Ma

KEY STAGE 3

TIER 6–8

2009

Mathematics test

Paper 1

Calculator **not** allowed

First name _____

Last name _____

School _____

Remember

- The test is 1 hour long.
- You **must not** use a calculator for any question in this test.
- You will need: pen, pencil, rubber and a ruler.
- 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

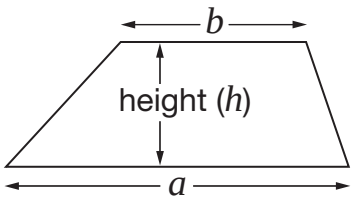
You **must not** use a calculator to answer any question in this test.

Formulae

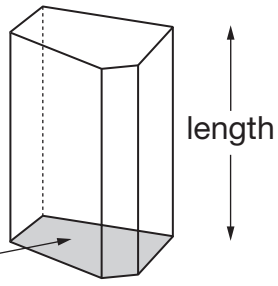
You might need to use these formulae

Trapezium

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



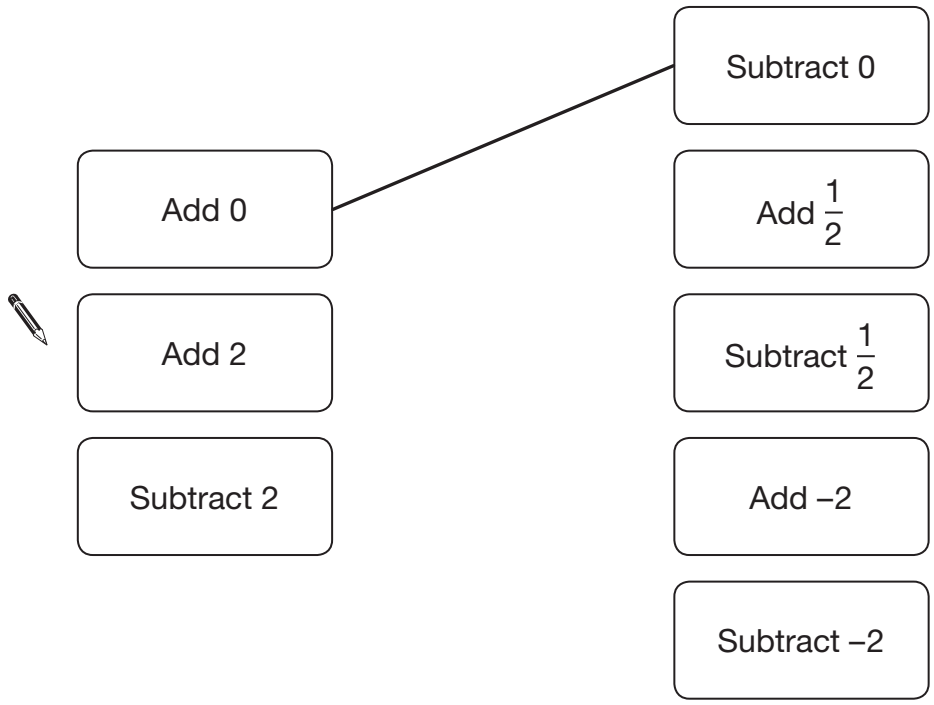
Prism



Volume = area of cross-section × length

1. Match each instruction on the left with an instruction on the right that has **the same effect**.

The first one is done for you.



1 mark

2. Pupils are investigating oak leaves.

They want to collect a sample of oak leaves.

Here is their plan for how to collect the sample.

Plan
Choose one oak tree. Take 10 leaves from the lowest branches of the tree.

Give **two** reasons why this sample of leaves may **not be representative** of all oak leaves.

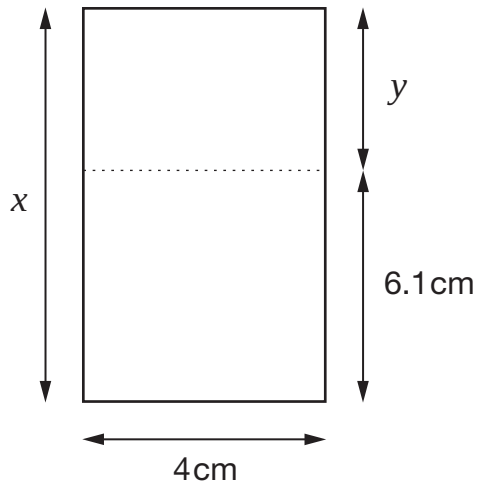
First reason:

1 mark

Second reason:

1 mark

3. Look at the rectangle.



Not drawn accurately

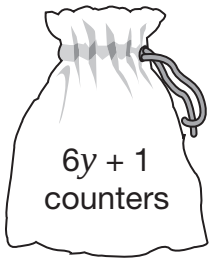
The **total area** of the rectangle is **40 cm^2**

Work out lengths x and y

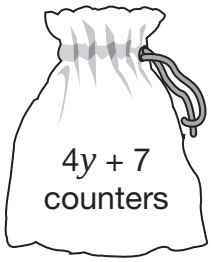
x = _____ cm y = _____ cm

2 marks

4. (a) Bags A and B contain some counters.



Bag A



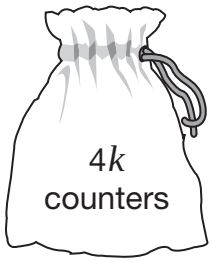
Bag B

The number of counters in each bag **is the same**.

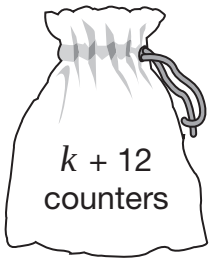
Work out the value of y

2 marks

(b) Bag **C** contains **more** counters than bag **D**.



Bag C



Bag D

What is the **smallest** possible value of k?

2 marks

5. Gary took part in a quiz show and won a **million pounds**.

He spent **£20 000** on a holiday.

Then he spent **half** of the **money left** on a house.

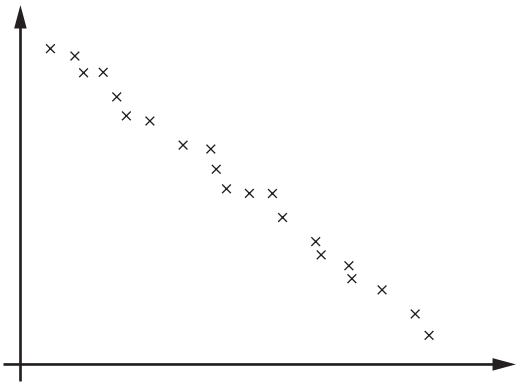
How much did Gary's house cost?

£

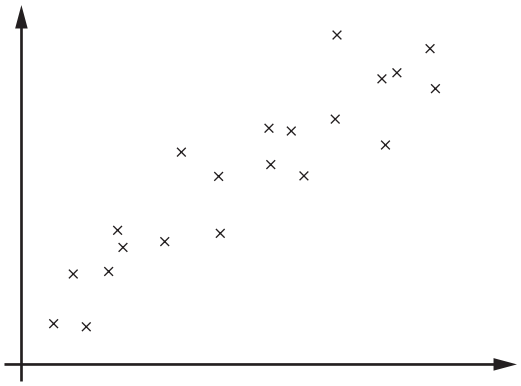
2 marks

6. Look at these two scatter graphs. They are both drawn using the same scale.

Graph A



Graph B



(a) Which scatter graph shows **positive** correlation?

☐ A ☐ B

Explain your answer.

1 mark

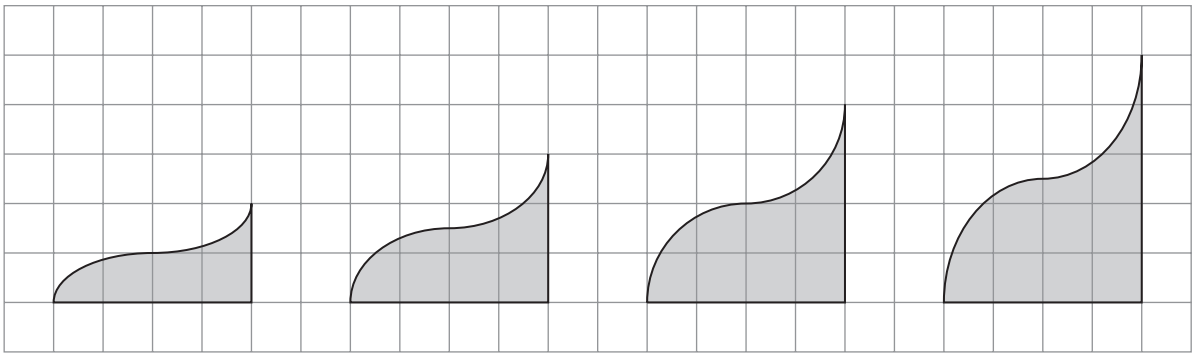
(b) Which scatter graph shows **stronger** correlation?

☐ A ☐ B

Explain your answer.

1 mark

7. Look at the sequence of shapes on a square grid.



Shape number 1 | Shape number 2 | Shape number 3 | Shape number 4

The table shows information about these shapes.

Shape number N	Base B	Height H	Area A
1	4	2	4
2	4	3	6
3	4	4	8
4	4	5	10

Rules connect N, B, H and A.

Write one missing letter in each space below to complete the rule.

H = _____ + 1

A = _____ × 2

_____ = $2N$ + 2

2 marks

8. Look at this information.

$$\frac{27}{40} = 0.675$$

$$\frac{29}{40} = 0.725$$

Use this information to write the missing **decimals** below.

$$\frac{31}{40} = \_\_\_\_\_$$

1 mark

$$\frac{23}{40} = \_\_\_\_\_$$

1 mark

9. In this question, n stands for any **whole number**.

(a) For the expression $\boldsymbol{2n}$, tick (✓) the correct statement below.

- ☐ $\boldsymbol{2n}$ must be odd.
- ☐ $\boldsymbol{2n}$ must be even.
- ☐ $\boldsymbol{2n}$ could be odd or even.

Explain your answer.

1 mark

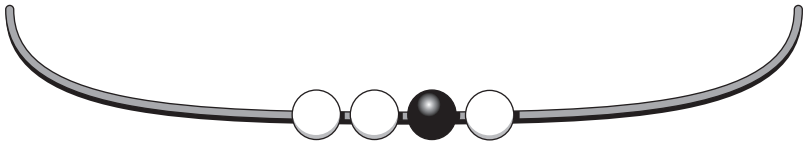
(b) For the expression $\boldsymbol{3n}$, tick (✓) the correct statement below.

- ☐ $\boldsymbol{3n}$ must be odd.
- ☐ $\boldsymbol{3n}$ must be even.
- ☐ $\boldsymbol{3n}$ could be odd or even.

Explain your answer.

1 mark

10. (a) On this necklace the ratio of black beads to white beads is **1 : 3**

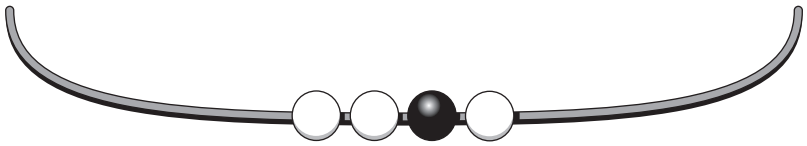


How many **more** black beads do you need to add to make the ratio of black to white **3 : 1**?

_____ black beads

1 mark

(b) Here is the necklace again.



How many **more** black beads and white beads do you need to add to make the ratio of black to white **3 : 2**?

_____ black beads, _____ white beads

1 mark

11. Show that the **difference** between 3^2 and 3^3 is **18**

1 mark

12. Sophie says:

> If n represents a prime number, then
> $2n + 1$ will also represent a prime number.

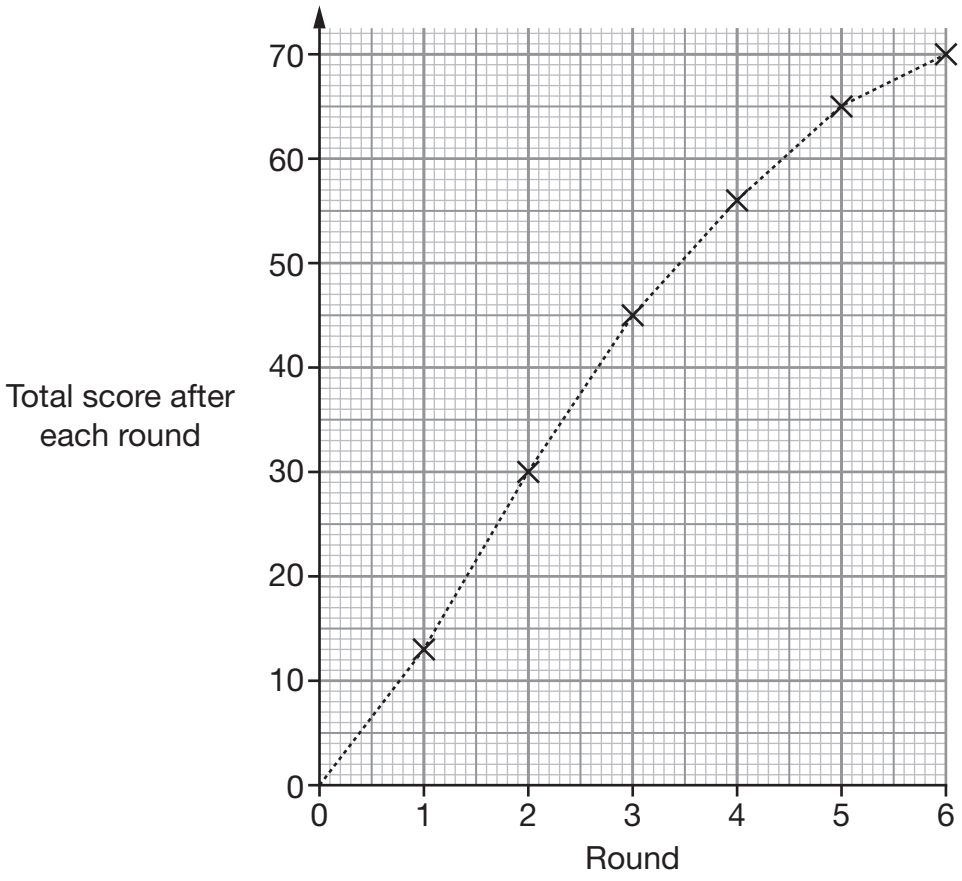
Use an example to explain why she is **wrong**.

1 mark

13. A game has six rounds.

In each round of the game, the player gains points which are added to their total score.

(a) The graph shows Sue's total score after each round of her game.



How many points did Sue gain in **round 4**?

2 marks

(b) Derek plays the game.

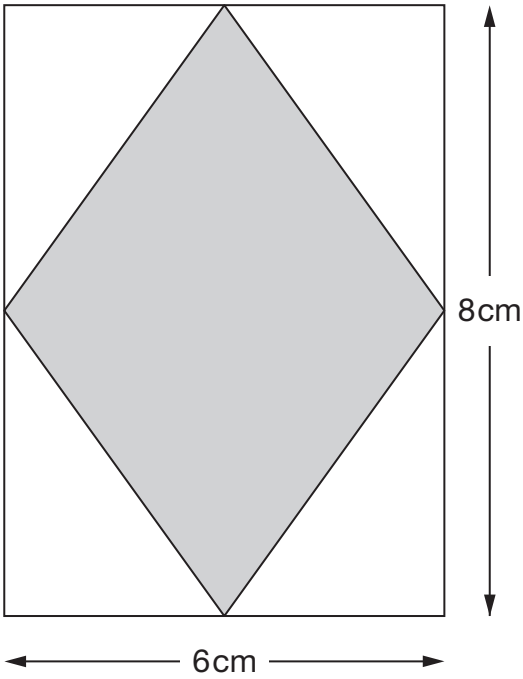
The graph of his total score after each round is a **straight line**.

What can you say about the number of points Derek gained in each round?

1 mark

14. Inside the rectangle below is a shaded rhombus.

The vertices of the rhombus are the midpoints of the sides of the rectangle.



Not drawn accurately

What is the **area** of the shaded rhombus?

2 marks

1 mark

15. (a) Sandra is thinking of two numbers.

Her two numbers have a **negative sum**, but a **positive product**.

Give an example of what her numbers could be.

_____ and _____

1 mark

(b) Mark is also thinking of two numbers.

His two numbers have a **positive sum**, but a **negative product**.

Give an example of what his numbers could be.

_____ and _____

1 mark

16. The mean of five numbers is **10**

I add one more number and the mean is now **11**

What number did I add?

_____

2 marks

17. Solve these simultaneous equations using an algebraic method.

$$3x + 6y = 30$$

$$x + 6y = 20$$

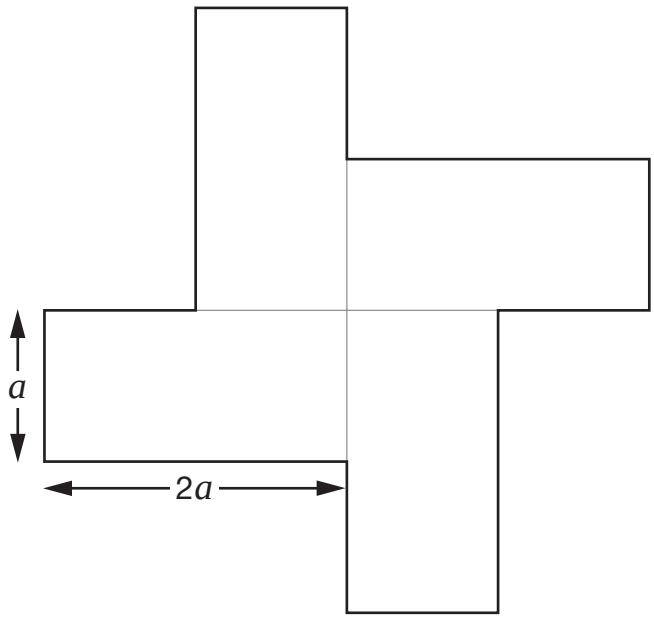
You **must** show your working.

$x =$ _____ $y =$ _____

3 marks

18. This shape is made of four congruent rectangles.

Each rectangle has side lengths $2a$ and a



Not drawn accurately

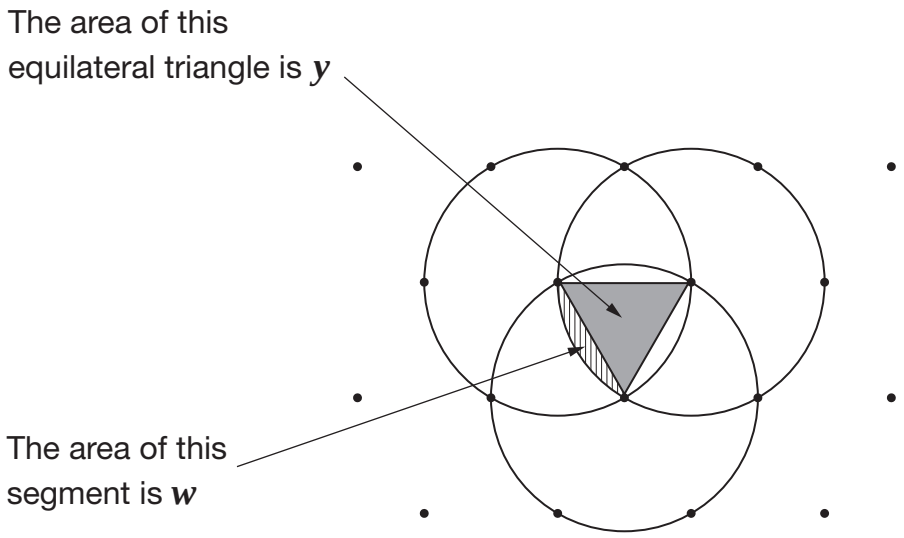
The **perimeter** of the shape is **80 cm**.

Work out the **area** of the shape.

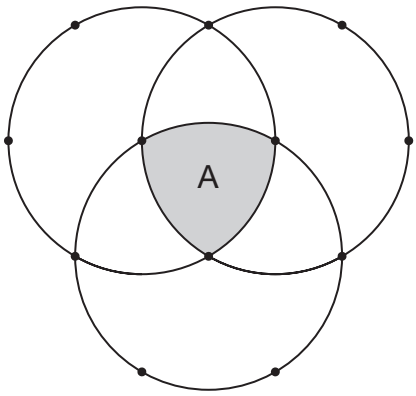
_____ cm^2

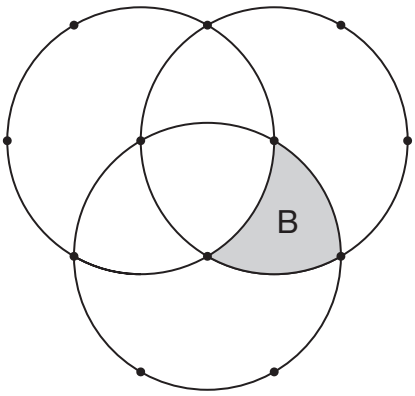
2 marks

19. The diagram shows three congruent circles drawn on an isometric grid.



Write expressions, using y and w, for area A and area B.





Area A = _____ Area B = _____

1 mark

1 mark

20. (a) A pupil wrote:

> For all numbers j and k,
> $(j + k)^2 = j^2 + k^2$

Show that the pupil is **wrong**.

2 marks

(b) A different pupil wrote:

> For all numbers j and k,
> $(j + k)^2$ can **never** be equal to $j^2 + k^2$

Show that this pupil is also **wrong**.

1 mark

21. I have two fair four-sided dice.

The dice are both numbered **3**, **4**, **5** and **6**

I am going to roll both dice and **multiply** the scores.

What is the probability that the product is a **multiple of 3**?

2 marks

22. Solve these equations using an algebraic method.

You **must** show your working.

$$\frac{5(3y - 4)}{2y} = 7$$

$y =$ _____

2 marks

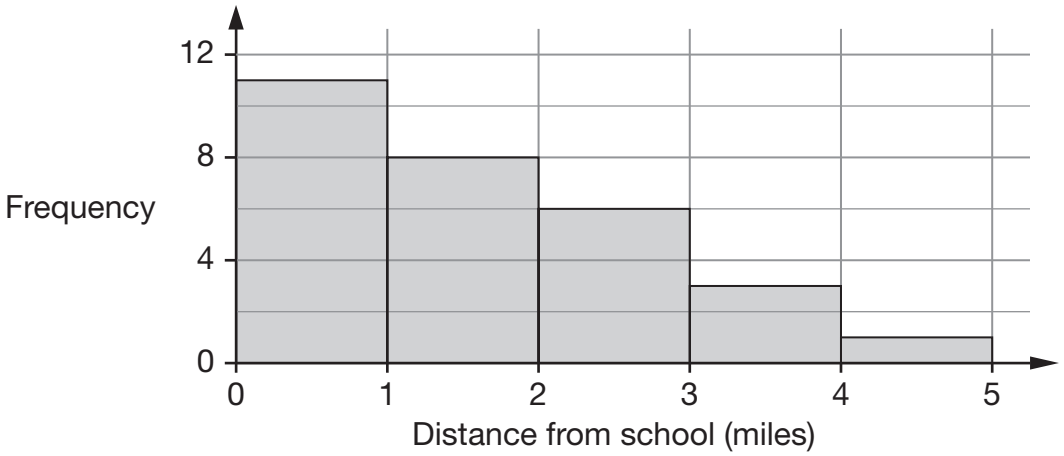
$$(x + 4)(x - 4) = 9$$

$x =$ _____ or $x =$ _____

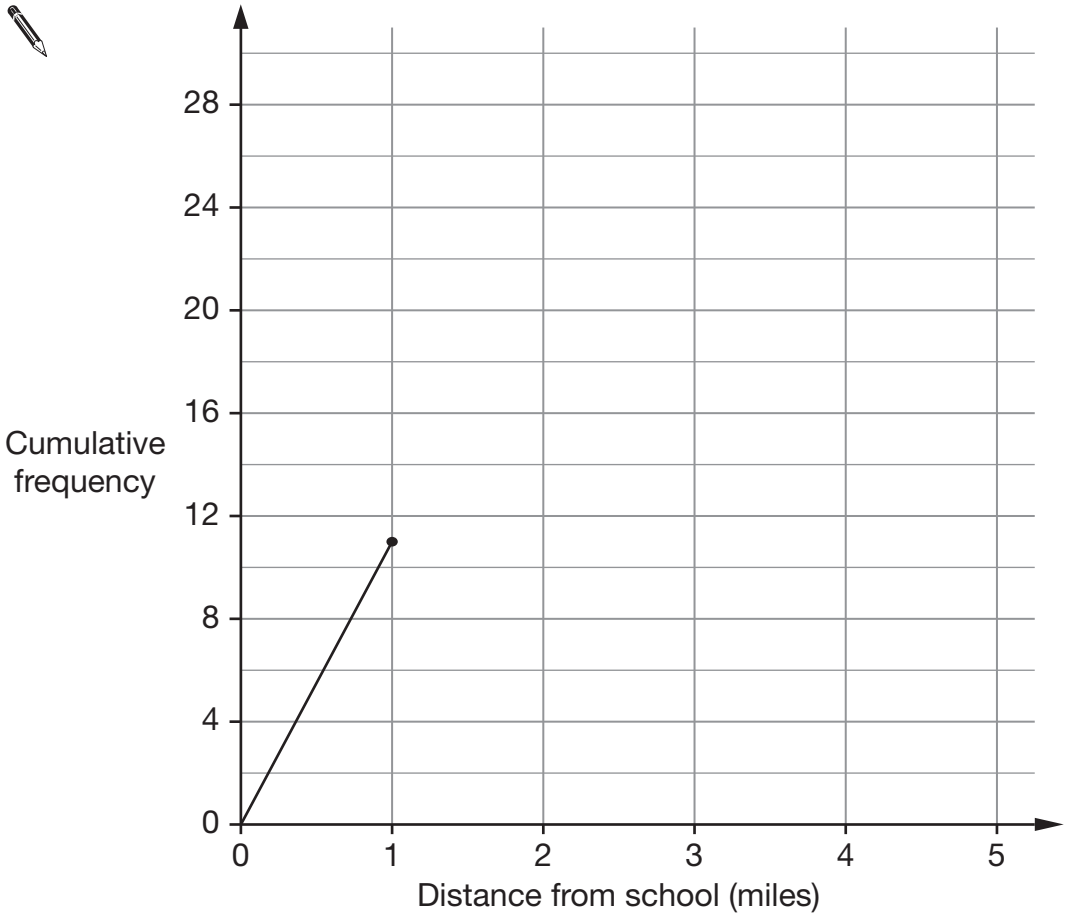
2 marks

23. Pupils in a class investigated how far they live from school.

The frequency diagram shows the results.



(a) Complete the **cumulative frequency** graph below to show these results.



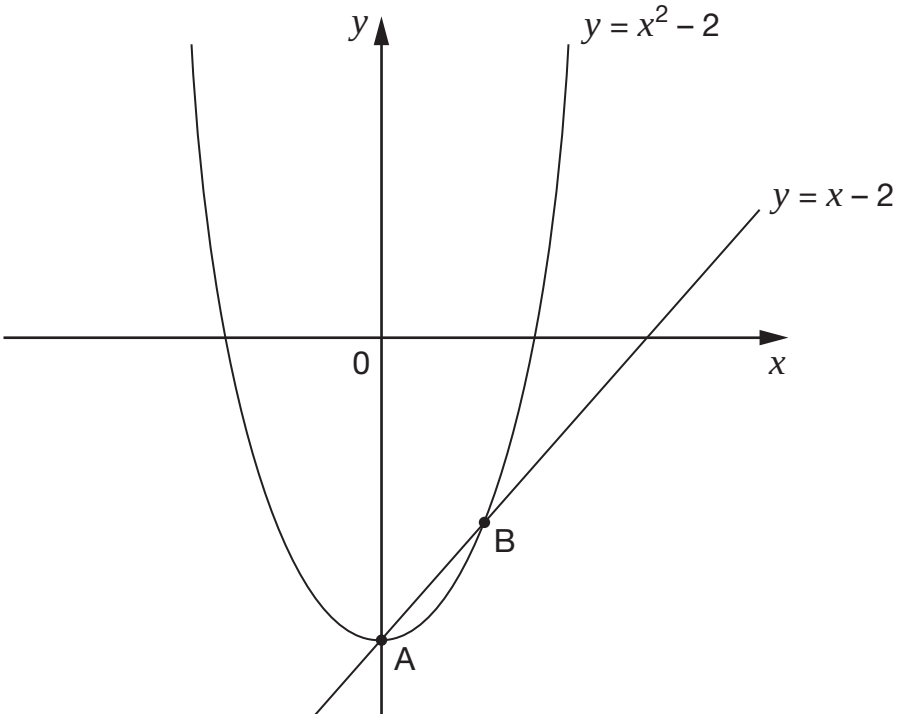
2 marks

(b) Estimate the median distance from school for this class.

miles

1 mark

24. Look at the graph.



Not drawn accurately

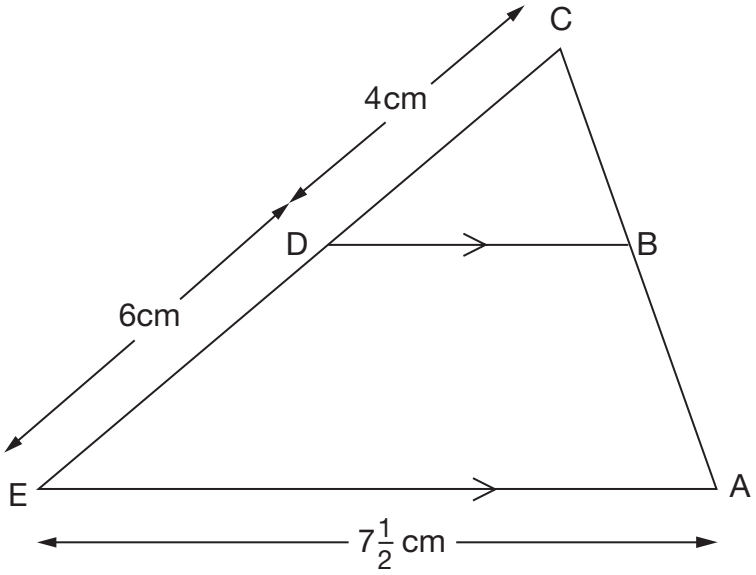
At points A and B, $y = x - 2$ **and** $y = x^2 - 2$

What are the coordinates of A and B?

A is (_____ , _____) _____ 1 mark

B is (_____ , _____) _____ 1 mark

25. In the diagram triangle BCD is mathematically similar to triangle ACE.



Not drawn accurately

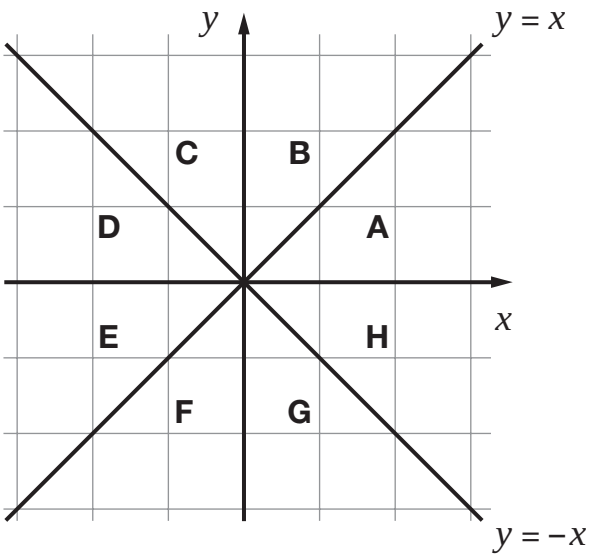
Work out the length of BD.

_____ cm

2 marks

26. Look at the graph.

The x-axis, the y-axis and the lines $y = x$ and $y = -x$ divide the graph into eight regions, A to H.



(a) Write down the letters of the four regions where $x \geq 0$

_____, _____, _____ and _____

1 mark

(b) Write down the letters of the four regions where $y \geq x$

_____, _____, _____ and _____

1 mark

(c) Write down the letters of the four regions where $xy \geq 0$

_____, _____, _____ and _____

1 mark

27. A cyclist went 1 km up a hill at 15 km per hour.

Then she went 1 km down the hill at 30 km per hour.

Show that her **average** speed for the 2 km was **20 km per hour**.

2 marks

END OF TEST

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