THIRD SPACE LEARNING

Specialist 1-to-1 maths interventions and curriculum resources

Rapid Reasoning

Year 6 | Weeks 19-24

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Specialist 1-to-1 maths interventions and curriculum resources

Rapid Reasoning

Year 6 | Week 22

As with the previous two weeks, the questions this week within *Rapid Reasoning* continue to focus on measurement.

As we are now nearing the end of this term of *Rapid Reasoning*, the number of questions faced by children each day has increased to 4, and the fourth question is presented as a Challenge question. This will help prepare children for their forthcoming SATs tests. Children should be able to tackle these four questions in the same time allowed for previous weeks.

This week, children will be expected to calculate the area of parallelograms and triangles for the first time. They will also be expected to solve problems involving similar shapes where the scale factor is known or can be found.

The following Year 6 objectives, which were first introduced in week 21, will also continue to be the focus of questions:

- recognise that shapes with the same areas can have different perimeters and vice versa
- recognise when it is possible to use formulae for area and volume of shapes.

As with previous weeks, other content from Year 6 that the children have met in previous weeks of *Rapid Reasoning*, along with objectives from previous years, will also feature this week.

Q1 Raheem says, "When you multiply a fraction by another fraction, the answer will be larger than the first fraction."

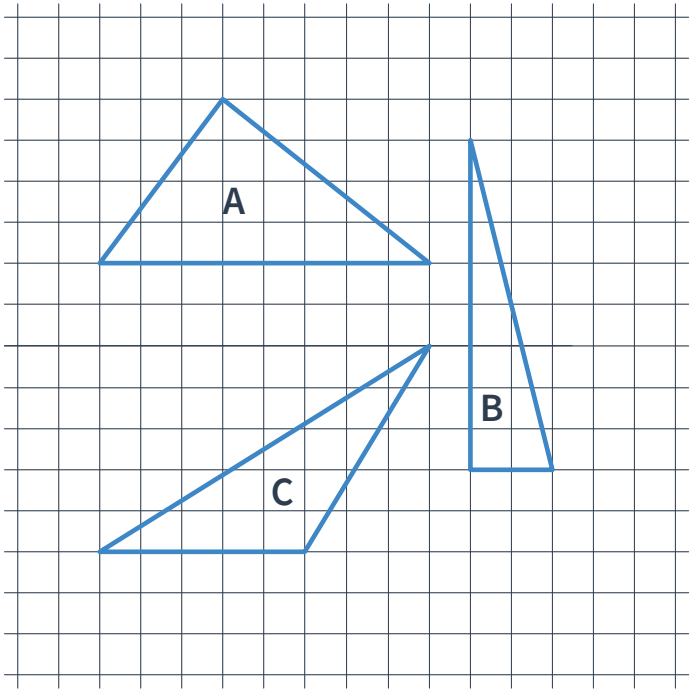
Work out the answer to $\frac{1}{5} \times \frac{3}{4}$, then tick the correct box below.

$$\frac{1}{5} \times \frac{3}{4} = \frac{\square}{\square}$$

True ☐ False ☐

1 mark

Q2



Calculate the area of each of these triangles.

Triangle A = ☐ cm^2

Triangle B = ☐ cm^2

Triangle C = ☐ cm^2

2 marks

Q3 This timetable shows the afternoon trains that travel from Eastham to Westbury.

	A	B	C	D	E
Eastham	14:04	14:34	15:04	15:34	16:04
Thornbury Halt	14:29	--	15:29	--	16:29
Little Plumstead	14:50	15:10	15:50	16:10	16:50
Upper Plumstead	15:06	15:26	--	16:26	17:06
Buckton	15:36	15:56	--	16:56	17:36
Westbury	15:52	16:12	16:42	17:12	17:52

a It is half-past three in the afternoon.

Mrs Thornton is waiting at Eastham station for the next train home to Upper Plumstead.

How long will the next train take to get from Eastham to Upper Plumstead?

1 mark

b Mr Griffiths is travelling from Little Plumstead to Buckton.

He has just missed the ten-past three train by seconds.

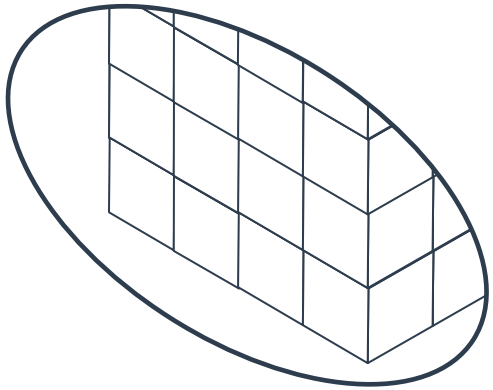
How long does he have to wait until the next train?

1 mark

Challenge Question

Q4 Miss Rowan shows her class part of a 3D shape.

She says, "Each of these little cubes is a 1cm cube and the whole shape is a larger cube."



What is the volume of the larger cube?

_____ cm^3

1 mark

Q1 Raheem says, "When you multiply a fraction by another fraction, the answer will be larger than the first fraction."

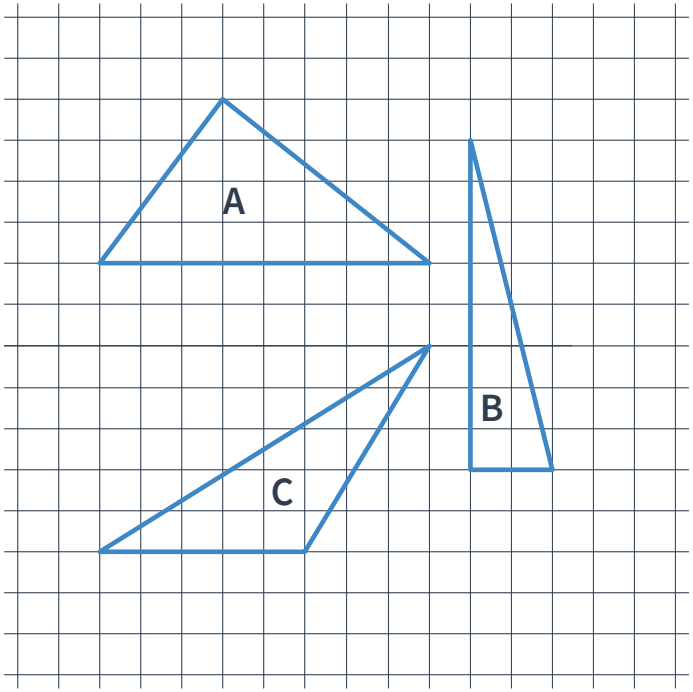
Work out the answer to $\frac{1}{5} \times \frac{3}{4}$, then tick the correct box below.

$$\frac{1}{5} \times \frac{3}{4} = \frac{3}{20}$$

True ☐ False ☑

1 mark

Q2



Calculate the area of each of these triangles.

Triangle A = 16 cm²

Triangle B = 8 cm²

Triangle C = 12.5 cm²

2 marks

Q3 This timetable shows the afternoon trains that travel from Eastham to Westbury.

	A	B	C	D	E
Eastham	14:04	14:34	15:04	15:34	16:04
Thornbury Halt	14:29	--	15:29	--	16:29
Little Plumstead	14:50	15:10	15:50	16:10	16:50
Upper Plumstead	15:06	15:26	--	16:26	17:06
Buckton	15:36	15:56	--	16:56	17:36
Westbury	15:52	16:12	16:42	17:12	17:52

a It is half-past three in the afternoon.

Mrs Thornton is waiting at Eastham station for the next train home to Upper Plumstead.

How long will the next train take to get from Eastham to Upper Plumstead?

52 minutes

1 mark

b Mr Griffiths is travelling from Little Plumstead to Buckton.

He has just missed the ten-past three train by seconds.

How long does he have to wait until the next train?

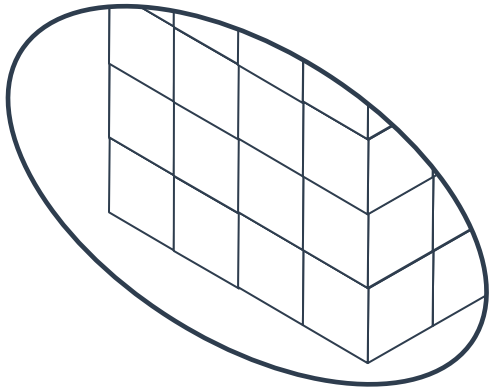
1 hour

1 mark

Challenge Question

Q4 Miss Rowan shows her class part of a 3D shape.

She says, "Each of these little cubes is a 1cm cube and the whole shape is a larger cube."



What is the volume of the larger cube?

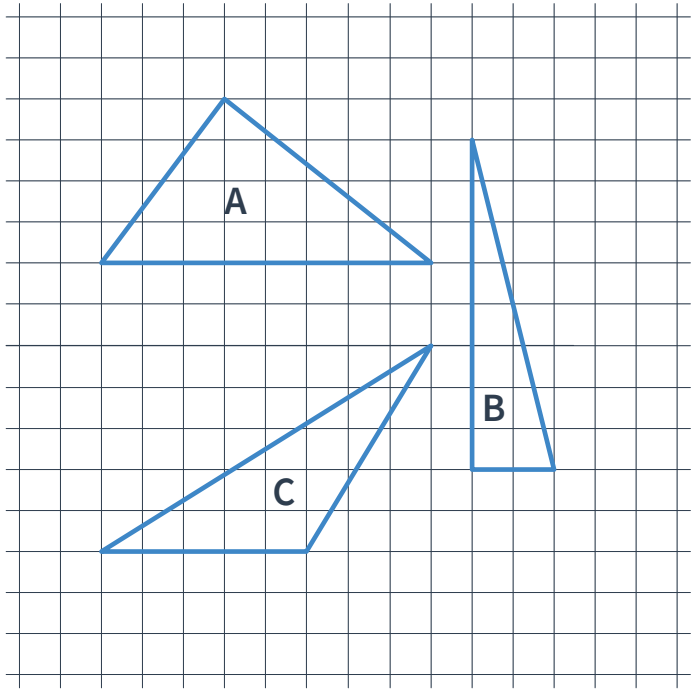
64 cm^3

1 mark

	Requirement	Mark	Additional guidance
Q1	$\frac{3}{20}$ Raheem's statement is **FALSE.** Award the mark for both the correct fraction **as well as** a recognition that Raheem is incorrect.	1	
Q2	Triangle A = 16cm^2 Triangle B = 8cm^2 Triangle C = 12.5cm^2	2	
Q3a	52 minutes	1	
Q3b	1 hour (or 60 minutes)	1	
Q4	64cm^3	1	

What are examiners looking for?

Q2



Calculate the area of each of these triangles.

Triangle A = 16 cm²

Triangle B = 8 cm²

Triangle C = 12.5 cm²

2 marks

Why are we asking this question?

This question is designed to assess children's ability to calculate the area of triangles using the $\frac{1}{2}\ b \times h$ formula.

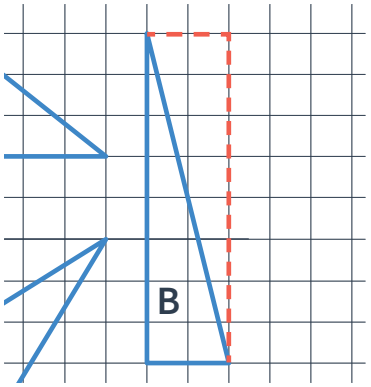
What common errors do we expect to see?

Some children may attempt to find the answer by counting the squares inside each triangle. This will not give an accurate answer and is not what the question means when it uses the word 'calculate'.

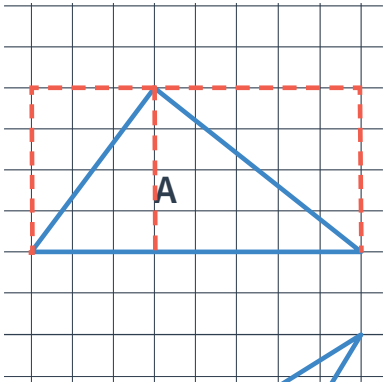
Some children may apply the *length* × *width* formula used to calculate the area of rectangles to find these areas. These children will give answers that are double the required answer (A = 32 cm², B = 16cm² and C = 25cm²).

How to encourage children to solve this question

Encourage children to draw on the grid, completing triangles A and B so that they become rectangles. Triangle B provides the clearest clue that the area of a triangle is half that of a rectangle:



Triangle A may require children to draw an extra line to separate the triangle into two in order for them to spot that this is half of the overall rectangle:



Encourage children to use their knowledge to derive the formula and apply this — the area of a triangle is half of the product of its base x height (or $\frac{1}{2}b \times h$) where $b \times h$ could be used to find the area of the surrounding rectangle, so $\frac{1}{2}b \times h$ is half of this.

Q1 This table shows different heights on a mountain.

Negative numbers show heights below sea level and positive numbers show heights above sea level.

Location	Height above or below sea level
Basecamp	– 30m
Checkpoint A	+ 10m
Checkpoint B	+ 15m
Checkpoint C	+ 75m

a A mountaineer is at Basecamp. She climbs to Checkpoint A.

How many metres has she climbed?

_____ m

1 mark

b When the mountaineer reaches Checkpoint B, she drops her water bottle.

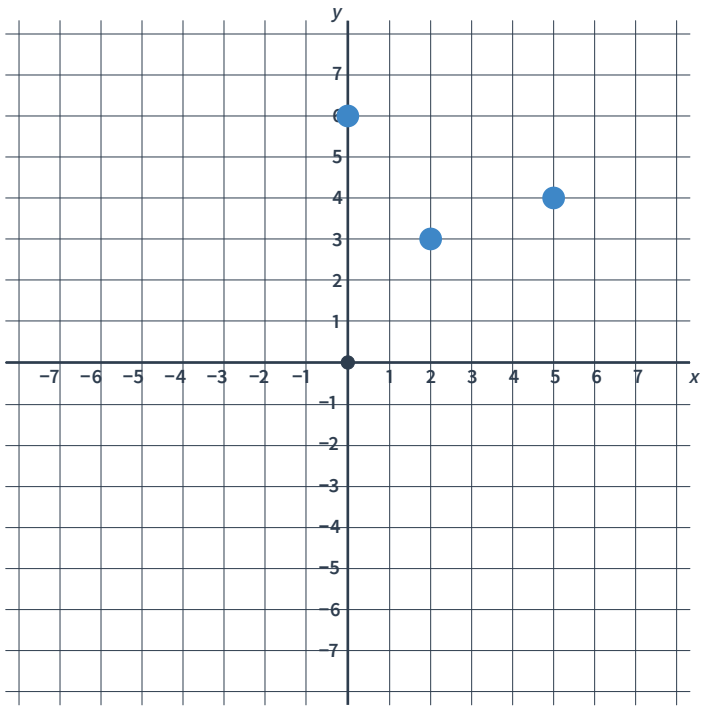
It falls a height of 20 metres.

At what height does the water bottle stop falling at? Mark its position on this number line.

1 mark

Q2 Ruby has been asked to plot the positions (2, −3), (−5, −4) and (0, −6) on a grid.

This is what she draws:



Is Ruby correct? **YES** / **NO**

Explain your answer.

1 mark

Q3 A restaurant gives free refills of sugar-free fizzy drinks.

Each time the button is pressed on the machine, it dispenses $\frac{1}{4}$ litre of drink.

Jordan accidentally presses the button three times!

He manages to collect 465ml in a glass, but the rest is wasted.

How many litres of fizzy drink are wasted?

l

1 mark

Challenge Question

Q4 Maya likes to make a homemade orange drink by mixing orange juice with grapefruit juice.

She mixes 4 parts of orange juice for every 1 part of grapefruit juice.

If Maya wants to fill a 600ml bottle, how many millilitres of each juice should she use?

Orange juice = ml

Grapefruit juice = ml

1 mark

Q1 This table shows different heights on a mountain.

Negative numbers show heights below sea level and positive numbers show heights above sea level.

Location	Height above or below sea level
Basecamp	– 30m
Checkpoint A	+ 10m
Checkpoint B	+ 15m
Checkpoint C	+ 75m

a A mountaineer is at Basecamp. She climbs to Checkpoint A.

How many metres has she climbed?

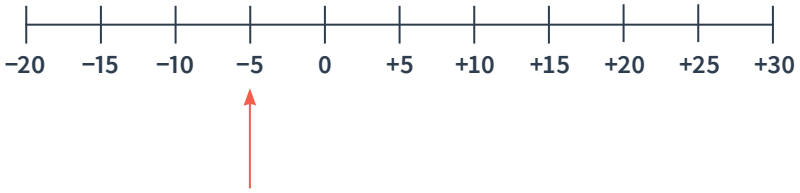
40 m

1 mark

b When the mountaineer reaches Checkpoint B, she drops her water bottle.

It falls a height of 20 metres.

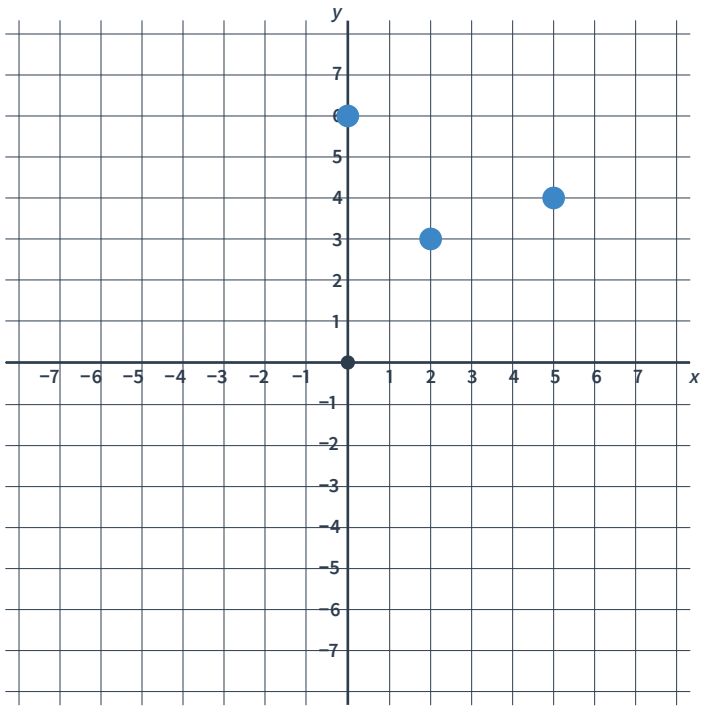
At what height does the water bottle stop falling at? Mark its position on this number line.



1 mark

Q2 Ruby has been asked to plot the positions (2, −3), (−5, −4) and (0, −6) on a grid.

This is what she draws:



Is Ruby correct? **YES** / **NO**

Explain your answer.

See mark scheme for example

1 mark

Q3 A restaurant gives free refills of sugar-free fizzy drinks.

Each time the button is pressed on the machine, it dispenses $\frac{1}{4}$ litre of drink.

Jordan accidentally presses the button three times!

He manages to collect 465ml in a glass, but the rest is wasted.

How many litres of fizzy drink are wasted?

0.285 l

1 mark

Challenge Question

Q4 Maya likes to make a homemade orange drink by mixing orange juice with grapefruit juice.

She mixes 4 parts of orange juice for every 1 part of grapefruit juice.

If Maya wants to fill a 600ml bottle, how many millilitres of each juice should she use?

Orange juice = 480 ml

Grapefruit juice = 120 ml

1 mark

	Requirement	Mark	Additional guidance
Q1a	40m	1	
Q1b	−5 m should be clearly marked	1	
Q2	**NO** — Ruby is not correct. She has ignored the minus signs and has treated the coordinates as if they were all positive numbers. Award **ONE** mark for an appropriate explanation **as well as** the recognition that Ruby is incorrect.	1	
Q3	0.285l	1	
Q4	Orange juice = 480ml Grapefruit juice = 120ml	1	

Q1 Mr Rushden has written a calculation on his whiteboard.

He has erased some of the digits.

$$\square\,3\,2\,5\,\square\,4$$
$$-\;6\,\square\,5\,9\,0\,8$$
$$1\,1\,6\,\square\,0\,6$$

Complete the missing digits so that the subtraction makes sense.

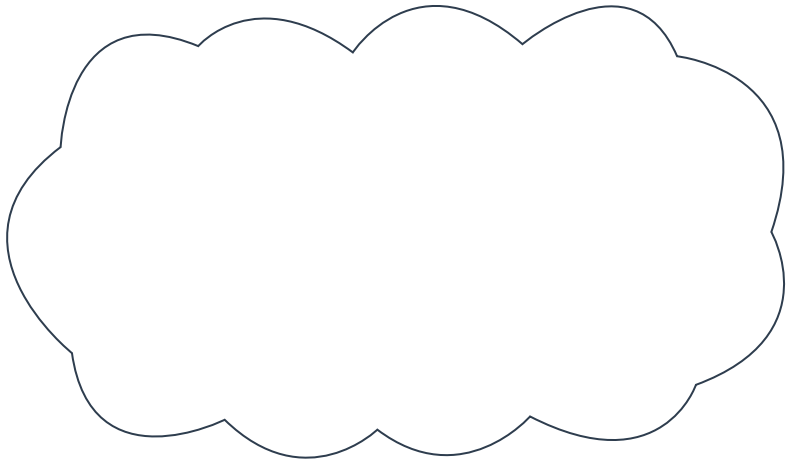
2 marks

Q2 Yusuf has written the calculation

$$52 - (4 \times 12) + 35$$

Alfie says, "You can erase those brackets! You don't need them!"

a Explain why Alfie is correct.



1 mark

b What is the answer to Yusuf's calculation?

1 mark

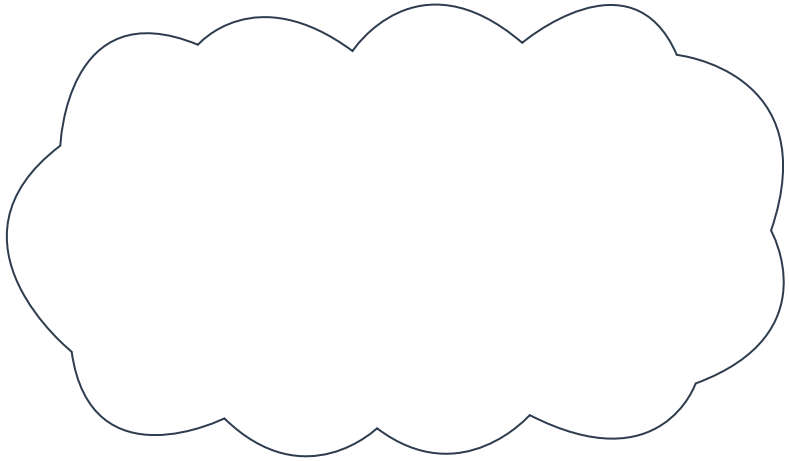
Q3 Nathan draws a rectangle with a length of 12cm and a width of 11cm.

Georgia draws a parallelogram with a base of 11cm and a height of 12cm.

Georgia says, "Our two shapes have the same area!"

Is Georgia correct? **YES** / **NO**

Explain your answer.



1 mark

Challenge Question

Q4 The safety rules at an indoor rock-climbing centre say that there must be 2 adult instructors for every 9 children.

a A class of 36 children are coming for a rock-climbing lesson.

How many instructors do there need to be?

instructors

1 mark

b Next Saturday, 12 instructors are needed to cover a lesson.

How many children will there be?

children

1 mark

Q1 Mr Rushden has written a calculation on his whiteboard.

He has erased some of the digits.

$$\begin{array}{rcccccc} & \boxed{7} & 3 & 2 & 5 & \boxed{1} & 4 \\ - & 6 & \boxed{1} & 5 & 9 & 0 & 8 \\ \hline & 1 & 1 & 6 & \boxed{6} & 0 & 6 \end{array}$$

Complete the missing digits so that the subtraction makes sense.

2 marks

Q2 Yusuf has written the calculation

$$52 - (4 \times 12) + 35$$

Alfie says, "You can erase those brackets! You don't need them!"

a Explain why Alfie is correct.

See mark scheme for example

1 mark

b What is the answer to Yusuf's calculation?

39

1 mark

Q3 Nathan draws a rectangle with a length of 12cm and a width of 11cm.

Georgia draws a parallelogram with a base of 11cm and a height of 12cm.

Georgia says, "Our two shapes have the same area!"

Is Georgia correct? **YES** / **NO**

Explain your answer.

See mark scheme for example

1 mark

Challenge Question

The safety rules at an indoor rock-climbing centre say that there must be 2 adult instructors for every 9 children.

a A class of 36 children are coming for a rock-climbing lesson.

How many instructors do there need to be?

8 instructors

1 mark

b Next Saturday, 12 instructors are needed to cover a lesson.

How many children will there be?

54 children

1 mark

	Requirement	Mark	Additional guidance
Q1	$\begin{array}{rcccccc} & \boxed{7} & 3 & 2 & 5 & \boxed{1} & 4 \\ - & 6 & \boxed{1} & 5 & 9 & 0 & 8 \\ \hline & 1 & 1 & 6 & \boxed{6} & 0 & 6 \end{array}$ Award **TWO** marks for all four correct digits. Award **ONE** mark for two or three correct digits.	2	
Q2a	Without brackets, the multiplication will still be calculated first because in the order of operations it comes before addition and subtraction.	1	Accept any similar answer where a correct explanation of the order of operations is given.
Q2b	39	1	

	Requirement	Mark	Additional guidance
Q3	**YES** — Georgia is correct. Award **ONE** mark for an appropriate answer **as well as** the recognition that Georgia is correct.	1	Accept explanations that compare the two formulae: Georgia is correct because the area of a rectangle is length multiplied by width (12 × 11) and the area of a parallelogram is base multiplied by height (11 × 12). Also accept explanations where the answers are given: The area of the rectangle is 12 × 11 = 121cm^2. The area of the parallelogram is 11 × 12 = 121cm^2.
Q4a	8 instructors	1	
Q4b	54 children	1	

Q1 This table shows the transfer fees for four football players.

Transfer	Player	Transfer fee
A	Antonio Assistini	£7,402,387
B	Brandon Block	£7,402,378
C	Carlos Kickaball	£7,420,378
D	Dwayne Dabwell	£7,407,238

a Write the letters A–D in order, from **least expensive to most expensive** player.

1 mark

b Use the digits 0, 2, 3, 4, 7, 7 and 8 to make a number that is in between transfer fees A and D.

_____

1 mark

Q2 Fatima has completed $\frac{3}{5}$ of the levels of a computer game.

There are 35 levels in total.

How many levels has Fatima completed?

	levels

1 mark

Q3

320g

720g

Work out the mass of one tennis ball and of one golf ball.

One tennis ball weighs ____ g

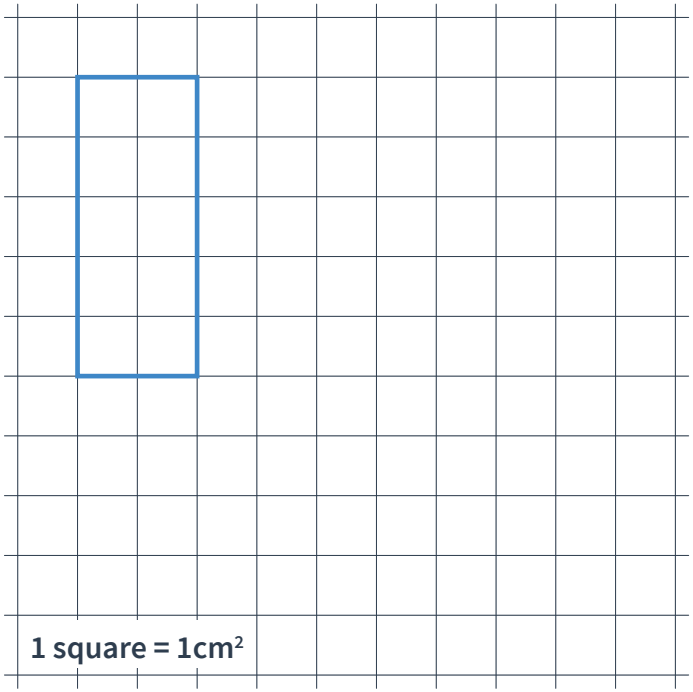
One golf ball weighs ____ g

2 marks

Challenge Question

Q4 Jessica says, "If we double the length and width of this rectangle, the perimeter will double."

Emma says, "The area will double too!"



Who is right? Tick one box.

Only Jessica ☐ Both ☐

Only Emma ☐ Neither ☐

Explain your answer.

1 mark

Q1 This table shows the transfer fees for four football players.

Transfer	Player	Transfer fee
A	Antonio Assistini	£7,402,387
B	Brandon Block	£7,402,378
C	Carlos Kickaball	£7,420,378
D	Dwayne Dabwell	£7,407,238

a Write the letters A–D in order, from **least expensive to most expensive** player.

B | A | D | C

1 mark

b Use the digits 0, 2, 3, 4, 7, 7 and 8 to make a number that is in between transfer fees A and D.

7,402,783

1 mark

Q2 Fatima has completed $\frac{3}{5}$ of the levels of a computer game.

There are 35 levels in total.

How many levels has Fatima completed?

21 levels

1 mark

Q3

320g

720g

Work out the mass of one tennis ball and of one golf ball.

One tennis ball weighs **120** g

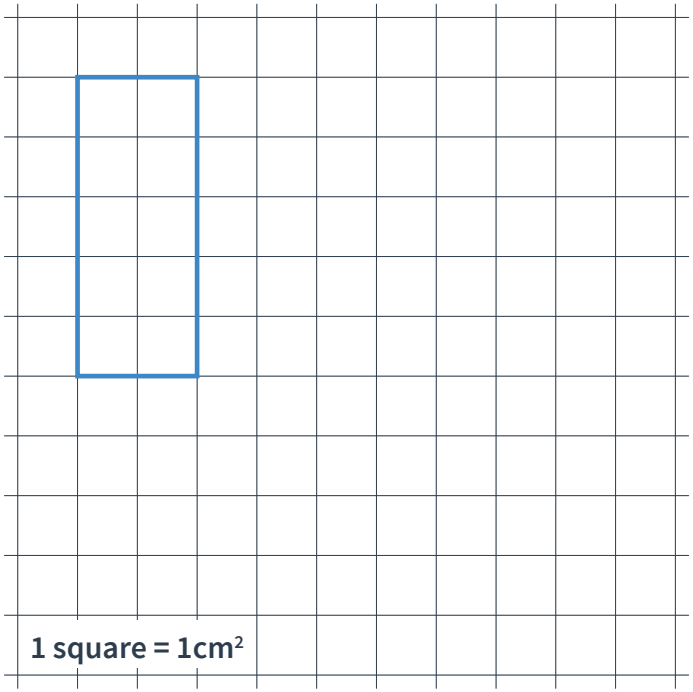
One golf ball weighs **80** g

2 marks

Challenge Question

Q4 Jessica says, "If we double the length and width of this rectangle, the perimeter will double."

Emma says, "The area will double too!"



Who is right? Tick one box.

Only Jessica	✓	Both	
Only Emma		Neither	

Explain your answer.

See mark scheme for example

1 mark

	Requirement	Mark	Additional guidance
Q1a	B,A,D,C	1	
Q1b	Accept any number greater than £7,402,387 and less than £7,407,238 using the given digits, for example: 7,402,783 7,403,872	1	
Q2	21 levels	1	
Q3	One tennis ball weighs 120g. One golf ball weighs 80g. Award **TWO** marks for both correct answers. Award **ONE** mark for either one correct answer or a correct method with one arithmetic error.	2	
Q4	Only Jessica is correct. The area of the rectangle is $10cm^2$. If the length and width are doubled, they become 10cm and 4cm. $10 \times 4 = 40$, so the area becomes four times as large ($40cm^2$), not twice as large. Award ONE mark for appropriate explanations **as well as** the recognition that only Jessica is correct.	1	

Q1 A parallelogram and a triangle both have the same area.

They also both have the same base length.

What can you say about the height of the triangle compared to the parallelogram?

_____

_____

_____

1 mark

Q2

DAVE'S DIY

2.5mm screws — 53p per pack
Metal washers — 28p per pack
Screwdrivers — £3.75 each

A customer visits Dave's DIY and buys 18 packs of screws, 18 packs of washers and a screwdriver.

How much does the customer spend in total?

£

2 marks

Q3 Year 6 pupils are comparing two types of seeds.

This line graph shows the rate of growth of both plants.

a Which plant is growing at a slower rate? Explain your answer.

Plant ☐ is growing at a slower rate because _____

_____

_____

1 mark

b When did both plants reach a height of 6cm?

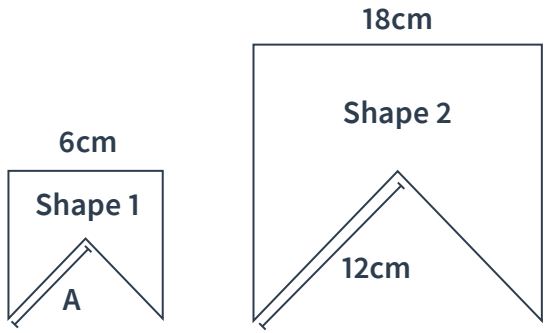
Plant A = ☐

Plant B = ☐

1 mark

Challenge Question

Q4 Shape 1 is increased in size by a scale factor.



Not to scale

a What scale factor has Shape 1 increased by?

It has increased by a scale factor of ☐

1 mark

b What is the length of the side labelled A?

☐ cm

1 mark

Q1 A parallelogram and a triangle both have the same area.

They also both have the same base length.

What can you say about the height of the triangle compared to the parallelogram?

See mark scheme

for example

1 mark

Q2

DAVE'S DIY

2.5mm screws — 53p per pack
Metal washers — 28p per pack
Screwdrivers — £3.75 each

A customer visits Dave's DIY and buys 18 packs of screws, 18 packs of washers and a screwdriver.

How much does the customer spend in total?

£ 18.33

2 marks

Q3 Year 6 pupils are comparing two types of seeds.

This line graph shows the rate of growth of both plants.

a Which plant is growing at a slower rate? Explain your answer.

Plant [A] is growing at a slower rate because

See mark scheme

for example

1 mark

b When did both plants reach a height of 6cm?

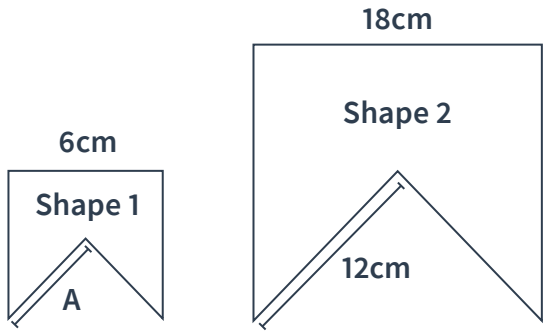
Plant A = [22nd July]

Plant B = [15th July]

1 mark

Challenge Question

Q4 Shape 1 is increased in size by a scale factor.



Not to scale

a What scale factor has Shape 1 increased by?

It has increased by a scale factor of **3**

1 mark

b What is the length of the side labelled A?

4 cm

1 mark

	Requirement	Mark	Additional guidance
Q1	The height of the triangle is twice as tall. Accept any other reasonable answers, for example: The height of the parallelogram will be half the height of the triangle.	1	
Q2	£18.33 Award **TWO** marks for a correct answer. Award **ONE** mark for a correct method with one arithmetic error.	2	
Q3a	Plant A Award the mark for both an acceptable answer **as well as** the recognition that Plant A grows at the slower rate.	1	Accept answers that compare the height of the plants: Plant A only grows to 90mm in the time it takes Plant B to grow to 120mm. Also accept answers that describe the shape of the line graph: Plant A grows more slowly because the line graph is more shallow and the Plant B line graph is steeper.

	Requirement	Mark	Additional guidance
Q3b	Plant A = 22nd July Plant B = 15th July	1	
Q4a	It has increased by a scale factor of 3.	1	
Q4b	4cm	1	

THIRD SPACE LEARNING

Specialist 1-to-1 maths interventions and curriculum resources

Rapid Reasoning

Do you have a group of pupils who need a boost in maths this term?

Each pupil could receive a personalised lesson every week from our specialist 1-to-1 maths tutors.

- Raise attainment
- Plug any gaps or misconceptions
- Boost confidence

Speak to us:

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