Ma

KEY STAGE 3

TIER 5–7

2009

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, tracing paper (optional) 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.

TOTAL MARKS	

Instructions

Answers

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

Calculators

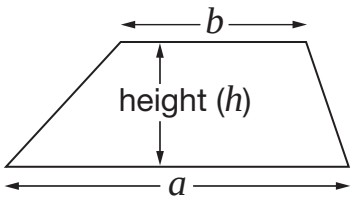
You **may** use a calculator to answer any question in this test.

Formulae

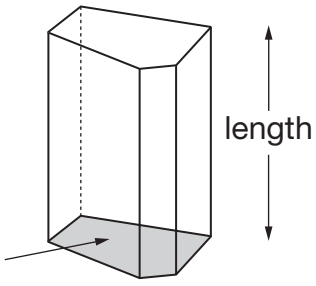
You might need to use these formulae

Trapezium

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



Prism



Volume = area of cross-section × length

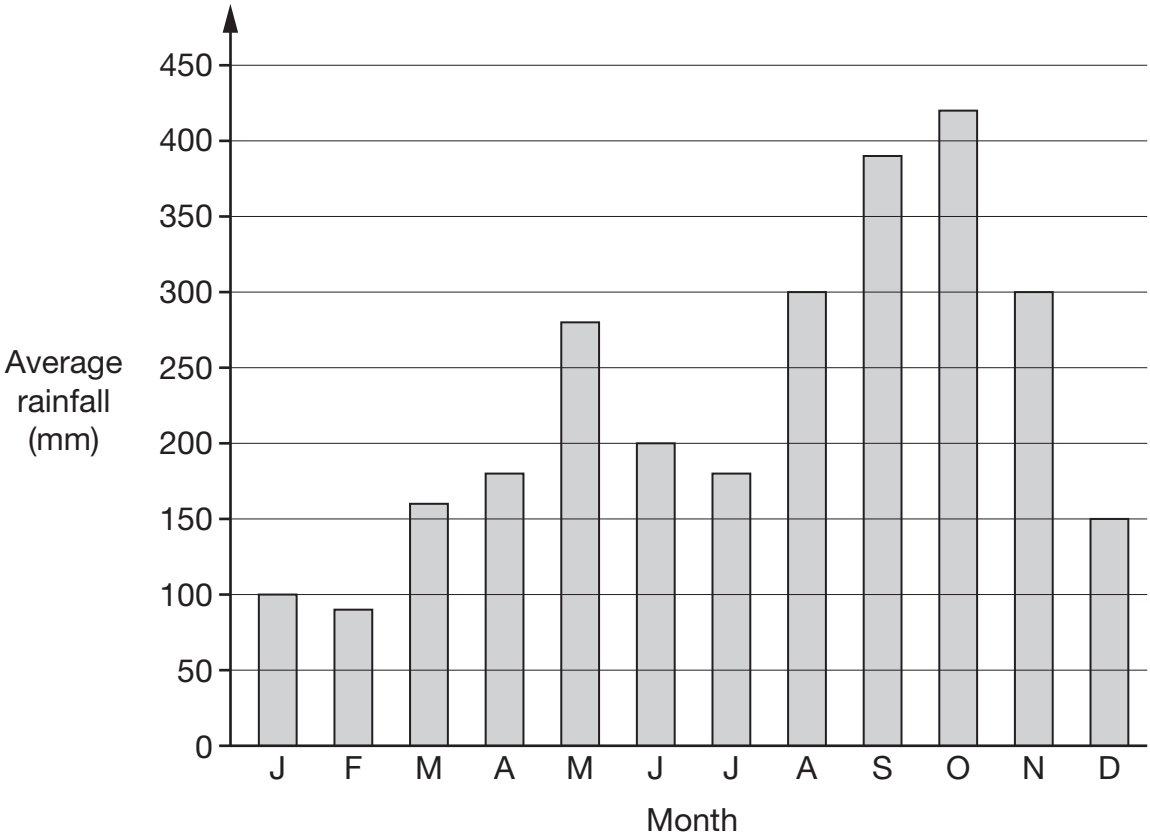
1. Complete the table to show what the units measure.

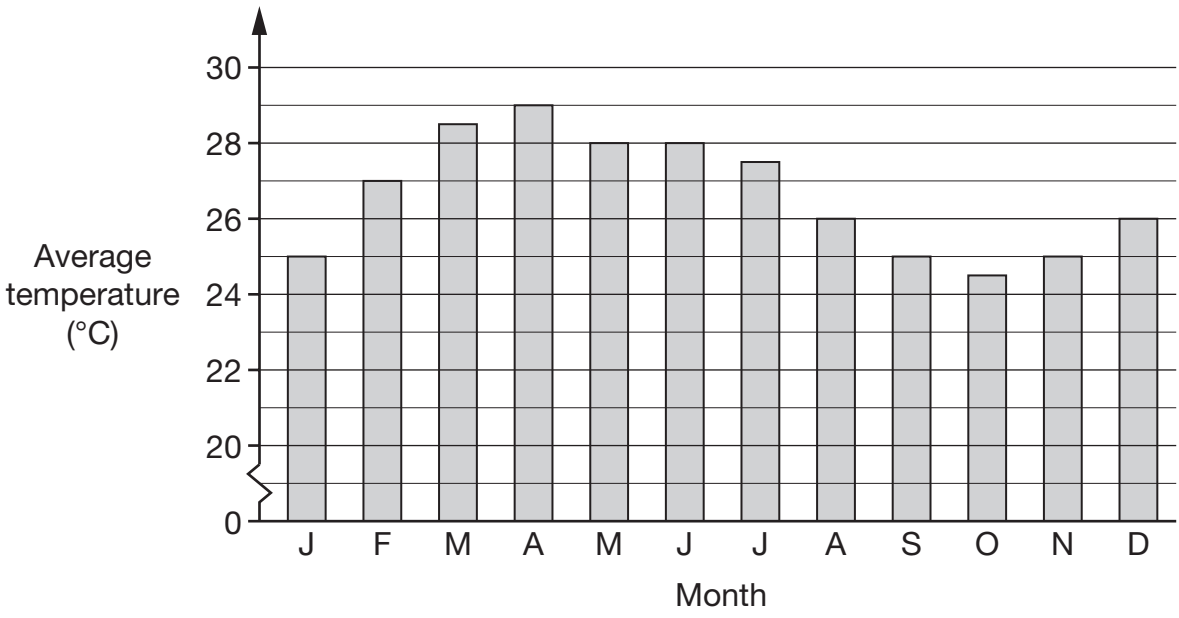
The first row is done for you.

	Length	Area	Volume	Mass
Centimetres	✓			
Litres				
Miles				
Grams				
Square metres				
Ounces				

2 marks

2. The charts show information about a rainforest.





Use the charts to answer these questions.

(a) In the month that has the **lowest** average **rainfall**, what is the average **temperature**?

_____ °C

1 mark

(b) In the month that has the **highest** average **temperature**, what is the average **rainfall**?

_____ mm

1 mark

(c) Sanjay has decided to visit the rainforest.

He does **not** like high temperatures and does **not** like high rainfall.

In which month do you think Sanjay should visit?

Put a ring round the correct month below.

January March April

October December

1 mark

3. Here are the prices of doughnuts at two different shops.

Shop A	Shop B
3 doughnuts for £2	5 doughnuts for £3.50

I want to buy **15** doughnuts.

In which shop are the doughnuts **cheaper**?

You **must** show your working.

Tick (✓) your answer.

☐ Shop A ☐ Shop B

2 marks

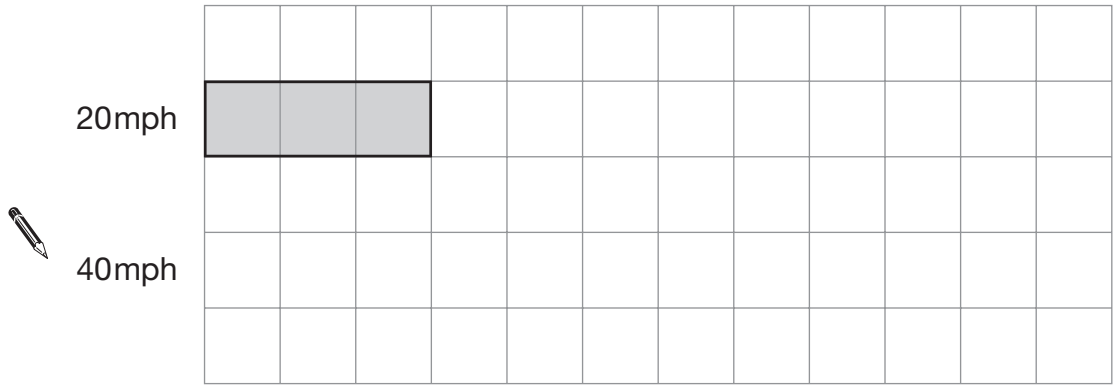
4. The table shows the stopping distances for a car at different speeds.

Speed	Stopping distance
20 mph	12 metres
40 mph	36 metres
60 mph	72 metres

(a) Look at the square grid below.

It shows the bar for the stopping distance at 20 mph.

Use the same scale to draw the bar for the stopping distance at **40 mph**.



1 mark

(b) The bar for the stopping distance at 60 mph will not fit on the grid.

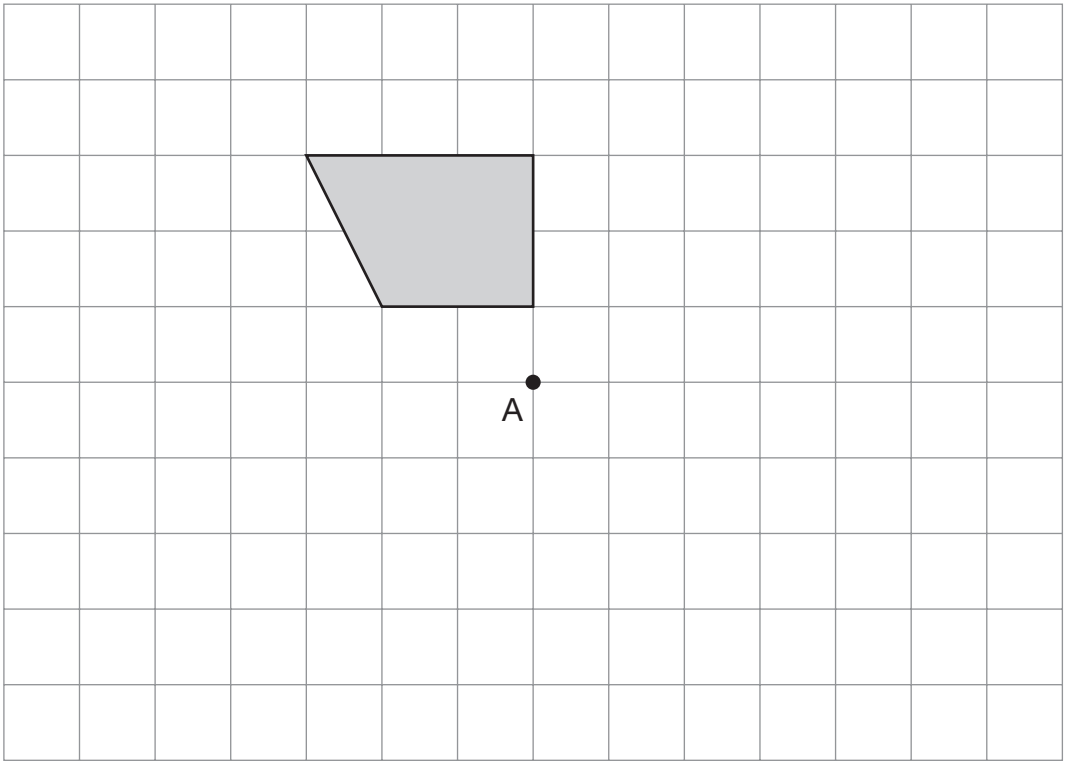
How many squares long should the bar be?

1 mark

5. Here is a shaded shape drawn on a square grid.

Rotate the shape **180°** about point A.

Draw the shape in its new position on the grid.



2 marks

6. Use $a = 7$ and $b = 28$ to work out the value of these expressions.

The first one is done for you.

$a + b =$ *35*

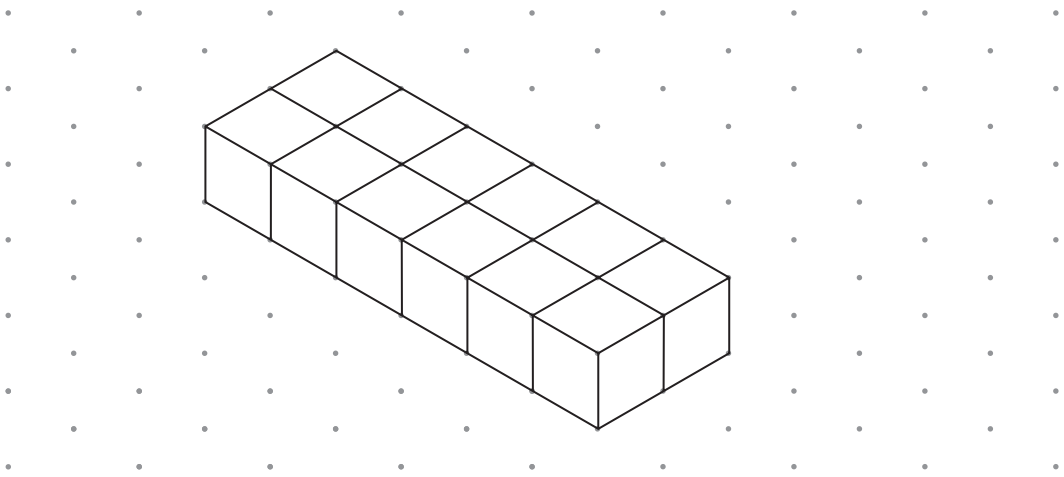
$ab =$ _____ 1 mark

$\frac{b}{a} =$ _____ 1 mark

$(a + b)^2 =$ _____ 1 mark

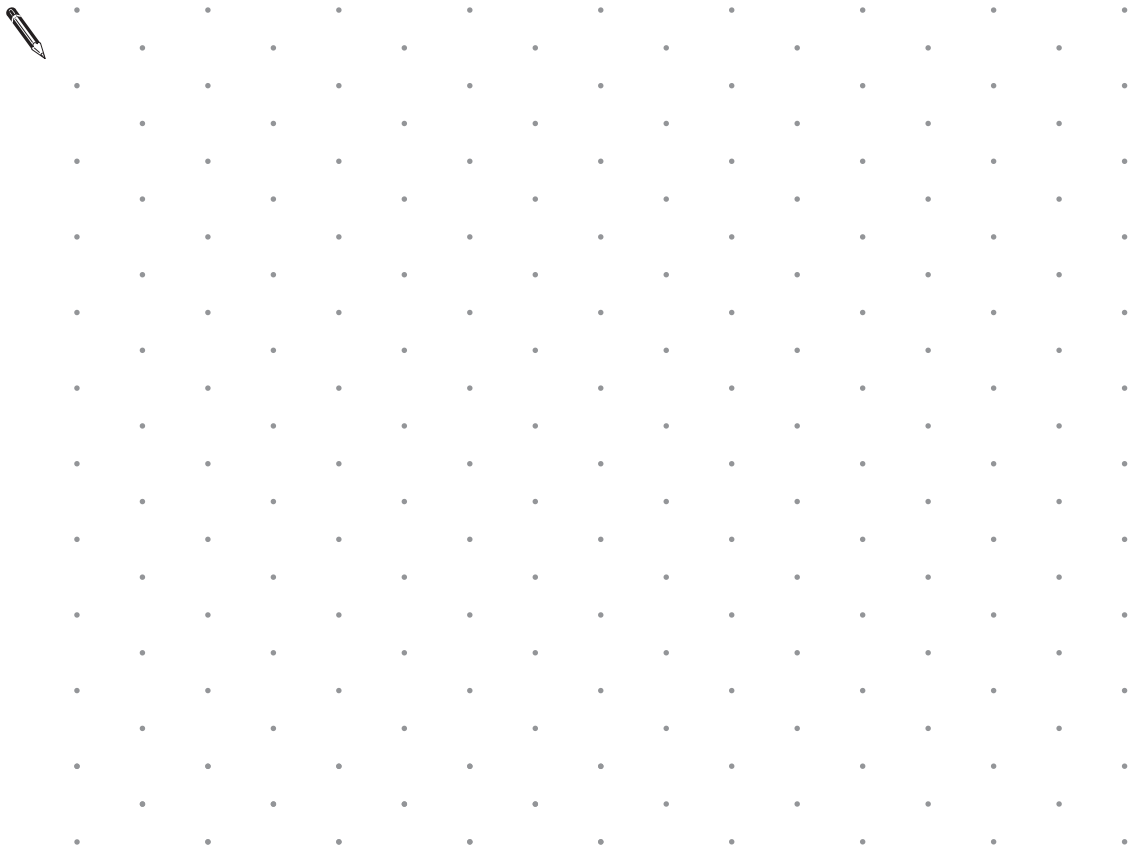
7. Look at the cuboid drawn on the grid.

It is made from **12 cubes**.



Isometric grid

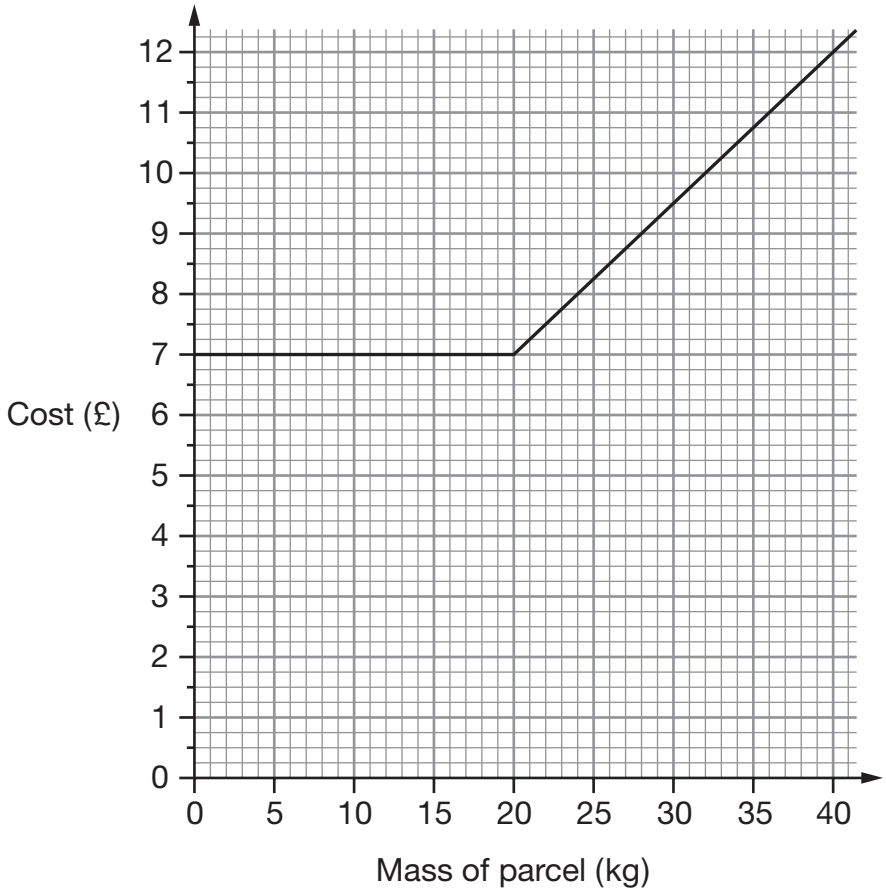
On the grid below, draw a **different** cuboid made from 12 cubes.



Isometric grid

2 marks

8. The graph shows how much a company charges to deliver parcels.



(a) Use the graph to complete the sentences below.

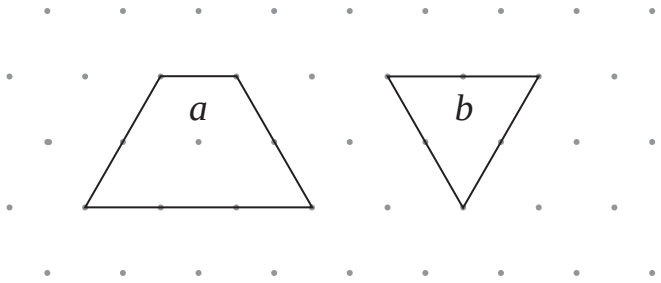
The company charges exactly £ _____ for parcels up to _____ kg. _____ 1 mark

Then for **each** extra kilogram the company charges another _____. _____ 1 mark

(b) Altogether, how much would the company charge to deliver two parcels, one of **15 kg** and one of **37 kg**?

£ _____ 1 mark

9. The diagram below shows a trapezium and an equilateral triangle.



Isometric grid

The **trapezium** has area $\boldsymbol{a}$

The **triangle** has area $\boldsymbol{b}$

(a) On the grid below, draw a shape with area $\boldsymbol{a} + \boldsymbol{2b}$

1 mark

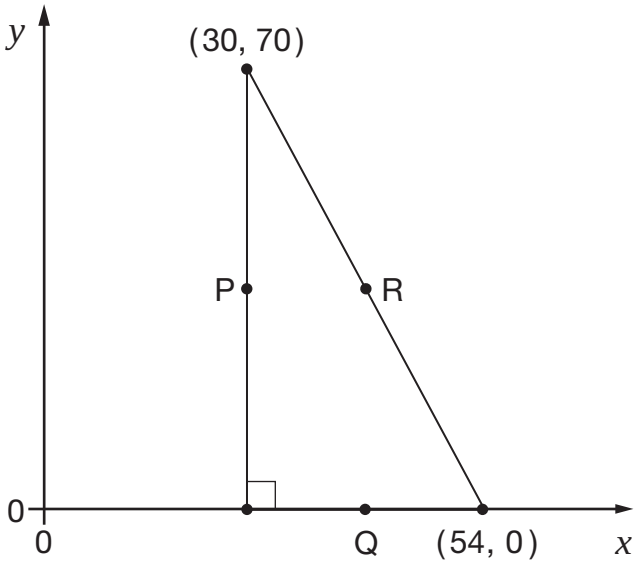
Isometric grid

(b) On the grid below, draw a shape with area $\boldsymbol{a} - \boldsymbol{b}$

1 mark

Isometric grid

10. The diagram shows a right-angled triangle.



Not drawn accurately

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

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

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

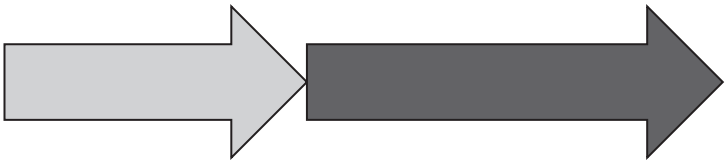
☐ A ☐ B

2 marks

12. 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**



30 feet	+	45 feet	=	75 feet
thinking distance		**braking distance**		**total stopping distance**

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

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

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

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

_____ feet

2 marks

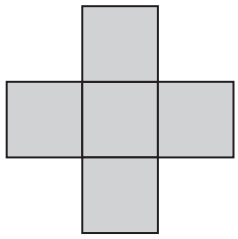
(b) A different car is travelling so that its **braking distance** is **125 feet**.

How fast is the car travelling?

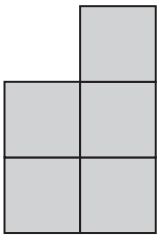
_____ miles per hour

1 mark

13. 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

14. 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?

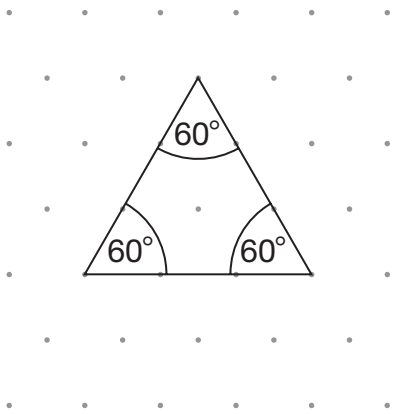
_____ tonnes

2 marks

15. (a) Look at the equilateral triangle.

Each angle in an equilateral triangle is 60°

Explain why.

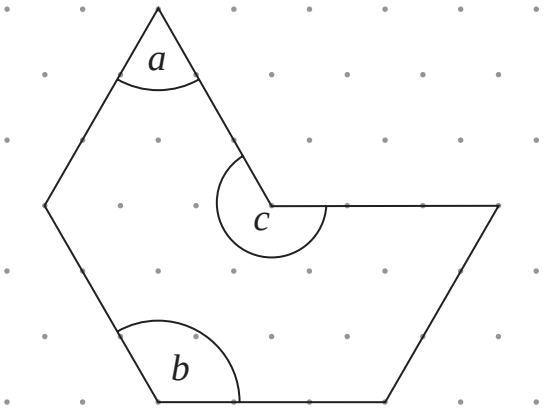


Isometric grid

1 mark

(b) Now look at this shape.

Work out the sizes of angles a, b and c



Isometric grid

a = _____ ° b = _____ ° c = _____ °

2 marks

16. A teacher has five bags containing only red and blue counters.

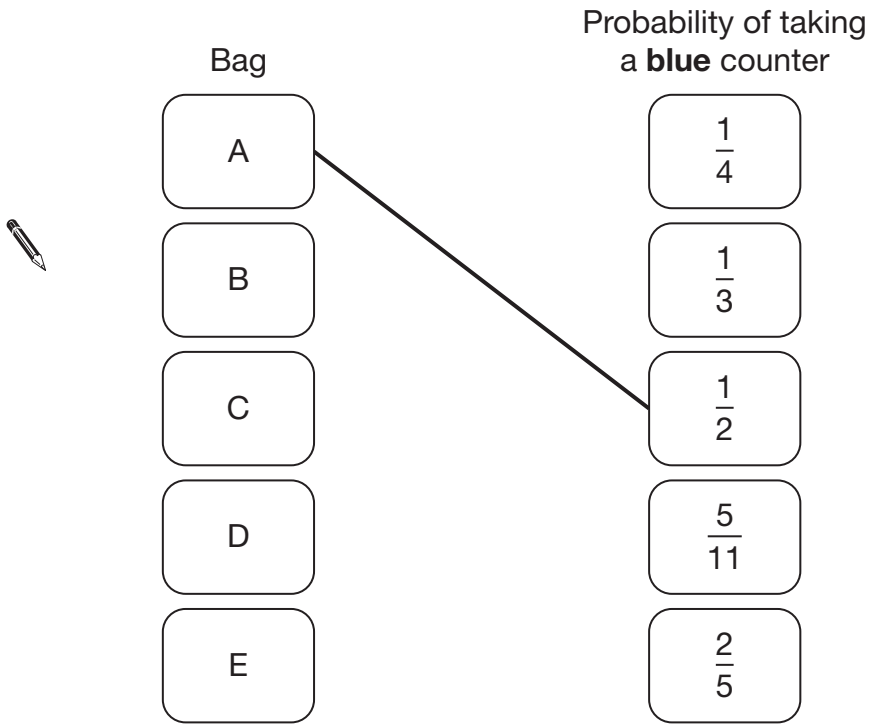
The table shows how many red and blue counters are in each bag.

	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.



2 marks

17. 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'.

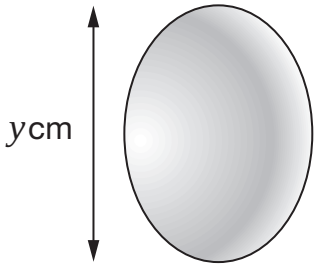
Altogether, how many pupils were in the survey?

2 marks

18. 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.

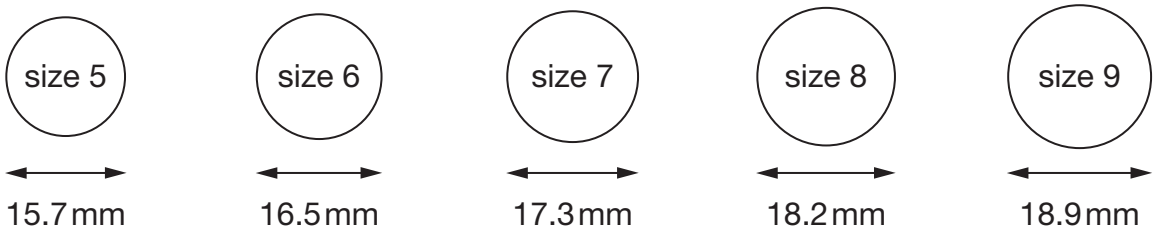
You **must** show your working.

Grade _____

2 marks

19. 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?

mm

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.

☐ size 5 ☐ size 6 ☐ size 7 ☐ size 8 ☐ size 9

2 marks

20. Look at this calculation.

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

Find the value of x.

You **must** show your working.

x = _____

2 marks

21. 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.

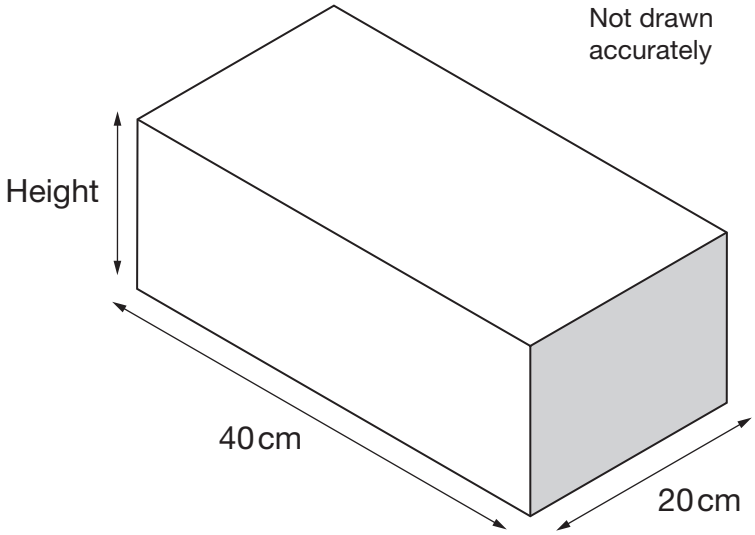
2 marks

22. The cuboid container below holds **12 litres** of water when full.

One litre is 1000cm^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

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

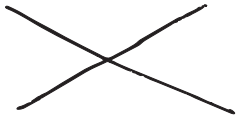
5, 16, 27, ...

Look at each expression below.

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

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

The first one is done for you.

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

3 marks

24. 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**

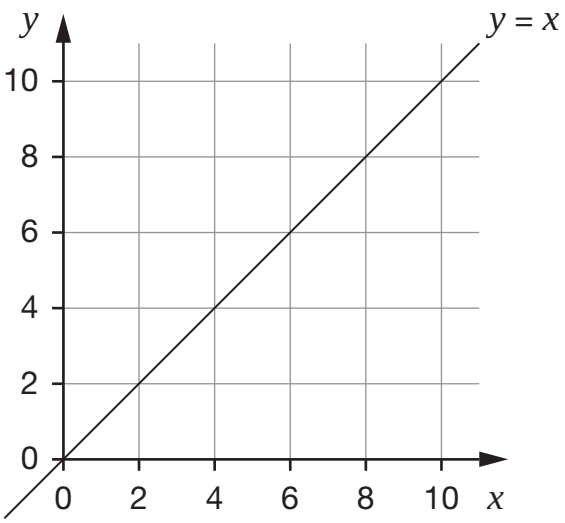
Tom has taken five units. His mean mark is **78**

To get grade A, how many marks must he get on the last unit?

2 marks

25. (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.

$x = y$ $\quad$ $y = -x$ $\quad$ $yx = 0$

$x - y = 0$ $\quad$ $x + y = 0$

1 mark

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

(_____ , _____) $\quad$ (_____ , _____)

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

_____

1 mark

26. 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

END OF TEST

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