NSW GOVERNMENT

Opportunity Class Placement Test

Mathematical Reasoning

Explained answers for the sample test

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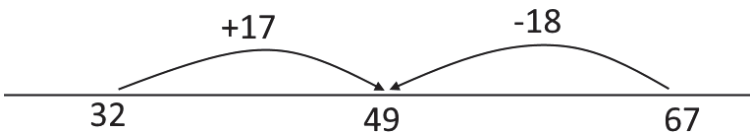
1 67 – ▲ = 32 + 17
32 + 17 = 49, so 67 – ▲ = 49.

That means ▲ must be the difference between 67 and 49 which is 18.
So the correct answer is **B** 18.

This is shown on the number line below:

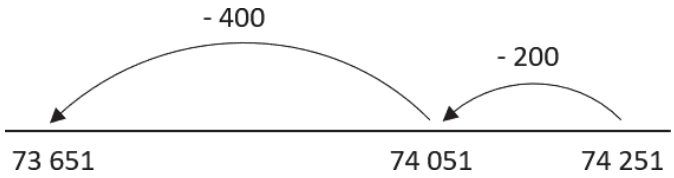


2 74 251 has 2 in the hundred position, so take 200 away first, giving
74 251 – 200 = 74 051.

To take away a total of 600, you need to take away another 600 – 200 = 400.

74 051 – 400 = 73 651 because 40 – 4 = 36, so the correct answer is **C** 73 651.

This is shown on the number line below:



3 Liu Wei was on the train from twenty to midnight until 2:45 pm the next day.
From twenty to midnight until midnight is 20 minutes.
From midnight to midday is 12 hours.
From midday to 2:45 pm is 2 hours 45 minutes.

So the total time on the train is 20 minutes + 12 hours + 2 hours + 45 minutes, which is 14 hours 65 minutes.

There are 60 minutes in an hour, so 65 minutes is 1 hour 5 minutes, so altogether, Liu Wei was on the train for 15 hours 5 minutes.

So the correct answer is **E** 15 hours 5 minutes.

Alternatively, twenty to midnight is 11:40 pm.
2:40 pm the next day is 15 hours later.
So 2:45 pm is 15 hours 5 minutes later.

4 There are eight squares altogether. We can divide the shape into quarters by splitting it into four sections, each with two squares.

To shade three-quarters of the shape, we need to shade 6 squares.

One square is already shaded, so 5 more need to be shaded.
So the correct answer is **D** 5.

5 Rounding each number to the nearest 10:

45 → 50 increased by 5
54 → 50 decreased by 4
77 → 80 increased by 3
80 → 80 stayed the same
99 → 100 increased by 1

The number which changed the most is 45, so the correct answer is **A** 45.

(Even though 45 is exactly half way between 40 and 50, we round to the higher number, so 45 rounds up to 50.)

6 Each square represents ten metres and north is straight up.

30 metres north is the same as 3 squares up.

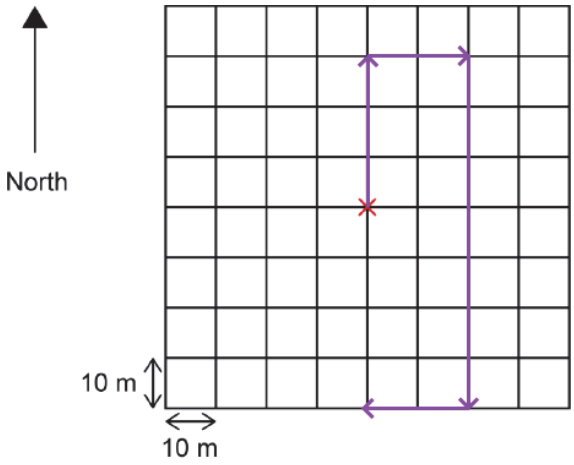
20 metres east is the same as 2 squares to the right.

70 metres south is the same as 7 squares down.

20 metres west is the same as 2 squares to the left.

After following these instructions, Claire is 4 squares away from her starting position, which is 40 metres.

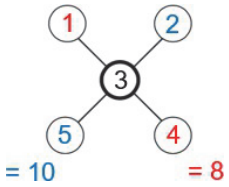
So the correct answer is **D** 40 metres.



7 Both lines of three numbers must sum to eight, each including the common number in the centre of the diagram. Once a number has been placed in the centre, the four remaining numbers need to be placed in the circles on either side of it.

If, for example, 3 is placed in the centre, then the numbers remaining are 1, 2, 4, and 5. These numbers must be put into two pairs, and both pairs must have a sum of 8 – 3 = 5. The pairing of 4 and 1 works as 3 + 4 + 1 = 8, but that leaves the other pair as 5 and 2, giving 3 + 5 + 2 = 10, which is incorrect.

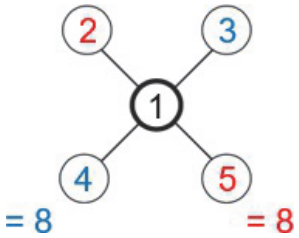
With 3 at the centre – incorrect:



Centre number	Remaining numbers	Two pairs of these must add up to:	Pairs
1	2, 3, 4, 5	7	2 and 5, 3 and 4
2	1, 3, 4, 5	6	1 and 5 only
3	1, 2, 4, 5	5	1 and 4 only
4	1, 2, 3, 5	4	1 and 3 only
5	1, 2, 3, 4	3	1 and 2 only

Using the numbers available, only the first of these options is possible. Hiro must write a 1 in the centre circle, and the pairs (2 and 5) and (3 and 4) on either side of it to create lines that add to 8.

With 1 at the centre – correct:



So the correct answer is **A** 1.

8 Every time Ollie adds blue beads to the necklace, he adds them in groups of 3. The finished necklace has 12 blue beads, so he must have added 4 groups of blue beads because 4 × 3 = 12 (or 12 ÷ 3 = 4).

This means Ollie must have added 4 groups of red beads too.

4 × 2 = 8, so Ollie's necklace has 8 red beads.

So the correct answer is **B** 8.

9 To start off with, container X has 35 mL of water in, because the water level is exactly halfway between 30 mL and 40 mL.

Container Y has 60 mL in, so 20 mL more needs to be poured in from container X for it to contain 80 mL.

That means container X now has 35 – 20 = 15 mL of water left.
So the correct answer is **C** 15 mL.

10 The wire is 80 cm long.
Two of the sides are 10 cm long, so that means there is 80 – 10 – 10 = 60 cm left for the other two sides. As the shape is a rectangle, the other two sides are the same length, so the 60 cm must be shared equally between them.

Half of 60 is 30, so each of the other two sides is 30 cm.

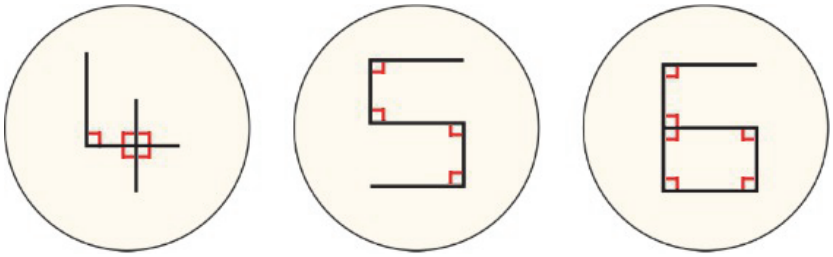
The longer sides of the rectangle are each 30 cm long, so the correct answer is **C** 30 cm.

Alternatively, we could work it out by thinking about the perimeter of the rectangle. The whole perimeter is 80 cm, which is two longer sides and two shorter sides.

Halfway round the perimeter is 40 cm, and this is one longer side and one shorter side.

One of the sides is 10 cm, so the other side must be 40 – 10 = 30 cm.

11 The diagram below shows the right angles in each digit:



The ‘4’ has five right angles.
The ‘5’ has four right angles.
The ‘6’ has six right angles.

The two cards with the highest number of right angles are the ‘6’ and the ‘4’, with a total of 6 + 5 = 11 right angles. The largest possible number of right angles on the two cards is 11, and so the correct answer is **E** 11.

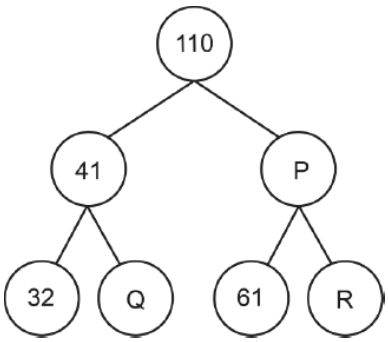
12 Working in kg:
1 kg is 1000 g, so 500 g is $\frac{1}{2}$ a kg.
To make 4 kg, Joe could buy a $2\frac{1}{2}$ kg bag and three 500 g bags, because $2\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 4$.

This would cost \$4.50 + \$1 + \$1 + \$1 = \$7.50.
(He could also buy eight 500 g bags but this would cost 8 × \$1 = \$8.)
So the correct answer is **E** \$7.50.

Working in g:
1 kg is 1000 g, so $2\frac{1}{2}$ kg is 2500 g and 4 kg is 4000 g.
Joe could make 4000 g by buying 2500 g + 500 g + 500 g + 500 g.

This would cost \$4.50 + \$1 + \$1 + \$1 = \$7.50.
(Joe could make 4000 g by buying 8 × 500 g but this would cost \$8.)
So the lowest price for 4 kg is \$7.50.

13 To work out the value of Q multiplied by R, we need to start by working out P, Q and R.



Each pair of numbers is added together to make the number above, so we know that 41 + P = 110. So we can work out 110 – 41 to find that P is 69.

In the same way, 32 + Q = 41 so we can work out 41 – 32 = 9 so Q must be 9.

Finally, 61 + R = 69 so R is 69 – 61 which is 8.

That means that Q multiplied by R is 9 × 8 = 72.
So the correct answer is **B** 72.

14 To work out the number of small square faces that Rachael can't see, we can work out how many faces she can see, and take it away from the total number of faces.

From the front, Rachael can see 3 × 3 = 9 faces. Since she can pick up the object and look from any direction, she can also see 9 faces on the back.

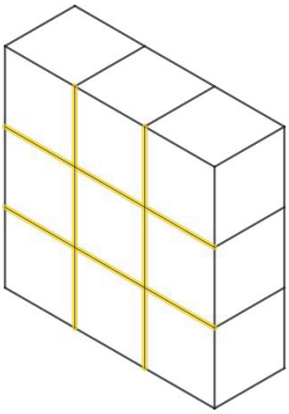
On the top, she can see 3 faces. She can also see 3 faces on the bottom.

On the side, she can see 3 faces. She can also see 3 faces on the opposite side.

The total number of faces Rachael can see is 9 + 9 + 3 + 3 + 3 + 3 = 30.

There are 9 cubes altogether and each one has 6 square faces, so altogether there are 9 × 6 = 54 square faces. The number of these faces which Rachael can't see is 54 – 30 = 24, so the correct answer is **C** 24.

Alternatively, we could work out directly how many faces are hidden.



In this diagram, the highlighted lines show all the places where two cubes meet.

Each line is three cube lengths and there are four lines so there are 3 × 4 = 12 places where two cubes meet. Two faces are hidden at each (one from each cube) so there are 12 × 2 = 24 hidden faces altogether.

15 In Jasper's sequence, each number is 4 less than double the previous number. We want to know the number that came before 36, so we have to work backwards.

36 is 4 less than 40, so 40 is double the previous number.
40 is double 20, so the previous number must have been 20.

Now Jasper adds the digits of 20: 2 + 0 = 2. The new number is 2, so the correct answer is **A** 2.

Alternatively, we could find a rule to move backwards in the sequence.
The rule to go forwards is × 2 then – 4.

That means that the rule to go backwards is + 4 then ÷ 2.

36 + 4 = 40
40 ÷ 2 = 20

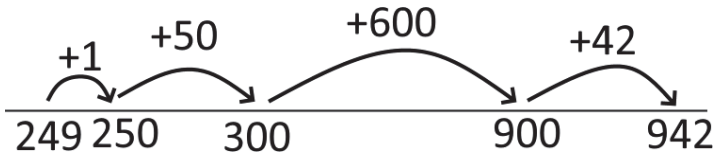
So the previous number in the sequence was 20, and the sum of the digits is 2.

16 To find the largest three-digit number Jo can make, we need to put the digits in order from largest to smallest, so 942 is the largest number Jo can make.

To find the smallest three-digit number, we need to reverse the order of the digits, so 249 is the smallest number Jo can make.

The difference between them is 942 – 249.

Using a number line:



The difference is 600 + 50 + 42 + 1 = **D** 693.

Using column subtraction:

$$\begin{array}{rccc} & {}^{8}\cancel{9} & {}^{13}\cancel{4} & {}^{1}2 \\ - & 2 & 4 & 9 \\ \hline & 6 & 9 & 3 \\ \hline \end{array}$$

So the correct answer is 693.

17 Reading from the graphs, in week 1, Balal sold:

Monday 6
Tuesday 5
Wednesday 7
Thursday 3
Friday 4
Total 6 + 5 + 7 + 3 + 4 = 25

In week 2 so far, Balal has sold:

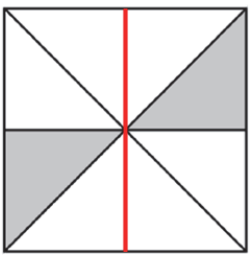
Monday 7
Tuesday 5
Wednesday 5
Thursday 6
Total 7 + 5 + 5 + 6 = 23

He wants to sell more umbrellas in week 2, so he needs to sell at least 26.
26 – 23 = 3, so he needs to sell at least 3 more, and the correct answer is **B** 3.

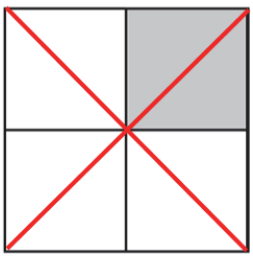
18 To decide whether $\frac{2}{8}$ is shaded, we can imagine drawing extra lines to divide each of the squares into eight pieces that are equal sizes and shapes:

X

Y



Z



Square X has four pieces out of eight shaded so does not have $\frac{2}{8}$ shaded.

Square Y has two pieces out of eight shaded so has $\frac{2}{8}$ shaded.

Square Z has two pieces out of eight shaded so has $\frac{2}{8}$ shaded.

So the correct answer is **E** squares Y and Z only.

19 The sequence starts 3, 6, 12, 24 …

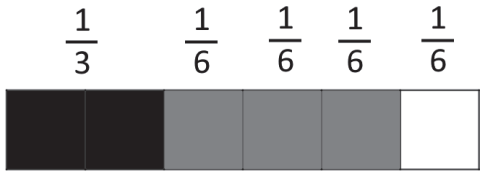
To get from one term to the next, we always multiply by 2.
That means the next two terms are 24 × 2 = 48 and 48 × 2 = 96.

The 4th term is 24, the 6th term is 96, so the difference between them is 96 – 24 = 72.
So the correct answer is **D** 72.

20 $\frac{1}{3} = \frac{2}{6}$ so Hassan spends $\frac{2}{6}$ of his money in the first shop.

He has $\frac{1}{6}$ of his money left at the end. Altogether that accounts for $\frac{2}{6} + \frac{1}{6} = \frac{3}{6}$ of his pocket money, so the remaining $\frac{3}{6}$ was spent in other shops.

He spent $\frac{1}{6}$ of his money in each of these shops so he must have visited 3 more shops because $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{3}{6}$.

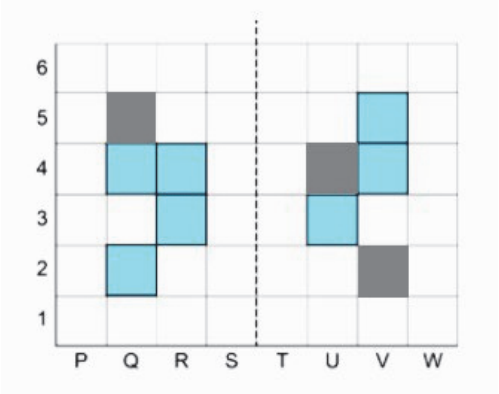


Altogether he visited 4 shops, so the correct answer is **B** 4.

21 To work out which squares need to be shaded, we can check each row.

In row 5, V5 is shaded, so Q5 needs to be shaded as it is the same distance from the line of symmetry.
In the same way, in row 4, there is a block of two shaded squares on the left but only one on the right, so U4 needs to be shaded.
Similarly in row 2, Q2 is shaded, so V2 also needs to be shaded.

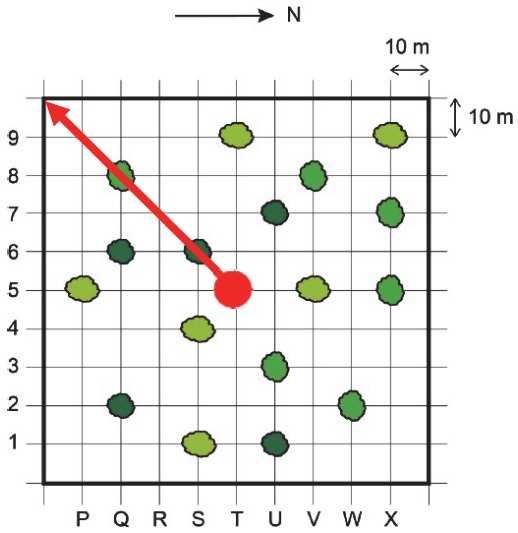
The three newly shaded squares are shown on the diagram below:



So the correct answer is **D** Q5, U4, V2.

22 We need to find where the birdwatcher is and which trees are south-west of him.

We know north is to the right, so we can work out that south is to the left, west is towards the top of the picture, and south-west is towards the top left of the picture.



The red dot shows where the birdwatcher stands at T5, and the arrow points to the south-west. It passes through two trees, at S6 and Q8.

Since each square represents 10 m, S6 is less than 25 m from the bird watcher, so the bird must be in the tree at Q8. So the correct answer is **B** Q8.

23 8 penguins eat 24 kg of fish per week. 4 penguins is half as many penguins, so they will eat half as much fish. Half of 24 is 12, so 4 penguins eat 12 kg of fish per week.

4 sea lions eat 24 kg of fish per week. 8 sea lions is twice as many sea lions, so they will eat twice as much fish. 48 is twice as much as 24, so 8 sea lions eat 48 kg of fish per week.

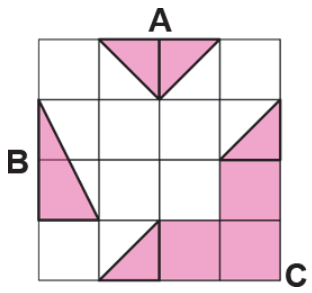
Altogether, 4 penguins and 8 sea lions would eat 12 + 48 = 60 kg of fish per week. So the correct answer is **D** 60 kg.

Alternatively, if 8 penguins eat 24 kg of fish, 1 penguin eats 24 ÷ 8 = 3 kg of fish, so 4 penguins eat 4 × 3 = 12 kg of fish per week.

If 4 sea lions eat 24 kg of fish, 1 sea lion eats 24 ÷ 4 = 6 kg of fish, so 8 sea lions eat 8 × 6 = 48 kg of fish per week.

24 This 4 × 4 square is a quarter of the area of the original paper, and all 4 quarters will be the same, so we need to find the remaining white area on the diagram and then multiply that by 4.

The original area is 16 squares.



Shaded area A has two half squares shaded, so area A is 1 square.

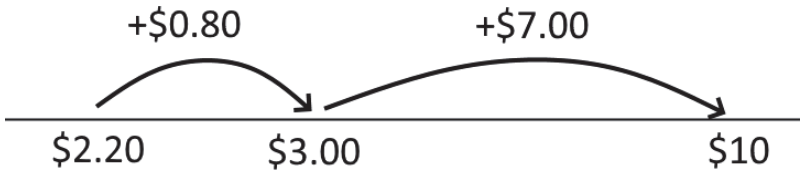
Shaded area B has half of 2 squares shaded, so area B is also 1 square.

Shaded area C has 3 whole squares and 2 half squares shaded, so area C is 4 squares.

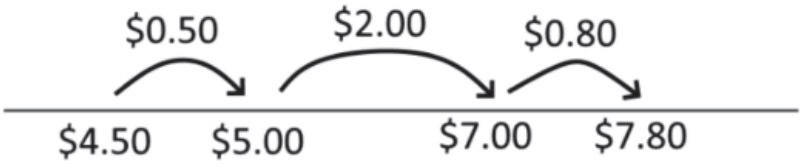
The total area shaded is 1 + 1 + 4 = 6 squares.

The white area remaining is 16 – 6 = 10 squares, so the total area remaining is 10 × 4 = 40 squares. So the correct answer is **D** 40 cm^2.

25 1 pen and 1 pencil costs $1.40 + $0.80 = $2.20.
Susie pays with a $10 note, so her change is $10 – $2.20 = $7.80:



Susie's change has nine 50 cent coins. 9 × 50 = 450 cents which is $4.50.
Her remaining change is $7.80 – $4.50 = $3.30:



$0.50 + $2.00 + $0.80 = $3.30

We want to know the greatest number of 20 cent coins this could include.
$1.00 can be made with five 20 cent coins, so $3.00 can be made with fifteen 20 cent coins, and $3.20 can be made with sixteen 20 cent coins.

Another 20 cent coin would take us over $3.30, so the greatest number of 20 cent coins Susie could have in her change is 16. So the correct answer is **B** 16.

26 August has 31 days, so after 11th August there are 20 more days in August. Then there are 21 days to get to 21st September, so there are 41 days between the two dates.

If 11th August is a Wednesday, then every 7 days after that will also be a Wednesday because there are 7 days in a week. 35 is a multiple of 7, and 41 is six more than 35, so 21st September is six days after a Wednesday, so it is a Tuesday. So the correct answer is **E** Tuesday.

Alternatively, 11th August is a Wednesday. Counting up in 7s, 18th and 25th August are also Wednesdays. Since August has 31 days, 1st September will be the next Wednesday, and then the 8th, 15th and 22nd will be Wednesdays. If 22nd September is a Wednesday, 21st September must be a Tuesday.

Or, 11th September is 31 days after 11th August, and 21st September is another 10 days after that, making 41 days in all. 42 is a multiple of 7, so 42 days after 11th August will be another Wednesday, so 41 days after 11th August must be a Tuesday.

27 Reading the information from the graph:

12 children had no pets
40 children had one pet
48 children had two pets
24 children had three pets
18 children had four pets

Let's look at the claims one at a time.

The first claim is: 'More than 100 children had one or two pets.'
The total number of children with one or two pets is 40 + 48 = 88, so the first claim is not correct.

The second claim is: 'Exactly three times as many children had 2 pets as 0 pets.'
12 children had 0 pets. 48 children had 2 pets. 3 × 12 = 36, so more than three times as many children had 2 pets as 0 pets, so the second claim is not correct.

The third claim is: 'There were 24 more children with 2 pets than children with 3 pets.'

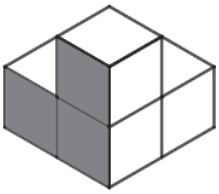
48 children had two pets. 24 children had three pets. 24 + 24 = 48, so the third claim is correct.

So the correct answer is **C** claim 3 only.

28 The two objects are identical, so we can count the faces Amanda can see on one object and then double our answer to find the total number of faces Amanda can see.

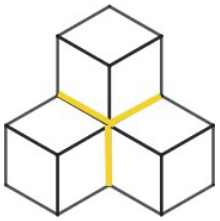
The pictures below are shaded to show how we can count 9 of the faces by looking from the top, front and right side viewpoints:

For each of the other three directions (back, bottom and left side) we would see an L shape made from three squares. Here is the view from the back:



This means Amanda can see another 9 faces. So Amanda can see 9 + 9 = 18 faces on each object. There are two objects, so the total number of faces Amanda can see is 18 × 2 = 36. So the correct answer is **C** 36.

Another way to work it out is by considering the hidden faces:
The object is made from four cubes. Each cube has 6 faces, so the total number of faces is 4 × 6 = 24. However, Amanda can't see all of them.



The three lines highlighted show all the places where two faces meet and so are hidden from view. This means there are six hidden faces. So Amanda can see 24 – 6 = 18 faces on each of the two objects.

We could also work it out by thinking about how many faces can be seen on each cube.

For three of the cubes on each object, five faces can be seen.
For the fourth cube, it is in the corner touching each of the three other cubes, so only three of its faces can be seen. So the total number of cubes that can be seen on each object is 5 + 5 + 5 + 3 = 18.

29 Sarah ate twice as many strawberries as Jack, so we can share the strawberries out three at a time, two for Sarah and one for Jack.

12 ÷ 3 = 4, so we can make four groups of three strawberries.
From each group, Sarah gets two and Jack gets one, so altogether, Sarah gets 8 and Jack gets 4. So the correct answer is **D** 8.

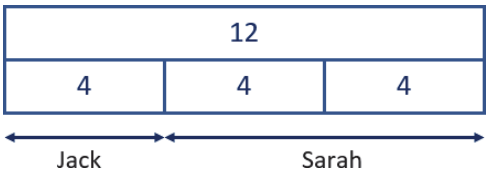
Alternatively, we can find ways of splitting 12 strawberries into two groups:

12 = 1 + 11
12 = 2 + 10
12 = 3 + 9
12 = 4 + 8
12 = 5 + 7
12 = 6 + 6

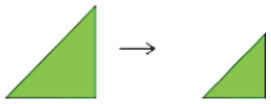
We need to choose the one where the larger number is twice the smaller number.

8 = 4 × 2, so the correct pair of numbers is 4 and 8, so Jack ate 4 and Sarah ate 8.

We could also use a bar model to show the 12 strawberries grouped into three equal parts, so that Sarah eats two parts and Jack eats one.
12 ÷ 3 = 4 so there are 4 strawberries in each part. Therefore Sarah eats 2 × 4 = 8.

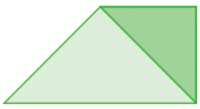


30

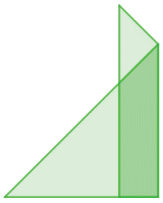


This shape cannot be made with just one fold without moving the paper in any other way, so **A** is the correct answer.

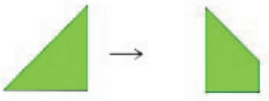
This shape can be made with a horizontal fold:



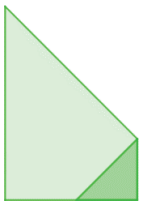
This shape can be made with a vertical fold:



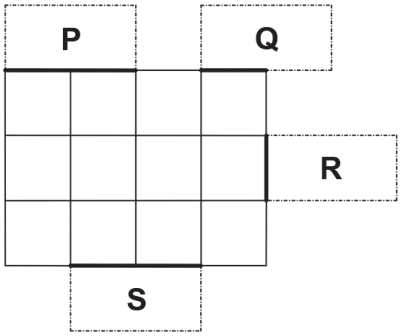
This shape can be made with a diagonal fold:



This shape can be made with a vertical fold:



31 When Ethan places the 2 cm × 1 cm rectangle in any of the positions P, Q, R or S, part of the perimeter of the existing larger rectangle – shown below by the thick line – is covered, and more perimeter – shown by the dotted line – is added. The difference between these two should be 4 cm.



Shape	Perimeter covered Thick line	Perimeter added Dotted line	Difference
P	2 cm	4 cm	2 cm
Q	1 cm	5 cm	4 cm
R	1 cm	5 cm	4 cm
S	2 cm	4 cm	2 cm

The increase in perimeter for each position would be:

P 2 cm
Q 4 cm
R 4 cm
S 2 cm

The positions for the 2 cm × 1 cm rectangle which would increase the perimeter by 4 cm are the shapes Q and R, so the correct answer is **C** Q and R only.

32 I started with 1000 points and bought 5 buildings which each cost 106 points.
Using addition:
106 + 106 + 106 + 106 + 106 = 530, and 1000 – 530 = 470, so after buying the buildings I have 470 points left.

After buying a farm I have 140 points left. The difference between 470 and 140 must be the cost of the farm so I need to work out 470 – 140 to get the cost of the farm.

470 – 140 = 330 so the farm must have cost 330 points. The correct answer is **A** 330.

Using multiplication:
5 × 106 = 530 (5 × 100 = 500, 5 × 6 = 30)
1000 – 530 = 470, so after buying the buildings I had 470 points left.

Then I bought a farm. Afterwards I had 140 points left. The difference between 470 and 140 must be the cost of the farm.
470 – 140 = 330, so the farm must have cost 330 points.

33 To decide which statements are correct, we need to look at them one at a time.

Statement 1: 'Jess is equally likely to take out an even number or an odd number.'

The even numbers in the bag are 2, 4, 6, 8 and 10.
The odd numbers are 1, 3, 5, 7, 9 and 11.

There are 5 even numbers and 6 odd numbers, so it is more likely Jess will take out an odd number, so statement 1 is not correct.

Statement 2: 'Jess is more likely to take out a number greater than 6 than a number less than 6.'

There are 5 numbers greater than 6: 7, 8, 9, 10 and 11.
There are 5 numbers less than 6: 1, 2, 3, 4 and 5.

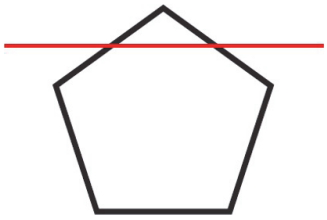
So it is equally likely that Jess will take out a number greater than 6 as a number less than 6, so statement 2 is not correct.

Statement 3: 'Jess is equally likely to take out the number 2 or the number 9.'

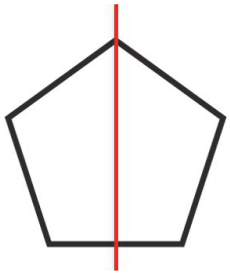
Each number appears on one counter and each counter is equally likely to be chosen by Jess because she chooses at random, so statement 3 is correct.

So the correct answer is **B** statement 3 only.

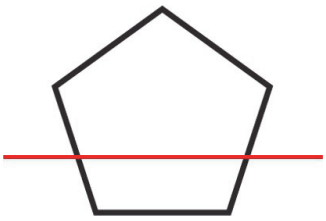
34 Bruce can make the following straight-line cuts to divide a regular pentagon into different pairs of shapes:



A triangle and a hexagon (X)



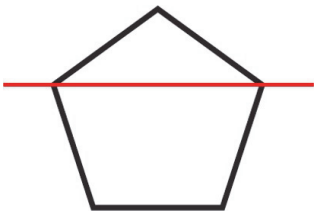
Two quadrilaterals (Y)



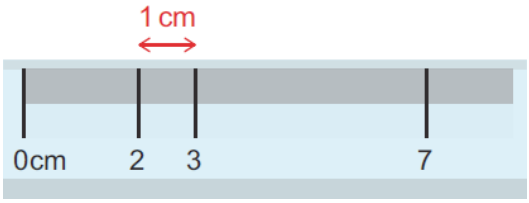
A quadrilateral and a pentagon (Z)

X, Y and Z are all possible, so the correct answer is **E** X, Y and Z.

(It's also possible to create a triangle and a quadrilateral with a one-line cut.)



35 Here are all the lengths it is possible for me to make with the ruler:



Starting from 0 cm:
I can draw a line of length 2 cm, 3 cm or 7 cm.

Starting from 2 cm:
I can draw a line of length 1 cm by joining to the 3 cm mark because 3 – 2 = 1.
I can draw a line of length 5 cm by joining to the 7 cm mark because 7 – 2 = 5.

Starting from 3 cm:
I can draw a line of length 4 cm by joining to the 7 cm mark because 7 – 3 = 4.

I can measure all the lengths listed except 6 cm, so the correct answer is **D** 6 cm.

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