

2017 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 2017 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

[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:

Show your method

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 maximum number of marks for each question.

1

Write the missing number to make this **division** correct.

$$75 \div \boxed{10} = 7.5$$

1 mark

The decimal place has moved once to the left so it must be a division by 10

2

A group of friends earns £80 by washing cars.

They share the money **equally**.

They get £16 each.

How many friends are in the group?

16, 32, 48, 64, 80

5

1 mark

Working out how many lots of £16 go into £80

3

Chen uses these digit cards.

5

6

9

She makes a 2-digit number and a 1-digit number.

She multiplies them together.

Her answer is a **multiple of 10**

What could Chen's multiplication be?

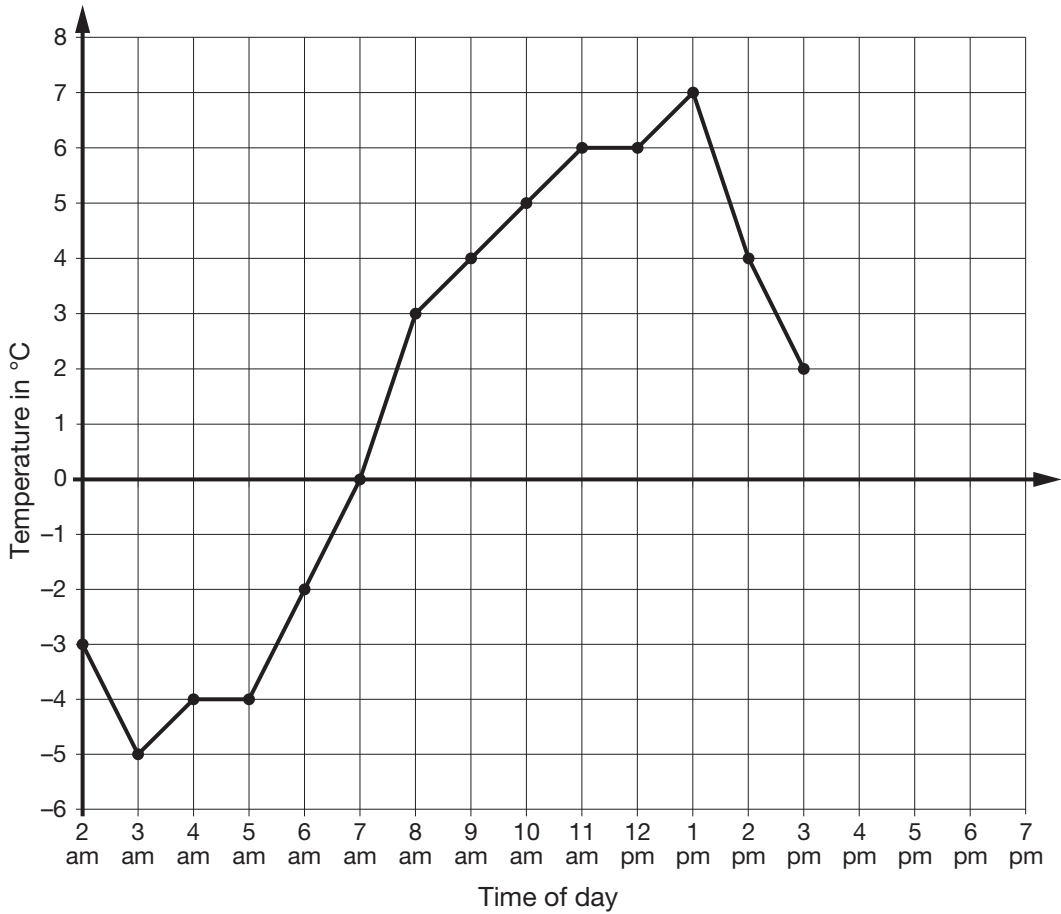
$$\begin{array}{|c|c|} \hline 9 & 5 \\ \hline \end{array} \times \begin{array}{|c|} \hline 6 \\ \hline \end{array}$$

1 mark

$5 \times 6 = 30$ and this ends in a 0 so
 95×6 must be a multiply of 10

4

This graph shows the temperature in °C from 2 am to 3 pm on a cold day.



How many degrees **warmer** was it at 3 pm than at 3 am?

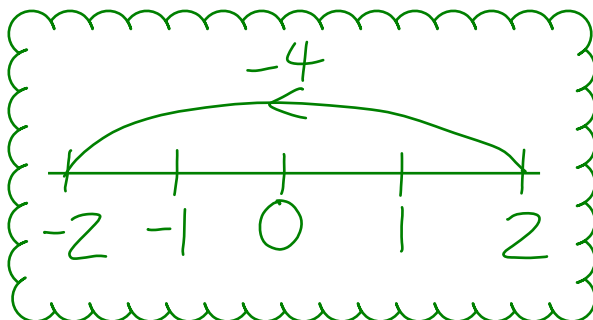
It was -5 degrees at 3am and 2 degrees at 3pm.
 $2 - -5 = 2 + 5 = 7$
 Subtracting a negative is the same as adding

7 °C

1 mark

At 6 pm the temperature was 4 degrees lower than at 3 pm.

What was the temperature at 6 pm?



-2 °C

1 mark

5

The children at Farmfield School are collecting money for charity.

Their target is to collect £360

So far they have collected £57.73

How much **more** money do they need to reach their target?

$$\begin{array}{r} 360.00 \\ - 57.73 \\ \hline 302.27 \end{array}$$

£ 302.27

Working out the difference (largest subtract smallest) between the target and what they have collected

1 mark

6

William wants to travel to Paris by train.
He needs to arrive in Paris by **5:30 pm**.

As this is in 12-hour time and it is 1pm or later, we can add 12 to the hours to convert it to 24-hour time. $5 + 12 = 17$ so 5:30pm becomes 17:30

Circle the **latest time** that William can leave London.

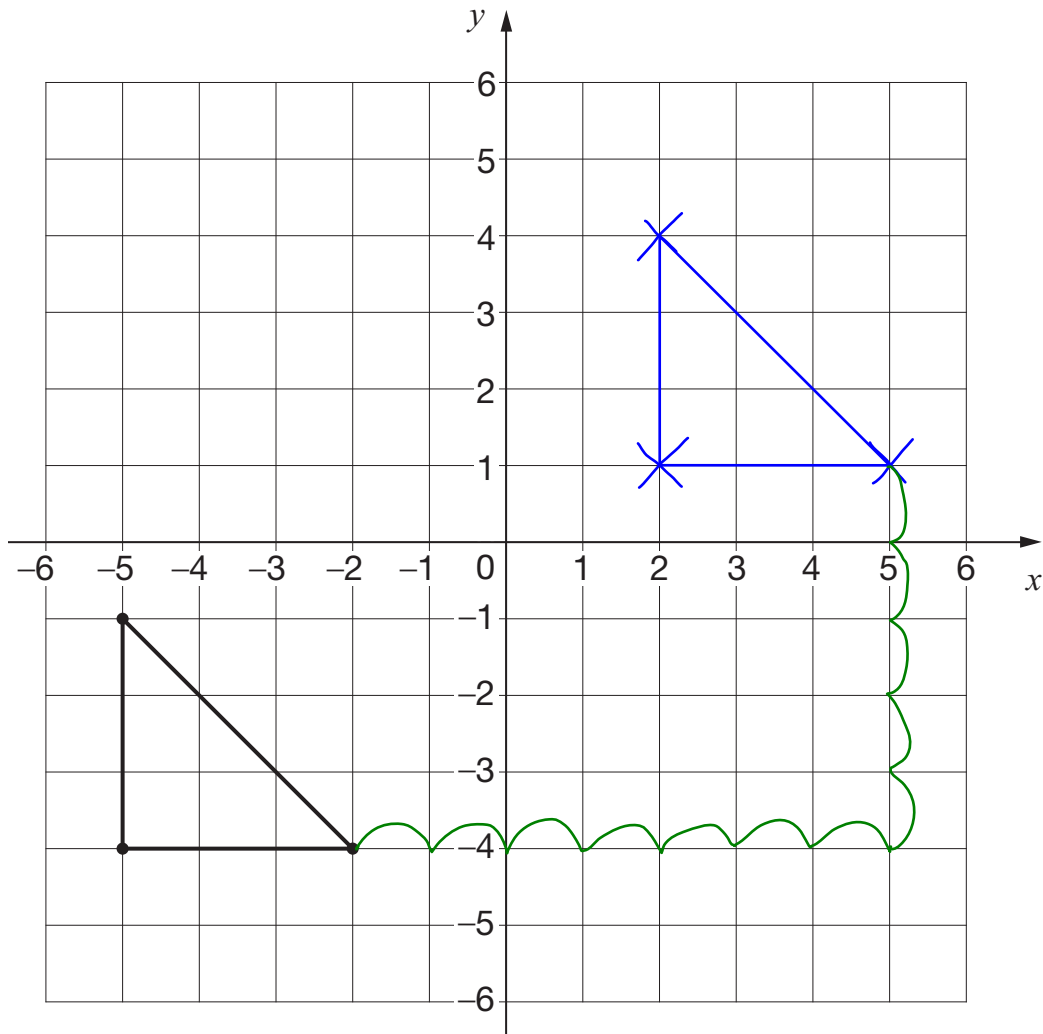
Leaves London	Arrives Paris
12:01	15:22
12:25	15:56
13:31	16:53
14:01	17:26
14:31	17:53
15:31	18:53
16:01	19:20

This is the latest arrival time before 17:30

1 mark

7

Here is a triangle drawn on a coordinate grid.



1 mark

The triangle is translated **7 right** and **5 up**.

Draw the triangle in its new position.

Move one of the corners 7 right and 5 up. The rest of the shape is the same but is moved so we can work out where the other corners are relative to the first one. Once the corners are plotted, we can use a ruler to draw the triangle

Numbers 30 can be divided by

8

Write three **factors of 30** that are **not** factors of 15

30

2

10

2 marks

1, 30
2, 15
3, 10
5, 6

Listing out the factor pairs of 30, starting with the smallest so we can spot any of them which aren't factors of 15. For example, $1 \times 30 = 30$ so both 1 and 30 are factors of 30

9

Here is the morning timetable for Chen's class this week.

Time	Mon	Tue	Wed	Thu	Fri
9:00 am–10:30 am	Maths	English	Maths	English	Maths
10:30 am–11:00 am	Break	Break	Break	Break	Break
11:00 am–12:00 pm	English	Maths	Science	Maths	English

What is the **total** number of hours for **English** on this timetable?

1:30
+ 1:30
+ 1:00
+ 1:00

4:60

5 hours

1 mark

9:00 am–10:30 am is 1 hour and 30 minutes.
11:00 am–12:00 pm is 1 hour. Adding together all the English lessons to get the total amount of time. 60 minutes is an hour so we can convert the 60 minutes to an extra hour

10

A bottle contains 568 millilitres of milk.

Jack pours out **half a litre**.



How much milk is left?

There are 1000ml in a litre so half a litre is 500ml. $568 - 500 = 68$

68ml

1 mark

11

A bicycle wheel has a diameter of 64 cm.

What is the **radius** of the bicycle wheel?

$$\begin{array}{r} 32 \\ 2 \overline{)64} \end{array}$$

Radius is half of the diameter

32 cm

1 mark

12



Adam buys **6** bags of white balloons.

Chen buys **3** bags of red balloons.

Adam says,

'I have four times as many balloons as Chen.'

Explain why Adam is correct.

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ \substack{2} \end{array}$$

$$\begin{array}{r} 12 \\ \times 3 \\ \hline 36 \end{array}$$

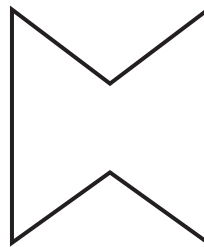
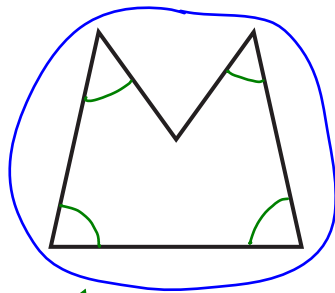
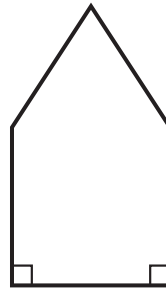
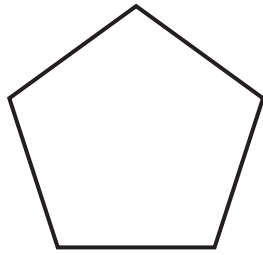
$$\begin{array}{r} 36 \\ \times 4 \\ \hline 144 \\ \substack{2} \end{array}$$

Adam has 144 balloons. Chen has 36 balloons. 144 is 4 times 36

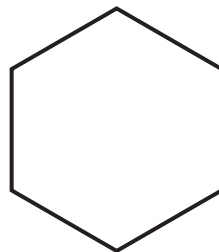
1 mark

13

Circle the **pentagon** with exactly **four acute angles**.



This is a pentagon as it has 5 sides and it has 4 acute angles (less than 90 degrees)

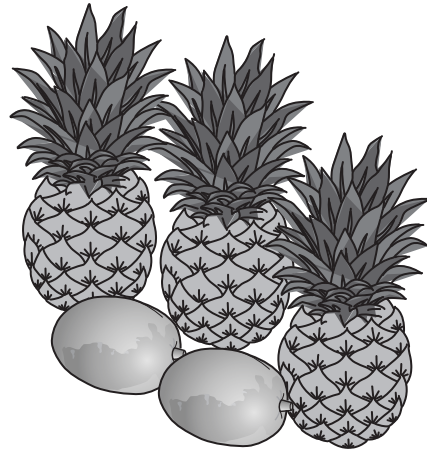


1 mark

14

3 pineapples cost the same as 2 mangoes.

One mango costs £1.35



How much does **one** pineapple cost?

Show your method

	1.35		0.90
x	2	3	2.70
	2.70		

First working out the cost of 2 mangoes

3 pineapples costs the same as 2 mangoes and dividing the cost by 3 works out the cost of one pineapple

£ 0.90

2 marks

15

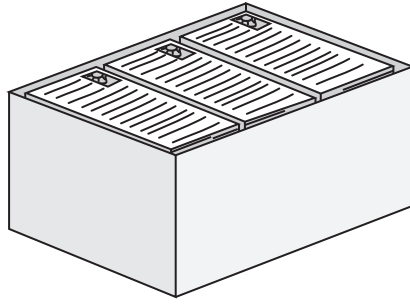
Look at the letters below.

Circle the letter below that has both parallel **and** perpendicular lines.

A C E L Z

1 mark

Parallel lines are going in the same direction and never meet. Perpendicular lines meet at right angles



There are 2,400 leaflets in a box.

William and Ally take 450 leaflets each.

Adam and Chen share the rest of the leaflets equally.

How many leaflets does Adam get?

Show your method

450	2400	750
$\times 2$	$- 900$	$2 \overline{) 1500}$
$\hline 900$	1500	

How many leaflets William and Ally took altogether

How many leaflets are left for Adam and Chen

Sharing the leaflets left between Adam and Chen

750

2 marks

In each box, circle the number that is **greater**.

$1\frac{1}{2}$ 1.2

$1/2 = 0.5$ so $1\frac{1}{2}$ is 1.5, which is greater than 1.2

$1\frac{1}{4}$ 1.3

$1/4 = 0.25$ so $1\frac{1}{4}$ is 1.25, which is smaller than 1.3

$1\frac{5}{100}$ 1.4

$5/100 = 0.05$ so $1\frac{5}{100}$ is 1.05, which is smaller than 1.4
Divide 5 by 100 by moving the decimal place twice to the left

$1\frac{3}{5}$ 1.5

$$5 \overline{) 3.0} \begin{array}{r} 0.6 \\ \underline{3.0} \\ 0 \end{array}$$

$3/5 = 0.6$ so $1\frac{3}{5}$ is 1.6, which is greater than 1.5

2 marks

18

A **square** number and a **prime** number have a total of 22

What are the two numbers?

$$\boxed{9} + \boxed{13} = 22$$

square
number

prime
number

1 mark

Starting with the smallest square number (the result of a number multiplied by itself), try subtracting square numbers from 22 until we get a prime number (a number only divisible by itself and 1).

$$22 - 1 = 21, \text{ which isn't prime}$$

$$22 - 4 = 18, \text{ which isn't prime}$$

$$22 - 9 = 13, \text{ which is prime}$$

19

Dev thinks of a **whole** number.

He multiplies it by 4

He rounds his answer to the nearest 10

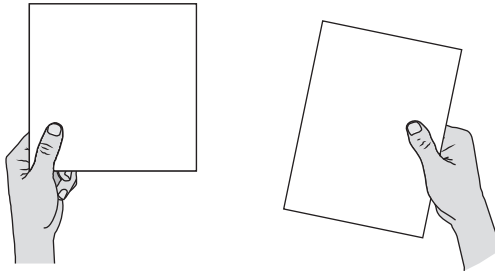
The result is 50

Write **all** the possible numbers that Dev could have started with.

12, 13

2 marks

A number could be as low as 45 or as high as 54 for it to round to 50. The multiples of 4 between 45 and 54 are 48 and 52. Dividing these by 4 gives 12 and 13



A square tile measures 20 cm by 20 cm.

A rectangular tile is 3 cm **longer** and 2 cm **narrower** than the square tile.

What is the **difference in area** between the two tiles?

$$\begin{array}{r}
 20 \\
 \times 20 \\
 \hline
 00 \\
 400 \\
 \hline
 400
 \end{array}
 \qquad
 \begin{array}{r}
 23 \\
 \times 18 \\
 \hline
 184 \\
 230 \\
 \hline
 414
 \end{array}$$

Show
your
method

To work out the area of a square, multiply the length of one of the sides by itself (square it). The other square tile measures 23cm by 18cm. Difference is largest subtract smallest: $414 - 400 = 14$

14 cm²

3 marks

21

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

Write the missing numbers.

It is increasing by $\frac{5}{8}$ each time as it has increased by this much from 1 to $1\frac{5}{8}$

$$\frac{3}{8}$$

$$1$$

$$1\frac{5}{8}$$

$$2\frac{1}{4}$$

$$\frac{23}{8}$$

1 mark

1 mark

$$\frac{8}{8} - \frac{5}{8} = \frac{3}{8}$$

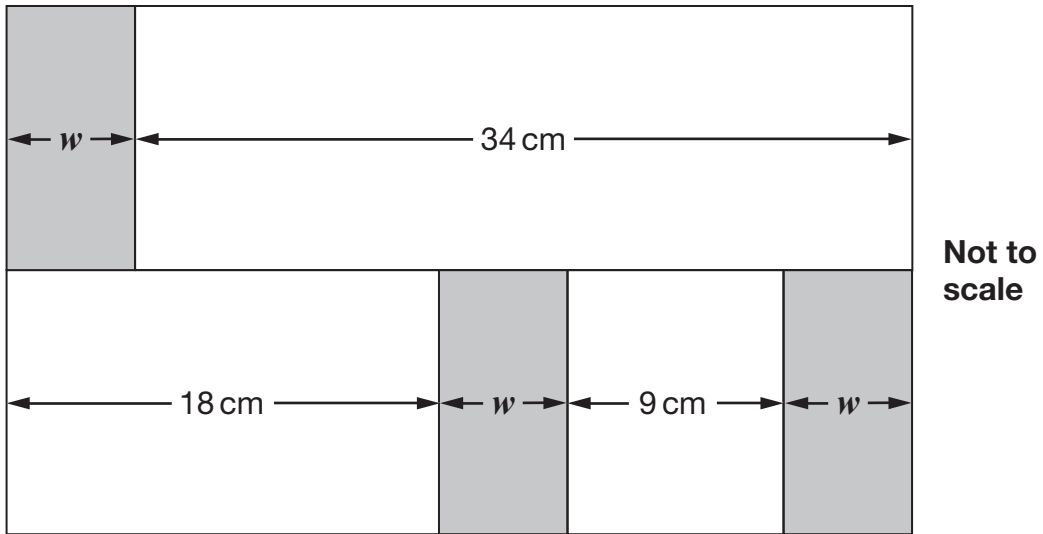
$$\frac{9}{4} + \frac{5}{8} = \frac{18}{8} + \frac{5}{8}$$

Going backward in the sequence is subtracting $\frac{5}{8}$ each time. $1 = \frac{8}{8}$. As the denominators are the same, the numerators can be subtracted

Convert $2\frac{1}{4}$ into an improper fraction by multiplying the whole number by the denominator then adding the result to the numerator. $2 \times 4 = 8$. $1 + 8 = 9$. Then convert into eighths so they both have the same denominator and can be added

22

In this diagram, the shaded rectangles are all of equal width (w).



Calculate the width (w) of one shaded rectangle.

Show
your
method

$$\begin{array}{r}
 18 \\
 + 9 \\
 \hline
 27
 \end{array}
 \qquad
 \begin{array}{r}
 34 \\
 - 27 \\
 \hline
 7
 \end{array}$$

The bottom row has an extra w . The difference between the total of the numbers in the top and bottom row is 7 so w must be 7cm

7 cm

2 marks

23

Here is a pattern of number pairs.

a	b
1	9
2	19
3	29
4	39

Complete the **rule** for the number pattern.

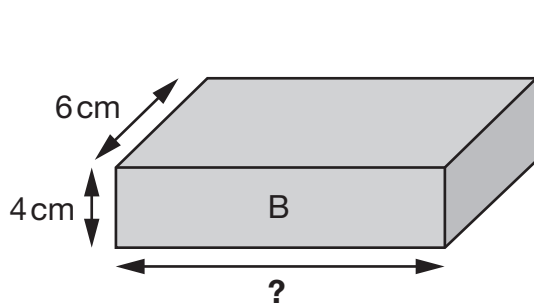
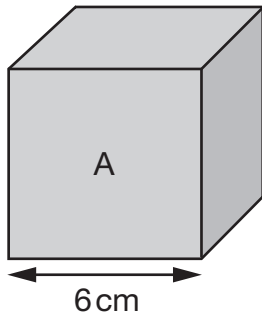
$$b = \boxed{10} \times a - \boxed{1}$$

1 mark

Every time a increases by 1, b increases by 10. So it must be $10 \times a$ (think of how times tables work: the 5 times table increases by 5 each time).
 $1 \times 10 = 10$ and 1 must be subtracted to get 9

24

Cube A and cuboid B have the same volume.



Not to scale

Calculate the missing length on cuboid B.

Show your method

	36	$6 \times 4 \times ? = 216$	$\frac{216}{24} = \frac{108}{12}$	<p>216 ÷ 24 simplifies to 108 ÷ 12, which is 9</p>
x	6	$24 \times ? = 216$		
$\begin{array}{r} 36 \\ \times 6 \\ \hline 216 \end{array}$		<p>Length x width x height is the volume of a cuboid. Rearrange the equation to find ?</p>		
<p>Cube (multiply by itself twice) the side length to work out the volume of the cube. $6 \times 6 = 36$</p>		<p>9 cm</p>		

2 marks