

2018 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						

Contains material developed by the Standards and Testing Agency for 2018 national curriculum assessments and licensed under Open Government Licence v3.0 <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

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](mailto:curtis@cgmaths.co.uk)

**[BLANK PAGE]**

Please do not write on this page.

## 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:**

Diagram illustrating a method box. A rounded rectangle on the left contains the text "Show your method". This is connected by a line to a large grid of red lines. In the bottom right corner of the grid, there is a smaller, empty rectangular box.

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

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

Write the missing numbers.

35

42

49

56

63

70

2 marks

It is increasing by 7 each time as it increases by 7 between 42 and 49. Going backward in the sequence goes down by 7.

$$42 - 7 = 35$$

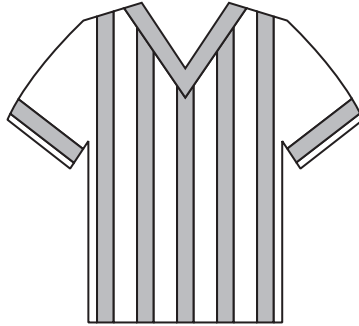
$$49 + 7 = 56$$

$$63 + 7 = 70$$

2

Adam chooses the colours for a new team shirt.

The shirt has **two** colours.



There are four colours to choose from: **yellow**, **blue**, **white** and **red**.

Write the **two** missing combinations.

The shirt could be:

- yellow and blue
- yellow and white
- yellow and red
- blue and white.

\_\_\_\_\_ Blue \_\_\_\_\_ and \_\_\_\_\_ Red \_\_\_\_\_

\_\_\_\_\_ White \_\_\_\_\_ and \_\_\_\_\_ Red \_\_\_\_\_

1 mark

3

Here are four number cards.



Layla uses each card once to make a four-digit number.

She places:

- 4 in the tens column
- 2 so that it has a higher value than any of the other digits
- the remaining two digits so that 7 has the higher value.

Write a digit in each box to show Layla's number.

The number 2743 is shown in four boxes. Each digit is accompanied by a green callout box explaining its placement:

- 2**: The thousands column is the highest value the 2 can be.
- 7**: The hundreds are worth more than the units so 7 must go here.
- 4**: This is the tens column.
- 3**: 3 must go here as there is nowhere else it can go once the other digits have been placed.

1 mark

4

Write the three missing digits to make this **addition** correct.

$$\begin{array}{r} 53249 \\ + 7427 \\ \hline 60676 \end{array}$$

2. 1 is carried over into the tens column.  $2 + 1 = 3$ . To get to 7 tens, this digit must be 4

1. The only way of adding a single digit to 9 to end in a 6 is adding 7 to get 16

3. 1 is carried over into the ten thousands column.  
 $5 + 1 = 6$

2 marks

5

Tick the numbers that are common factors of both **12** and **18**

2

3

6

9

12

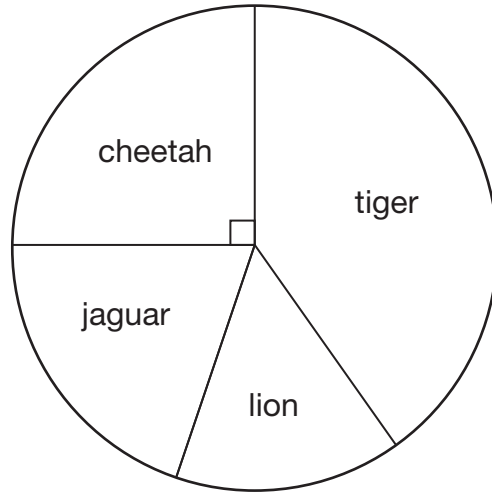
Numbers which both 12 and 18 can be divided by

2 marks

6

This chart shows the number of different types of big cat in a zoo.

There are **20** big cats in the zoo altogether.



Here are some statements about the chart.

Tick the statements that are **true**.

There are more cheetahs than jaguars.

The angle for cheetahs is greater than for jaguars

The total number of lions and tigers is 10

Combined they are more than half so they must be more than 10

One-quarter of the big cats are cheetahs.

90 degrees (a right angle) is a quarter of 360 degrees

There are more than 5 jaguars.

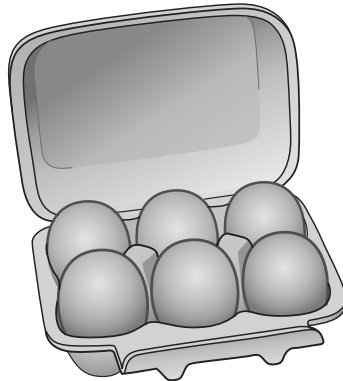
5 is a quarter of 20 and there is less than a quarter of the cats are jaguars

2 marks

7

A farmer is packing eggs.

Each box holds **six** eggs.



The farmer has 980 eggs to pack.

How many boxes can the farmer **fill** using 980 eggs?

$$\begin{array}{r} 163r2 \\ 6 \overline{)980} \end{array}$$

163

full boxes

1 mark

How many eggs will be left over?

The remainder from the division is the amount of eggs left over

2

left over

1 mark

8

Jack has £400

He spends **35%** of his money on a new bike.



How much does Jack spend on his new bike?

$$\begin{array}{r} 35 \\ \times 4 \\ \hline 140 \end{array}$$

£ 140

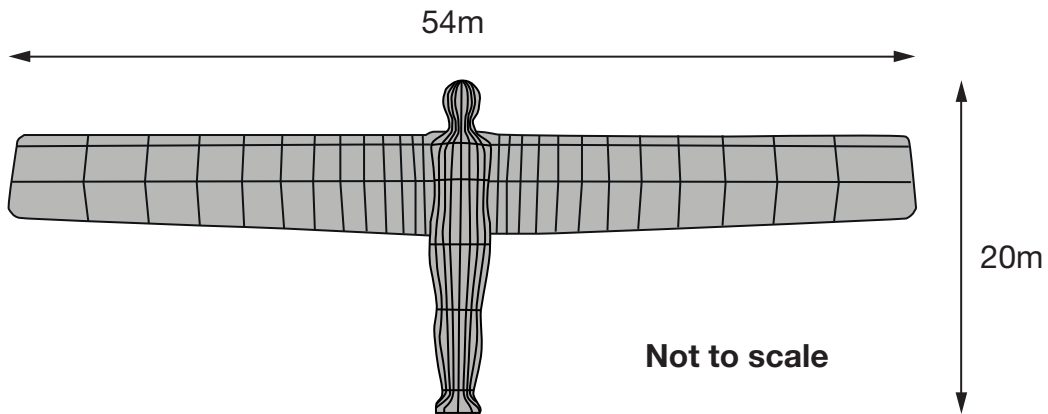
1 mark

To find 1%, divide 400 by 100. Remove both 0s to divide by 100. 1% is £4 and multiplying 1% by 35 gives 35%

9

The Angel of the North is a large statue in England.

It is 20 metres tall and 54 metres wide.



Ally makes a scale model of the Angel of the North.

Her model is 40 centimetres tall.

How **wide** is her model?

$$\begin{array}{r} 54 \\ \times 2 \\ \hline 108 \end{array}$$

108 cm

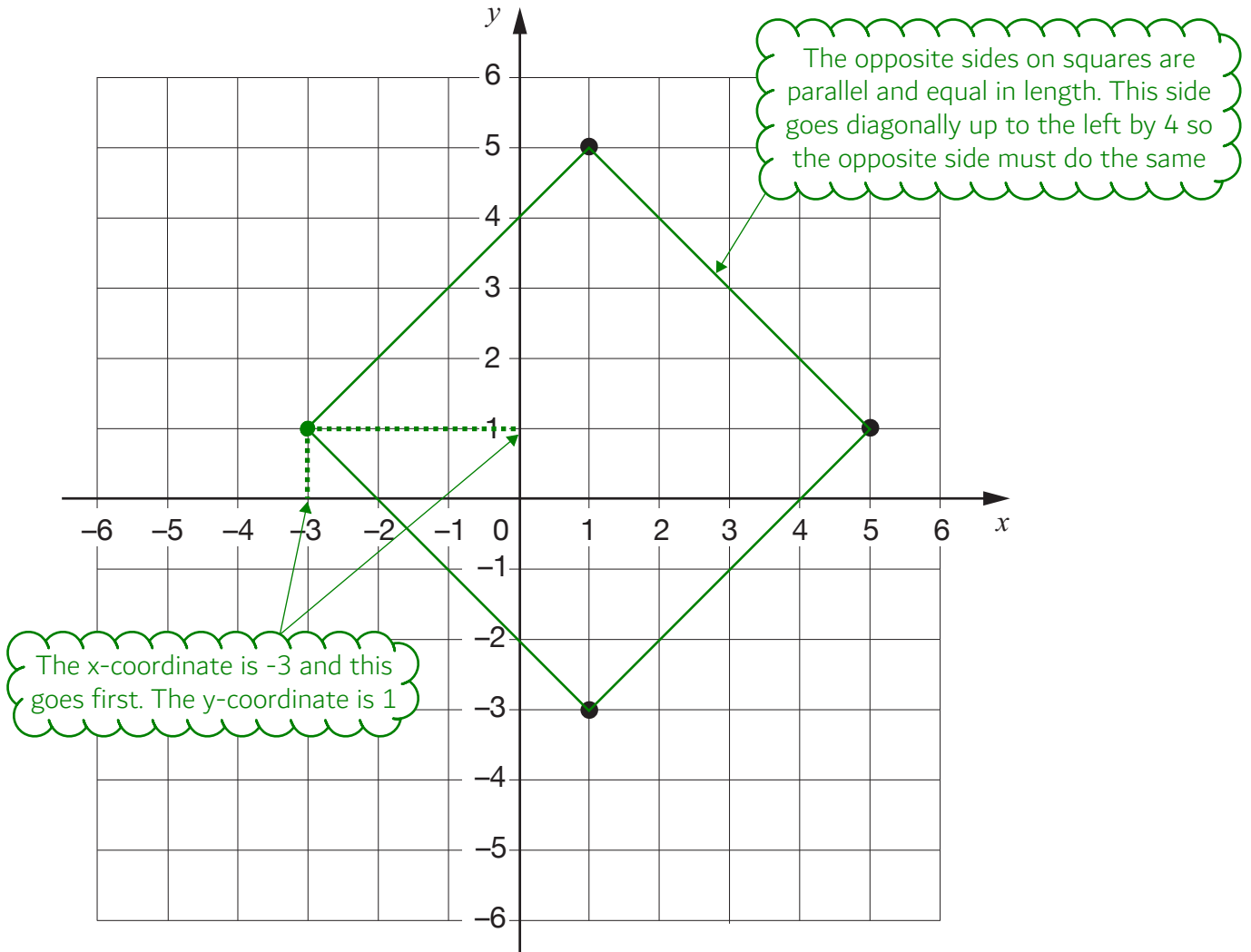
40 is double 20 so doubling the number of metres gives the number of centimetres

1 mark

10

Layla draws a **square** on this coordinate grid.

Three of the vertices are marked.



What are the coordinates of the missing vertex?

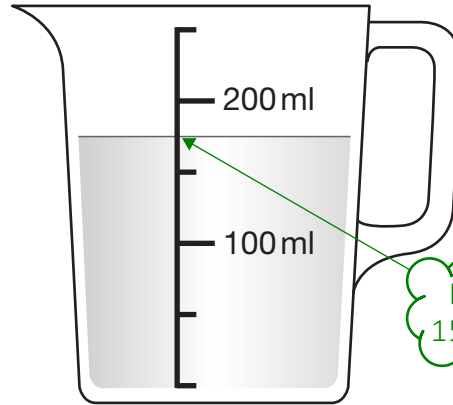
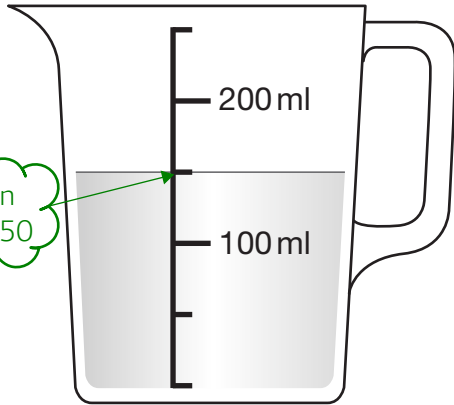
$(-3, 1)$

1 mark

11

Stefan has **600 millilitres** of water in a bottle.

He pours some of the water into two measuring jugs as shown.



How many millilitres of water are left in Stefan's bottle?

Show your method

150	<del>50</del> 0
+ 175	- 325
-----	-----
325	275

Working out how much has been poured out in total

Working out how much is left once the water has been poured out

**275 ml**

2 marks

**12**

This table shows the areas of the United Kingdom and Jamaica.

Country	Area (square kilometres)
United Kingdom	240,000
Jamaica	10,000

The area of the United Kingdom is larger than the area of Jamaica.

How many times larger is the United Kingdom?

$$240000 \div 10000$$

Remove 4 0s

**24** times larger

1 mark



14

Two of the angles in a triangle are  $70^\circ$  and  $40^\circ$

Jack says,

The triangle is equilateral.



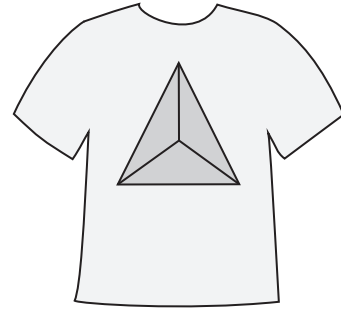
Explain why Jack is **not** correct.

All of the angles in an equilateral triangle are equal  
70 and 40 are not equal

1 mark

15

A shop prints designs on T-shirts.



They use this formula to work out the price for printing a design.

$$\text{price} = 60\text{p} \times \text{number of colours} + \text{£}1.25$$

What is the price for printing a design that has **3** colours in it?

$$\begin{array}{r} 60 \\ \times 3 \\ \hline 180 \end{array} \quad \begin{array}{r} 1.80 \\ + 1.25 \\ \hline 3.05 \end{array}$$

$$\text{£ } 3.05$$

1 mark

BIDMAS so multiplication should be done first. The number of colours is 3. 180p = £1.80. Then add the £1.25

Amina has **£5** to spend on printing a design.

What is the greatest number of **colours** she can have in the design?

Show your method

<del>48.00</del>					
- 1.25	60	3	7	5	
3.75	60, 120, 180, 240, 300, 360, 420				

The £1.25 is added regardless of how many colours there are so subtracting this leaves the money available for the colours

Working out how many 60p can be got out of £3.75 (375p). The remainder of 15p isn't enough to buy another colour

6 colours

2 marks

16

A book has 276 pages.

Amina has read  $\frac{1}{3}$  of the book.

How many pages are **left** for Amina to read?

Show  
your  
method

The student work is written on a grid background. It shows two calculations:

1. A long division problem:  $3 \overline{)276}$ . The quotient is written as 92. A green arrow points from a cloud-shaped note to the 92. The note says: "Working out  $\frac{1}{3}$  of 276 to work out how many pages have been read".

2. A subtraction problem:  $\begin{array}{r} 276 \\ - 92 \\ \hline 184 \end{array}$ . A green arrow points from a cloud-shaped note to the 92. The note says: "Taking away the pages read leaves the pages left to read".

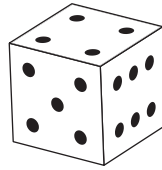
3. The final answer is written in a box: **184 pages**.

2 marks

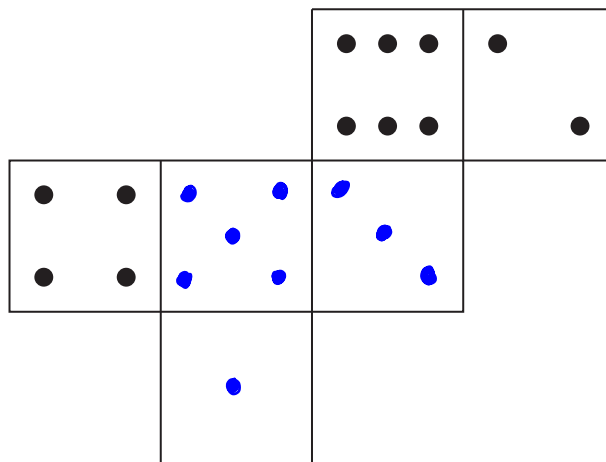
17

On a dice, the **sum** of the dots on opposite faces is always 7

Added together



Draw dots on the three empty faces of the net so that it could fold up to make a dice.



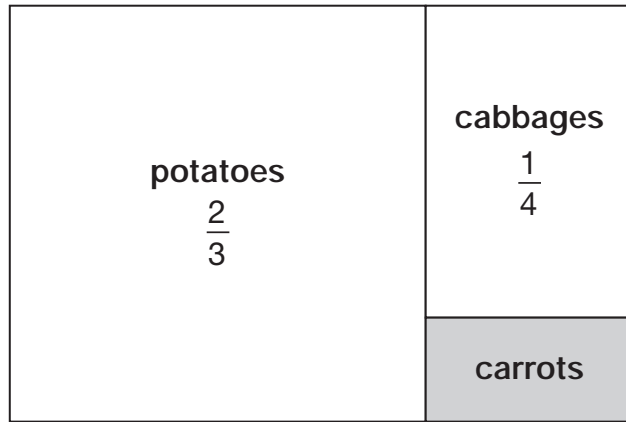
1 mark

Opposite faces don't touch

18

This is a diagram of a vegetable garden.

It shows the fractions of the garden planted with potatoes and cabbages.



Not to scale

The remaining area is planted with carrots.

What **fraction** of the garden is planted with carrots?

Show  
your  
method

$$\frac{2 \times 4}{3 \times 4} + \frac{1 \times 3}{4 \times 3} = \frac{8}{12} + \frac{3}{12} = \frac{11}{12} \quad \frac{12}{12} - \frac{11}{12}$$

Adding the fractions for potatoes and cabbages works out the total fraction of the garden covered.  $\frac{12}{12}$  is the whole garden as this equals 1. Taking away the fraction covered leaves the fraction for the carrots

$$\frac{1}{12}$$

2 marks

$$33,630 = 354 \times 95$$

Use this multiplication to complete the calculations below.

$$354 \times 9.5 = \boxed{3363}$$

$$3,540 \times 95 = \boxed{336300}$$

$$3,363 \div 95 = \boxed{35.4}$$

$354 \times 10 = 3540$   
 $354 \times 95 = 33630$   
 As 354 is multiplied by 10, the answer is multiplied by 10

$95 \div 10 = 9.5$   
 $354 \times 95 = 33630$   
 As 95 is divided by 10, the answer is divided by 10

$33630 \div 10 = 3363$   
 $33630 \div 95 = 354$   
 As 33630 is divided by 10, the answer is divided by 10

2 marks

20

In March, Ken collects 2, 3 or 4 eggs each day from his hens.

In the first 20 days, Ken collects 57 eggs altogether.

There are 31 days in March.

What is the **greatest** number of eggs Ken can collect in March?

Show your method

$\begin{array}{r} 31 \\ -20 \\ \hline 11 \end{array}$	$\begin{array}{r} 11 \\ \times 4 \\ \hline 44 \end{array}$	$\begin{array}{r} 57 \\ +44 \\ \hline 101 \end{array}$
---	--	--

How many days are left in March

11 days of 4 eggs as this is the most possible amount of eggs per day

57 eggs so far plus the maximum possible amount of eggs for the other 11 days

**101 eggs**

2 marks

21

Jack finished a sponsored run in 53 minutes 25 seconds.

Ally finished 3 minutes 50 seconds **after** Jack.

How long did Ally take?

$$\begin{array}{r} 53:25 \\ + 3:50 \\ \hline 56:75 \end{array}$$

57 min 15 sec

1 mark

75 seconds is over 59 so it needs to be converted into minutes and seconds. Taking 60 seconds from 75 gives 15 and the 60 seconds convert to an extra minute

Layla finished the run 8 minutes 45 seconds **before** Jack.

How long did Layla take?

$$\begin{array}{r} 53:25 \\ - 8:45 \\ \hline 44:40 \end{array}$$

44 min 40 sec

1 mark

Taking away 8:45 from 53:25 works out 8 minutes 45 seconds before. 25 seconds subtract 45 seconds can't be done so a minute needs to be converted into 60 seconds.  $25 + 60 = 85$