Mathematics test

Paper 2
Calculator allowed

Please read this page, but do not open your booklet until your teacher tells you to start. Write your name and the name of your school in the spaces below.

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.

For marker's use only	Total marks	
	Borderline check	

Instructions

Answers

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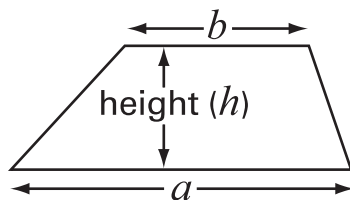
Calculators

You **may** use a calculator to answer any question in this test.
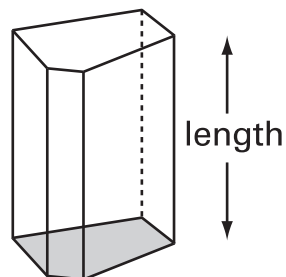
Formulae
You might need to use these formulae

Trapezium

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

Prism

Volume = area of cross-section × length

1.   Paul is 14 years old.

His sister is exactly **6 years younger**, so this year she is 8 years old.

This year, the ratio of Paul's age to his sister's age is 14 : 8

14 : 8 written as simply as possible is **7 : 4**

(a) When Paul is **21**, what will be the ratio of Paul's age to his sister's age?

Write the ratio as simply as possible.

……… **:** ………

1 mark

(b) When his sister is **36**, what will be the ratio of Paul's age to his sister's age?

Write the ratio as simply as possible.

……… **:** ………

1 mark

(c) Could the ratio of their ages ever be **7 : 7**?

Tick (✓) Yes or No.

Yes ☐   No ☐

Explain how you know.

1 mark

2. The information in the box describes three different squares, A, B and C.

> The **area** of square A is **36 cm^2**
>
> The **side length** of square B is **36 cm**
>
> The **perimeter** of square C is **36 cm**

Put squares A, B and C in order of size, starting with the smallest.

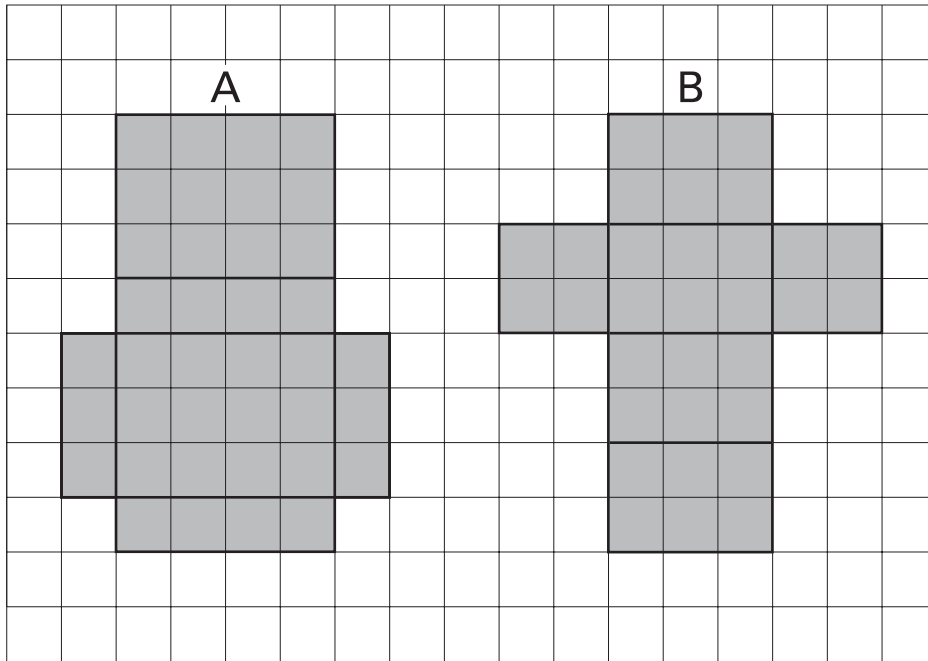You **must** show calculations to explain how you work out your answer.

. . . .

smallest   largest

. . . .

. . . .

2 marks

3.   The squared paper shows the nets of cuboid A and cuboid B.

(a) Do the cuboids have the **same surface area**?

Show calculations to explain how you know.

(b) Do the cuboids have the **same volume**?
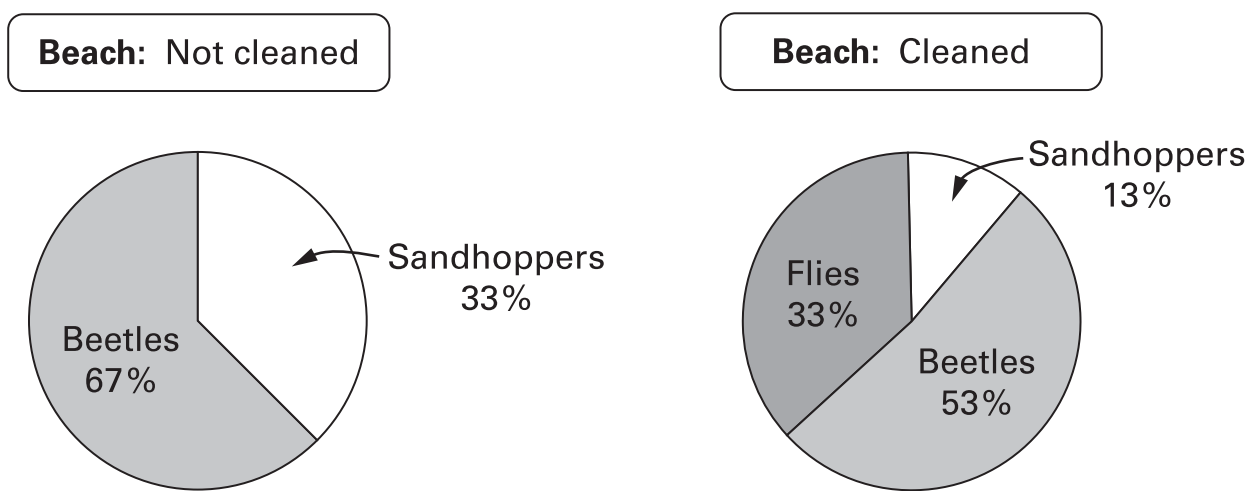
Show calculations to explain how you know.

4.   Two beaches are very similar.

A survey compared the number of animals found in one square metre on each beach.

One beach had not been cleaned.

The other beach had been cleaned.

Beach: Not cleaned

Beach: Cleaned

(a) The data for the beach that had **not been cleaned** represent **1620** animals.

Complete the table to show how many of each animal were found.

Beach: Not cleaned

	Number found
Sandhoppers	
Beetles	
Flies	

2 marks

(b) The data for the beach that had been **cleaned** represent **15** animals.

Complete the table to show how many of each animal were found on the cleaned beach.

Beach: Cleaned	
	Number found
Sandhoppers	
Beetles	
Flies	

. . . .
. . . .
2 marks

(c) Cleaning the beach changes the numbers of animals and the proportions of animals.

Write a sentence to describe **both** these changes.

. . . .
1 mark

5.   Find the values of t and r

$$\frac{2}{3} = \frac{t}{6}$$

$t =$ . . . .

. . . . .
1 mark

$$\frac{2}{3} = \frac{5}{r}$$

$r =$ . . . .
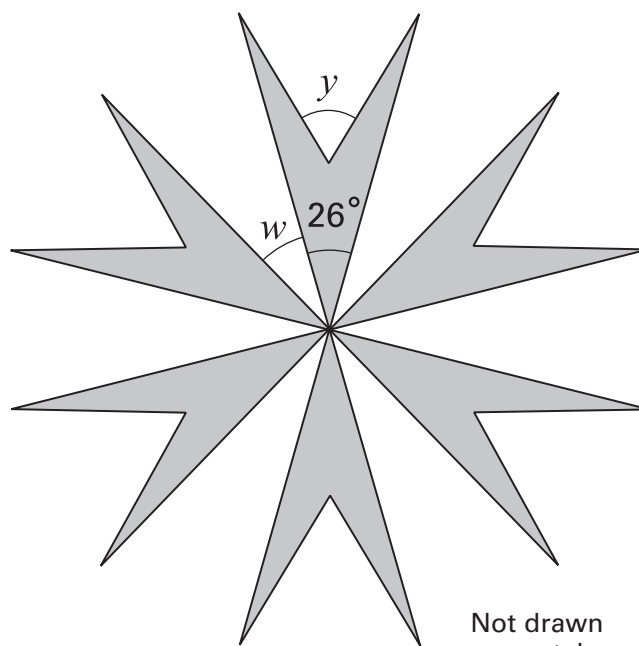
. . . . .
1 mark

6.   This pattern has rotation symmetry of order 6

(a) What is the size of angle w ?

Show your working.

Not drawn
accurately

. . . . °
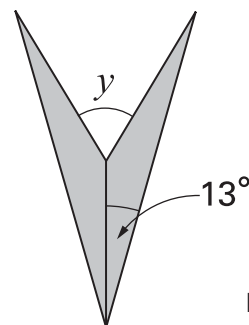
. . . .
. . . .
2 marks

(b) Each quadrilateral in the pattern is made from
two congruent **isosceles** triangles.

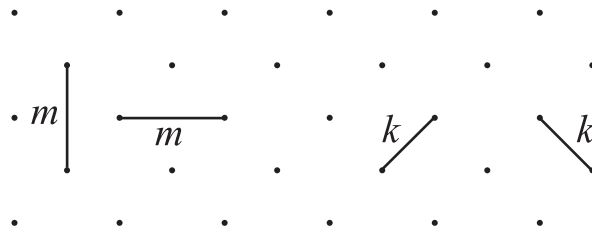What is the size of angle y ?

Show your working.

13°

Not drawn
accurately

. . . .

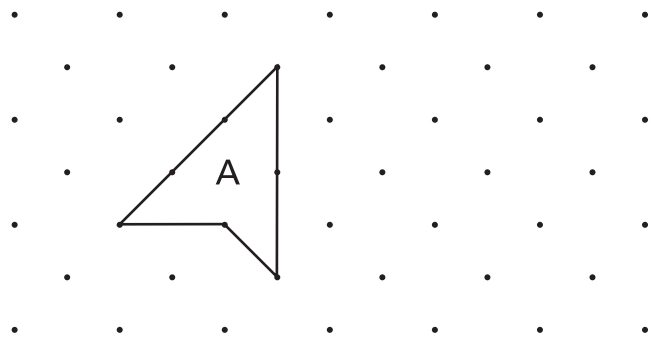. . . . . °

. . . .
2 marks

7. On the square grids below you can join dots with two different length lines.

Length m is greater than length k

(a) Draw a shape with each perimeter shown below.

The first one is done for you.

Perimeter **4k + 3m**
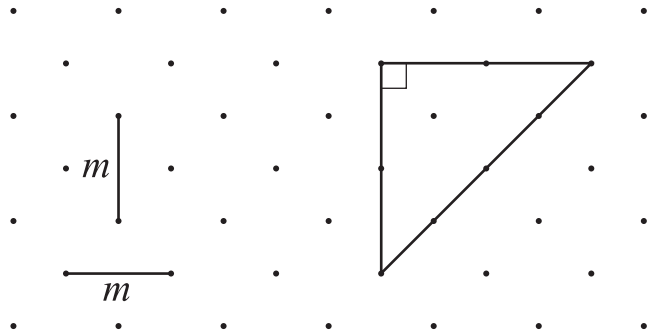
Perimeter **4k + m**

1 mark

Perimeter **2(2k + m)**

1 mark

(b) What is the **area** of this triangle?
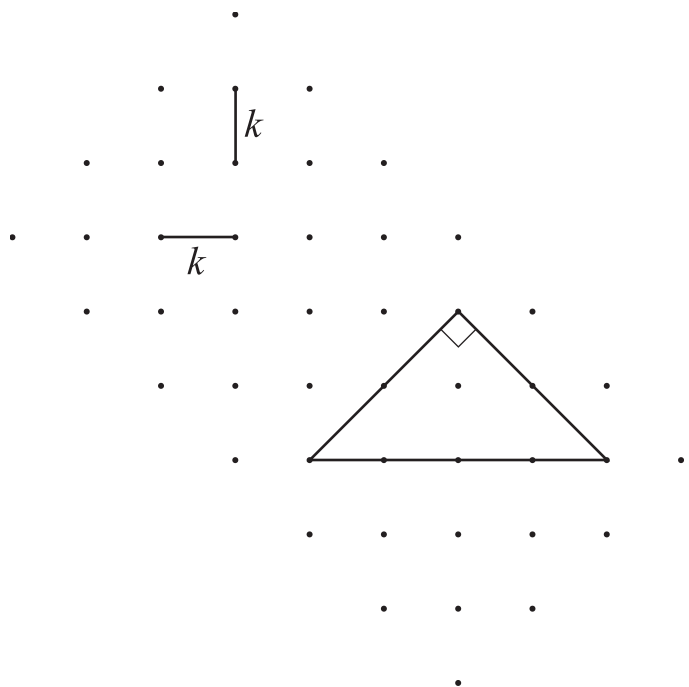
Write it **in terms of m**

(c) This is the **same triangle and grid**.

What is the area of the triangle?

Write it **in terms of k**

(d) Using your answers to (b) and (c), explain why $m^2 = 2k^2$

8.   A book gives this information:

> A baby giraffe was born that was 1.58 metres high.
>
> It grew at a rate of 1.3 centimetres **every hour**.

Suppose the baby giraffe continued to grow at this rate.

About how many days old would it be when it was **6 metres** high?

Show your working.

. . . . days old

3 marks

9. Owls eat small mammals.

They regurgitate the bones and fur in balls called pellets.

The table shows the contents of **62** pellets from long-eared owls.

Number of mammals found in the pellet	1	2	3	4	5	6
Frequency	9	17	24	6	5	1

(a) Show that the **total** number of mammals found is **170**

1 mark

(b) Calculate the **mean** number of mammals found in each pellet.

Show your working and give your answer correct to 1 decimal place.

. . . .

2 marks

(c) There are about **10 000** long-eared owls in Britain.

On average, a long-eared owl regurgitates **1.4 pellets** per day.

Altogether, how many **mammals** do the 10 000 long-eared owls eat in **one day**?

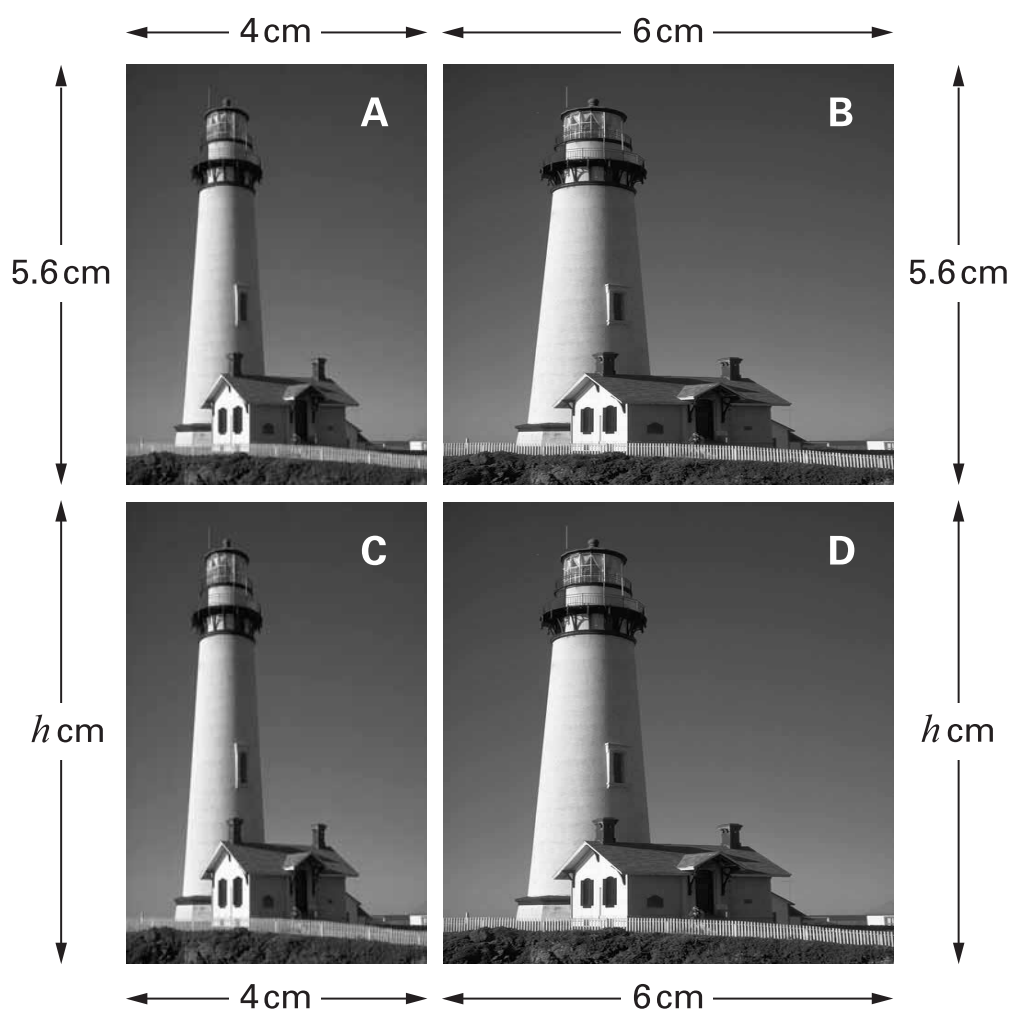Show your working and give your answer to the nearest thousand.

. . . .

2 marks

10. Here are four pictures, A, B, C and D. They are not to scale.

(a) Picture A can be stretched horizontally to make picture B.

Show that the horizontal factor of enlargement is **1.5**

1 mark

(b) Picture A can be stretched vertically to make picture C.

The vertical factor of enlargement is **1.25**

What is the height, h, of picture C?

.... cm

1 mark

(c) Show that pictures A and D are **not** mathematically similar.

(d) Picture E (not shown) **is** mathematically similar to picture A.

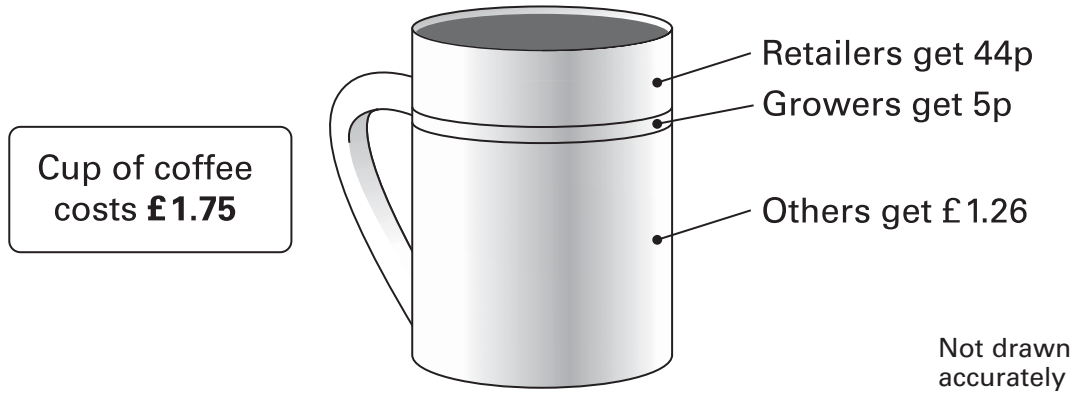The width of picture E is **3 cm**.

What is the height of picture E?

. . . . cm

11. A cup of coffee costs £ 1.75

The diagram shows how much money different people get when you buy a cup of coffee.

Cup of coffee costs **£1.75**

Retailers get 44p
Growers get 5p
Others get £1.26

Not drawn accurately

(a) Complete the table to show what **percentage** of the cost of a cup of coffee goes to retailers, growers and others.

Show your working.

Retailers	%
Growers	%
Others	%

2 marks

(b) Some people think the growers should get more.

Suppose the percentages changed to:

Retailers	23%
Growers	10%
Others	67%

Suppose the **retailers** still got **44p** from each cup of coffee sold.
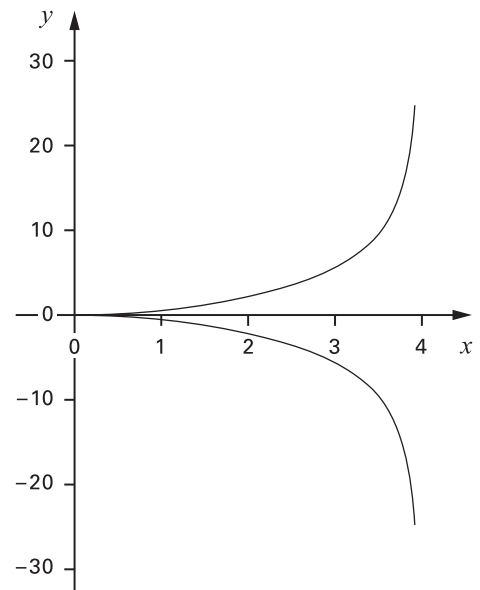
How much would a cup of coffee cost?

Show your working.

£

2 marks

12. The equation of the curve shown is

$$y = \pm \sqrt{\dfrac{x^3}{4 - x}}$$

When $x = $ **2.5** calculate the **positive** value of y

Show all the digits on your calculator display.

....

...
1 mark

When $x = $ **2.5** give **both** values of y correct to **3 significant figures**.

.... and ....

2 marks

13. The table shows information about some countries.

Country	Population	Area (km^2)
Canada	3.1×10^7	1.0×10^7
France	6.0×10^7	5.5×10^5
Gambia	1.4×10^6	1.1×10^4
India	1.0×10^9	3.3×10^6
United Kingdom	6.0×10^7	2.4×10^5
United States	2.8×10^8	9.3×10^6

(a) Use the table to fill in the gaps:

The country with the largest population is ....

1 mark

The country with the smallest area is ....

1 mark

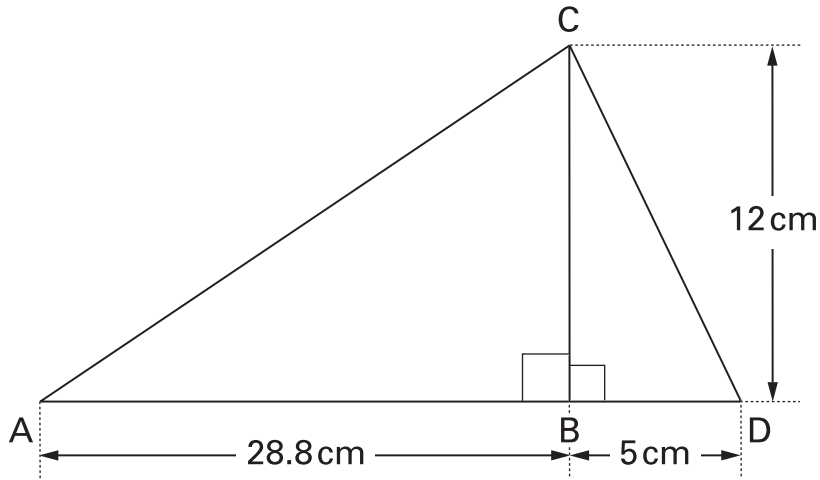(b) On average, how many **more** people per km^2 are there in the United Kingdom than in the United States?

Show your working.

....

3 marks

14. Two right-angled triangles are joined together to make a larger triangle ACD.

Not drawn accurately

(a) Show that the perimeter of triangle ACD is 78 cm.

. . . .

. . . .
2 marks

(b) Show that triangle ACD is also a right-angled triangle.

. . . .

. . . .
2 marks

15. y^2 represents a square number; y is an integer.

(a) Think about the expression $9 + y^2$

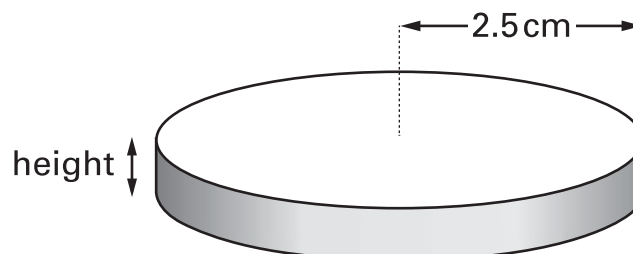Explain how you know there are values of y for which this expression does **not** represent a square number.

(b) Explain why the expression $16y^2$ **must** represent a square number.

16.   A cylinder has a **radius** of **2.5 cm**.

The volume of the cylinder, in cm^3, is **4.5π**

$\longleftarrow$2.5 cm$\longrightarrow$

height $\updownarrow$

What is the height of the cylinder?

Show your working.
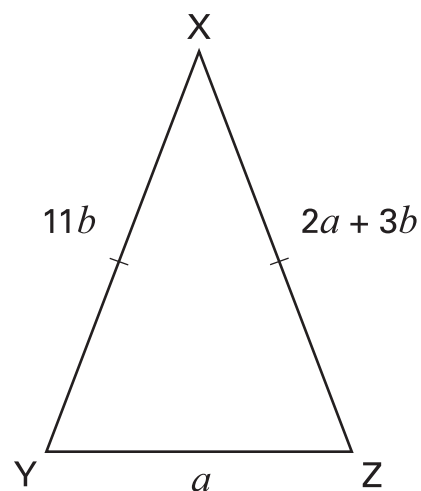
.... cm

. . . .

. . . .

. . . .

3 marks

17. The diagram shows a triangle.

Side XY is of length **11b**

Side XZ is of length **2a + 3b**

Side YZ is of length **a**

The triangle is **isosceles**, with **XY = XZ**

The perimeter of the triangle is **91**

Use algebra to find the values of a and b

. . . . .
1 mark

. . . . .
1 mark

a = ... b = ...

. . . . .
1 mark

END OF TEST