macedonia, Republic of Slovak Republic Botswana Cyprus South Africa Moldova, Rep. of Serbia and Montenegro	17 15 15 14 11 10 10 9 7 7 6 5 4 3	* * * * * * * * * * * * * * * * * * *
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Country average vs. International average:

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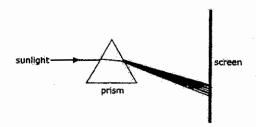
Sunlight through a glass prism (continued)

Item Number: S032375

Student Responses

Correct Response:

The diagram shows a ray of sunlight entering a glass prism.



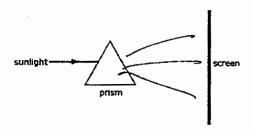
Describe what will be seen on the screen.

(You may draw on the diagram to help explain your answer.)

Seven different colours namely red, orange, yellow, green blue, indigo and violet will be seen.

Partially Correct Response:

The diagram shows a ray of sunlight entering a glass prism.



Describe what will be seen on the screen.
(You may draw on the diagram to help explain your answer.)

You will see many

different light

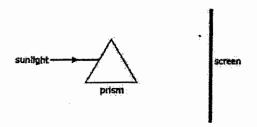
Sunlight through a glass prism (continued)

Item Number: S032375

Student Responses (continued)

Incorrect Response:

The diagram shows a ray of sunlight entering a glass prism.



Describe what will be seen on the screen.

(You may draw on the diagram to help explain your answer.)

reflection of one side of the prism

Content Domain	Main Topic	Cognitive Domain
PHYSICS	Light	Conceptual Understanding

Lightning seen before thunder heard

Mary was looking out her window on a stormy night. She saw lightning and then heard thunder a few seconds later.

Explain why she saw lightning before she heard thunder.

Item Number: S032626

SCORING

Correct Response

• Refers to light traveling faster than sound (or similar).

Examples: Speed of light is faster than speed of sound.

Light travels quicker than sound.

It takes more time for sound to reach her than light.

· Other correct.

Incorrect Response

· Refers only to lightning being closer or thunder being further away (explicitly or implicitly).

Examples: Thunder has a longer way to go.

Thunder is striking from kilometers away.

Refers to lightning occurring first, causing thunder, or similar.
 [No explicit mention of the relative speed of light/sound to travel.]

Examples: Lightning is so quick, thunder only happens afterward.

The noise occurs later.

Thunder occurs from lightning.

Thunder is the echo of lightning.

· Other incorrect (including crossed out/erased, stray marks, illegible, or off task).

Overall Percent Correct

Singapore	88	
England	74	
Chinese Taipei	70	
Japan	65	
Hong Kong, SAR	62	
Lithuania	61	
Sweden	59	<u> </u>
Botswana	54	<u> </u>
Hungary	54	<u> </u>
Norway	54	<u> </u>
Estonia	53	<u> </u>
Latvia	52	
Netherlands	52	
Australia	51	
Korea, Republic of	47	
Malaysia	47	A
Israel	46	0
United States	46	A
Bahrain	45	0
Saudi Arabia	45	O
Romania	44	O
Slovenia	44	O
Bulgaria	43	0
New Zealand	43	0
Scotland	43	Ο
Belgium (Flemish)	43 42	0 0
Belgium (Flemish)	42	
Belgium (Flemish) International average	42 42	0
Belgium (Flemish) International average Italy	42 42 41	0
Belgium (Flemish) International average Italy Slovak Republic	42 42 41 41	0 0
Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of	42 42 41 41 41	0 0 0 0 0 0
Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of Egypt Jordan	42 41 41 41 40	0 0 0 0 0 0
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Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of Egypt Jordan Serbia and Montenegro Russian Federation Cyprus Moldova, Rep. of Lebanon Palestinian Nat'l Auth. Armenia Chile Indonesia	42 41 41 40 39 37 36 35 35 32 31 26 19	0 0 0 0 0 0 0 0
Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of Egypt Jordan Serbia and Montenegro Russian Federation Cyprus Moldova, Rep. of Lebanon Palestinian Nat'l Auth. Armenia Chile Indonesia Iran, Islamic Republic of	42 41 41 40 39 37 36 35 35 32 31 26 19 19	0 0 0 0 0 0 0 0
Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of Egypt Jordan Serbia and Montenegro Russian Federation Cyprus Moldova, Rep. of Lebanon Palestinian Nat'l Auth. Armenia Chile Indonesia Iran, Islamic Republic of Philippines	42 41 41 40 39 37 36 35 35 32 31 26 19 19 15	0 0 0 0 0 0 0 0
Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of Egypt Jordan Serbia and Montenegro Russian Federation Cyprus Moldova, Rep. of Lebanon Palestinian Nat'l Auth. Armenia Chile Indonesia Iran, Islamic Republic of Philippines Morocco	42 41 41 40 39 37 36 35 35 32 31 26 19 19 15 13	0 0 0 0 0 0 0 0
Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of Egypt Jordan Serbia and Montenegro Russian Federation Cyprus Moldova, Rep. of Lebanon Palestinian Nat'l Auth. Armenia Chile Indonesia Iran, Islamic Republic of Philippines Morocco Tunisia	42 41 41 40 39 37 36 35 32 31 26 19 19 15 13 12 8	0 0 0 0 0 0 0 0
Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of Egypt Jordan Serbia and Montenegro Russian Federation Cyprus Moldova, Rep. of Lebanon Palestinian Nat'l Auth. Armenia Chile Indonesia Iran, Islamic Republic of Philippines Morocco Tunisia South Africa	42 41 41 40 39 37 36 35 35 32 31 26 19 19 15 13 12 8 4	0 0 0 0 0 0 0 0
Belgium (Flemish) International average Italy Slovak Republic Macedonia, Republic of Egypt Jordan Serbia and Montenegro Russian Federation Cyprus Moldova, Rep. of Lebanon Palestinian Nat'l Auth. Armenia Chile Indonesia Iran, Islamic Republic of Philippines Morocco Tunisia	42 41 41 40 39 37 36 35 32 31 26 19 19 15 13 12 8	0 0 0 0 0 0 0 0

Country average vs. International average:

Lightning seen before thunder heard (continued)

Item Number: S032626

Student Responses

Correct Response:

Mary was looking out her window on a stormy night. She saw lightning and then heard thunder a few seconds later.

Explain why she saw lightning before she heard thunder.

Light travels raster than sound. So the lightning was moving faster than the thursder even though the were part of the same thing.

Incorrect Response:

Mary was looking out her window on a stormy night. She saw lightning and then heard thunder a few seconds later.

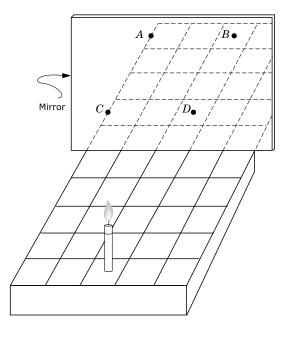
Explain why she saw lightning before she heard thunder.

She saw lightning first because the lightning is close

Content Domain	Main Topic	Cognitive Domain
PHYSICS	Light	Reasoning and Analysis

Candle position reflected on grid

A candle is placed on a ruled grid in front of a mirror, as shown. At what point will the reflection of the candle appear to be?



- (A) Point A
- (B) Point B
- © Point C
- (D) Point D

Item Number: S012015

Correct Response:

В

Overall Percent Correct

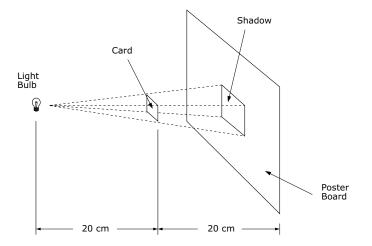
Belgium (Flemish)	89	A
Singapore	88	A
Netherlands	87	
New Zealand	86	
England	86	
Scotland	83	A
Hungary	80	<u> </u>
Hong Kong, SAR	80	<u> </u>
Estonia	80	
Australia		
, tasti ana	80	A
Slovak Republic	77	
Korea, Republic of	77	A
Chinese Taipei	77	A
Japan	75	A
Bahrain	74	A
Malaysia	73	
United States	73	A
Slovenia	72	
Russian Federation	71	
Norway	70	
Latvia	69	A
Lithuania	68	A
Cyprus	65	0
• •	65	0
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International average	64	
International average Italy	64 64	0
International average Italy Israel	64 63	0
International average Italy Israel Chile	64 64 63 63	0 0
International average Italy Israel Chile Indonesia	64 64 63 63 60	0 0 0
International average Italy Israel Chile Indonesia Sweden	64 64 63 63 60 60	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro	64 64 63 63 60 60 59	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of	64 64 63 63 60 60 59 56	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth.	64 64 63 63 60 60 59 56	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of	64 64 63 63 60 60 59 56	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth.	64 64 63 63 60 60 59 56	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria	64 63 63 60 60 59 56 55 54	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania	64 64 63 63 60 60 59 56 55 54	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of	64 64 63 63 60 60 59 56 55 54 53	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt	64 64 63 63 60 60 59 56 55 54 53 53	0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt Iran, Islamic Republic of	64 64 63 63 60 60 59 56 55 54 53 53 53	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt Iran, Islamic Republic of Lebanon	64 64 63 63 60 60 59 56 55 54 53 53 52 51	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt Iran, Islamic Republic of Lebanon Saudi Arabia	64 64 63 60 60 59 56 55 54 53 53 52 51 48	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt Iran, Islamic Republic of Lebanon Saudi Arabia Morocco	64 64 63 60 60 59 56 55 54 53 53 52 51 48 46	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt Iran, Islamic Republic of Lebanon Saudi Arabia Morocco Jordan Tunisia	64 63 63 60 60 59 56 55 54 53 53 52 51 48 46 45 43	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt Iran, Islamic Republic of Lebanon Saudi Arabia Morocco Jordan Tunisia Botswana	64 64 63 60 60 59 56 55 54 53 53 52 51 48 46 45 43 42	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt Iran, Islamic Republic of Lebanon Saudi Arabia Morocco Jordan Tunisia Botswana Philippines	64 64 63 60 60 59 56 55 54 53 53 52 51 48 46 45 43 42 41	0 0 0
International average Italy Israel Chile Indonesia Sweden Serbia and Montenegro Moldova, Rep. of Palestinian Nat'l Auth. Bulgaria Romania Macedonia, Republic of Egypt Iran, Islamic Republic of Lebanon Saudi Arabia Morocco Jordan Tunisia Botswana	64 64 63 60 60 59 56 55 54 53 53 52 51 48 46 45 43 42	0 0 0

Country average vs. International average:

Content Domain	Main Topic	Cognitive Domain
PHYSICS	Light	Reasoning and Analysis

Shadow size from distance diagram

A tiny light bulb is held 20 centimeters to the left of a square card, which is in turn held 20 centimeters to the left of a poster board, as shown. The shadow of the card on the poster board has a side of 10 centimeters.



If the poster board is moved 40 cm further to the right so that it is 80 cm from the light, what will be the new side of the card's shadow on the poster board?

- (A) 5 cm
- (B) 10 cm
- © 15 cm
- (D) 20 cm

Item Number: S012029

Correct Response:

D

Overall Percent Correct

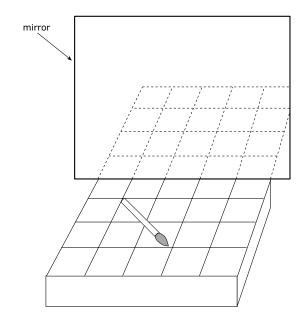
Korea, Republic of	79	
Sweden	69	
Belgium (Flemish)	69	
Estonia	68	
Chinese Taipei	68	
Japan	67	
Russian Federation	67	
Singapore	66	<u> </u>
Netherlands	64	A
Lithuania	63	0
Lebanon	63	0
Malaysia	63	<u> </u>
Scotland	63	0
Romania	62	0
Hungary	61	0
United States	61	0
Latvia	61	0
	61	0
Hong Kong, SAR Slovenia	61	0
Siovenia Botswana	60	0
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Armenia		0
Israel	60	0
England	60	0
International average	59	
International average		
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Italy Moldova, Rep. of Macedonia, Republic of Australia Serbia and Montenegro Bahrain New Zealand Iran, Islamic Republic of Philippines Norway Bulgaria Morocco Jordan	59 59 58 58 58 58 57 57 57 57	
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Italy Moldova, Rep. of Macedonia, Republic of Australia Serbia and Montenegro Bahrain New Zealand Iran, Islamic Republic of Philippines Norway Bulgaria Morocco Jordan Palestinian Nat'l Auth. Cyprus	59 58 58 58 58 57 57 57 56 56 56 56 55	
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Italy Moldova, Rep. of Macedonia, Republic of Australia Serbia and Montenegro Bahrain New Zealand Iran, Islamic Republic of Philippines Norway Bulgaria Morocco Jordan Palestinian Nat'l Auth. Cyprus	59 58 58 58 58 57 57 57 56 56 56 56 55	0 0 0 0 0 0 0 0
Italy Moldova, Rep. of Macedonia, Republic of Australia Serbia and Montenegro Bahrain New Zealand Iran, Islamic Republic of Philippines Norway Bulgaria Morocco Jordan Palestinian Nat'l Auth. Cyprus Tunisia	59 58 58 58 58 57 57 57 57 56 56 56 56 55	0 0 0 0 0 0 0 0
Italy Moldova, Rep. of Macedonia, Republic of Australia Serbia and Montenegro Bahrain New Zealand Iran, Islamic Republic of Philippines Norway Bulgaria Morocco Jordan Palestinian Nat'l Auth. Cyprus Tunisia Slovak Republic	59 58 58 58 58 57 57 57 56 56 56 56 55 53	0 0 0 0 0 0 0 0
Italy Moldova, Rep. of Macedonia, Republic of Australia Serbia and Montenegro Bahrain New Zealand Iran, Islamic Republic of Philippines Norway Bulgaria Morocco Jordan Palestinian Nat'l Auth. Cyprus Tunisia Slovak Republic South Africa	59 58 58 58 58 57 57 57 56 56 56 55 53 53	0 0 0 0 0 0 0 0
Italy Moldova, Rep. of Macedonia, Republic of Australia Serbia and Montenegro Bahrain New Zealand Iran, Islamic Republic of Philippines Norway Bulgaria Morocco Jordan Palestinian Nat'l Auth. Cyprus Tunisia Slovak Republic South Africa Indonesia	59 58 58 58 58 57 57 57 56 56 56 55 53 53 51 50	0 0 0 0 0 0 0 0
Italy Moldova, Rep. of Macedonia, Republic of Australia Serbia and Montenegro Bahrain New Zealand Iran, Islamic Republic of Philippines Norway Bulgaria Morocco Jordan Palestinian Nat'l Auth. Cyprus Tunisia Slovak Republic South Africa Indonesia Saudi Arabia	59 58 58 58 58 57 57 57 56 56 56 55 53 53 51 50 49	

Country average vs. International average:

Content Domain	Main Topic	Cognitive Domain
PHYSICS	Light	Reasoning and Analysis

Brush reflected in mirror at angle

The picture shows a paint brush that is lying on a shelf in front of a mirror. Draw a picture of the paint brush as you would see it in the mirror. Use the patterns of lines on the shelf to help you.



Item Number: S022279

Overall Percent Correct

New Zealand	75	
Netherlands	72	
Belgium (Flemish)	71	
England	71	
Scotland	70	
Estonia	67	
Japan	66	
Australia	61	
Hungary	61	
Hong Kong, SAR	60	
Singapore	59	
Latvia	59	<u> </u>
Lithuania	58	<u> </u>
Russian Federation	56	
Armenia	54	
Norway	53	<u> </u>
Slovenia	53	
Slovak Republic	52	<u> </u>
Chinese Taipei	52	<u> </u>
Sweden	51	<u> </u>
Malaysia	51	<u> </u>
Moldova, Rep. of	51	<u> </u>
United States	51	<u> </u>
Korea, Republic of	46	0
Serbia and Montenegro	45	\circ
Serbia and Montenegro Bahrain	45 44	0
Bahrain	44	
•		
Bahrain International average	44 44	0
Bahrain International average Italy Romania	44 44 42	0 0
Bahrain International average Italy	44 44 42 41	0 0
Bahrain International average Italy Romania Bulgaria	44 42 41 37	0 0
Bahrain International average Italy Romania Bulgaria Israel	44 42 41 37 36	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia	44 42 41 37 36 35	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of	44 42 41 37 36 35 35	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of	44 42 41 37 36 35 35 35	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of	44 42 41 37 36 35 35 35 35	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus	44 42 41 37 36 35 35 35 32 31	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia	44 42 41 37 36 35 35 35 32 31 26	0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines Morocco	44 42 41 37 36 35 35 35 32 31 26 24 23	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines	44 42 41 37 36 35 35 35 32 31 26 24	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines Morocco Egypt	44 42 41 37 36 35 35 35 32 31 26 24 23 22	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines Morocco Egypt Palestinian Nat'l Auth.	44 42 41 37 36 35 35 35 32 31 26 24 23 22 22	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines Morocco Egypt Palestinian Nat'l Auth. Saudi Arabia	44 42 41 37 36 35 35 35 32 31 26 24 23 22 22 21 21	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines Morocco Egypt Palestinian Nat'l Auth. Saudi Arabia Lebanon	44 42 41 37 36 35 35 35 32 31 26 24 23 22 22 21	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines Morocco Egypt Palestinian Nat'l Auth. Saudi Arabia Lebanon Jordan	44 42 41 37 36 35 35 35 32 31 26 24 23 22 21 21 20	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines Morocco Egypt Palestinian Nat'l Auth. Saudi Arabia Lebanon Jordan Botswana	44 42 41 37 36 35 35 35 32 31 26 24 23 22 21 21 20 17	0 0
Bahrain International average Italy Romania Bulgaria Israel Chile Indonesia Macedonia, Republic of Iran, Islamic Republic of Cyprus Tunisia Philippines Morocco Egypt Palestinian Nat'l Auth. Saudi Arabia Lebanon Jordan Botswana South Africa	44 42 41 37 36 35 35 35 32 31 26 24 23 22 21 21 20 17 8	0 0

Country average vs. International average:

Higher
Not different
Lower

Brush reflected in mirror at angle (continued)

Item Number: S022279

SCORING

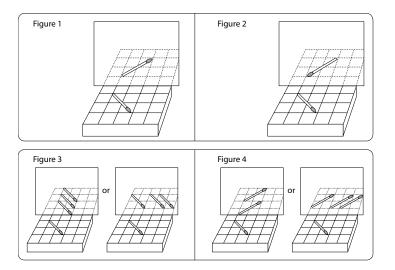
Note: A brush on the borderline of the correct squares should be accepted as correct. Credit is given for a brush in the correct squares even if the hairs are not clearly shown. Only if the hairs are clearly shown in the wrong direction is the answer incorrect.

Correct Response

• Correct placement: angle, grid position, and direction (hairs to the right). (See Figure 1.)

Incorrect Response

- Correct angle and placement, but image flipped with hairs clearly turned to the left. (See Figure 2.)
- Image parallel to original (hairs to the right or left). (See Figure 3; other rows/columns are possible).
- Correct angle but image translated (hairs to the right or left). (See Figure 4; other rows/columns are possible).
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task).



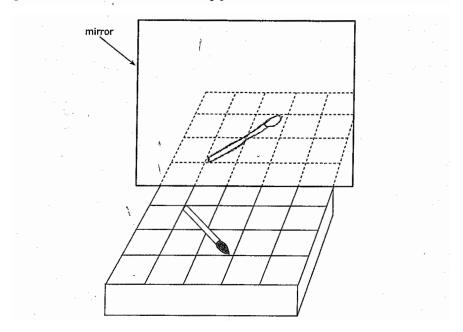
Brush reflected in mirror at angle (continued)

Item Number: S022279

Student Responses

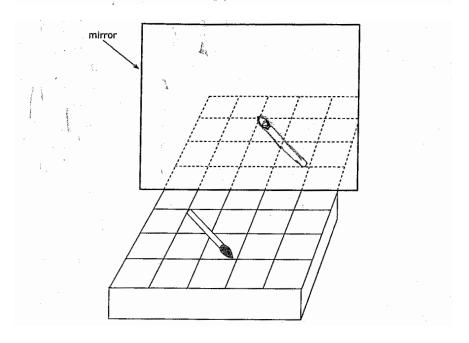
Correct Response:

The picture shows a paint brush that is lying on a shelf in front of a mirror. Draw a picture of the paint brush as you would see it in the mirror. Use the patterns of lines on the shelf to help you.



Incorrect Response:

The picture shows a paint brush that is lying on a shelf in front of a mirror. Draw a picture of the paint brush as you would see it in the mirror. Use the patterns of lines on the shelf to help you.



Content Domain	Main Topic	Cognitive Domain
PHYSICS	Physical States and Changes in Matter	Factual Knowledge

Wet towel dries in the sun

A wet towel will dry when it is left in the Sun. Which process occurs to make this happen?

- (A) melting
- (B) boiling
- © condensation
- (D) evaporation

Item Number: S032055

Correct Response:

D

Overall Percent Correct

Chinese Taipei	98	A
Singapore	95	_
Hungary	95	<u> </u>
Estonia	94	<u> </u>
Slovak Republic	94	<u> </u>
Hong Kong, SAR	94	<u> </u>
Japan	94	<u> </u>
Russian Federation	94	<u> </u>
Korea, Republic of	93	<u> </u>
Tunisia	91	_
Lithuania	91	_
Slovenia	90	<u> </u>
England	89	<u> </u>
Moldova, Rep. of	89	<u> </u>
New Zealand	88	<u> </u>
Australia	88	<u> </u>
Latvia	88	<u> </u>
Netherlands	88	<u> </u>
Malaysia	87	<u> </u>
Bulgaria	87	<u> </u>
Scotland	87	0
Jordan	86	0
Romania	86	0
Armenia	86	0
Belgium (Flemish)	85	0
United States	85	0
Israel	85	0
Serbia and Montenegro	85	0
Bahrain	84	0
Norway	84	Ο
International average	83	
Iran, Islamic Republic of	83	0
Morocco	83	0
Sweden	82	0
Saudi Arabia	82	0
Italy	81	0
Palestinian Nat'l Auth.	78	•
Macedonia, Republic of	78	•
Cyprus	77	▼
Indonesia	77	▼
Chile	76	▼
Lebanon	76	▼
Philippines	69	▼ ▼ ▼
Botswana	67	▼
Egypt	59	▼
South Africa	51	▼
Ghana	39	•

Country average vs. International average:

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