2022 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						

.CG Maths.
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 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

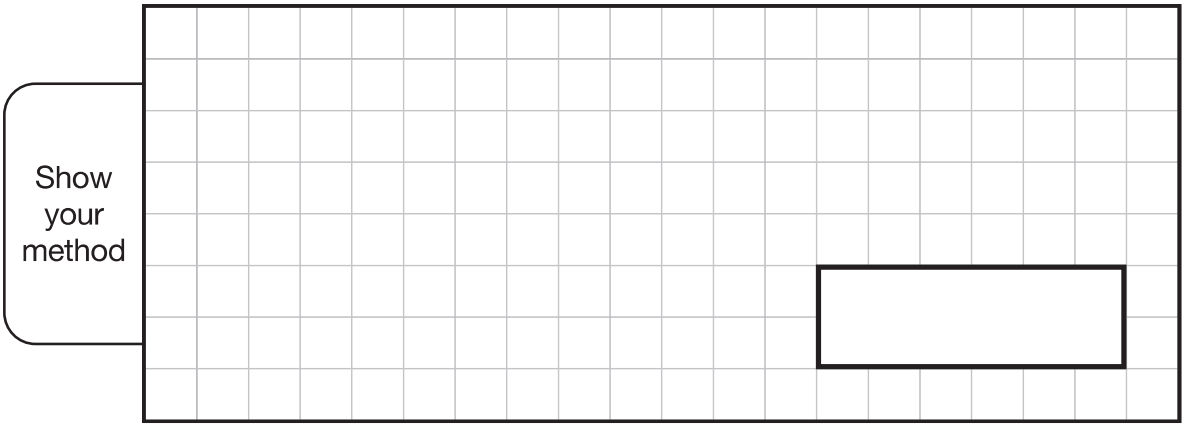
You have **40 minutes** to complete this test.

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:



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 Circle the **greatest** number.

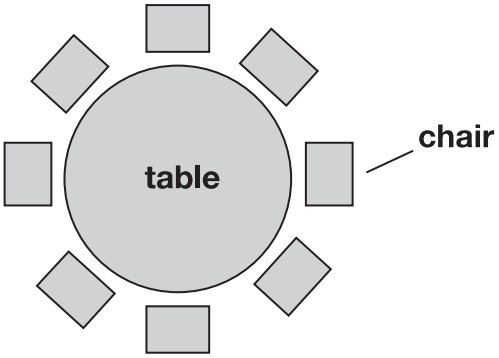
~~9,206,499~~ 9,215,300 ~~9,206,504~~

9,215,298 ~~9,206,909~~

1 mark

Comparing the digits in each place from left to right. They all have 9 millions and 2 hundred thousands. Three of the numbers have 0 ten thousands whereas the other two have 1 ten thousand, so these three are crossed out as they are smaller. The remaining two both have 5 thousands. The circled number has 3 hundreds whereas the other number only has 2 hundreds so the circled number is greatest

2 One table can seat 8 people.



How many tables are needed to seat 40 people?

5 **tables**

1 mark

40 is 5 x 8 so 5 tables are needed as this is 5 lots of 8 seats

3 Write the missing number to make this **addition** correct.

400,000 + 30000 + 70 = 430,070

1 mark

Subtracting the 400000 and 70 from 430070 works out the difference between what is on the left and what is on the right, which is 30000. So this is what needs to be added

4 Children estimated the number of beans in a jar.

These were the estimates of five children.

Amir	1,310
Olivia	1,220
Emma	1,400
John	1,290
Chen	1,460

The exact number of beans in the jar was **1,380**

Whose estimate was **closest** to the exact number?

Emma

1 mark

Amir is the closest below 1380 and is 70 away. Emma is the closest above and is 20 away

Whose estimate was **furthest** from the exact number?

Olivia

1 mark

Olivia is the furthest below and is 160 away. Chen is the furthest above and is 80 away

5 One tonne is 1,000 kilograms.

A truck can carry a load of 2.3 tonnes.

How many **kilograms** can the truck carry?

2300 **kg**

1 mark

Each tonne is 1000 kilograms so multiplying the number of tonnes by 1000 converts it into kilograms. This moves the decimal point 3 places to the right

6 Emma has a 5 litre bag of compost.

She uses 2.75 litres.

How much compost does Emma have left?

$$\begin{array}{r} 5.00 \\ -\ 2.75 \\ \hline 2.25 \end{array}$$

2.25 **litres**

1 mark

Subtracting the 2.75 litres used from the 5 litres works out how much is left

7 In a race, Ali completes a swim, a run and a bicycle ride.

The swim is $\frac{1}{10}$ of the total distance.

The run is $\frac{3}{10}$ of the total distance.

What fraction of the total distance is the **bicycle ride**?

$\frac{6}{10}$

1 mark

1 represents the total distance. Subtracting 1/10 and 3/10 from 1 leaves the fraction of the total distance the bicycle ride is. 1 = 1/1 = 10/10. 10/10 - 1/10 - 3/10 = 6/10. The fraction does not need to be simplified

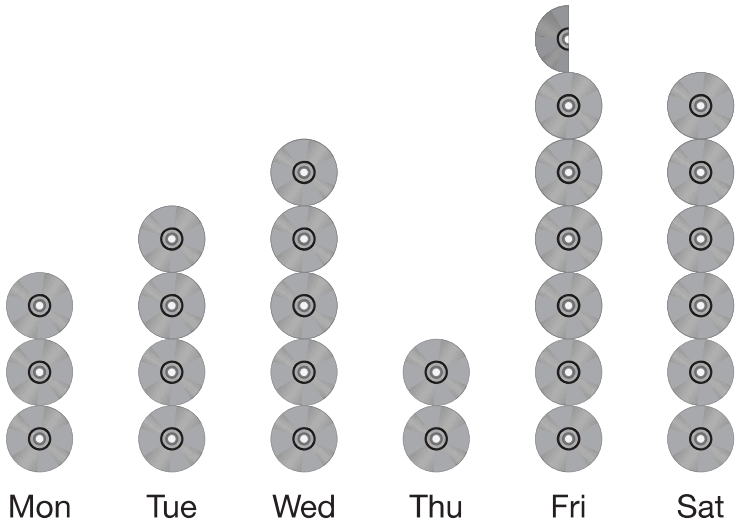
8 Circle the improper fraction that is equivalent to $2\frac{3}{8}$

$\frac{5}{8}$ $\frac{14}{8}$ $\frac{19}{8}$ $\frac{23}{8}$ $\frac{26}{8}$

1 mark

$2^3/_8 = 2/1 + 3/8 = 16/8 + 3/8 = 19/8$

9 This pictogram shows how many DVDs a shop sells in one week.



On **Monday**, 24 DVDs were sold.

How many DVDs were sold on **Friday**?

52

1 mark

3 whole symbols represent 24. 24/3 = 8 so each symbol represents 8. There are $6^{1}/_{2}$ symbols for Friday. 6 x 8 = 48. 1/2 of 8 is 4. Adding the 4 onto the 48 gives 52

10 A shop has an offer.

Buy one box for £1.90

Get the second box half price.

Ali buys two boxes of cereal.

How much must he pay **altogether**?

Show your method

0.95
2 | 1.90

Working out the price of the second box, which is half the price of the first box

1.90
+ 0.95
2.85

£ 2.85

Adding the price of the second box to the price of the first box to work out how much he pays for two boxes

2 marks

11 Write the missing values.

$$\frac{3}{10} = \frac{\boxed{6}}{20}$$

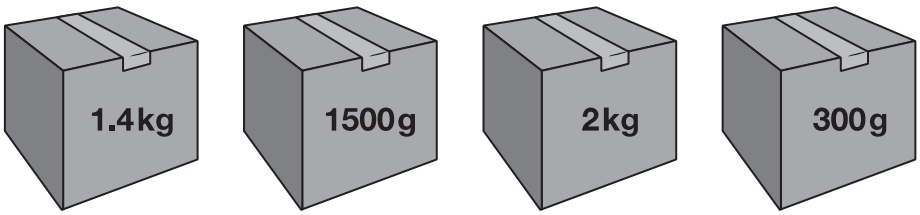
The denominator of 3/10 was multiplied by 2 to get 20. So the numerator must also be multiplied by 2 to get 6 to keep the fractions equivalent

$$\frac{12}{15} = \frac{4}{\boxed{5}}$$

The numerator of 12/15 was divided by 3 to get 4. So the denominator must also be divided by 3 to get 5 to keep the fractions equivalent

1 mark

12 William has four parcels.



Write the masses in order, starting with the **heaviest.**

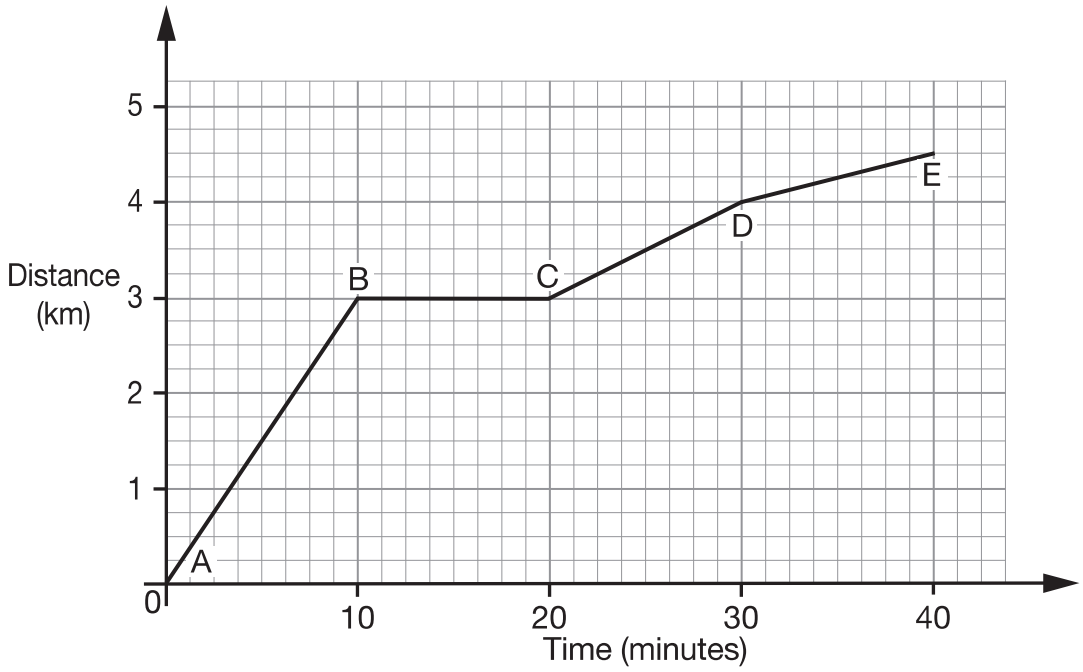
2kg	1500g	1.4kg	300g

heaviest

1 mark

There are 1000g in 1kg. So multiplying the 1.4kg and 2kg by 1000 converts them into 1400g and 2000g

13 Look at the graph below that shows Dev's bike ride.

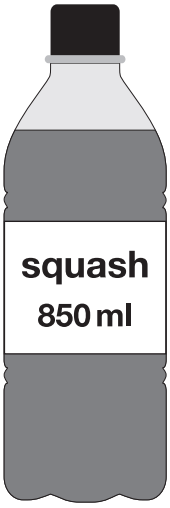


Match each part of Dev's journey to the correct sentence.

A to B	Dev rests for 10 minutes.
B to C	Dev cycles 1 km in 10 minutes.
C to D	Dev cycles 3 km in 10 minutes.
D to E	Dev cycles less than 1 km in 10 minutes.

1 mark

14 This 850 ml bottle of squash makes 17 drinks.



How many millilitres of squash are in each drink?

$$17 \overline{)850} = 50$$

34
51
68
85

50 ml

1 mark

Dividing the 850ml by the 17 drinks works out how many millilitres are in each drink

15 Write the correct sign =, > or < in each box.

6 $1 \times 2 \times 3$ [=] $1 + 2 + 3$ 6

8 $2 \times 2 \times 2$ [>] $2 + 2 + 2$ 6

100 $1 \times 10 \times 10$ [>] $1 + 10 + 10$ 21

0 $0 \times 10 \times 10$ [<] $0 + 10 + 10$ 20

2 marks

The inequality symbols point to the side which is smaller

16 Tick the numbers that round to 28.7

28.07	☐
28.65	☑
28.71	☑
28.75	☐
28.97	☐

This rounds to 28.7 to 1 decimal place. The 5 in the second decimal place causes the 6 in the first decimal place to round up to a 7. Then everything after the first decimal place is ignored

This rounds to 28.7 to 1 decimal place. The 1 in the second decimal place causes the 7 in the first decimal place to round down to a 7. Then everything after the first decimal place is ignored

1 mark

28.07 rounds to 28.1 to 1 decimal place. 28.75 rounds to 28.8 to 1 decimal place. 28.97 rounds to 29.0 to 1 decimal place

17 6 divides into 40 with a remainder of 4

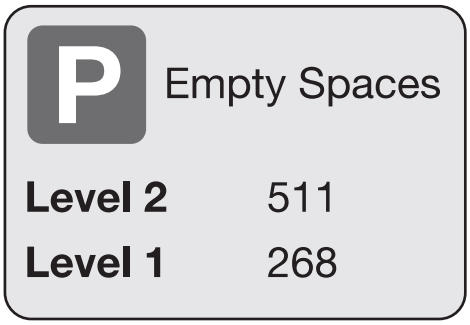
Write **one** other number that divides into 40 with a remainder of 4

9

1 mark

If there is a remainder of 4 it must divide exactly into the number which is 4 less than 40, which is 36. 9 divides into 36 as 9 x 4 = 36

18 This sign shows the number of **empty spaces** on each level of a car park at 10 am.



In this car park, **each** level has 800 spaces.

What is the total number of cars **parked** in the car park at 10 am?

Show your method

$$\begin{array}{r} {}^{7}\cancel{8}\,{}^{1}\cancel{0}\,{}^{9}0 \\ -\ 5\,1\,1 \\ \hline 2\,8\,9 \end{array} \qquad \begin{array}{r} {}^{7}\cancel{8}\,{}^{1}\cancel{0}\,{}^{9}0 \\ -\ 2\,6\,8 \\ \hline 5\,3\,2 \end{array} \qquad \begin{array}{r} 2\,8\,9 \\ +\ 5\,3\,2 \\ \hline {}^{1}8\,{}^{1}2\,1 \end{array}$$

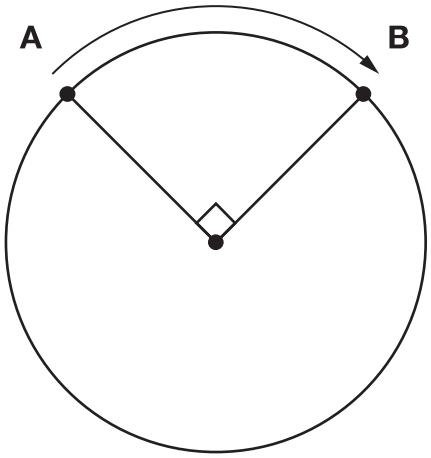
821

2 marks

Subtracting the number of empty spaces on each level from the 800 spaces on each level works out how many cars are parked on each level. Adding the 289 cars parked on Level 2 and the 532 cars parked on Level 1 works out that there are 821 cars parked in the car park in total

Circumference is the distance around the outside of the circle

19 The **circumference** of this circle is 60 centimetres.



Not actual size

What is the distance around the edge of the circle from **A** to **B**?

$4\overline{)60}$ = 15

15 **cm**

1 mark

90° is 1/4 of 360° so the distance around the edge of the circle from A to B must be 1/4 of the circumference

20 There are 432 places at a dance school.

There are two age groups.

This table shows the number of classes and the number of pupils in each class for each age group at the moment.

Age in years	Number of classes	Number of pupils in each class
7–12	15	16
13–18	10	18

How many **more** pupils can join the dance school?

Show your method

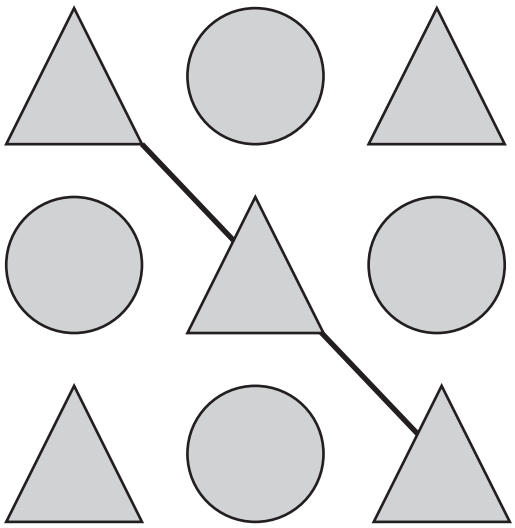
$$\begin{array}{r} 16 \\ \times\ 15 \\ \hline 80 \\ 160 \\ \hline 240 \\ +\ 180 \\ \hline 420 \\ {\scriptstyle 1\ 1} \end{array} \qquad \begin{array}{r} 432 \\ -\ 420 \\ \hline 12 \end{array}$$

12

2 marks

Multiplying the number of classes by the number of pupils in each class for each age category works out the total number of pupils in each age category. So there are 240 in the 7-12 category and 180 in the 13-18 category. Adding both of these together works out that there are 420 pupils in total. Subtracting this from the432 places works out how many more pupils can join

21



Each shape stands for a number.

The total of the shapes on the diagonal line is 48

The total of all the shapes is 200

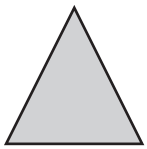
Calculate the value of each shape.

$$3\overline{)48} = 16$$

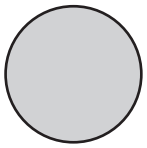
$$16 \times 5 = 80$$

$$200 - 80 = 120$$

$$4\overline{)120} = 30$$

 = 16

1 mark

 = 30

1 mark

The total of 3 triangles is 48 so dividing the 48 by 3 works out the value of 1 triangle. So each triangle is worth 16. There are 5 triangles so multiplying the value of 1 triangle by 5 works out the value of all 5. Subtracting this from the total of all of the shapes (200) leaves the value of the 4 circles. Dividing this by 4 works out the value of 1 circle. So the value of each circle is 30

22 You can make green paint by mixing:

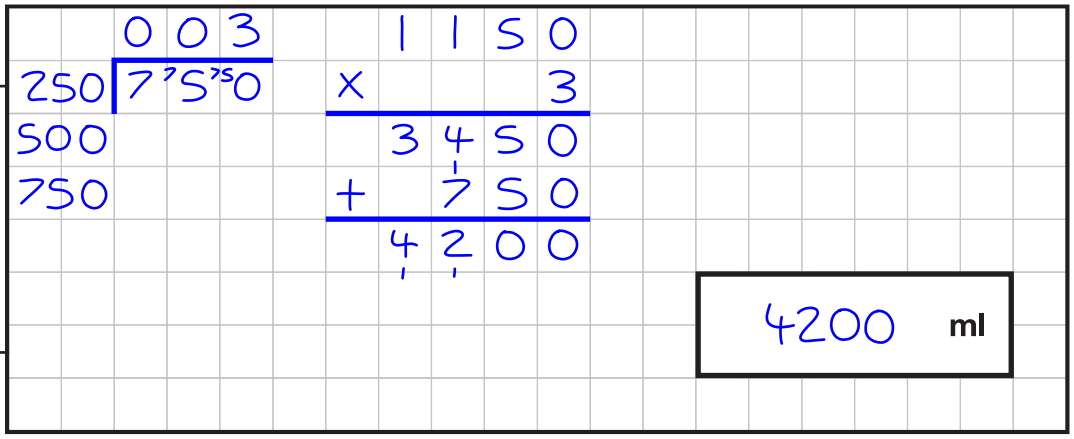
- 250 ml of blue paint
- 1,150 ml of yellow paint.

Stefan wants to make some of this green paint.

He uses 750 ml of **blue** paint.

How much **green** paint does he make?

Show your method



2 marks

Dividing the 750ml of blue paint used by the 250ml of blue paint works out that 3 lots of the 250ml of blue paint is used. Therefore there also needs to be 3 lots of the 1150ml of yellow paint to keep the colours in the same proportion. 3 lots of the 1150ml of yellow paint is 3450ml. Adding the 750ml of blue paint works out how much green paint is made

23 Adam has a bag of fruit that weighs **1.25 kilograms**.

He takes out a banana. Now the bag of fruit weighs **1.1 kg**.

Next, he takes out an orange. Now the bag weighs **920 g**.

How much **more** does the orange weigh than the banana?

Show your method

1250 − 1100 = 150

1100 − 920 = 180

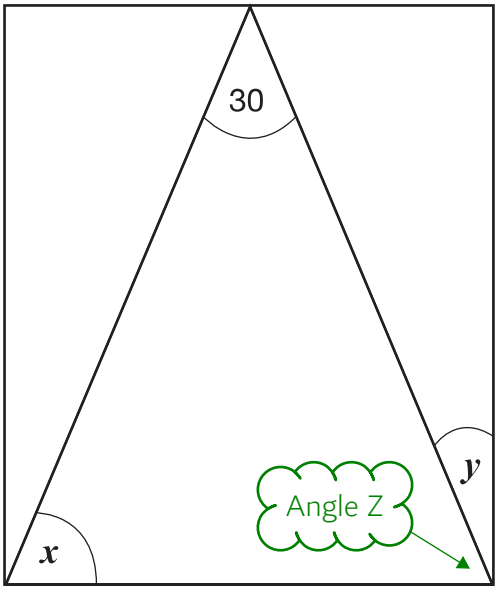
180 − 150 = 30

30 g

2 marks

There are 1000g in 1kg so multiplying the 1.25kg and 1.1kg by 1000 converts them into 1250g and 1100g. It is best to work in grams as the answer needs to be in grams. Subtracting the weight of the bag after the banana is taken out from the original weight of the bag works out the difference in the weights and therefore the weight of the banana. So the banana weighs 150g. Subtracting the weight of the bag after the orange is also taken out from the weight of the bag after only the banana is taken out works out the difference in the weights and therefore the weight of the orange. So the orange weighs 180g. Subtracting the 150g from the 180g works out the difference in the weight of the orange and banana

24 Here is an **isosceles** triangle inside a rectangle.



Not to scale

Calculate the sizes of angles x and y.

Show your method

180 − 30 = 150

075
2 | 1'5'0

8 9 1 0
− 7 5
1 5

x = 75 °

y = 15 °

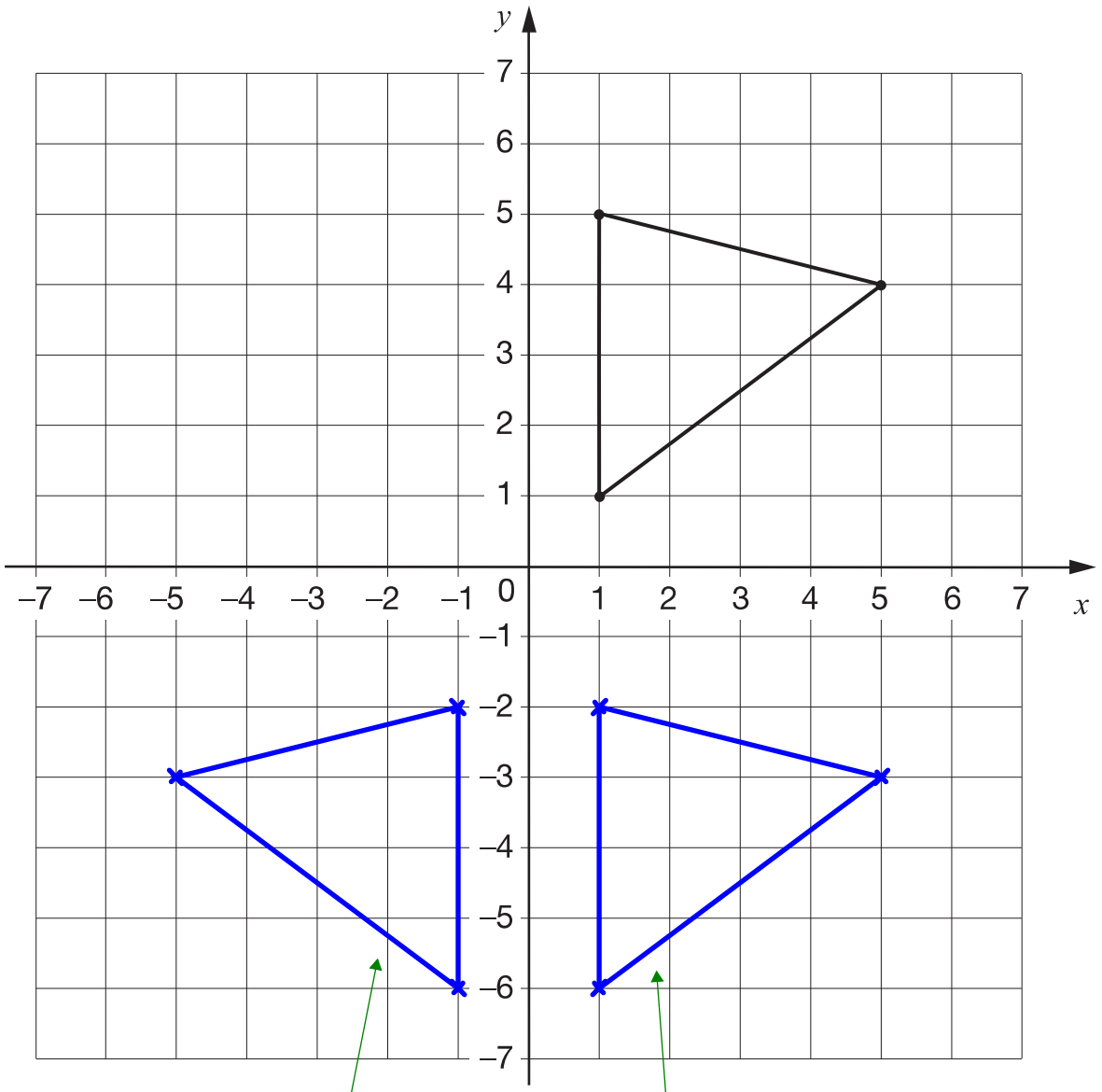
2 marks

There are 180° in total in a triangle. Subtracting the 30° from this works out how many degrees remain in the triangle. 150° remain. The base angles of an isosceles triangle are equal so dividing this by 2 works out each of the base angles. Each base angle is 75° so x = 75° and also angle Z = 75°. The angle in a rectangle is 90° so subtracting angle Z from this leaves angle y, which is 15°

25 The triangle is to be transformed on the grid as follows:

- First translate the shape 7 units down.
- Then reflect the **resulting** triangle in the y-axis.

Draw the new triangle on the grid after **each** transformation.



2 marks

Use a ruler.

This is the result of reflecting the translated shape in the y-axis. The number of jumps to the y-axis is counted and the same number of jumps are done on the other side for each corner. Then the corners are joined up with a ruler

This is the result of translating the shape 7 units down. Each corner is moved 7 down. Then the corners are joined up with a ruler

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Paper 2: reasoning
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