Selective High School Placement Test

Mathematical Reasoning

Explained answers for Practice Test 3

Janison.

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1 The pointer is halfway between 2 kg and 3 kg on the scale, so the total mass is $2\frac{1}{2}$ kg, or 2.5 kg.

1 kg = 1000 g, so $2\frac{1}{2}$ kg = 2500 g

The mass of package 3 is the total mass minus the masses of packages 1 and 2:

2500 g − 850 g − 225 g = 1425 g

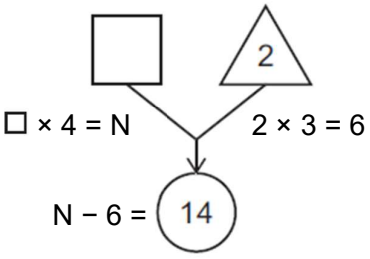
So the correct answer is **C** 1425 g

2 1 box holds 6 plants, so:
27 boxes hold 27 × 6 = 162 plants

To fill 27 boxes, Claire needs 162 − 149 = 13 more plants.

So the correct answer is **D** 13

3 The diagram below shows the information from the question (using ☐ for the number in the square and N for the result of ☐ × 4.)



If N − 6 = 14, then N = 14 + 6 = 20.

If ☐ × 4 = N = 20, then ☐ = 20 ÷ 4 = 5.

So the correct answer is **C** 5.

4 The pizza has 10 equal slices, so each slice is $\frac{1}{10}$ of the pizza.
Rana eats 2 slices.
Penny eats 4 slices.
Joshua eats 4 slices, because $\frac{1}{5}$ of the pizza is 2 slices and $\frac{2}{5}$ of the pizza is 4 slices.
(If the pizza is divided into 5 equal parts, or fifths, then each fifth is made of 2 slices.)

Statement 1: They eat the whole pizza.
The number of slices they eat altogether is 2 + 4 + 4 = 10. This is all of the slices.
Statement 1 is correct.

Statement 2: Joshua eats the least pizza.
Joshua eats 4 slices. Rana eats the least pizza, as she only eats 2 slices.
Statement 2 is incorrect.

Statement 3: Penny eats twice as much pizza as Joshua.
Penny and Joshua eat the same amount: 4 slices each.
Statement 3 is incorrect.

The correct answer is **A** statement 1 only

5 There are 60 seconds in every minute.
There are 60 minutes in every hour.
So in 1 hour, there are 60 × 60 seconds.

There are **24** hours in every day.
So in 1 day, there are **24** × 60 × 60 seconds.

> **Tip:** Changing the order of numbers in a multiplication does not change the result – so if your answer is 60 × 60 × 24 × 24, it is the same as 24 × 24 × 60 × 60.

In **24** days, there are 24 times as many seconds, or **24** × **24** × 60 × 60 seconds.

So the correct answer is **E** 24 × 24 × 60 × 60

6 We can answer the question in three steps:

Step 1: Work out the graph scale using the size of Class 3.
Step 2: Use the scale to find the total number of children in Classes 1 to 5.
Step 3: Subtract this from 160 to find the size of Class 6.

Step 1:
In Class 3, there are 30 children, and the column for Class 3 is 15 divisions high.
So one division on the graph represents 30 ÷ 15 = **2** children.

Step 2:
The heights of all the columns shown on the graph are:
Class 1 – 10 divisions
Class 2 – 14 divisions
Class 3 – 15 divisions
Class 4 – 13 divisions
Class 5 – 12 divisions
The total height of these four columns is 10 + 14 + 15 + 13 + 12 = 64 divisions.

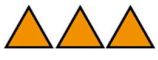
This represents 64 × **2** = **128** children.

Step 3:
There are 160 children in the school, so the number of children in Class 6 is 160 − **128** = 32.

So the correct answer is **C** 32

7 Imagine taking objects off the scales. If we take objects of equal mass from both sides, the scales will still balance.

Taking  and  from each side leaves:

 on the left, and  on the right.

Since each  has mass 6 g, the total mass on the right is now 3 × 6 g = 18 g.
So the total mass on the left is also 18 g.

If the mass of  is 18 g, the mass of  is 18 g ÷ 2 = 9 g.

So the correct answer is **D** 9 g

8 The fastest drivers are the drivers with the lowest times.

All of the times have the same number of whole seconds.

Tenths (in the first place after the decimal point) are larger than hundredths (in the second place). So to compare decimals:

- First compare the tenths. If one number has more tenths, it must be larger.
- If both numbers have the same number of tenths, compare the hundredths (and then the thousandths).

Tip: We can write 0 in any empty place after the decimal point. For example, we can write Batra's time as 58.200. If all of the numbers have three digits after the decimal point, we can compare their sizes by ignoring the decimal point. For example, 58 208 is bigger than 58 200, and 58.208 is bigger than 58.200.

Adams was fastest, because 58.046 has no tenths and so it is the shortest time.

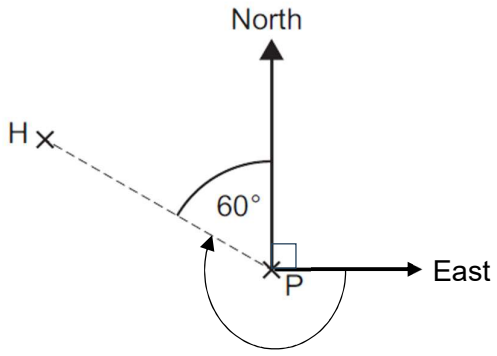
Smith was second fastest, because 58.117 has only one tenth.

Cruz's and Batra's times, 58.208 and 58.2, both have two tenths and no hundredths.
Cruz's time has 8 thousandths and Batra's has no thousandths, so Batra's time is shorter.
This means **Batra** was third fastest.

So the correct answer is **E** Adams, Smith, Batra

9 In the diagram below, east is shown with an arrow.
The angle between north and east is always a right angle, 90°.

The boy stands at P facing east.
His turn clockwise, to face the house at H, is shown by the curved arrow.



The angle the boy turns, plus 60°, plus 90°, equals an angle of revolution, which is 360°.
The angle the boy turns is 360° − 60° − 90° = 210°.

So the correct answer is **D** 210°.

10 Working backwards:

Charlie spent $9, which was a quarter of what Alex gave him.
So Alex gave Charlie four times as much: 4 × $9 = $36.

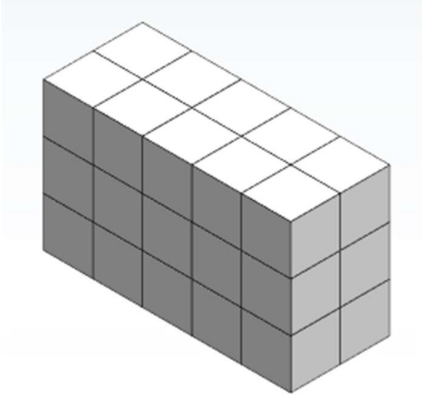
Alex gave Charlie $36, which was half of what Alex had after spending some.
So before he gave money to Charlie, Alex had twice as much: 2 × $36 = $72.

Before spending money in the shop, Alex had $76.
So Alex spent $76 − $72 = $4 in the shop.

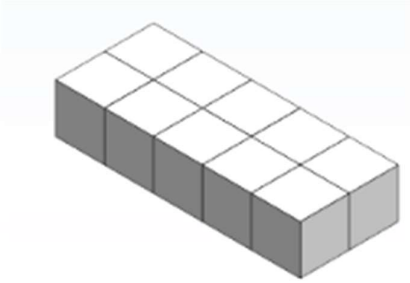
So the correct answer is **A** $4

11 The three diagrams show three different rectangles, which must be the three different faces of the cuboid.

Below is a 3D diagram of the cuboid. It shows the three different faces (3 by 5 in dark grey, 5 by 2 in white, and 3 by 2 in light grey).



Now we need to count the cubes in the cuboid. One way is to split the cuboid into three layers, with each layer measuring 5 by 2 cubes:



Each layer contains 5 × 2 = 10 cubes, so three layers contain 10 × 3 = 30 cubes.

So the correct answer is **B** 30

12 Think about each of the three keys in turn.

Jennifer can use key X (represents 4 bunches) because:

- 24 = 6 × 4, so Monday would have 6 whole flower pictures

- 28 = 7 × 4, so Tuesday would have 7 whole flower pictures
- 36 = 9 × 4, so Wednesday would have 9 whole flower pictures.

She can use key Y ( represents 8 bunches) because:

- 24 = 3 × 8, so Monday would have 3 whole flower pictures
- 28 = 3 × 8 + 4 and 4 is half of 8, so Tuesday would have 3½ flower pictures
- 36 = 4 × 8 + 4, so Wednesday would have 4½ flower pictures.

She cannot use key Z ( represents 12 bunches) because:

- 24 = 2 × 12, so Monday would have 2 whole flower pictures
- 36 = 3 × 12, so Tuesday would have 3 whole flower pictures
- but 28 = 2 × 12 + 4, and 4 is not half of 12, so Wednesday's 28 bunches could not be represented by whole and half flower pictures.

So the correct answer is **B** key X or key Y only

13 When three of the numbers are chosen, one number is rejected.
There are four possible numbers to reject, so there are four possible totals:

5 + 6 + 8 = **19** (3 is not used)
3 + 6 + 8 = **17** (5 is not used)
3 + 5 + 8 = **16** (6 is not used)
3 + 5 + 6 = **14** (8 is not used)

Now consider each of the statements.

Statement 1: The total cannot be a multiple of 8.
The total can be a multiple of 8 because **16** is a multiple of 8.
Statement 1 is incorrect.

Statement 2: The total can be a multiple of 3.
The total cannot be a multiple of 3, because none of the totals are multiples of 3.
Statement 2 is incorrect.

Statement 3: The total is always odd.
The total is not always odd, because **16** and **14** are even.
Statement 3 is incorrect.

So the correct answer is **A** none of them

14 Rectangle area = 11 cm × 12 cm = 132 cm^2.

Rectangle area = triangle area + grey area

So triangle area = rectangle area − grey area = 132 cm^2 − 84 cm^2 = 48 cm^2.

So the correct answer is **D** 48 cm^2

15 The container has 5 divisions for every 100 mL.

So one division on the container is 100 mL ÷ 5 = 20 mL.

The table below shows:

- the volume in the container at the end of each week (as shown on the diagrams)
- the volume at the start of the week (which equals the volume at the end of the previous week)
- the amount of rain during the week (which is the difference between the two volumes above).

Week	1	2	3	4	5
Volume in container at start (mL)	0	60	100	180	220
Volume in container at end (mL)	60	100	180	220	360
Amount of rain during that week (mL)	60	40	80	40	140

Weeks 2 and 4 both had the same amount of rainfall, 40 mL.

So the correct answer is **D** week 2 and week 4

16 A quadrilateral is a 2D shape with four straight sides. The types of quadrilateral are:

square rectangle rhombus parallelogram
trapezium kite irregular quadrilateral

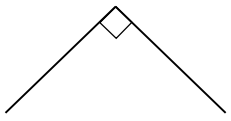
The quadrilateral has sides of different lengths, so it cannot be a square or a rhombus. This leaves:

rectangle parallelogram
trapezium kite irregular quadrilateral

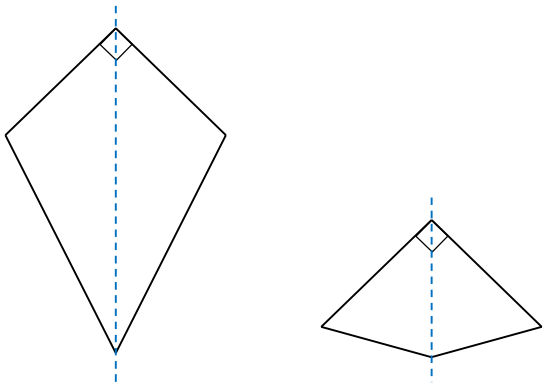
These types of quadrilateral each have two pairs of parallel sides: square, rectangle, parallelogram, rhombus. A trapezium has one pair of parallel sides. This leaves:

kite irregular quadrilateral

The quadrilateral has two pairs of equal sides. If the equal sides were opposite each other, then the shape would be a square, rectangle, rhombus or parallelogram – but we already know it cannot be any of these. So the equal sides must be next to each other. They could have a right angle between them:



The other two sides are equal. The shape can only be a kite:



A kite has one line of symmetry, as shown by the dashed line.

(The right angle cannot be between two sides of different length, because then there must be a right angle on each side of the mirror line. This quadrilateral has exactly one right angle, so it cannot have two.)

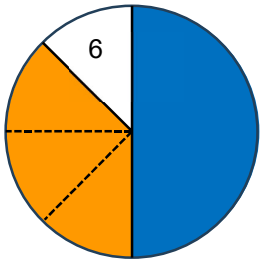
So the correct answer is **B** 1

17 After the first section is planted, $\frac{3}{4}$ of the remaining bulbs are planted in the second section. So $\frac{1}{4}$ must be left.
This is 6 bulbs.

So four quarters (all) of the remaining bulbs is 6 × 4 = 24 bulbs.

These 24 remaining bulbs are $\frac{1}{2}$ of the bulbs that were in the box at the start.
So there were 24 × 2 = 48 bulbs in the box at the start.

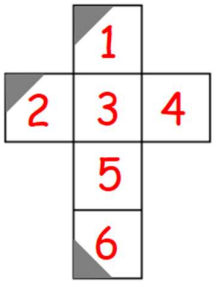
Tip: Here is an alternative method. The circle represents the bulbs in a box.



$\frac{1}{2}$ of the circle is blue; this represents the bulbs planted in the first section of the garden.
$\frac{3}{4}$ of the rest of the circle is orange; this represents the bulbs planted in the second section.
The fraction of bulbs remaining is then $\frac{1}{4}$ of $\frac{1}{2}$, which is $\frac{1}{8}$. So $\frac{1}{8}$ of the bulbs is **6** bulbs.
The total number of bulbs (eight eighths) is 8 × **6** = 48.

So the correct answer is **E** 48

18 Here is diagram 1 with a number label on each square face:

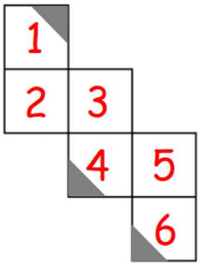


When this is folded:

- the triangles on faces 1 and 2 meet at a vertex;
- and faces 1, 3, 5 and 6 roll up so that 6 meets 1 and 2.

Diagram 1 is possible.

Here is diagram 2 with a number label on each square face:



When this is folded:

- the triangles on faces 4 and 6 meet at a vertex;
- but the triangle on face 1 meets faces 3 and 5, not 4 and 6. It should be in a different place, shown below in red.

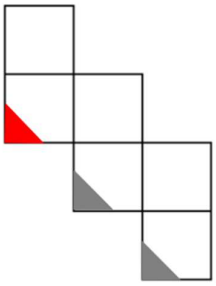
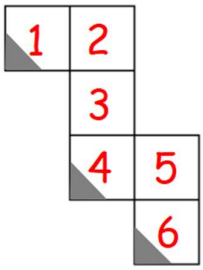


Diagram 2 is not possible.

Here is diagram 3 with a number label on each face:



When this is folded:

- the triangles on faces 4 and 6 meet;

- but the triangle on face 1 meets faces 3 and 4, not 6 and 4. It should be in a different place, shown below in red.

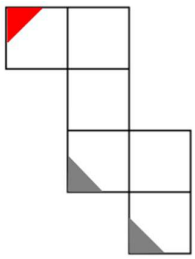


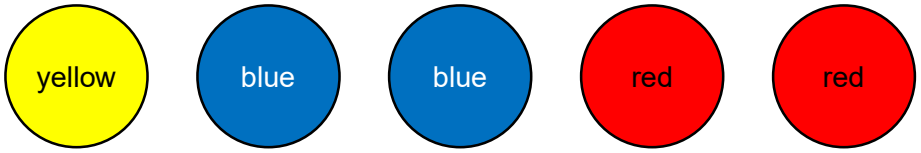
Diagram 3 is not possible.

The correct answer is **A** diagram 1 only

19 From the information given, we can write:

For every red disc, there is a blue disc.
For every yellow disc, there are two blue discs.

So for every yellow disc, there must be two blue discs and two red discs:



If there are 5 discs altogether and 2 are blue, the probability of selecting a blue disc is $\frac{2}{5}$.

The question does not say how many discs there are. The total number of discs could be any multiple of 5. However, the probability of selecting a blue disc will still be $\frac{2}{5}$ because 2 out of every 5 discs will be blue.

So the correct answer is **D** $\frac{2}{5}$

20 Writing the information in a shorter way:

burger + drink = \$6.00
chips + drink = \$3.75
burger + chips + drink = \$8.50

The difference between burger + chips + drink (\$8.50) and burger + drink (\$6.00) must be the cost of the chips.
So chips cost \$8.50 − \$6.00 = **\$2.50**.

The difference between burger + chips + drink (\$8.50) and chips + drink (\$3.75) must be the cost of the burger.
So a burger costs \$8.50 − \$3.75 = **\$4.75**.

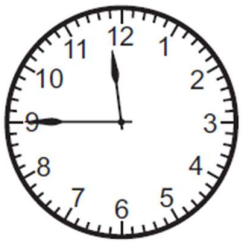
A burger and chips costs **\$4.75** + **\$2.50** = \$7.25.

So the correct answer is **C** \$7.25

21 The time difference between 7:05 am and 3:25 pm is 8 hours 20 minutes.
The clock's hands turned twice as fast as normal during that time, so they went forward by 16 hours 40 minutes.

16 hours 40 minutes = 12 hours + 4 hours + 40 minutes.

12 hours after 7:05 am is **7:05 pm**.
4 hours after **7:05 pm** is **11:05 pm**.
40 minutes after **11:05 pm** is 11:45 pm.



So the correct answer is **E**

22 Since I have equal numbers of $1 and $2 coins, I can make pairs of coins.
Each pair is made up of a $1 coin and a $2 coin and is worth $3 altogether.

$54 ÷ 3 = $18, so I have 18 pairs of coins. So I have 18 of each type of coin.

The total weight of the $1 coins is:
18 x 9 g = **162 g**

The total weight of the $2 coins is:
18 × 7 g = **126 g**

The total weight of all the coins is **162 g** + **126 g** = 288 g.

So the correct answer is **B** 288 g

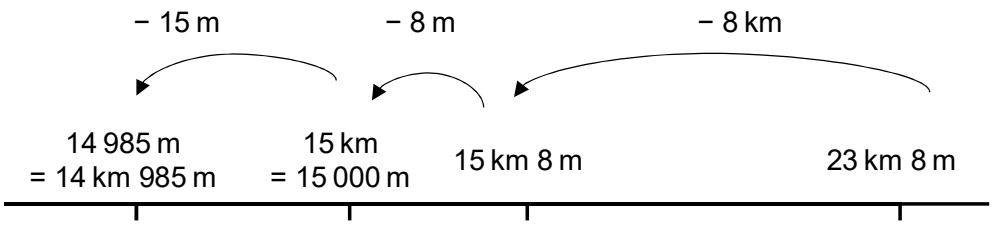
23 We need to subtract 8 km 23 m from 23 km 8 m.

First subtract 8 km:
23 km 8 m − 8 km = 15 km 8 m

1 km = 1000 m, so 15 km 8 m = 15 008 m

We can subtract 23 m by subtracting 8 m first and then 15 m:
15 008 m − 8 m = 15 000 m
15 000 m − 15 m = 14 985 m

The diagram shows the same calculation.



So the correct answer is **B** 14 km 985 m

24 The area that has hills is made up of area with hills only, and area with both hills and bush ('hilly bush'):

$$\text{hills area} = \text{hills only} + \text{hilly bush} = 132\ \text{km}^2$$

The area that has bush is made up of area with bush only, and area with both hills and bush:

$$\text{bush area} = \text{bush only} + \text{hilly bush} = 80\ \text{km}^2$$

If you add these two areas together, the sum is the total area of the island plus the area of hilly bush:

$$\text{hills only} + \text{bush only} + \text{hilly bush} + \text{hilly bush} = 132 + 80 = 212\ \text{km}^2$$

$$= \text{total area of island} + \text{hilly bush}$$

$$= 164\ \text{km}^2 + \text{hilly bush}$$

The area with hilly bush is then $212 - 164 = 48\ \text{km}^2$

So the correct answer is **C** $48\ \text{km}^2$

25 The numbers of minutes after 7:00 am when the blue and green lights flash are shown below, for the first half hour.

G	3	6	9	12	**15**	18	21	24	27	**30**
B	5	10	**15**	20	25	**30**

Both lights flash every 15 minutes (since 15 is the lowest common multiple of 3 and 5).

The red light flashes at every even number of minutes after 7:00 am, as shown below.

G	3	6	9	12	**15**	18	21	24	27	**30**
B	5	10	**15**	20	25	**30**
R	2	4	6	8	10	12	14	16	18	20	22	24	26	28	**30**

It flashes at even common multiples of 3 and 5 (30 minutes, 60 minutes, and so on).
It does not flash at odd common multiples of 3 and 5 (15 minutes, 45 minutes, and so on).

So the green and blue lights flash together when the number of minutes is an odd multiple of 15: 15, 30, 45 and so on. The times between 7:01 am and 9:59 am are:

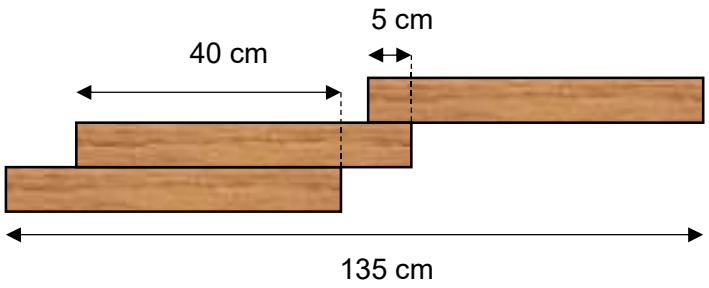
7:15 am, 7:45 am, 8:15 am, 8:45 am, 9:15 am and 9:45 am

There are 6 times.

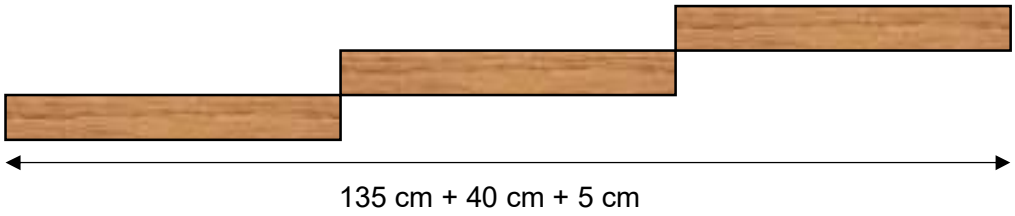
So the correct answer is **A** 6

26 If you slide the planks of wood along so that they do not overlap, then the middle plank moves 40 cm to the right and the right-hand plank moves 40 cm + 5 cm to the right.

The arrangement goes from this:



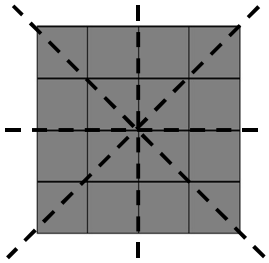
to this:



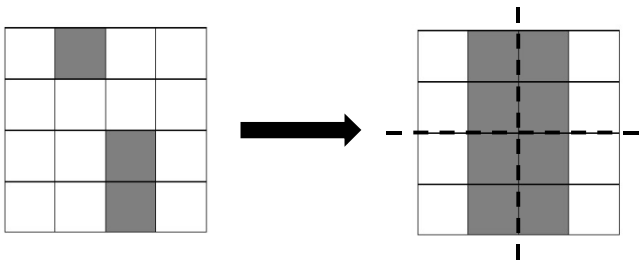
The total length is now 135 cm + 40 cm + 5 cm = 180 cm. This is the length of three planks.
The length of one plank is 180 ÷ 3 = 60 cm.

So the correct answer is **C** 60 cm

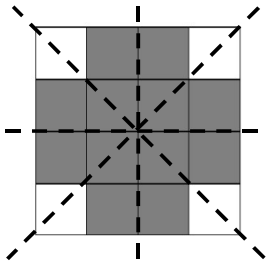
27 A complete square has four lines of symmetry (mirror lines). One is horizontal, one is vertical and two are diagonal, as shown by the dashed lines below.



At the start, the pattern has no lines of symmetry. To make a pattern with two lines of symmetry, the smallest number of extra squares Alison can shade is **5**:



To make a pattern with four lines of symmetry, Alison does not have to shade all of the remaining squares. She can shade **4** more:



The smallest number of extra squares she can shade altogether is **5** + **4** = 9.

So the correct answer is **D** 9

28 Think about one statement at a time.

Statement 1: She sold ten more orange drinks than lemon drinks.
This is only possible if 33 can be made by adding a number to another number that is 10 bigger. We can look for ways of doing this:

33 = 10 + 23 (second number is 13 bigger)
33 = 11 + 22 (second number is 11 bigger)
33 = 12 + 21 (second number is 9 bigger)

It is not possible for the bigger number to be 10 more than the smaller number.
Statement 1 cannot be correct.

Statement 2: She sold twice as many orange drinks as lemon drinks.
This is only possible if 33 can be made by adding a number, N, to a number that is twice as big, N + N.
Then 33 is N + N + N, which is three times the smaller number.
So the smaller number, N, must be 33 ÷ 3 = 11.
The bigger number, N + N, is 11 + 11 = 22.
11 and 22 add up to 33.
Statement 2 can be correct.

Statement 3: She sold five more lemon drinks than orange drinks.
This is only possible if 33 can be made by adding a number to another number that is 5 bigger. We can look for ways of doing this:

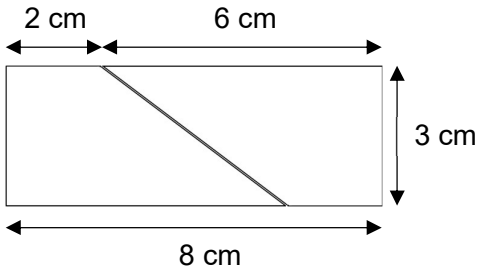
33 = 16 + 17 (second number is 1 bigger)
33 = 15 + 18 (second number is 3 bigger)
33 = 14 + 19 (second number if 5 bigger)

Statement 3 can be correct.

Only statement 1 cannot be correct.

So the correct answer is **A** statement 1 only

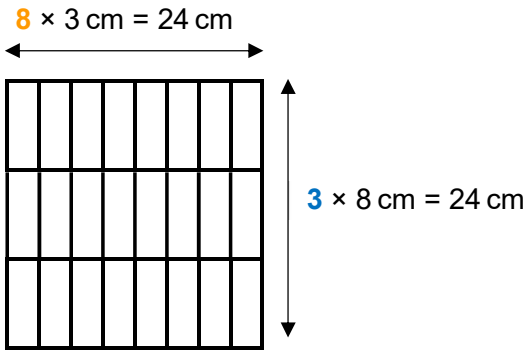
29 Two of these trapezia can be joined to make a rectangle measuring 8 cm by 3 cm:



The square is 24 cm long, so the length of the rectangle, 8 cm, fits along the length of the square 24 cm ÷ 8 cm = **3** times.

The square is 24 cm wide, so the width of the rectangle, 3 cm, fits along the width of the square 24 cm ÷ 3 cm = **8** times.

The diagram shows the rectangles inside the square:

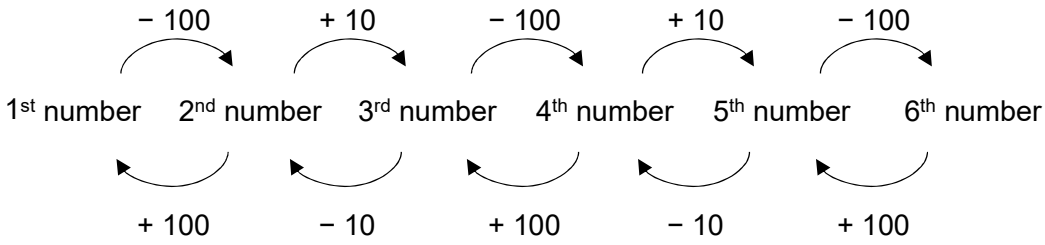


So the rectangle fits into the square exactly **3** × **8** = 24 times.

Each rectangle is made up of two trapezia, so 24 × 2 = 48 trapezia can be cut from the square.

So the correct answer is **D** 48

30 The diagram shows how to get from one number in the sequence to the next, going forwards or backwards:



Working backwards from the 6th number, 8451:

8451 + 100 = 8551 (5th)
8551 − 10 = 8541 (4th)
8541 + 100 = 8641 (3rd)
8641 − 10 = 8631 (2nd)
8631 + 100 = 8731 (1st)

So the correct answer is **E** 8731

31 Four quarter-turns make one full turn (revolution).

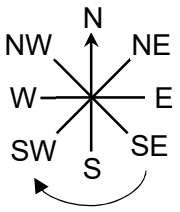
58 ÷ 4 = 14 remainder 2
so 58 quarter-turns clockwise have the same effect as 14 full turns and **2** quarter-turns clockwise.

93 ÷ 4 = 23 remainder 1
so 93 quarter-turns anti-clockwise have the same effect as 23 full turns and **1** quarter-turn anti-clockwise.

Each full turn (revolution) does not change the robot's direction: when it makes a full turn, it faces south-east again.

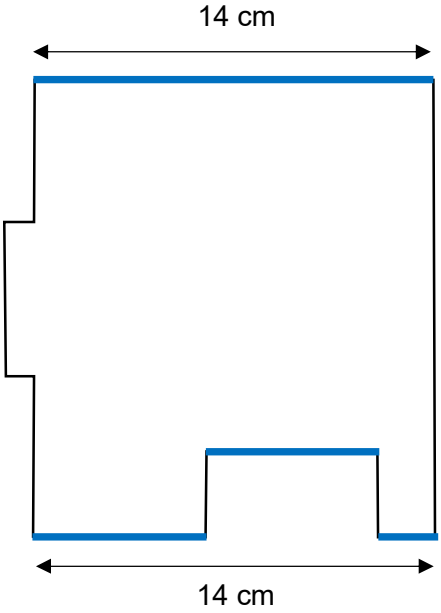
The overall effect of **2** quarter-turns clockwise and **1** quarter-turn anticlockwise is 1 quarter-turn clockwise.

After a quarter-turn clockwise from south-east, the robot faces south-west:

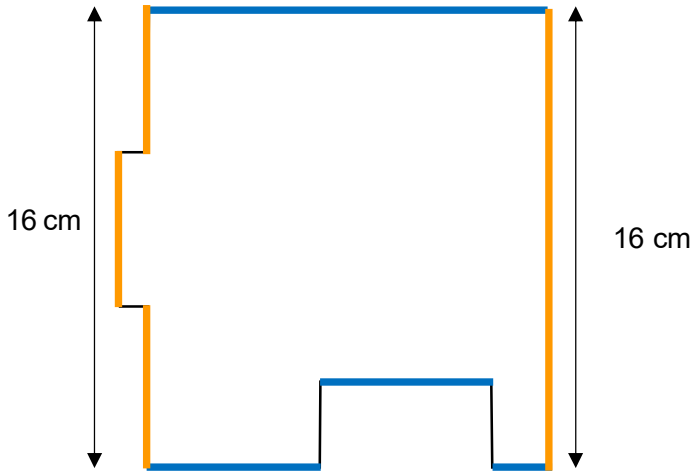


So the correct answer is **E** south-west

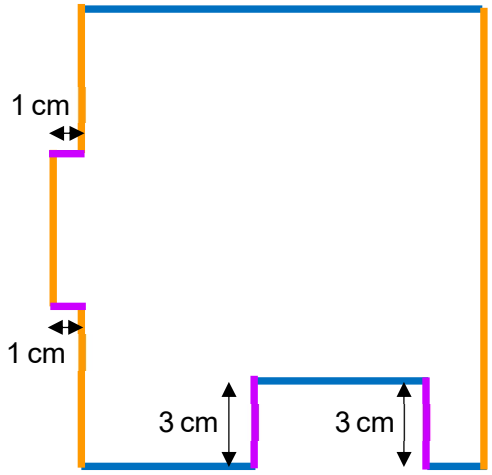
32 The line across the top of the shape, shown below in blue, is 14 cm long.
The three blue lines across the bottom are 14 cm long altogether.
The total length of the blue lines is 14 cm + 14 cm = **28 cm**.



The line on the right, shown below in orange, is 16 cm long.
The three orange lines on the left are 16 cm long altogether.
The total length of the orange lines is 16 cm + 16 m = **32 cm**.



The lengths of the other lines, shown below in purple, are all shown in the question.
Their total length is 3 cm + 3 cm + 1 cm + 1 cm = **8 cm**.



The perimeter is the sum of all the lengths, which is **28 cm** + **32 cm** + **8 cm** = 68 cm.

So the correct answer is **E** 68 cm

33 When a two-digit number is reversed and changes its value, it either:

- gets smaller, if the tens digit decreases and the ones digit increases by the same amount (for example, 42 → 24), or
- gets bigger, if the tens digit increases and the ones digit decreases by the same amount (for example, 37 → 73).

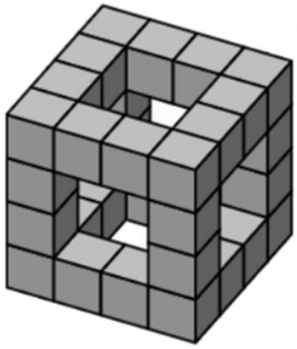
If the tens digit increases by 7, then the ones digit decreases by 7, and Nicole's number increases by only 63 (since 70 − 7 = 63).

If the tens digit increases by 8 and the ones digit decreases by 8, then her number increases by 72 (since 80 − 8 = 72). So this is what happens.

In Nicole's original number, the ones digit is 8 more than the original tens digit. The digits must be 9 and 1 (since 91 − 19 = 72).

So the correct answer is **E** 9

34 After Harry removes some small cubes, he can see a 2 by 2 hole through the object when he looks at each face. The object now looks like this:



To get this object, Harry removes 4 small cubes from each of the original cube's six faces. This is 6 × 4 = **24** small cubes altogether.

He also removes a 2 by 2 by 2 cube from the centre of the original cube (so that he can see straight though it), which is another **8** small cubes.

Harry removes **24** + **8** = **32** small cubes altogether.

The original large cube was made from 64 small cubes, so the object now has 64 − **32** = 32 small cubes.

So the correct answer is **B** 32

35 It is helpful to show the information in a table, with a row for each game. First, here are Aaron's spins (in order of size):

Aaron	Tom	Winner
1		
1		
2		
2		
2		
3		
3		
3		

Since there are no draws, Tom and Aaron never score 2 in the same game.
Tom spins 2 in five games, so these must be the games in which Aaron scores 1 or 3:

Aaron	Tom	Winner
1	2	
1	2	
2		

2		
2		
3	2	
3	2	
3	2	

Now we can fill the other spaces with Tom's two 1s and one 3. The order does not matter, because they all happen in games in which Aaron spins 2.

Aaron	Tom	Winner
1	2	T
1	2	T
2	1	A
2	1	A
2	3	T
3	2	A
3	2	A
3	2	A

The table now shows that Aaron wins 5 games. So the correct answer is **C** 5