TIMSS 2015

TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY

Released Items: Mathematics and Science

Second Year

Educational Research Centre
St Patrick's College, Dublin 9

TIMSS 2015 released items:

Mathematics, Second Year

The items shown in this section are real mathematics items that were administered to Second Year students who took part in TIMSS in 2015.

Each item is shown in the format that it was presented in Ireland, along with the correct answer and the percentage of pupils who answered the item correctly in Ireland and at the international average.

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Note:

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1

Which number is closest in size to $\frac{3}{4}$?

Ⓐ 0.34

Ⓑ 0.43

Ⓒ 0.74 ✓

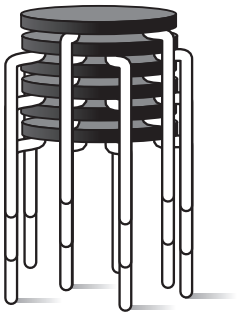
Ⓓ 0.79

Correct:	Ireland: 86%	TIMSS: 62%

M052209

2

In John's house there are stools stacked together.



One stool is 49 cm high.

When 2 stools are stacked the stools are 55 cm high.

How high above the ground is the top of a stack of 6 stools?

Ⓐ 79 cm ✓

Ⓑ 85 cm

Ⓒ 110 cm

Ⓓ 165 cm

Correct:	Ireland: 47%	TIMSS: 40%

M052142

3

$\frac{2}{3}x+1$ is a whole number.

Which of these statements about x must be true?

Ⓐ x must be an odd number

Ⓑ x must be an even number

Ⓒ x must be a number greater than 3

Ⓓ ✓ x must be a number divisible by 3

M052006

Correct:	Ireland: 43%	TIMSS: 44%

4

Place <, >, or = in each box so that each statement is true.

0.35 [=] 0.350

0.35 [<] 0.4

0.35 [>] 0.305

0.35 [>] 0.035

M052035

Correct:	Ireland: 60%	TIMSS: 42%

5

You have a recipe for a cake that needs 2 eggs and 0.3 litres of milk.

You want to make as large a cake as you can and you have 5 eggs.

How many litres of milk do you need to make the largest possible cake?

Answer: [*0.75*] litres

M052016

Correct:	Ireland: 50%	TIMSS: 38%

6

$$\frac{a^2}{2} - 6a + 36$$

Which is the value of this expression when $a = 3$?

Ⓐ 58.5

Ⓑ 27

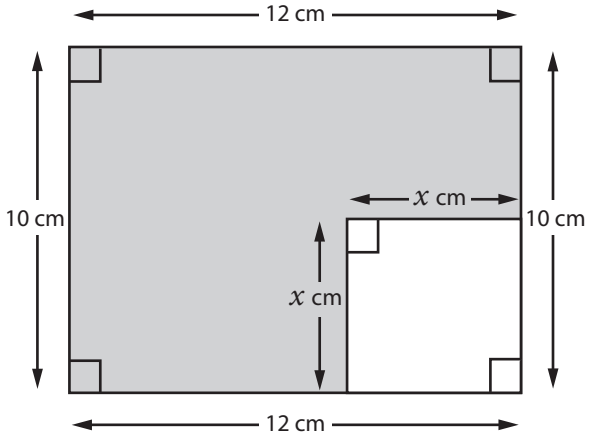
Ⓒ 22.5 ✓

Ⓓ 21

M052064

Correct:	Ireland: 62%	TIMSS: 50%

7



Write an expression in terms of x for the area of the **shaded** portion of the figure.

Answer: $120 - x^2$ cm^2

M052126

Correct:	Ireland: 6%	TIMSS: 17%

8

$$y = \sqrt{x - 9}$$

Which of these is a value of y when $x = 25$?

Ⓐ 3

Ⓑ 4 ✓

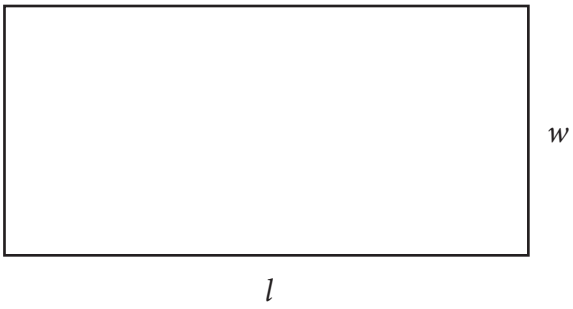
Ⓒ 8

Ⓓ 16

Correct:	Ireland: 69%	TIMSS: 54%

M052103

9



The shape above is a rectangle, with length l, and width w.

If the length is doubled and the width stays the same, which formula gives the area (A) of the new rectangle?

Ⓐ $A = 2l + 2w$

Ⓑ $A = 2l + 4w$

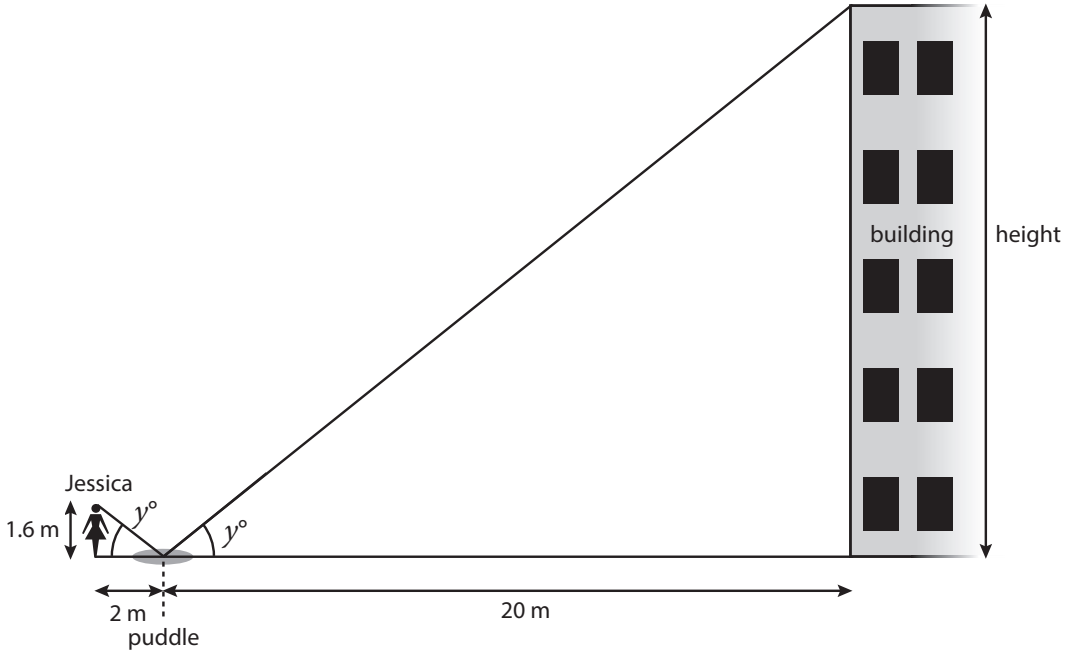
Ⓒ $A = 2lw$ ✓

Ⓓ $A = 4lw$

Correct:	Ireland: 57%	TIMSS: 51%

M052066

10 Jessica is standing near a puddle in which she can see the reflection of the top of a building opposite. Her line of sight makes an angle of $y°$ with the puddle and reflects at the same angle.



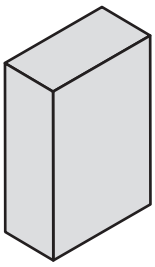
Given the heights and distances shown in the picture, what is the height of the building?

Answer: 16 m

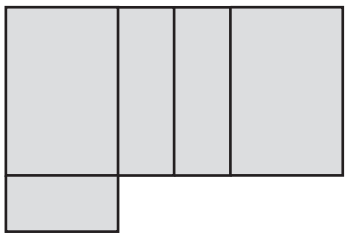
Correct:	**Ireland:** 10%	**TIMSS:** 16%

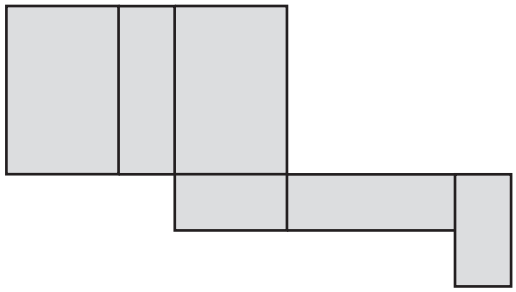
M052041

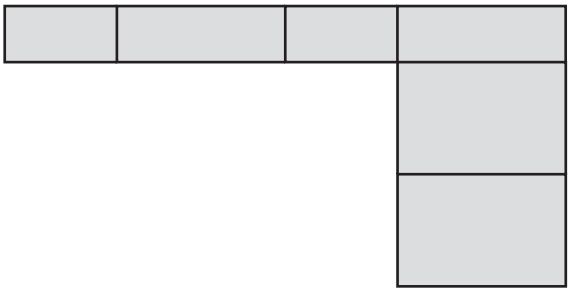
11

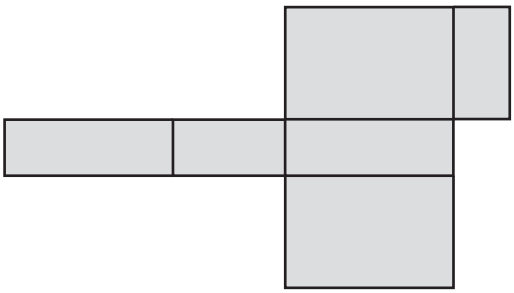


The diagram shows a rectangular box.
Which figure can be folded to form the rectangular box?

Ⓐ 

Ⓑ 

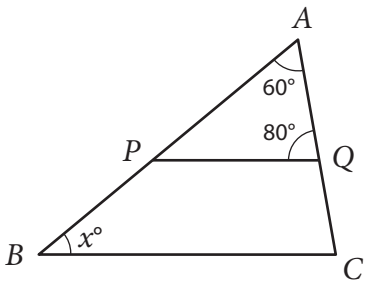
Ⓒ 

Ⓓ ✓ 

Correct:	Ireland: 64%	TIMSS: 57%

M052057

12



Lines *PQ* and *BC* are parallel.

What is the value of *x*?

Answer: *40*

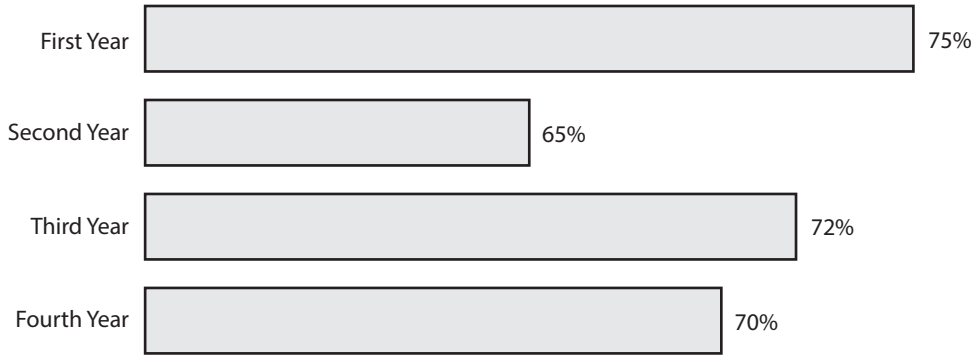
Correct:	**Ireland:** 47%	**TIMSS:** 43%

M052417

13

School Sports Survey — First to Fourth Year

Percent of students who chose soccer as their favourite sport:



John's school asked students in First to Fourth Year to choose their favourite sport. There are 100 students in each grade. The graph shows the results for the students choosing soccer.

John compared the results for First Year and Second Year. He thought twice as many students in First Year as in Second Year chose soccer.

Explain how the graph led John to make this mistake.

Grade 7 bar is twice as long as grade 8 bar
OR
Origin not at 0
OR
Graph not drawn to scale.

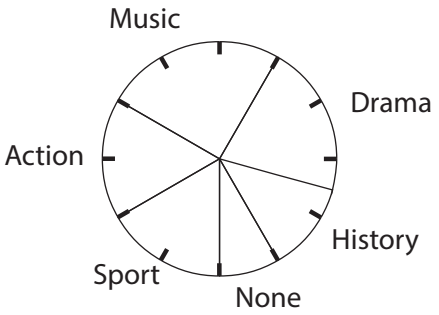
Correct: **Ireland:** 41% **TIMSS:** 27%

M052501

14

M052410

Television Programmes Liked by Students



The graph shows the type of television programme 240 students say they like most.

Which one of these is the number of students that chose History?

Ⓐ 20

Ⓑ 30 ✓

Ⓒ 40

Ⓓ 60

Correct:	**Ireland:** 58%	**TIMSS:** 52%

15

M052170

One of these number lists has the smallest range AND the largest mean.
Which one?

Ⓐ 6 8 12 23 46

Ⓑ 6 8 12 28 46 ✓

Ⓒ 6 8 12 23 51

Ⓓ 6 8 12 18 51

Correct:	**Ireland:** 43%	**TIMSS:** 40%

TIMSS 2015 released items:

Science, Second Year

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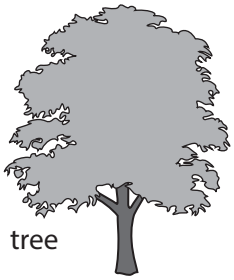
16

Growth rings can be used to work out the age of some organisms.

Which of the following has annual growth rings?

Ⓐ

mushroom

Ⓑ ✓ 

tree

Ⓒ

earthworm

Ⓓ

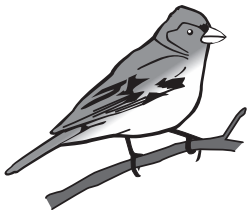
zebra

S052003

Correct:	Ireland: 89%	TIMSS: 68%

17

Birds puff up their feathers when it is cold.



bird in hot weather

bird in cold weather

How does this behaviour help a bird?

Ⓐ It increases heat production.

Ⓑ It prevents the skin from drying out.

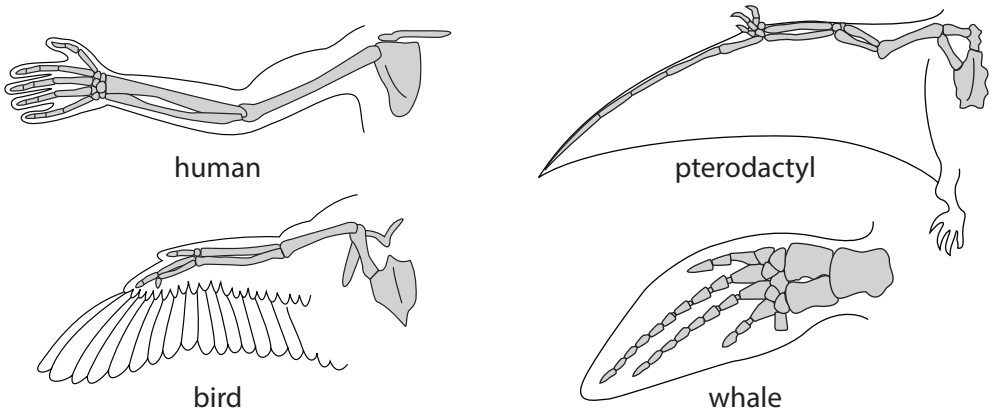
Ⓒ ✓ It reduces heat loss.

Ⓓ It protects feathers from damage.

S052071

Correct:	Ireland: 67%	TIMSS: 47%

18 The diagrams show the bones inside the limb of a human, pterodactyl, bird, and whale.



Which conclusion is best supported by the diagrams?

✓ (A) The animals had a common ancestor.

(B) The animals lived in the same environment.

(C) The animals' external appearances were similar.

(D) The animals were present on Earth at the same time.

Correct:	**Ireland:** 56%	**TIMSS:** 45%

S052246

19 Calcium is important for strong bones.

Which of the following is a good source of calcium?

(A) rice

(B) pasta

(C) red meat

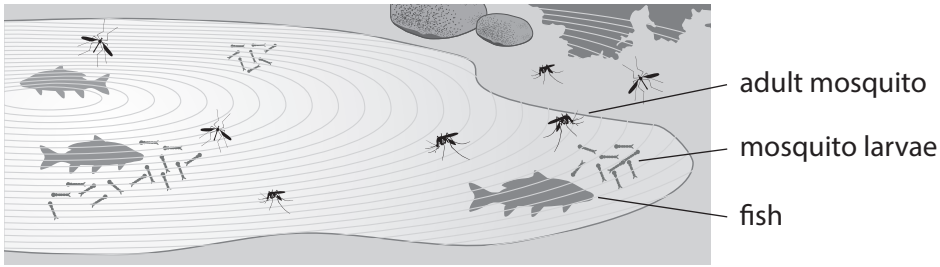
✓ (D) cheese

Correct:	**Ireland:** 92%	**TIMSS:** 61%

S052276

20

There is a pond near Monte's school. Mosquitoes lay their eggs in the pond. There are also small fish living in the pond as shown below. Small fish prefer to eat mosquito larvae swimming in the water.



A. Why do fish eat mosquito larvae but not adult mosquitoes?

Ⓐ Adult mosquitoes swim too fast.

Ⓑ Adult mosquitoes live in the air. ✓

Ⓒ The mosquito larvae taste better.

Ⓓ There are more larvae than adult mosquitoes.

Correct:	**Ireland:** 61%	**TIMSS:** 62%

B. Monte added some more fish to the pond.

How could this affect the number of adult mosquitoes that live around the pond?

(Tick one box.)

☐ The number will increase.

☑ The number will decrease.

☐ The number will stay the same.

Explain your answer.

Provides explanation that the fish eat the mosquito larvae so that there are fewer larvae to develop into mosquitoes; e.g.:

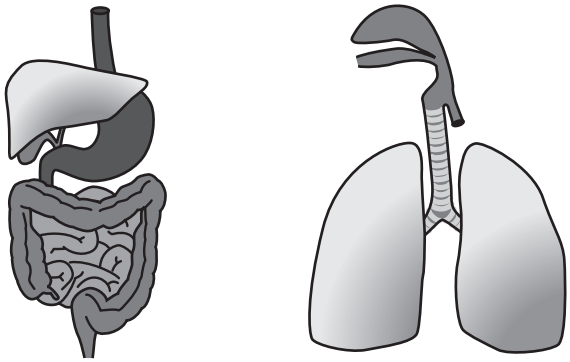
- *The more fish there are, the more mosquito larvae will be eaten causing the number of adult mosquitoes to decrease.*
- *More mosquito larvae would be eaten.*

Correct:	**Ireland:** 41%	**TIMSS:** 36%

S052303

21

The diagrams below show parts of the human body.



How would these parts of the body be described?

Ⓐ as cells

Ⓑ as tissues

Ⓒ as organs

Ⓓ as organ systems ✓

S052125

Correct: **Ireland:** 65% **TIMSS:** 59%

22

The table below lists some properties of water, mercury, and iron.

	State at Room Temperature (20°C)	Melting Point (°C)	Boiling Point (°C)
Water	Liquid	0	100
Mercury	Liquid	–39	357
Iron	Solid	1,530	2,450

What is the state (solid, liquid, or gas) of water, of mercury, and of iron at 350°C?

Water: *Gas*

Mercury: *Liquid*

Iron: *Solid*

S052145

Correct: **Ireland:** 43% **TIMSS:** 39%

23

A student is given a mixture of small pieces of iron and copper.

Which method can be used to separate the mixture?

(Tick one box.)

- [x] Method 1: Spread the mixture on paper and pass a magnet over the mixture
- [ ] Method 2: Add the mixture to a beaker of water and filter

1. Explain why the method you chose will work.

Explains that method 1 works because iron is magnetic; e.g.:
- *Method 1 will work because iron is attracted by a magnet and copper is not.*

2. Explain why the other method will not work.

Explains that method 2 will not work because iron and copper are insoluble and / or metals will not go through the filter; e.g.:
- *Method 2 will not work because neither iron nor copper will dissolve in water, so both will remain in the filter paper.*

2 points: Refers to both methods and provides correct explanation for each.
1 point: Chooses method 1, provides explanation that addresses either the magnetic method or the filtration method correctly.

2 Points		1 Point	
Ireland: 20%	**TIMSS:** 15%	**Ireland:** 30%	**TIMSS:** 32%

S052049

24

Which is an example of a chemical process that releases energy?

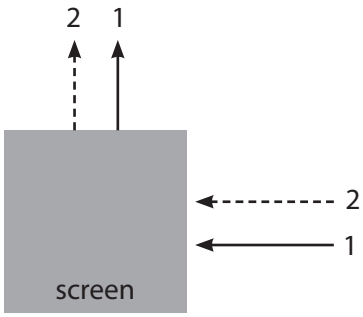
- Ⓐ water boiling
- Ⓑ raw egg cooking
- [x] Ⓒ oil lamp glowing
- Ⓓ white sugar dissolving

Correct:	**Ireland:** 54%	**TIMSS:** 50%

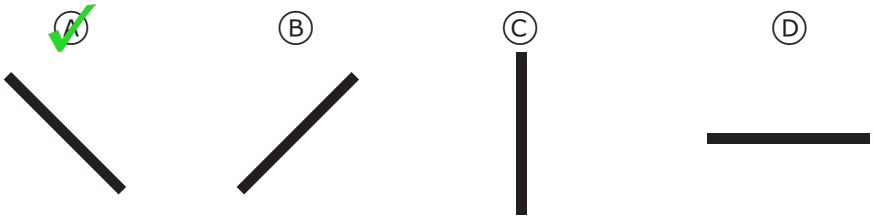
S052063

26

There is a flat mirror hidden behind a screen. Light beams from two laser pointers (1 and 2) shine on the mirror behind the screen. The light beams change direction as shown in the diagram.



Which figure shows how the mirror is placed behind the screen?

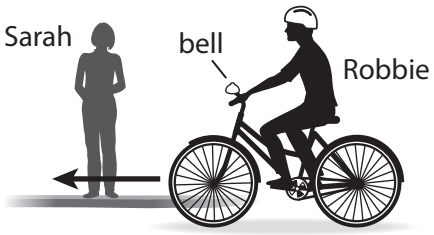


S052192

Correct:	Ireland: 65%	TIMSS: 50%

27

Sarah, who is standing still, sees Robbie riding past her on his bike.



Which of the following is true about the bell on Robbie's bike?

Ⓐ The bell is moving with respect to Sarah and Robbie.

Ⓑ The bell is not moving with respect to Sarah and Robbie.

Ⓒ The bell is moving with respect to Robbie but is not moving with respect to Sarah.

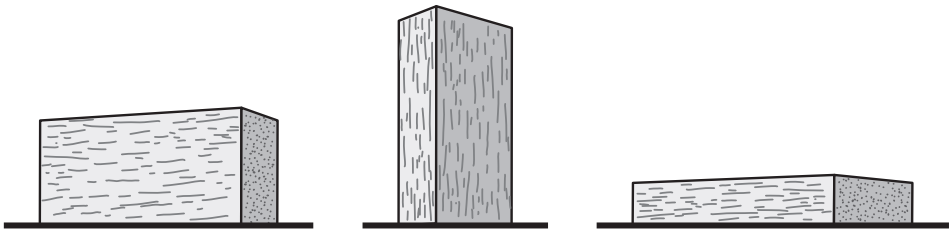
Ⓓ The bell is not moving with respect to Robbie but is moving with respect to Sarah.

S052232

Correct:	Ireland: 32%	TIMSS: 38%

28

The same wooden rectangular block can be placed on the ground in three different positions as shown below.



Position A **Position B** **Position C**

In which position is the most pressure put on the ground?

(Tick one box.)

- ☐ Position A
- ☑ Position B
- ☐ Position C

Explain your answer.

Provides explanation relating to the same weight spread over a smaller surface area; e.g.:
- The surface area is small, the weight is being concentrated on it.
- The smaller the surface area, the greater the pressure
- The surface area is small.

Correct: **Ireland:** 41% **TIMSS:** 25%

S052141

29

Which energy source is non-renewable?

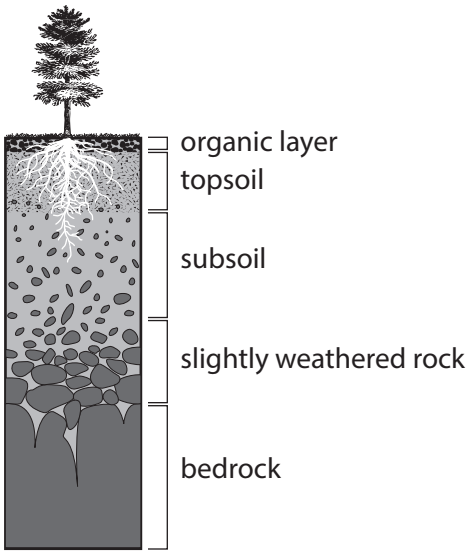
- (A) ✓ oil
- (B) water
- (C) wind
- (D) solar

Correct: **Ireland:** 87% **TIMSS:** 65%

S052096

30

The diagram shows layers in the soil.



Most plants have roots that grow in the topsoil, but some have roots that reach into the subsoil.

Write two advantages for a plant to have long roots that go down into the subsoil.

2 points: Any two specific, valid examples from list below:
- *Long roots can reach more nutrients (minerals).*
- *Long roots can reach water.*
- *Long roots anchor the plant better.*

1 point: Identifies only 1 advantage. Second advantage missing or incorrect.

2 Points		1 Point	
Ireland: 43%	**TIMSS:** 31%	**Ireland:** 35%	**TIMSS:** 28%

S052116

31

A student claims that his weight would be less on the moon than on Earth.

Is his claim correct?

(Tick one box.)

☑ Yes

☐ No

Explain your answer.

Provides explanation about the moon having less gravity; e.g.:

- *The moon has less gravitational pull than Earth.*
- *There is less gravity on the moon.*

Correct: **Ireland:** 23% **TIMSS:** 24%

S052110

TIMSS 2015

TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY

Released Items: Mathematics and Science

Second Year