2024 national curriculum tests

Key stage 2

Mathematics

Paper 2: reasoning

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

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Worked Solutions

Please note that these worked solutions have neither been provided nor approved by the Standards and Testing Agency and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue should be written in the exam.

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

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

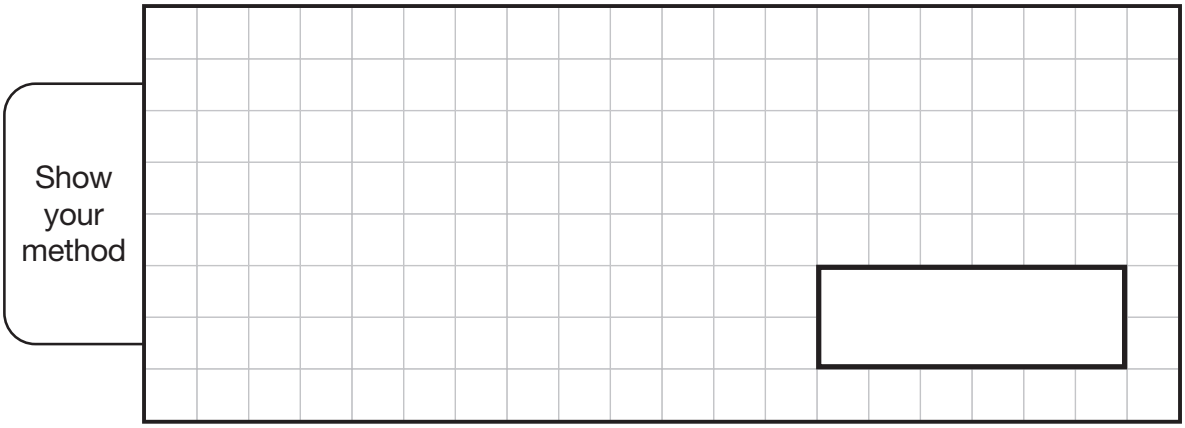
You have **40 minutes** to complete this test.

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:



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

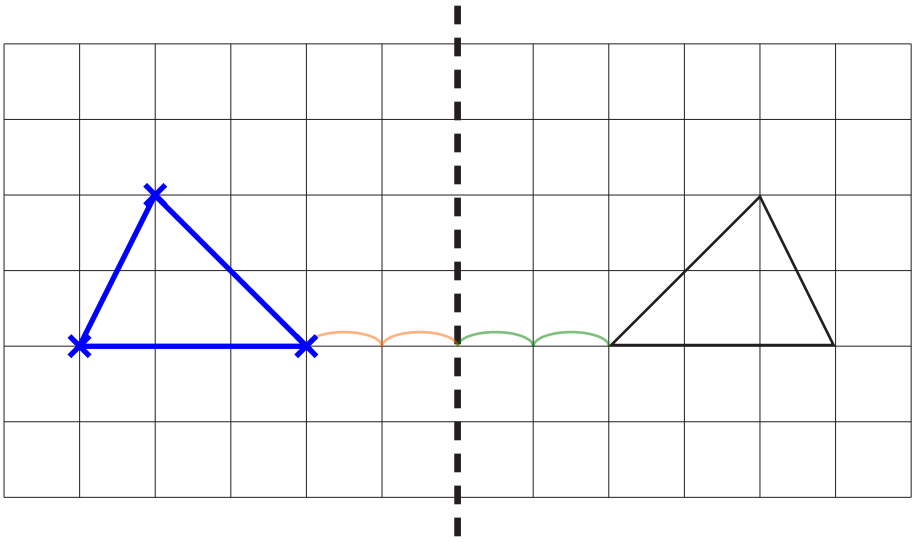
If you cannot do a question, **go on to the next one**.
You can come back to it later, if you have time.

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 triangle on a grid.



Draw the reflection of the triangle in the mirror line.

Use a ruler.

1 mark

First reflecting the corners. Counting the number of boxes to the mirror line and doing the same number of boxes on the other side. Then joining up the corners using a ruler

2 This table shows the cost of fruit at a school cafeteria.

Fruit	Cost for one
banana	12p
plum	23p
apple	32p
pear	38p

Amir buys two pieces of fruit.

He pays with a £2 coin.

He gets £1.50 change.

Tick the **two** pieces of fruit that Amir buys.

Tick **two**.

banana ☑

plum ☐

apple ☐

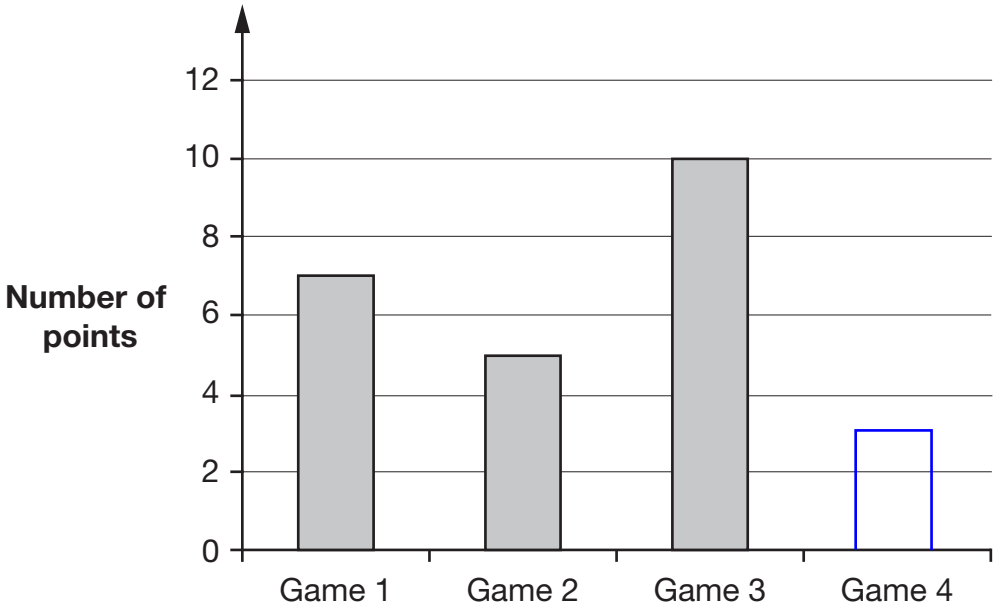
pear ☑

1 mark

£2 is 50p more that £1.50 so the two pieces of fruit cost must cost 50p in total. 12p + 38p = 50p, so it must be the banana and pear

3 Layla plays basketball.

This graph shows how many points she scored in her first 3 games.



1 mark

After 4 games, Layla had scored a total of 25 points.

Complete the graph.

Use a ruler.

Game 1 was 7 points. Game 2 was 5 points. Game 3 was 10 points. Adding the 7, 5 and 10 points gives 22 points so far. So another 3 points are needed to get a total of 25 points

4 The numbers in this sequence increase by the same amount each time.

Write the missing numbers.

–11	-5	1	7	13	19

1 mark

It has increased by 6 between 1 and 7. So it increases by 6 each time. 6 more than -11 is -5 and 6 more than 7 is 13

5 Write the three missing digits to make this multiplication correct.

(3) Subtracting the 1 carried over from the 7 gives 6. It must be 2 × 3 to get this 6

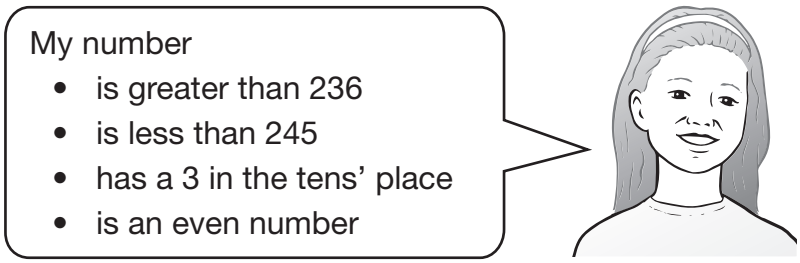
(1) 4 × 3 = 12, which ends in a 2. So this must be 4 as there is no other single digit number which can multiply by 3 to end in a 2

$$\begin{array}{r} \square\,5\,\square \\ \times\quad 3 \\ \hline 7\,\square\,2 \\ {\scriptstyle 1\quad 1} \end{array}$$

(2) 1 was carried over from the 4 × 3 = 12. Then 5 × 3 = 15, add the 1 is 16. The 1 is carried over

1 mark

6 Olivia is thinking of a number.



What number is Olivia thinking of?

Even numbers end in 0, 2, 4, 6, 8. The tens' place is highlighted in orange

238

1 mark

7 A box holds 40 packets of envelopes.

Each packet holds 25 envelopes.

How many **envelopes** does the box hold?

$$\begin{array}{r} 25 \\ \times\ 40 \\ \hline 1000 \\ {\scriptstyle 2} \end{array}$$ ← 40 packets of 25 envelopes

1000

1 mark

8 Write a **whole number** in each box to make the statements correct.

One has been done for you.

18 rounded to the nearest **ten** is 20

4000 rounded to the nearest **thousand** is 4,000

820000 rounded to the nearest **ten thousand** is 820,000

1 mark

9

$4 \div 10$	$40 \div 10$
$4 \div 100$	$40 \div 100$

Two of these calculations have the same answer.

Write this answer as a **decimal.**

0.4

1 mark

$4 \div 10 = 0.4$ and $40 \div 100 = 0.4$. To divide by 10, the decimal point can be moved 1 time to the left. To divide by 100, the decimal point can be moved 2 times to the left

10 Circle the two **prime** numbers that have a difference of 2

15 (17) (19) 21 23 25

1 mark

Prime numbers are only divisible by themselves and 1.
The 17, 19 and 23 are prime.
15 is not prime as it is divisible by 5 (15 ÷ 5 = 3).
21 is not prime as it is divisible by 3 (21 ÷ 3 = 7).
25 is not prime as it is divisible by 5 (25 ÷ 5 = 5).
17 and 19 have a difference of 2 as 19 is 2 more than 17

11 This table shows the number of children and adults at a childcare centre.

Complete the table to make it correct.

The first row has been done for you.

Age in years	Number of children	Number of adults	Number of children per adult
1 and under	12	4	3
2 or 3	20	5 A	4
4 or 5	24 B	3	8

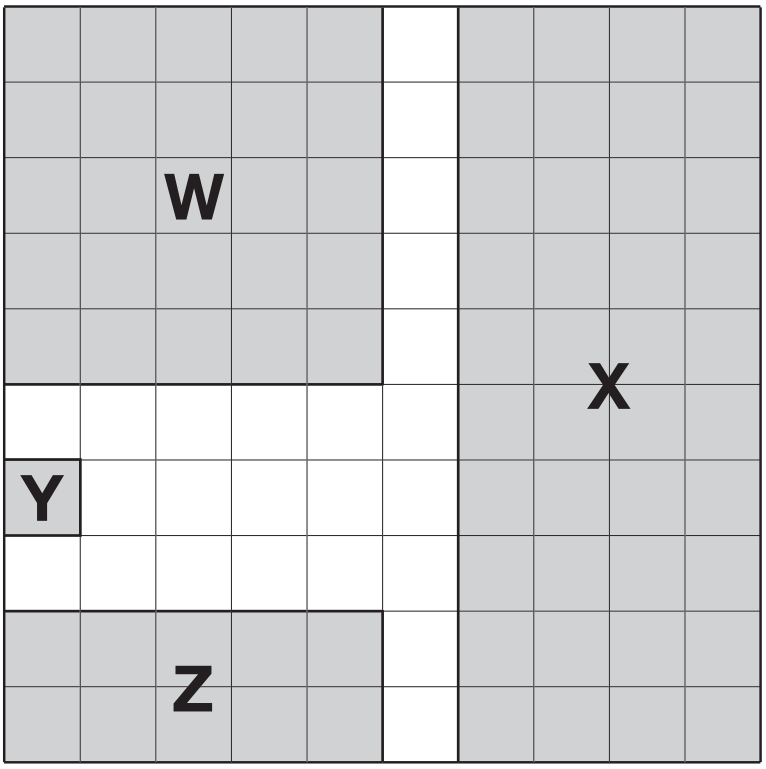
1 mark

A: There needs to be 1 adult for every 4 children.
20 is 5 lots of 4 so there needs to be 5 adults.

B: There are 8 children for every 1 adult. 3 × 8 = 24

10 × 10 = 100 small squares

12 Shapes **W, X, Y** and **Z** cover different fractions of this 10 by 10 square.



Match each shape to the correct fraction.

Shape **W**	$\frac{1}{4}$
Shape **X**	$\frac{2}{5}$
Shape **Y**	$\frac{1}{100}$
Shape **Z**	$\frac{1}{10}$

$\frac{1}{100}$ ← 1 out of the 100 is shaded for Y

$\frac{1}{4}$ ← 25/100 is shaded for W. Dividing both the numerator and denominator by 25 simplifies it to 1/4

$\frac{2}{5}$ ← 40/100 is shaded for X. Dividing both the numerator and denominator by 20 simplifies it to 2/5

$\frac{1}{10}$ ← 10/100 is shaded for Z. Dividing both the numerator and denominator by 10 simplifies it to 1/10

1 mark

13 Match the name of each 3-D shape to its number of vertices.




cube	9
square-based pyramid	8
triangular-based prism	6
octagonal-based pyramid	5

1 mark

The vertices are highlighted in orange

14 A class votes for a captain.

Three-quarters of the class vote for Sam.

The remaining 7 pupils vote for Alex.

How many pupils are in the class?

28

1 mark

There is 1 class. 1 - 3/4 = 4/4 - 3/4 = 1/4. So 1/4 of the class vote for Alex. The opposite of doing 1/4 of a number is multiplying by 4. So 7 × 4 = 28 pupils in the class

15 Write the missing number to make this **multiplication** correct.

$$3.207 \times 100 = \boxed{32.07} \times 10$$

1 mark

3.207 × 100 = 320.7, which can be worked out by moving the decimal point 2 times to the right. 32.07 × 10 = 320.7, which can be worked out by moving the decimal point 1 time to the right. Both equal to 320.7 so both sides of the equation must be equal

16 Here is a number.

9,658,214

Tick the statements that are **true**.

The digit 5 represents 50,000	✓
The value of the digit 9 is nine hundred thousands.	
The digit 6 represents 6 millions.	
The value of the digit 2 is twenty tens.	✓

2 marks

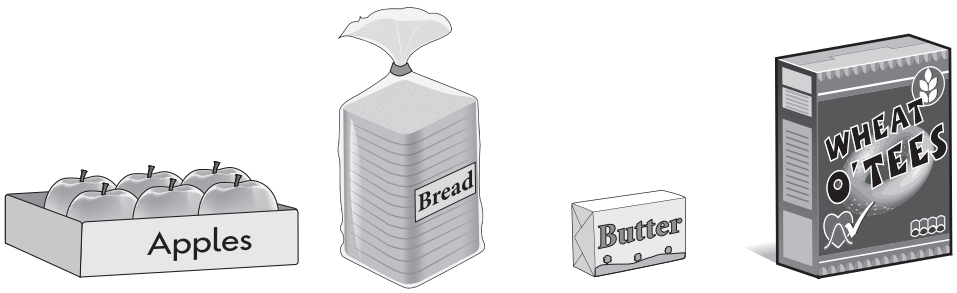
The digit 5 is in the ten thousands place so is worth 50000.

The value of the digit 9 is nine million. Nine hundred thousands is 900000.

The digit 6 represents 6 hundred thousands. 6 millions is 6000000.

Twenty tens is two hundred, which is the value of the digit 2

17 Chen buys these four items.



670 grams	400 grams	500 grams	750 grams
£1.50	£0.70		£1.45

Chen pays for the four items with a £10 note. The price of the butter is not shown.

She receives £3.85 change.

What is the price of the **butter**?

Show your method

$$\begin{array}{r} 1.50 \\ +\ 0.70 \\ +\ 1.45 \\ \hline 3.65 \end{array}$$
A

$$\begin{array}{r} {}^{0}\cancel{1}\,{}^{9}\cancel{0}.{}^{9}\cancel{0}\,{}^{10}0 \\ -\ 3.85 \\ \hline 6.15 \end{array}$$
B

$$\begin{array}{r} {}^{5}\cancel{6}.{}^{11}1\,5 \\ -\ 3.65 \\ \hline 2.50 \end{array}$$
C

£ 2.50

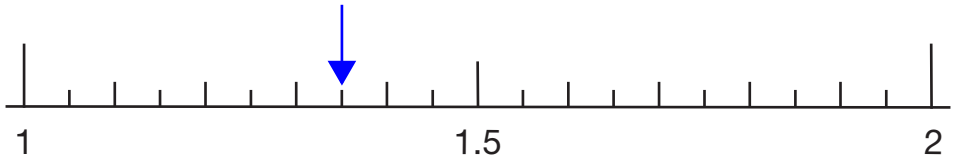
2 marks

A: Adding all of the known prices together works out that the total price not including the butter is £3.65.

B: Subtracting the £3.85 change from the £10 paid works out that the total price including the butter is £6.15.

C: Subtracting the total price not including the butter from the total price including the butter works out that the price of the butter is £2.50

18 Draw an arrow (↑) on the scale below to show **1350 grams**.



kilograms

1 mark

There are 1000 grams in 1 kilogram. So 1.5 kilograms is 1500 grams. There is a difference of 500 grams between the 1 kilogram and the 1.5 kilograms. There are 10 divisions between the 1 kilogram and the 1.5 kilograms. Dividing the 500 grams by the 10 divisions works out that each division is worth 50 grams. Counting back in 50s from 1500 grams: 1450, 1400, 1350. So 1350 grams is 3 divisions before 1.5 kilograms

19 A hall has 1,250 seats.

At 7 pm, 880 seats are filled.

At 8 pm, there are 40 empty seats.

How many seats were filled between 7 pm and 8 pm?

Show your method

	1	2	5	0		0 11	1 2	11	0
-			4	0	-		8	8	0
	1	2	1	0			3	3	0
		A					B		

330 **seats**

2 marks

A: Subtracting the 40 empty seats from the 1250 total seats works out that at 8 pm, 1210 seats are filled.

B: Working out the difference between the seats filled at 7 pm and the seats filled at 8 pm works out how many seats were filled between 7 pm and 8 pm

20 Each day, a school has

- break from 10:15 am to 10:30 am
- lunchtime from 12:40 pm to 1:30 pm.

There are 15 minutes from 10:15 am to 10:30 am

There are 20 minutes from 12.40 pm to 1 pm. Then there are another 30 minutes from 1 pm to 1:30 pm. 20 + 30 = 50 minutes

What is the **total** time the school has for breaks and lunchtime in a 5-day week?

Show your method

	1	5		1	0	5
+	5	0	×			5
	6	5		5	2	5
	A				B	

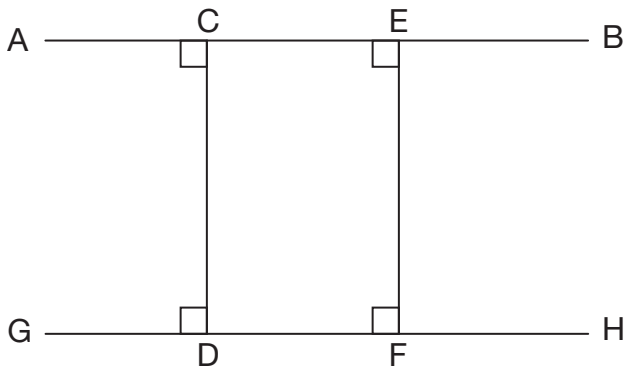
5 **hours** 25 **minutes**

2 marks

A: Adding the 15 minutes for break and the 50 minutes for lunchtime works out that the total time for breaks and lunchtime in 1 day is 65 minutes. There are 60 minutes in 1 hour so the 65 minutes is 1 hour and 5 minutes.

B: Multiplying the 1 hour and 5 minute in 1 day by 5 works out that there are 5 hours and 25 minutes for breaks and lunchtime in a 5-day week

21



Tick **all** the correct statements.

AB is parallel to CD	☐	← AB is perpendicular to CD
GH is parallel to AB	☑	
CD is perpendicular to GH	☑	
EF is perpendicular to CD	☐	← EF is parallel to CD

1 mark

Perpendicular means they are at 90° (a right angle) to each other. Parallel means that they are going in the same direction and they will never meet

22 This table shows the distance that five friends travel to school each day.

Name	Distance (km)
Amina	1.8
William	2.4
Layla	3.2
Chen	1.6
Dev	4.5

13.5 ← Adding them up to work out the total distance

What is the **mean** distance they travel to school each day?

Show your method

$$5 \overline{)\,1\,3.5}$$ = 0 2.7 ← Dividing the total distance by the 5 friends

2.7 **km**

2 marks

23 Mrs Mills has **940** seeds to plant into trays.

She plants **12** seeds in each tray.

The last tray is not full.

What **fraction** of the last tray is filled?

Show your method

		0	7	8	r4
1	2	9	$^{9}4$	$^{10}0$	

$\frac{4}{12}$

2 marks

Dividing the 940 seeds by the 12 seeds in each tray works out that there are 78 full trays with a remainder of 4 seeds, which are put into the last tray. 4 out of the 12 spaces in the last tray are filled

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24 Here are four numbers.

40 60 64 100

Use each number **once** to complete these statements.

100	is a square number.
64	is a cube number.
60	is a common multiple of **4** and **5**
40	is a common factor of **80** and **120**

2 marks

1) There are two possibilities for the square number so leaving this for now.

2) The only cube number is 64 as $4^3 = 4 \times 4 \times 4 = 64$.

3) Now going back to the square number. 100 is the only square number remaining as $10^2 = 10 \times 10 = 100$.

4) There are two possibilities for the common multiple of 4 and 5 so leaving this for now.

5) 40 is the only common factor of 80 and 120 as both 80 and 120 are divisible by 40 ($80 \div 40 = 2$ and $120 \div 40 = 3$).

6) This leaves 60 for the common multiple of 4 and 5, which it is as it is in the 4 and 5 times table ($4 \times 15 = 60$ and $5 \times 12 = 60$)

25 Write the missing numbers so that $3 \times b - a = 2$

a	b
4	2
13	5

2 marks

3 × 2 = 6, when 4 must be subtracted from 6 to get 2 so a must be 4 when b is 2.

15 - 13 = 2, so 3 × b must be 15 and b must be 5 when a is 13

26 Here are 3 translations on a coordinate grid.

Tick the translations that are **four units to the left**.

from (0, 2) to (4, 2) ☐ ← This goes 4 to the right as the x-coordinate is increased by 4 from 0 to 4

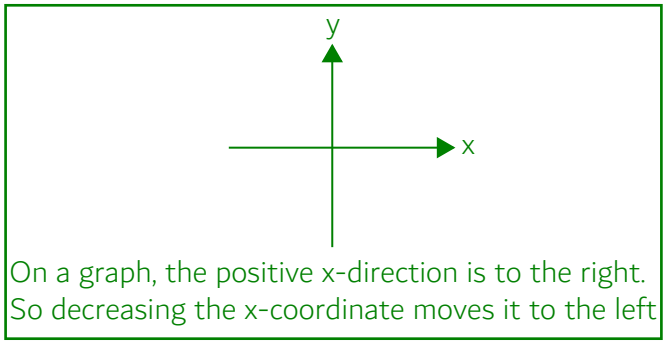
from (6, 8) to (2, 8) ✓

from (–3, 5) to (–7, 5) ✓

These go 4 to the left as the x-coordinate decreases by 4

x-coordinate y-coordinate

1 mark

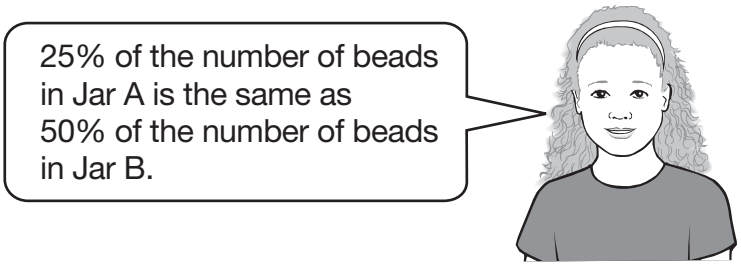


On a graph, the positive x-direction is to the right.
So decreasing the x-coordinate moves it to the left

27 Olivia has two jars of beads.

The number of beads in Jar A is **double** the number of beads in Jar B.

Olivia says,



Explain why Olivia is correct.

If there were 100 beads in Jar A there would be 50 beads in Jar B.

100 is double 50

25% of 100 = 25
50% of 50 = 25

25% can be worked out by dividing by 4.
50% can be worked out by dividing by 2

1 mark

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Paper 2: reasoning
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