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KEY STAGE

3

TIER

6–8

# Mathematics test

## Paper 2

### Calculator allowed

First name \_\_\_\_\_

Last name \_\_\_\_\_

School \_\_\_\_\_

#### Remember

- The test is 1 hour long.
- You may use a calculator for any question in this test.
- You will need: pen, pencil, rubber, ruler and a scientific or graphic calculator.
- Some formulae you might need are on page 2.
- This test starts with easier questions.
- Try to answer all the questions.
- Write all your answers and working on the test paper – do not use any rough paper. Marks may be awarded for working.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

2009

TOTAL MARKS	
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## Instructions

### Answers



This means write down your answer or show your working and write down your answer.

### Calculators



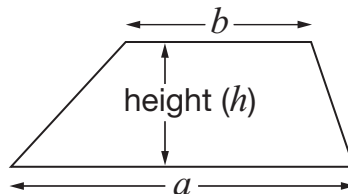
You **may** use a calculator to answer any question in this test.

## Formulae

You might need to use these formulae

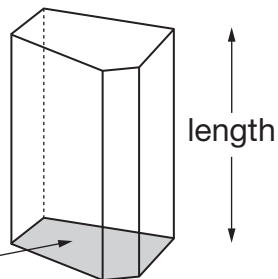
### Trapezium

$$\text{Area} = \frac{1}{2}(a + b)h$$



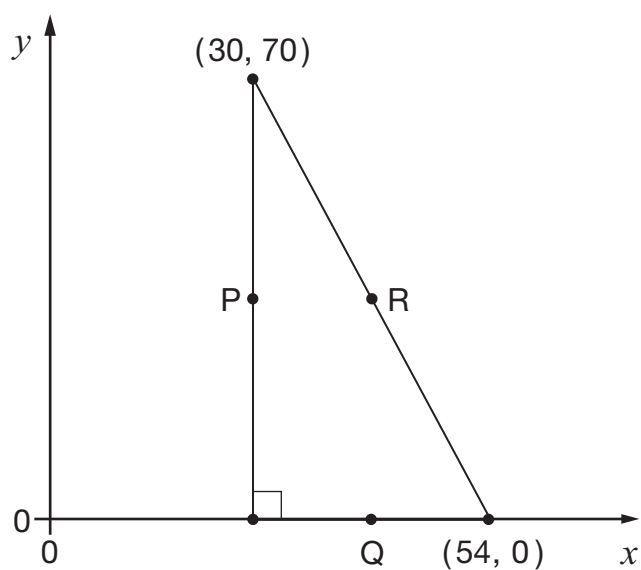
### Prism

area of cross-section



$$\text{Volume} = \text{area of cross-section} \times \text{length}$$

1. The diagram shows a right-angled triangle.



P, Q and R are the **midpoints** of the sides of the triangle.

Work out the coordinates of P, Q and R.

 P is ( \_\_\_\_\_ , \_\_\_\_\_ )

\_\_\_\_\_   
 1 mark

 Q is ( \_\_\_\_\_ , \_\_\_\_\_ )

\_\_\_\_\_   
 1 mark

 R is ( \_\_\_\_\_ , \_\_\_\_\_ )

\_\_\_\_\_   
 1 mark



2. The table shows information about the rainfall in two places in South America.

Place	Season	Mean rainfall	Number of months	Months
A	Dry	10cm per month	8	Jan to Aug
	Wet	20cm per month	4	Sept to Dec
B	Dry	5cm per month	10	July to Apr
	Wet	50cm per month	2	May to June

Which of the places has **more rainfall** on average over the whole year?

Show working to explain your answer.



Tick (✓) your answer.

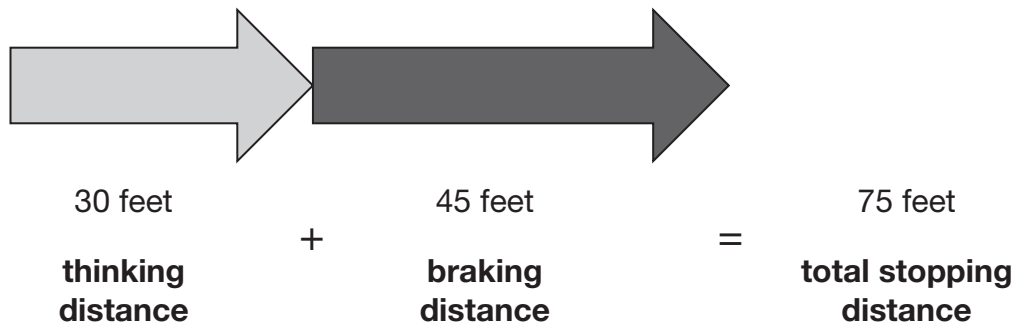
 A B

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2 marks

3. The distance needed for a car to stop depends on how fast the car is travelling. This distance can be calculated by adding the thinking distance and the braking distance.

For example: at **30 miles per hour**



Here are the formulae to work out the thinking distance and the braking distance for a car travelling at  $V$  miles per hour.

$$\text{Thinking distance} = V \text{ feet} \quad \text{Braking distance} = \frac{V^2}{20} \text{ feet}$$

- (a) A car is travelling at **70 miles per hour**.

What is the **total stopping distance** for this car?



\_\_\_\_\_ feet

2 marks

- (b) A different car is travelling so that its **braking distance** is **125 feet**.

How fast is the car travelling?

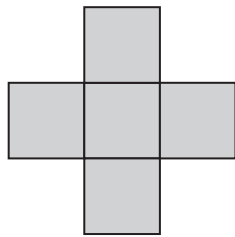


\_\_\_\_\_ miles per hour

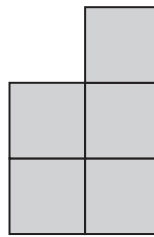
1 mark



4. Shape A and shape B are each made from five identical squares.



A



B

Not drawn  
accurately

The **perimeter** of shape A is **72cm**.

Work out the **perimeter** of shape B.



\_\_\_\_\_ cm

\_\_\_\_\_

2 marks

5. In one year, **2 million tonnes** of glass bottles and jars were thrown away in the UK.

**38%** of these bottles and jars were recycled.

**How many tonnes** of the bottles and jars were recycled?



\_\_\_\_\_ tonnes

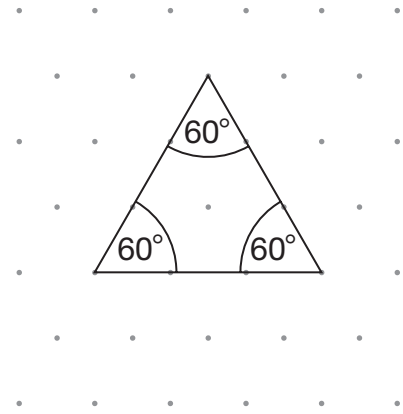
\_\_\_\_\_

2 marks

6. (a) Look at the equilateral triangle.

Each angle in an equilateral triangle is  $60^\circ$

Explain why.

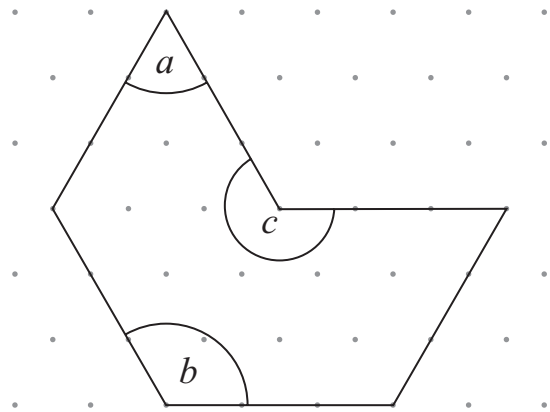


Isometric grid

1 mark

(b) Now look at this shape.

Work out the sizes of angles  $a$ ,  $b$  and  $c$



Isometric grid

$a = \text{_____}^\circ$        $b = \text{_____}^\circ$        $c = \text{_____}^\circ$

2 marks



7. A teacher has five bags containing only red and blue counters.  
The table shows how many red and blue counters are in each bag.


	Bag				
	A	B	C	D	E
Red counters	6	6	6	6	6
Blue counters	6	5	4	3	2

The teacher is going to take a counter at random from each bag.

Match each bag with the correct probability of taking a **blue** counter below.

The first one is done for you.

Bag	Probability of taking a <b>blue</b> counter
A	$\frac{1}{4}$
B	$\frac{1}{3}$
C	$\frac{1}{2}$
D	$\frac{5}{11}$
E	$\frac{2}{5}$



A line connects Bag A to the probability  $\frac{1}{2}$ .

2 marks



8. In a survey, pupils were asked if they owned a bicycle.

Results:

$\frac{3}{8}$  of the pupils said 'Yes'.

$\frac{5}{8}$  of the pupils said 'No'.

**46 more** pupils said 'No' than said 'Yes'.

Altogether, how many pupils were in the survey?



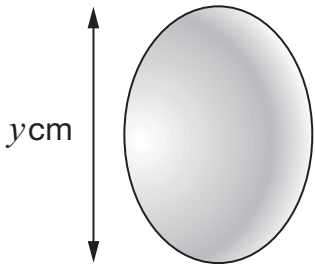
2 marks



9. In this question you will need the following information about hens' eggs.

Approximate **mass**, in grams, is given by:

$$\text{Mass} = \frac{\pi y^3}{10} \times 1.15$$



Mass of egg	Grade of egg
Up to 53g	Small
53g up to 63g	Medium
63g up to 73g	Large
73g or more	Extra large

The length,  $y$ , of an egg is **5.5cm**.

Use the formula to find the **grade** of the egg.

You **must** show your working.



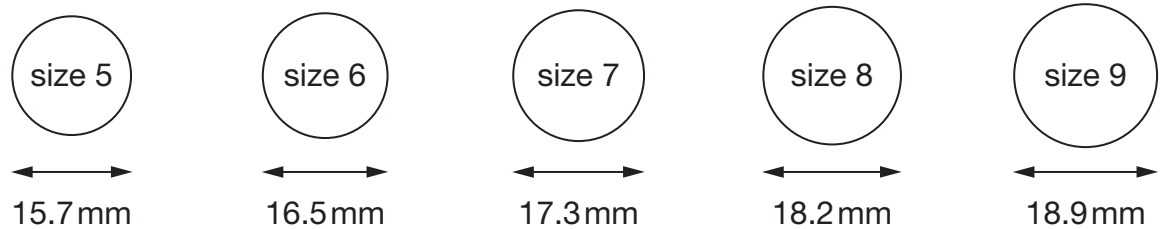
Grade \_\_\_\_\_

\_\_\_\_\_

2 marks

10. A shop sells rings of different sizes.

The diagram shows the diameters of the different sizes.



- (a) What is the circumference of a **size 8** ring?




1 mark

- (b) Rachel wants to buy a ring for her middle finger.

That finger has a circumference of **51 mm**.

What size ring should she buy?

Show working to explain your answer.



Tick (✓) your answer.



<input type="checkbox"/>	size 5	<input type="checkbox"/>	size 6	<input type="checkbox"/>	size 7	<input type="checkbox"/>	size 8	<input type="checkbox"/>	size 9
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2 marks

11. Look at this calculation.

$$3^5 + 10^2 = 7^x$$

Find the value of  $x$ .

You **must** show your working.



$$x = \underline{\hspace{2cm}}$$

2 marks

12. The table below shows the number of schools and the number of pupils in England.

	Number of schools	Total number of pupils
Primary	17 642	4 069 385
Secondary	3 385	3 315 805

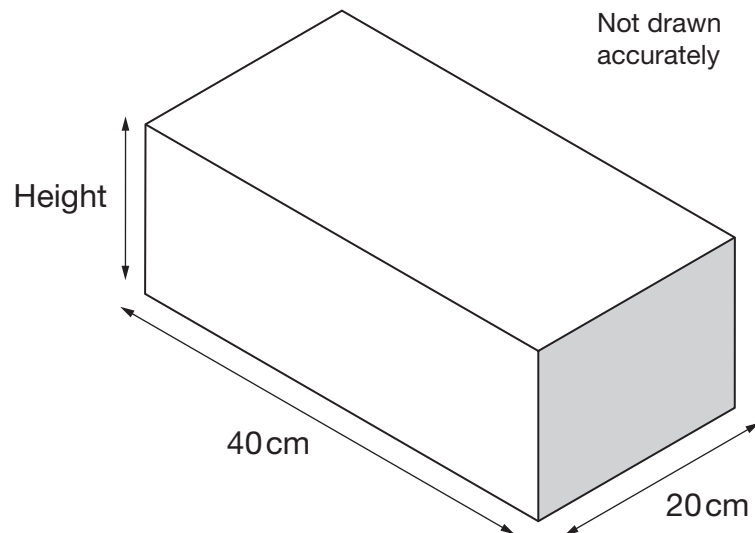
Show that, on average, a secondary school has about **four times** as many pupils as a primary school.



2 marks

13. The cuboid container below holds **12 litres** of water when full.  
One litre is  $1000\text{cm}^3$   
The inside length and width of the cuboid are **40cm** and **20cm**.

What is the inside **height** of the cuboid?



Height = \_\_\_\_\_ cm

\_\_\_\_\_  
2 marks



14. The first three terms of a sequence are shown in the box.

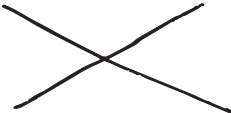
5, 16, 27, ...

Look at each expression below.

Write 'No' if it could **not** be the  $n$ th term expression for this sequence.

Write 'Yes' if it could be the  $n$ th term expression for this sequence and then work out the **4th** term.

The first one is done for you.

Expression	Could it be the $n$ th term expression?	If 'Yes', work out the 4th term
$5n$	No	
$n + 11$		
$11n - 6$		
$n^2(6 - n)$		

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3 marks

15. There are 6 units in an exam course.  
Each unit is marked out of 100  
To get grade A, the **mean** mark of all six units must be at least **80**  
Tom has taken five units. His mean mark is **78**  
To get grade A, how many marks must he get on the last unit?



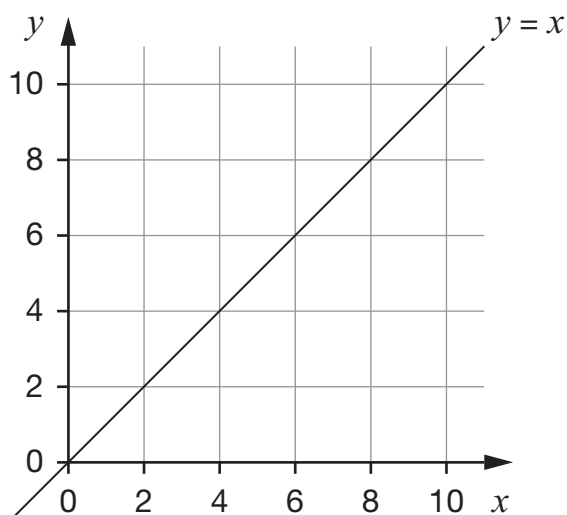
\_\_\_\_\_

\_\_\_\_\_

2 marks



16. (a) The grid shows a straight line.  
The equation of the line is  $y = x$



**Two** of the equations below also describe the straight line  $y = x$

Put rings round the correct equations.



$x = y$

$y = -x$

$yx = 0$

$x - y = 0$

$x + y = 0$

1 mark

- (b) Write the coordinates of two points that have an  $x$  coordinate that is one less than the  $y$  coordinate.



( \_\_\_\_\_ , \_\_\_\_\_ )      ( \_\_\_\_\_ , \_\_\_\_\_ )

What would be the equation of the straight line through these two points?



\_\_\_\_\_

1 mark



17. In 2004 a newspaper published this **incorrect** report:

Houses cost £60 000 one year ago.

They now cost £80 000

This is a 25% increase.

Write the missing numbers below to make each statement correct.

- (a) Houses cost £60 000 one year ago.



They now cost £ \_\_\_\_\_

This is a 25% increase.

\_\_\_\_\_ 1 mark

- (b) Houses cost £60 000 one year ago.

They now cost £80 000



This is a \_\_\_\_\_ % increase.

\_\_\_\_\_ 1 mark

- (c)  Houses cost £ \_\_\_\_\_ one year ago.

They now cost £80 000

This is a 25% increase.

\_\_\_\_\_ 1 mark



18. Here are some number cards with the values written in standard form.

$$2 \times 10^4$$

$$2 \times 10^6$$

$$2 \times 10^8$$

$$2.5 \times 10^4$$

$$2.5 \times 10^6$$

$$2.5 \times 10^8$$

Two of the number cards **multiply** to give  $5 \times 10^{16}$

Write them in the calculation below.



$$\boxed{\phantom{000000000000000000}} \times \boxed{\phantom{000000000000000000}} = 5 \times 10^{16}$$

1 mark

19. (a) Look at this equation:

$$c + 3 = d - 4$$

Which of  $c$  and  $d$  is greater, and by how much?



\_\_\_\_\_, by \_\_\_\_\_

\_\_\_\_\_ 1 mark

(b) Look at this equation:

$$3 - e = 4 - f$$

Which of  $e$  and  $f$  is greater, and by how much?



\_\_\_\_\_, by \_\_\_\_\_

\_\_\_\_\_ 1 mark



20. Look at this information from January 2005.

**546 400**, or **98%** of all 3-year-old children in England go to play school or nursery, or have some other type of education.

To the **nearest thousand**, how many 3-year-old children were there in England?

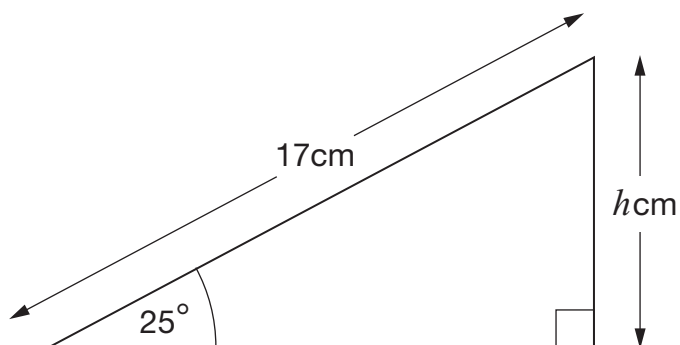


\_\_\_\_\_

\_\_\_\_\_

2 marks

21. The diagram shows a right-angled triangle.



Not drawn accurately

What is the value of  $h$ ?



$$h = \underline{\hspace{2cm}}$$

2 marks



22. A town in the south of England has the lowest ratio of men to women in England.  
There were only 87 men for every 100 women.

Men	Women
87	100

**For every 100 men**, how many women were there?

Give your answer to the nearest integer.

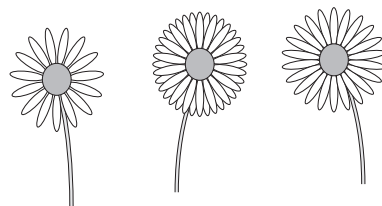


Men	Women
100	_____

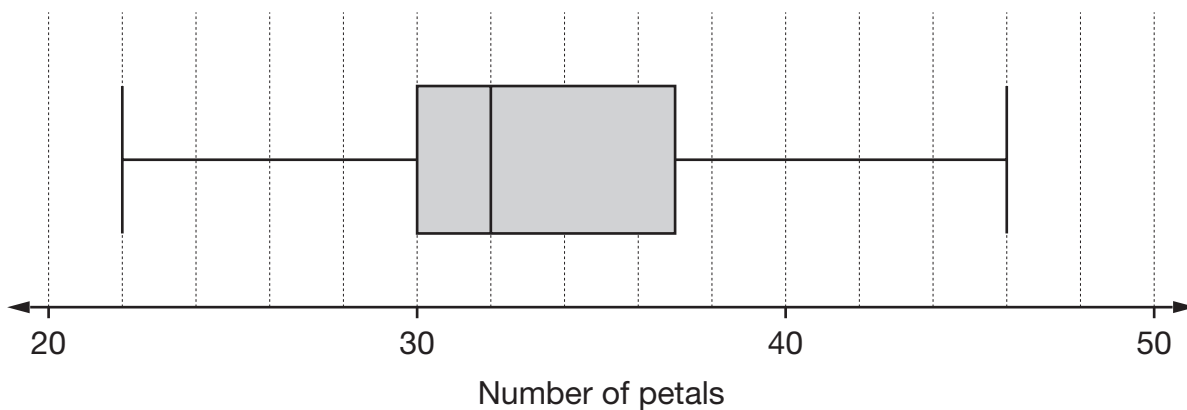
\_\_\_\_\_

2 marks

23. The numbers of petals that daisies have can vary.



The box plot shows information about the petals for a sample of daisies.



- (a) For the sample of daisies, what is the median number of petals?



\_\_\_\_\_

1 mark

- (b) For the sample of daisies, what is the **inter-quartile range** of the number of petals?



\_\_\_\_\_

1 mark

- (c) What percentage of the daisies in the sample has **fewer than 30** petals?

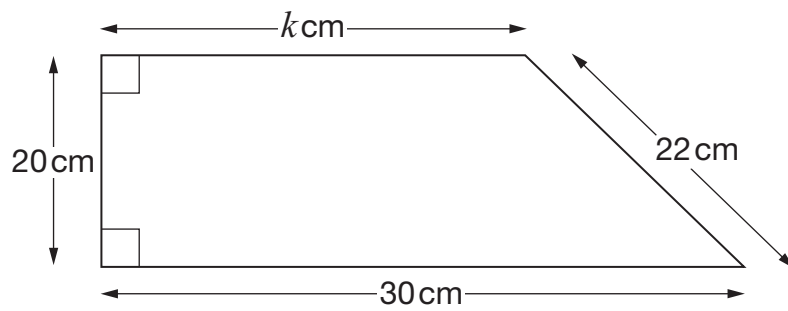


\_\_\_\_\_ %

1 mark



24. Here is a trapezium.



Not drawn accurately

Use Pythagoras' theorem to find the value of  $k$

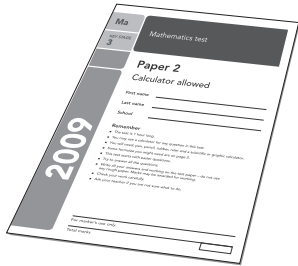


$$k = \underline{\hspace{2cm}}$$

2 marks



25. A booklet is made from **6** rectangular pieces of paper.  
 Each piece of paper measures **297 mm** by **420 mm**.  
 The mass of the paper is **80 g per m<sup>2</sup>**



Calculate the mass of the booklet.  
 Give your answer correct to **2 significant figures**.

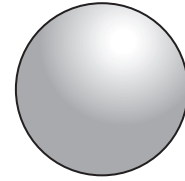


\_\_\_\_\_ g \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 3 marks



26. This table gives some information about a solid sphere.

Radius	Volume	Surface area
$r$	$\frac{4}{3}\pi r^3$	$4\pi r^2$

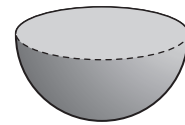


The solid sphere is cut in half to produce a solid hemisphere.

Complete the table below for the solid hemisphere.

Write your answers as simply as possible.

Radius	Volume	Surface area
$r$		



\_\_\_\_\_

\_\_\_\_\_

2 marks



**END OF TEST**

**END OF TEST**