

2022 national curriculum tests

Key stage 2

Mathematics

Paper 3: reasoning

First name						
Middle name						
Last name						
Date of birth	Day		Month		Year	
School name						
DfE number						

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Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

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Instructions

You **must not** use a calculator to answer any questions in this test.

Questions and answers

You have **40 minutes** to complete this test.

Follow the instructions for each question.

Work as quickly and as carefully as you can.

If you need to do working out, you can use the space around the question.

Do not write over any barcodes.

Some questions have a method box like this:

The diagram illustrates a method box. It features a large grid with a rounded rectangle on the left side containing the text "Show your method". A smaller empty rectangle is positioned in the bottom right corner of the grid.

For these questions, you may get a mark for showing your method.

If you cannot do a question, **go on to the next one.**

You can come back to it later, if you have time.

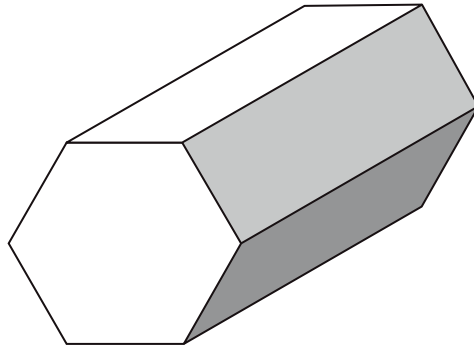
If you finish before the end, **go back and check your work.**

Marks

The number under each line at the side of the page tells you the number of marks available for each question.

1

Here is a drawing of a hexagonal prism.



How many **faces** does the prism have?

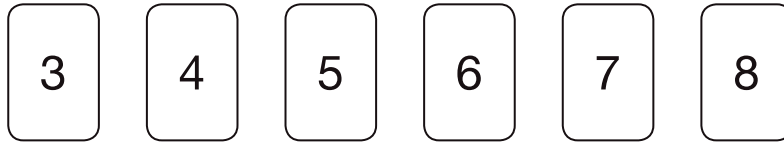
8

1 mark

1 at the front, 1 at the back, 6 connecting the front and back

2

Here are six number cards.

Use **all six** cards to complete the three multiplications below.

$$24 = 3 \times 8$$

$$28 = 4 \times 7$$

$$30 = 5 \times 6$$

1 mark

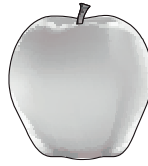
Leaving 24 to last as 4×6 would also work.
There is only one way of doing 28 and 30

3

Olivia buys a banana, an apple and a bag of nuts.



30p



45p



60p

She pays with three 50p coins.

What is her change?

Show
your
method

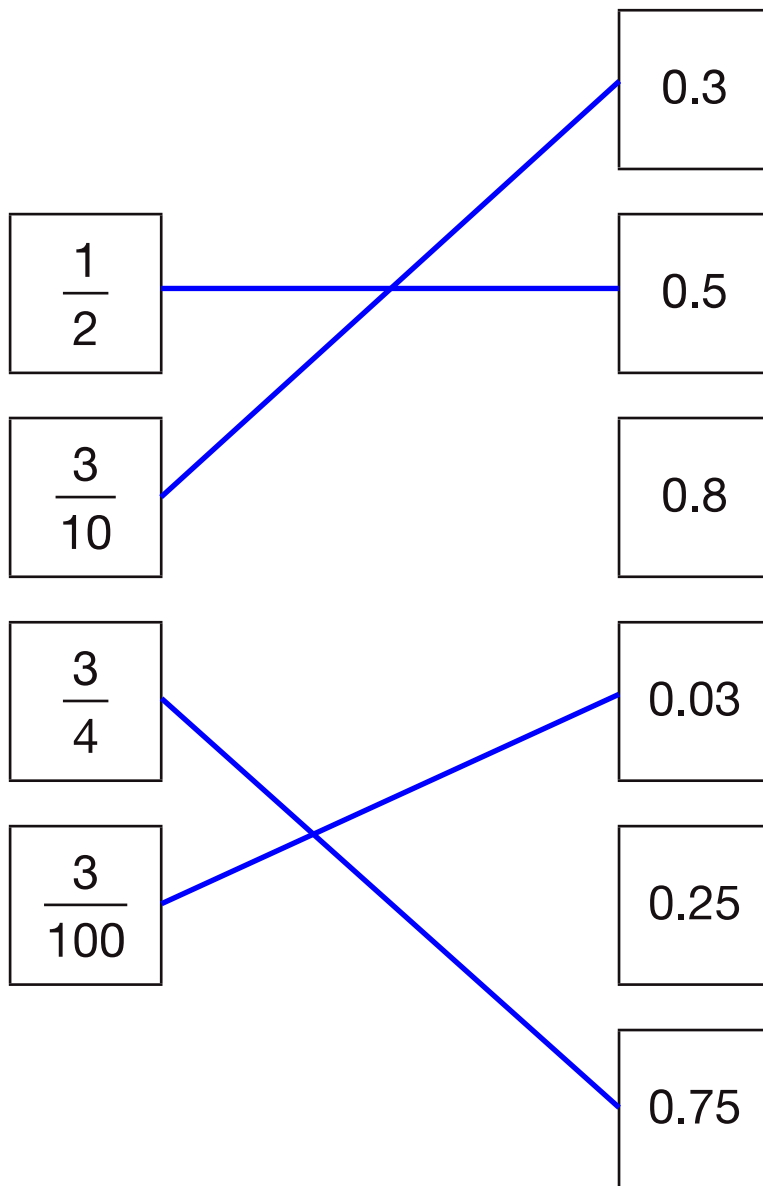
50	30	150	
$\times 3$	$+ 45$	$- 135$	
<hr/>	<hr/>	<hr/>	
150	135	15	

15 p

2 marks

Multiplying the 50p by 3 works out how much pence was paid, which is 150p. Adding the cost of the banana, the apple and the bag of nuts works out the total cost, which is 135p. Subtracting the cost from what was paid works out the change

4

Draw **four** lines to match each fraction to its equivalent decimal.

2 marks

$$2 \overline{) 1.0} \quad 4 \overline{) 3.00}$$

$\frac{1}{2}$ and $\frac{3}{4}$ could be memorised as these are common fractions. Otherwise they could be converted into decimals by dividing the numerators by the denominators. This can also be done for $\frac{3}{10}$ and $\frac{3}{100}$. To divide by 10, move the decimal point once to the left. To divide by 100, move the decimal point twice to the left

5

Some children vote for their favourite ice-cream flavour.

Ice-cream flavour	Number of children
vanilla	87
chocolate	154
strawberry	?
mint	38
Total	402

How many children vote for **strawberry**?

Show your method

		87		³⁴ 10 ¹²					
+	1	54		-	279				
+		38			<u>123</u>				
		<u>279</u>							
		₁							
		₁							

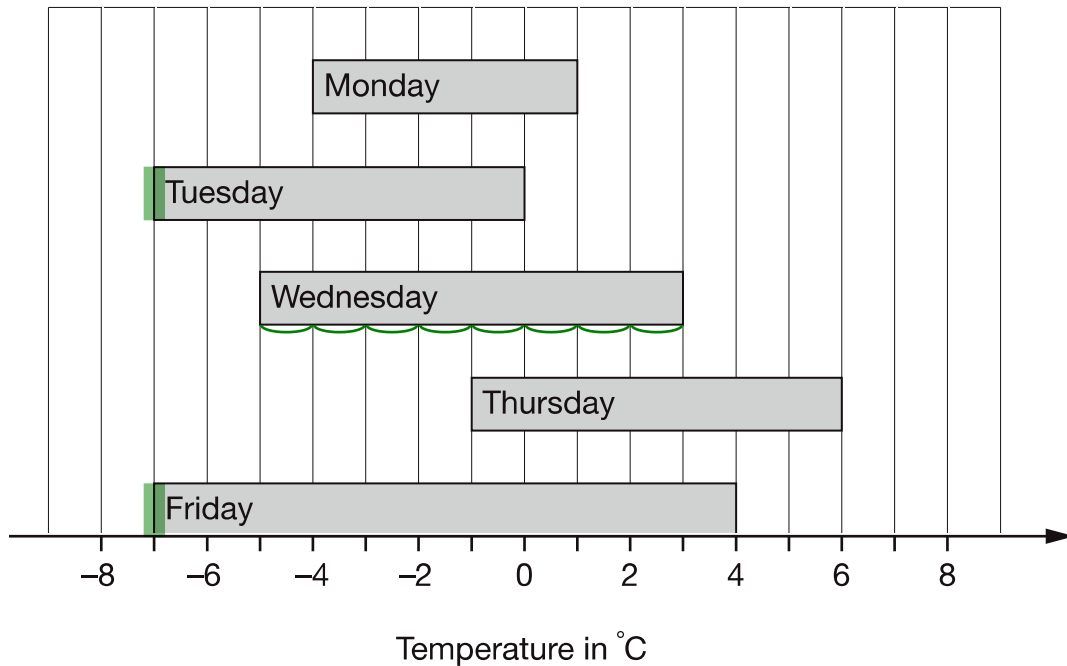
123 children

2 marks

Adding the numbers of children who voted for vanilla, chocolate and strawberry works out that 279 did not vote for strawberry. Subtracting this from the total of 402 works out that 123 children voted for strawberry.

6

This chart shows the range of temperatures each day during one week from Monday to Friday.



What was the **lowest** temperature?

The lowest temperature was the most negative, which happened on both Tuesday and Friday

-7 °C

1 mark

What was the difference between the highest and lowest temperatures on **Wednesday**?

Difference = largest - smallest = $3 - -5 = 3 + 5 = 8$.
Alternatively the difference could be counted on the chart

8 °C

1 mark

8

7,546

Round this number:

to the nearest 1,000

8000

The 5 in the hundreds place causes the 7 in the thousands place to round up to an 8. Then everything after the thousands place is set to 0

to the nearest 100

7500

The 4 in the tens place causes the 5 in the hundreds place to round down to 5. Then everything after the hundreds place is set to 0

to the nearest 10

7550

The 6 in the units place causes the 4 in the tens place to round up to 5. Then everything after the tens place is set to 0

2 marks

9

Complete the calculation.

$$1,000 \times 416 = 10 \times$$

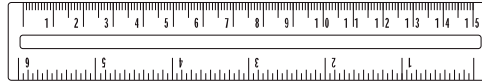
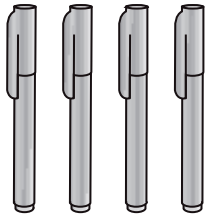
41600

1000 is divided by 100 to get 10, so the 416 needs to be multiplied by 100 to keep both sides of the equation equal

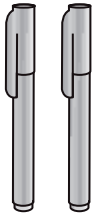
1 mark

10

Adam buys 4 pens and a ruler and pays £4.75 altogether.



Jack buys 2 pens and pays £1.98 altogether.



How much does a **ruler** cost?

Show your method

	1.98	3.475
x	2	- 3.96
	<u>3.96</u>	0.79

£0.79

2 marks

Multiplying the cost of 2 pens by 2 works out the cost of 4 pens. Subtracting the cost of the 4 pens from the cost of 4 pens and a ruler leaves the cost of the ruler

11

Ally chooses a whole number.

When she multiplies her number by **4**, the answer is **less than 100**

When she multiplies her number by **5**, the answer is **greater than 100**

Write a number that Ally could have started with.

$$\begin{array}{r} 020 \\ 5 \overline{)100} \end{array}$$

21

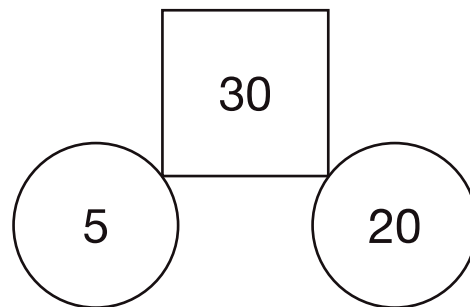
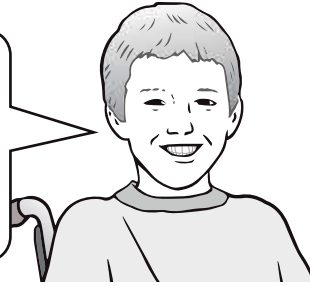
1 mark

Dividing 100 by 5 works out that 20 can be multiplied by 5 to get 100.
Therefore the number could be 1 more than this to be greater than 100 when multiplied by 5. Multiplying 21 by 4 would give 84, which is less than 100

William says the rule for this diagram.

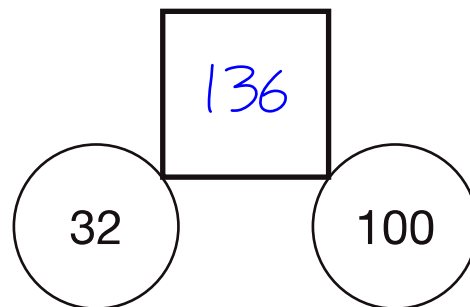
Find the difference between the numbers in the circles.

Double this to make the number in the square.



Use the same rule to write the missing numbers below.

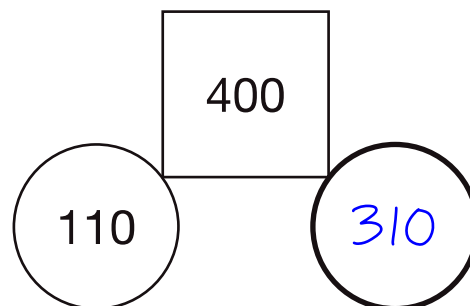
$$\begin{array}{r} 100 \\ - 32 \\ \hline 68 \\ \times 2 \\ \hline 136 \end{array}$$



100 - 32 works out the difference. Then multiplying by 2 doubles it

1 mark

$$\begin{array}{r} 200 \\ 2 \overline{)400} \\ 110 \\ + 200 \\ \hline 310 \end{array}$$



400 is double the difference so dividing it by 2 works out the difference. Adding or subtracting the difference to 110 works out what the other number is

1 mark

13

Write the missing fraction to make this **addition** correct.

$$\frac{2}{3} + \boxed{\frac{1}{6}} = \frac{5}{6}$$

1 mark

Multiplying the numerator and denominator of $\frac{2}{3}$ by 2 gives $\frac{4}{6}$, which has the same denominator as $\frac{5}{6}$. $\frac{1}{6}$ must be added to $\frac{4}{6}$ to get $\frac{5}{6}$

14

Jack hires a hall for a party.

This formula is used to work out the total cost.

$$\text{Total cost} = \text{£15 booking fee} + \text{£12.50 per hour}$$

What is the total cost of hiring the hall from 6pm until 11pm?

$$\begin{array}{r} 12.50 \\ \times \quad 5 \\ \hline 62.50 \\ + 15 \\ \hline 77.50 \end{array}$$

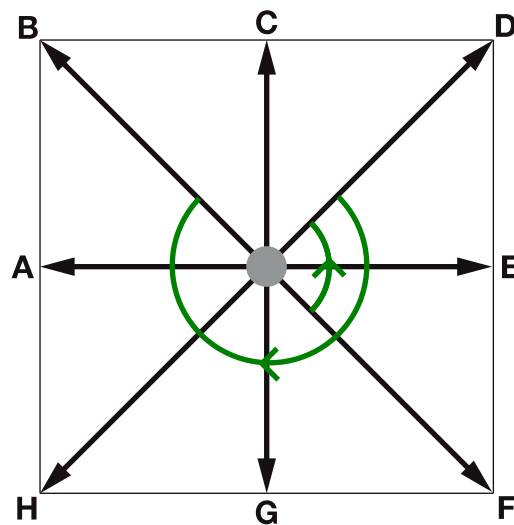
£ 77.50

1 mark

$11 - 6 = 5$ so there are 5 hours from 6pm until 11pm. Multiplying the cost per hour by 5 then adding the £15 booking fee works out the total cost

15

Stefan stands in the centre of this square.



Not actual size

Stefan is facing towards **F**.

He turns **anti-clockwise** to face **D**.

What **angle** does Stefan turn through?

90 degrees

1 mark

Stefan is now facing towards **D**.

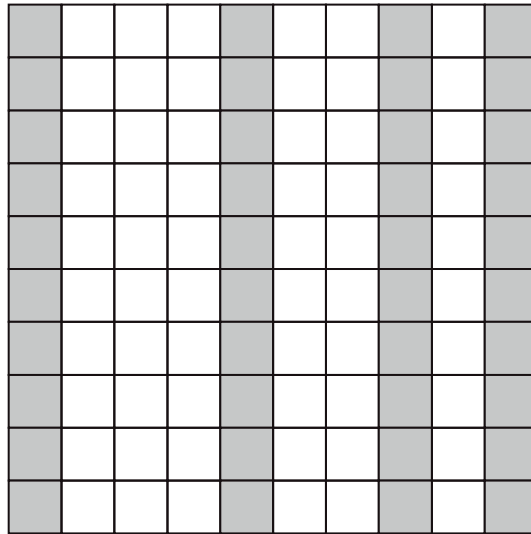
He turns **3 right angles clockwise**.

Write the **letter** he faces after the turn.

B

1 mark

16

Part of this 10×10 grid is shaded.

Tick the fractions that represent the shaded part of the grid.

$\frac{1}{4}$

$\frac{2}{5}$

$\frac{4}{10}$

$\frac{6}{10}$

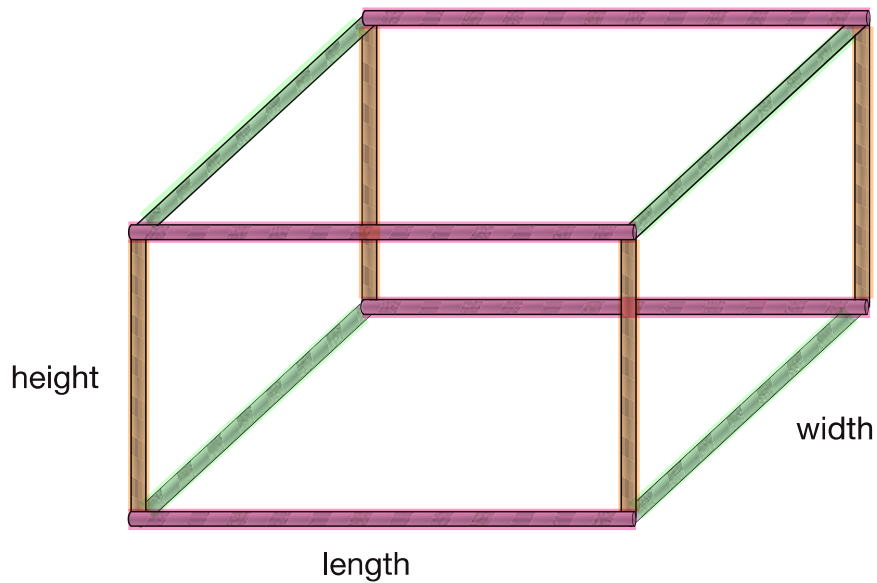
$\frac{40}{100}$

2 marks

40 out of the 100 squares are shaded so the fraction is $\frac{40}{100}$. Dividing both the numerator and denominator by 10 simplifies it to $\frac{4}{10}$, so it cannot be $\frac{6}{10}$. Dividing both the numerator and denominator of $\frac{4}{10}$ by 2 simplifies it to $\frac{2}{5}$, which is not equivalent to $\frac{1}{4}$ as if the numerator and denominator of $\frac{1}{4}$ are multiplied by 2 this gives $\frac{2}{8}$ which is not $\frac{2}{5}$.

17

Kim makes a cuboid model using straws.



She uses straws that are 7.5 cm long for the height.

She uses straws that are 11 cm long for the length.

She uses straws that are 8.5 cm long for the width.

What is the **total** length of all the straws in her model?

Show your method

7.5	8.5	30
$\times 4$	$\times 4$	$+ 44$
$\hline 30.0$	$\hline 34.0$	$+ 34$
		$\hline 108$

108 cm

2 marks

There are 4 straws used for the height, 4 straws used for the length and 4 straws used for the width. Multiplying the 7.5cm by 4 works out that a total of 30cm were used for the height. Multiplying the 11cm by 4 works out that a total of 44cm were used for the length. Multiplying the 8.5cm by 4 works out that a total of 34cm were used for the width. Adding all of these totals together works out that the total length of all of the straws is 108cm



The **full price** of a T-shirt is £15

The price is reduced by 30%.

What is the **reduced price**?

Show
your
method

$$\begin{array}{r} 1.50 \\ \times \quad 7 \\ \hline 10.50 \end{array}$$

£ 10.50

2 marks

The full price is 100%. Subtracting the 30% leaves 70%. Dividing the £15 by 10 works out that 10% is £1.50. Multiplying this by 7 works out the 70%

19

Jack says,

When you square a prime number, the answer has only two factors.



Explain why Jack is **not** correct.

2 is a prime number.
 $2^2 = 4$
1, 2 and 4 are factors of 4.
4 has three factors.

1 mark

2 is prime as it only has two factors, itself and 1. Factors are whole numbers which a number can be divided by to get a whole number result

This table shows how many people finished the New York Marathon in each of the first four decades it was held.

New York Marathon	
Decade	Total number of people who finished
1st decade	24,863
2nd decade	170,932
3rd decade	282,420
4th decade	350,824

What is the mean number of people who finished the marathon per decade? Round your answer to the **nearest hundred**.

Show
your
method

	2 4 8 6 3		2 0 7 2 5
+	1 7 0 9 3 2	4	8 2 9 0 3 9
+	2 8 2 4 2 0		
+	3 5 0 8 2 4		
+	8 2 9 0 3 9		
	$\begin{array}{r} \underline{8} \\ \underline{2} \\ \underline{9} \\ \underline{0} \\ \underline{3} \\ \underline{9} \end{array}$		

Mean = total/number. The total is all of the people who finished each decade added together, which is 829039. Number is 4 as there are 4 decades, so the total is divided by 4. The division is not completed as it is to be rounded to the nearest hundred. Going until the tens place gives enough of the number for it to be rounded

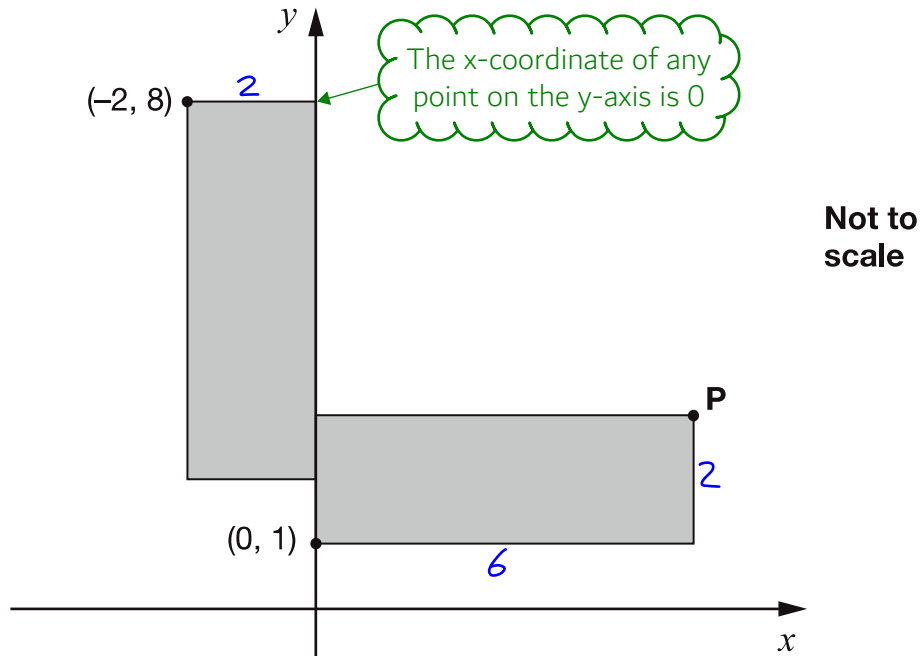
207300 people

3 marks

21

These two rectangles are identical.

The length of each rectangle is **three times** its width.



What are the coordinates of point P?

(6 , 3)

1 mark

The point $(-2, 8)$ has an x-coordinate of -2 . Therefore the distance from there to the y-axis is 2 and this must be the width of the rectangle.

$2 \times 3 = 6$ so this is the length of the rectangle. Point P is 6 in the x-direction and 2 in the y-direction from $(0, 1)$. $0 + 6 = 6$ so this is the x-coordinate of point P. $1 + 2 = 3$ so this is the y-coordinate of point P

[END OF TEST]

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2022 key stage 2 mathematics

Paper 3: reasoning

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