Ma

KEY STAGE 3

TIER 6–8

2002

Mathematics test

Paper 1

Calculator **not** 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. If you have been given a pupil number, write that also.

First name _____

Last name _____

School _____

Pupil number | | | | | | |

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, ruler and a pair of compasses.
- 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.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

For marker's use only

Total marks	

QCA/02/840

Instructions

Answers

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

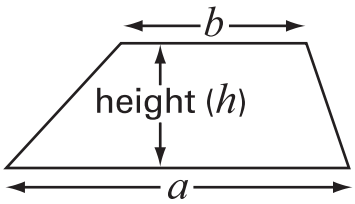
Calculators

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

Formulae

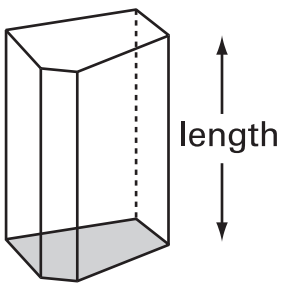
You might need to use these formulae

Trapezium



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

Prism



Volume = area of cross-section × length

1. Work out the **number** that is halfway between **27 × 38** and **33 × 38**

Show your working.

. . . . . .

2 marks

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2. Solve the equation $9y + 3 = 5y + 13$

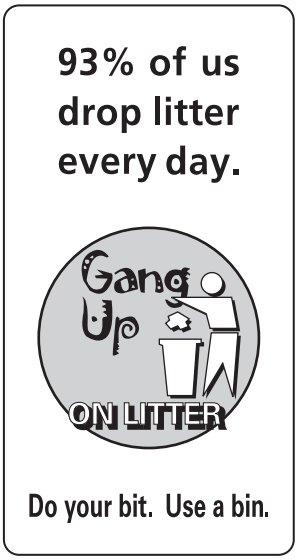
Show your working.

$y =$ . . . . . .

. . . . . .

2 marks

3. This advert was in a newspaper.



It does not say how the advertisers know that 93% of people drop litter every day.

Some pupils think the percentage of people who drop litter every day is much lower than 93%.

They decide to do a survey.

(a) Jack says:

> We can ask 10 people if they drop litter every day.

Give two **different** reasons why Jack's method might not give very good data.

First reason:

1 mark

Second reason:

1 mark

(b) Lisa says:

> We can go into town on Saturday morning.
>
> We can stand outside a shop and record how many people walk past and how many of those drop litter.

Give two **different** reasons why Lisa's method might not give very good data.

First reason:

1 mark

Second reason:

1 mark

---

4. Fill in the missing numbers in the boxes using **only negative numbers**.

$\square - \square = 5$

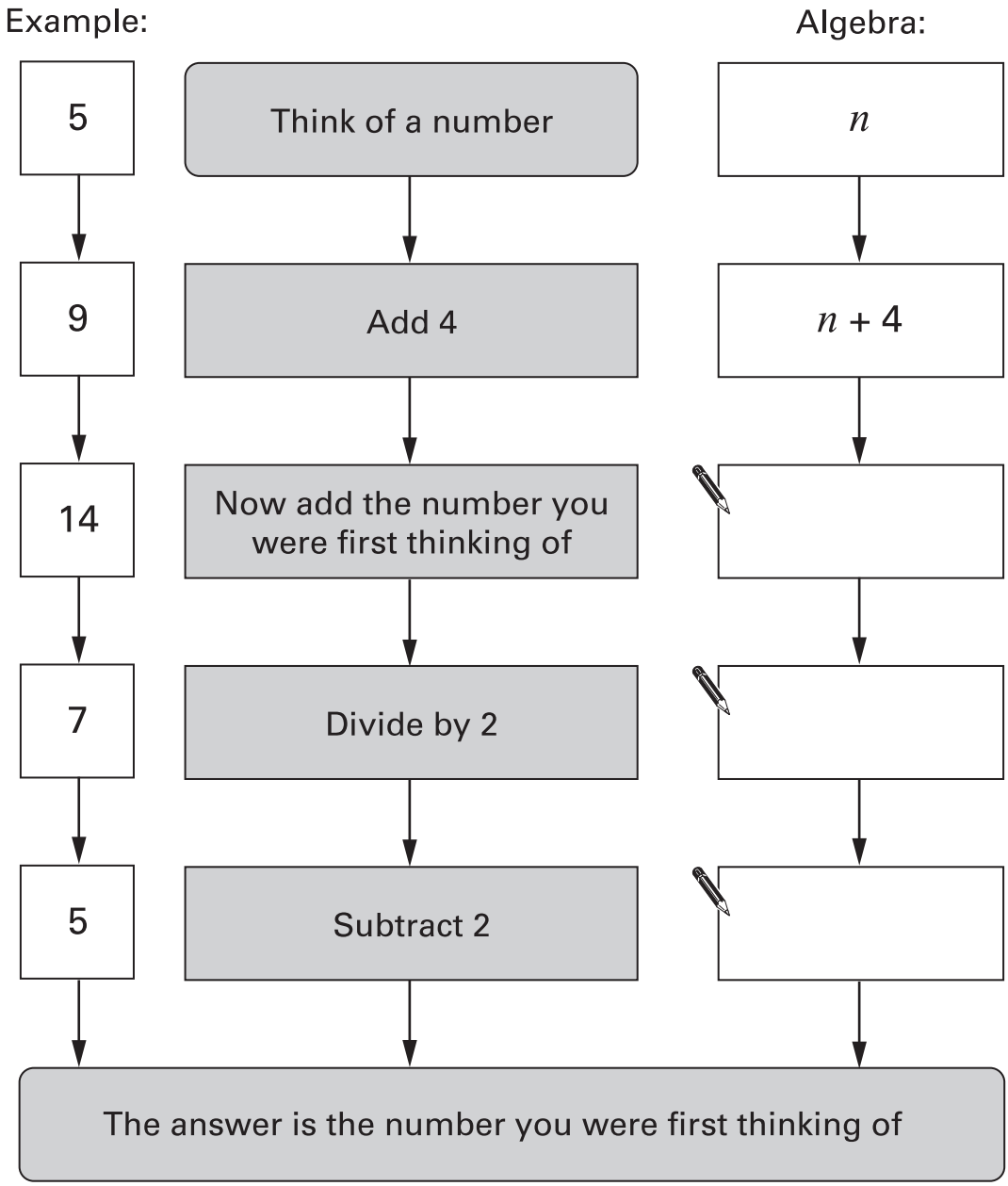
1 mark

$\square - \square = -5$

1 mark

5. You can often use algebra to show why a number puzzle works.

Fill in the missing expressions.



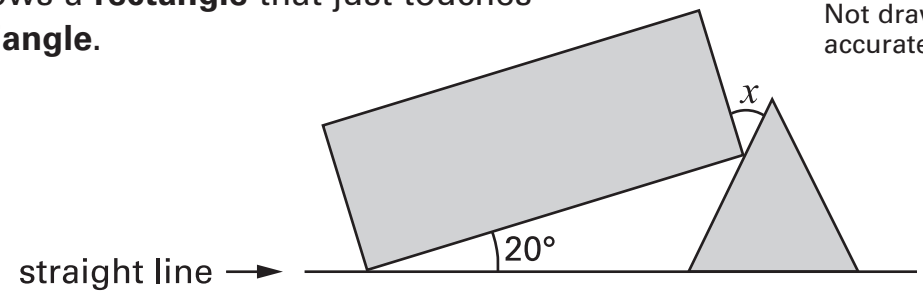
. . . . .

. . . . .

2 marks

6. The diagram shows a **rectangle** that just touches an **equilateral triangle**.

Not drawn accurately



(a) Find the size of the angle marked x

Show your working.

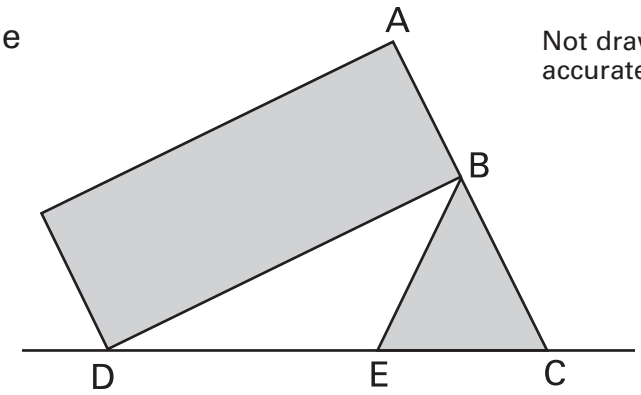
. . . . .

. . . . . °

2 marks

(b) Now the rectangle just touches the equilateral triangle so that **ABC** is a **straight line**.

Not drawn accurately



Show that **triangle BDE** is **isosceles**.

. . . . .

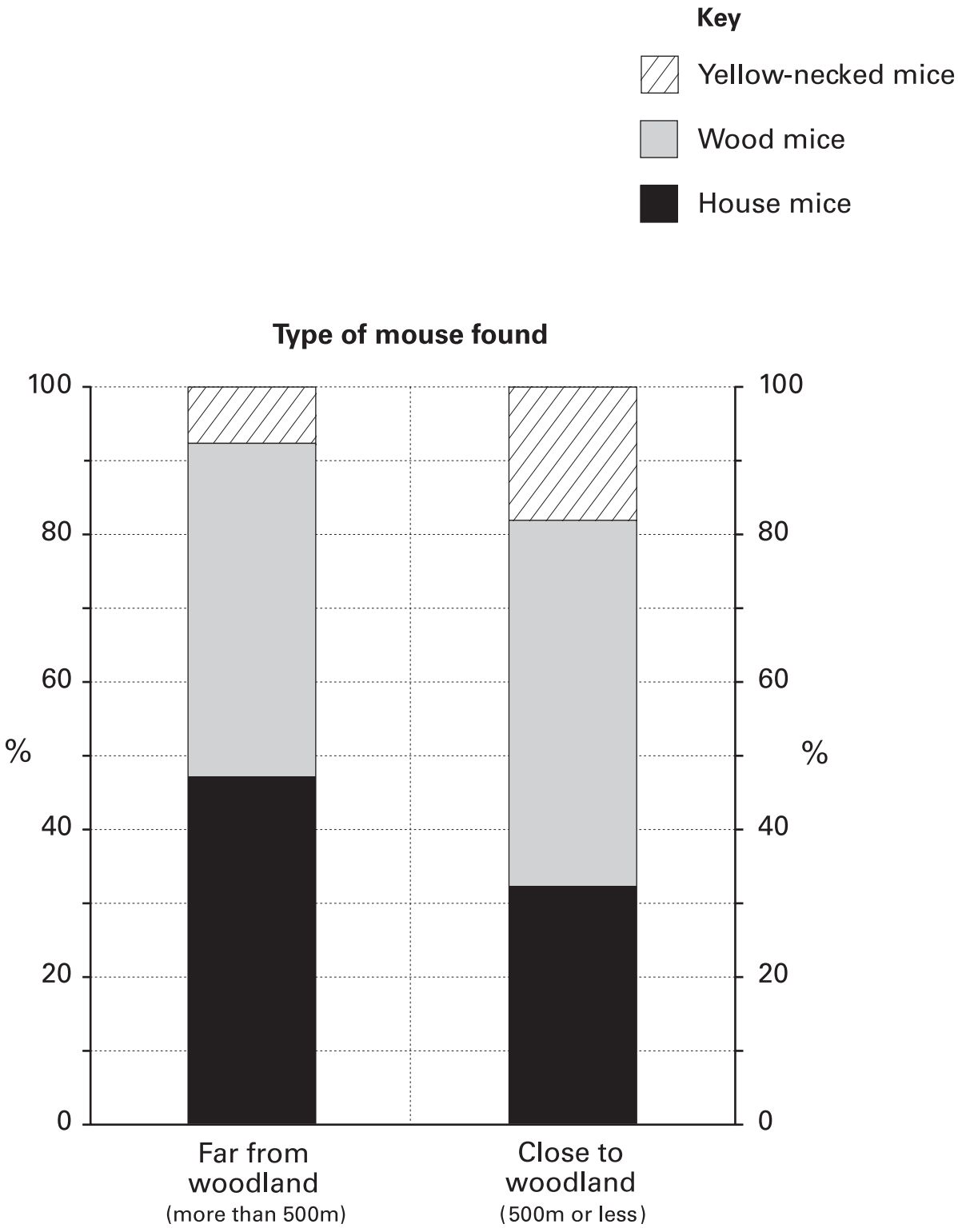
. . . . .

2 marks

7. Three types of mice might come into our homes.

Some mice are more likely to be found in homes far from woodland. Others are more likely to be found in homes close to woodland.

The bar charts show the **percentages of mice** that are of each type.



Use the bar charts to answer these questions.

(a) About what percentage of mice in homes **close to woodland** are **wood mice**?

..... %

1 mark

(b) About what percentage of mice in homes **far from woodland** are **not** wood mice?

..... %

1 mark

(c) The **black** bars show the percentages for house mice.
One of the black bars is taller than the other.

Does that mean there **must be more** house mice in homes far from woodland than in homes close to woodland?

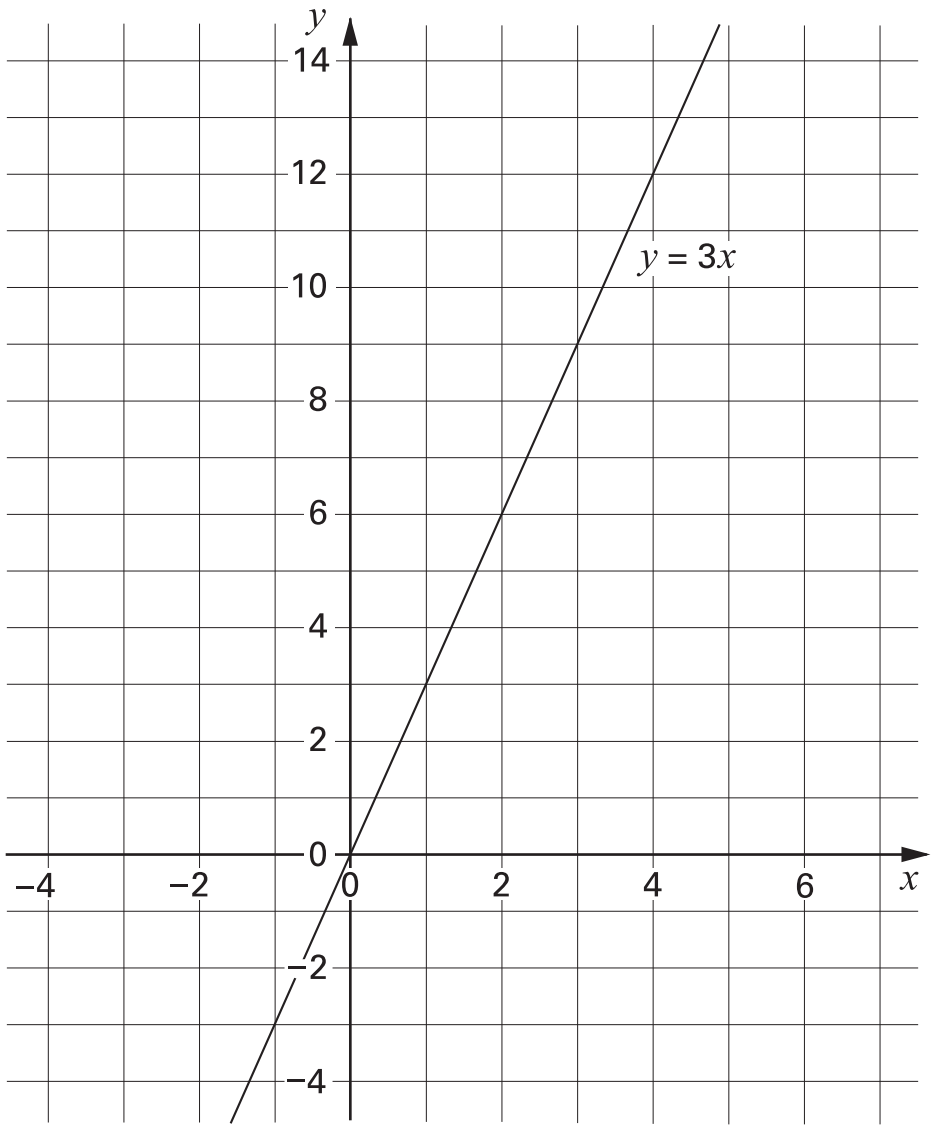
Tick (✓) Yes or No.

Yes ☐ No ☐

Explain your answer.

1 mark

8. The graph shows a straight line. The equation of the line is $y = 3x$



(a) Does the point (25, 75) lie on the straight line $y = 3x$?

Tick (✓) Yes or No.

Yes ☐ No ☐

Explain how you know.

1 mark

(b) Write the coordinates of the point that lies on both the straight lines $y = 4x + 1$ and $y = 6x - 4$

You **must** show your working.

(,)

3 marks

(c) Explain how you can tell there is no point that lies on both the straight lines $y = \frac{1}{2}x + 3$ and $y = \frac{1}{2}x + 5$

1 mark

9. $\frac{1}{3}$, $\frac{1}{8}$, $\frac{1}{5}$ are all examples of unit fractions.

All unit fractions must have

a numerator that is 1

$\frac{1}{3}$

a denominator that is an integer greater than 1

The ancient Egyptians used only unit fractions.

For $\frac{3}{4}$, they wrote the sum $\frac{1}{2} + \frac{1}{4}$

(a) For what fraction did they write the sum $\frac{1}{2} + \frac{1}{5}$?

Show your working.

. . . . . .

1 mark

(b) They wrote $\frac{9}{20}$ as the sum of two unit fractions.

One of them was $\frac{1}{4}$

What was the other?

Show your working.

1 mark

. . . . . .

1 mark

(c) What is the biggest fraction you can make by adding two **different** unit fractions?

Show your working.

. . . . .

. . . .

. . . . .

2 marks

10. (a) The subject of the equation below is p

$$p = 2(e + f)$$

Rearrange the equation to make e the subject.

$e =$ . . . . . .

2 marks

(b) Rearrange the equation $r = \frac{1}{2}(c - d)$ to make d the subject.

Show your working.

$d =$ . . . . . .

2 marks

11. I have a bag that contains blue, red, green and yellow counters.

I am going to take out one counter at random.

The table shows the probability of each colour being taken out.

	Blue	Red	Green	Yellow
Probability	0.05	0.3	0.45	0.2

(a) Explain why the number of **yellow** counters in the bag **cannot** be 10

. . . . .

1 mark

(b) What is the **smallest** possible number of each colour of counter in the bag?

Blue	Red	Green	Yellow

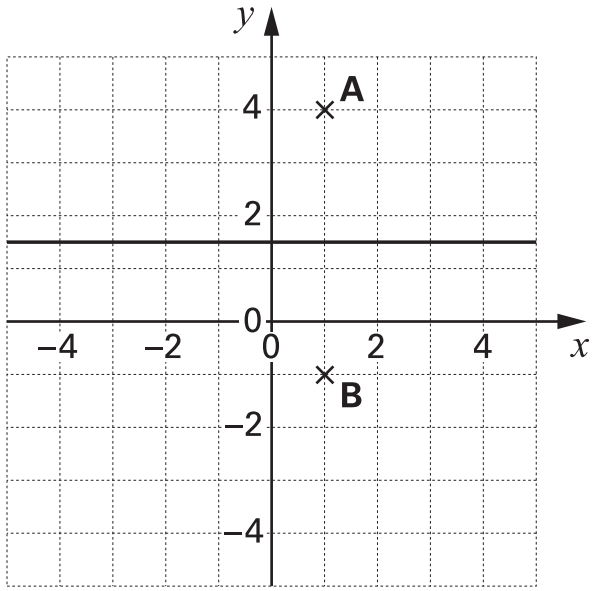
. . . . .

. . . . .

2 marks

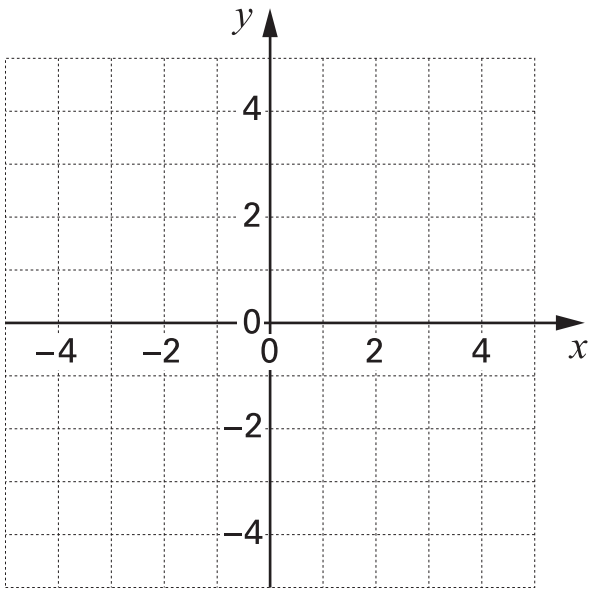
12. The diagram shows the locus of all points that are the **same distance** from A as from B.

The locus is one straight line.



(a) The locus of all points that are the **same distance** from (2, 2) and (–4, 2) is also one straight line.

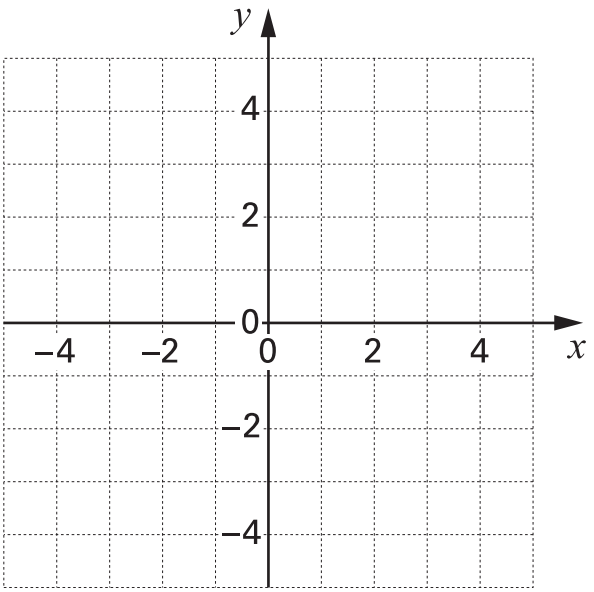
Draw this straight line.



1 mark

(b) The locus of all points that are the **same distance** from the x-axis as they are from the y-axis is **two** straight lines.

Draw both straight lines.



1 mark

(c) Look at points C and D below.

Use a straight edge and compasses to draw the locus of all points that are the **same distance** from C as from D.

Leave in your construction lines.

C

D

. . . .

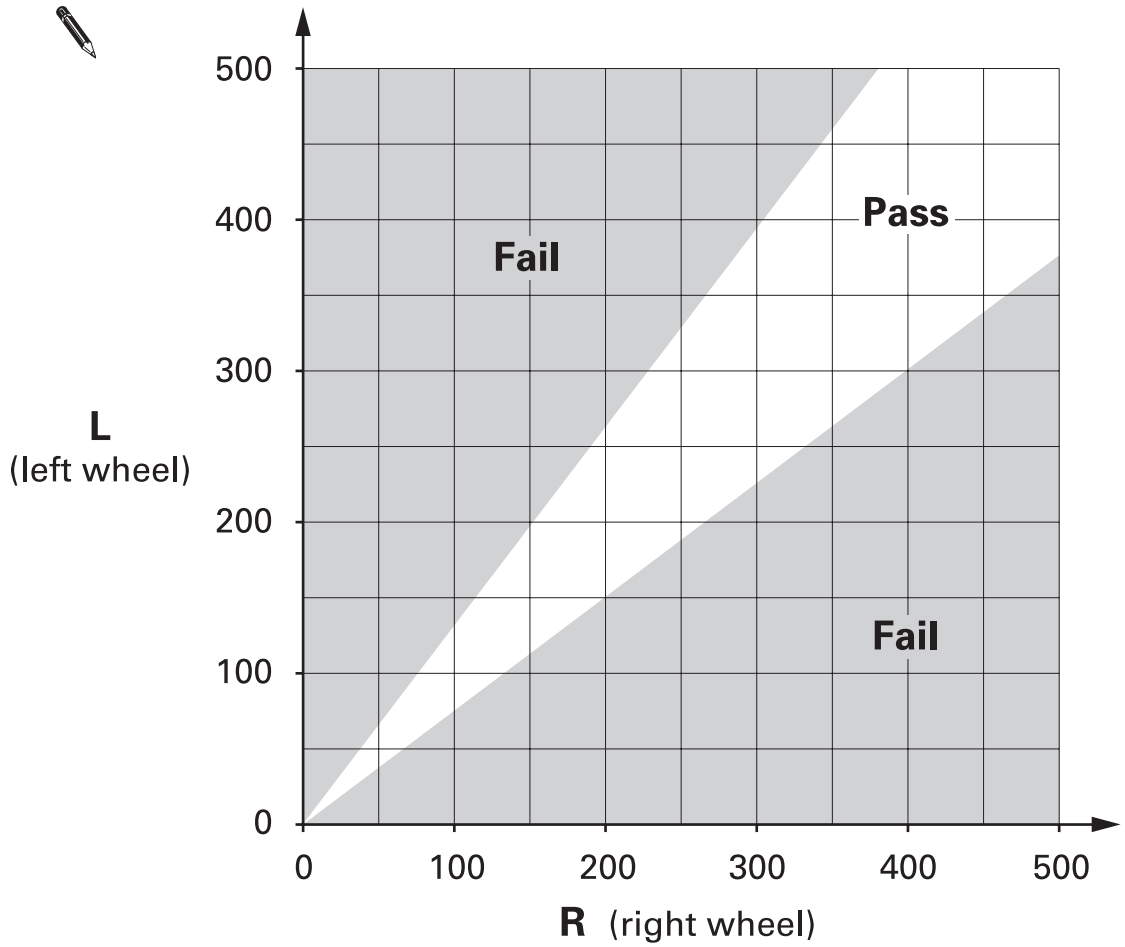
. . . .

2 marks

13. Cars more than three years old must pass a test called an MOT.

The testers measure the right and left front wheel brakes, and give each brake a score out of 500

Then they use the graph.



For example: A car has R = 300, L = 350

(300, 350) is in the white region,

so the car **passes** this part of the test.

(a) A man takes his car to be tested.

L = 200

Approximately, between what values does R need to be for his car to pass this test?

..... and ..... 1 mark

A different part of the test uses R + L

To pass, **R + L ≥ 400**

(b) On the graph, draw the straight line R + L = 400 1 mark

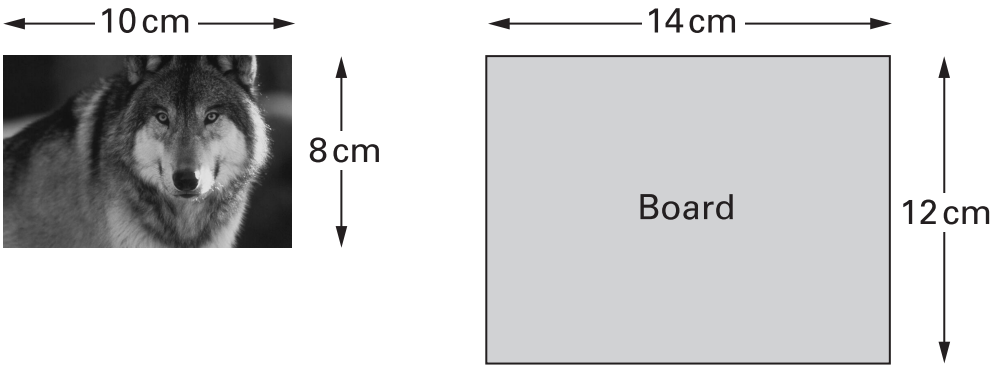
Then shade the region where the car **fails**, R + L < 400 1 mark

(c) If L = 200, between what values does R need to be to pass **both** parts of the test?

..... and ..... 1 mark

14. A picture has a board behind it.

The drawings show the dimensions of the rectangular picture and the rectangular board.



(a) Show that the two rectangles are **not** mathematically similar.

1 mark

(b) Suppose you wanted to cut the board to make it mathematically similar to the picture.

Keep the width of the board as 14 cm.

What should the new height of the board be?

Show your working.

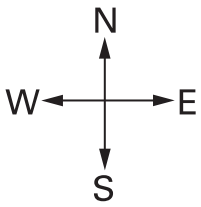
..... cm

2 marks

15. A robot can move N, S, E or W along the lines of a grid.

It starts at the point marked ● and moves one step at a time.

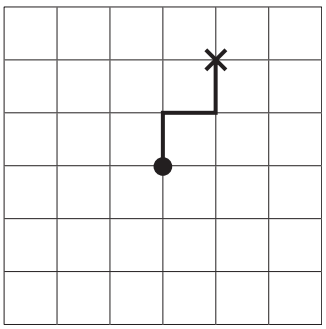
For each step, it is **equally likely** that the robot will move **N, S, E or W**.



(a) The robot is going to move 3 steps from the point marked ●

What is the probability that it will move along the path shown?

Show your working.



. . . .

2 marks

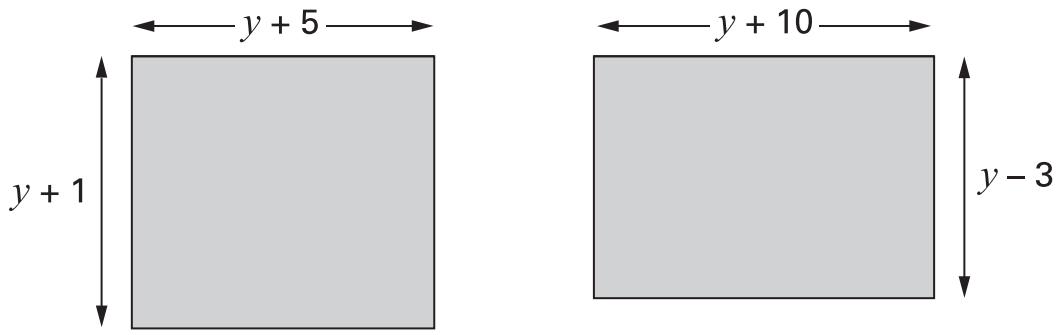
(b) The robot is going to move 3 steps from the point marked ●

What is the probability that it will reach the point marked × by **any route**?

. . . .

1 mark

16. The two rectangles below have the **same area**.



Not drawn accurately

Use an algebraic method to find the value of y

You **must** show your working.

$y =$ .....

4 marks

17. I fill a glass with orange juice and lemonade in the ratio **1 : 4**

I drink $\frac{1}{4}$ of the contents of the glass, then I fill the glass using orange juice.

Now what is the ratio of orange juice to lemonade in the glass?

Show your working, and write the ratio in its simplest form.

. . . . .

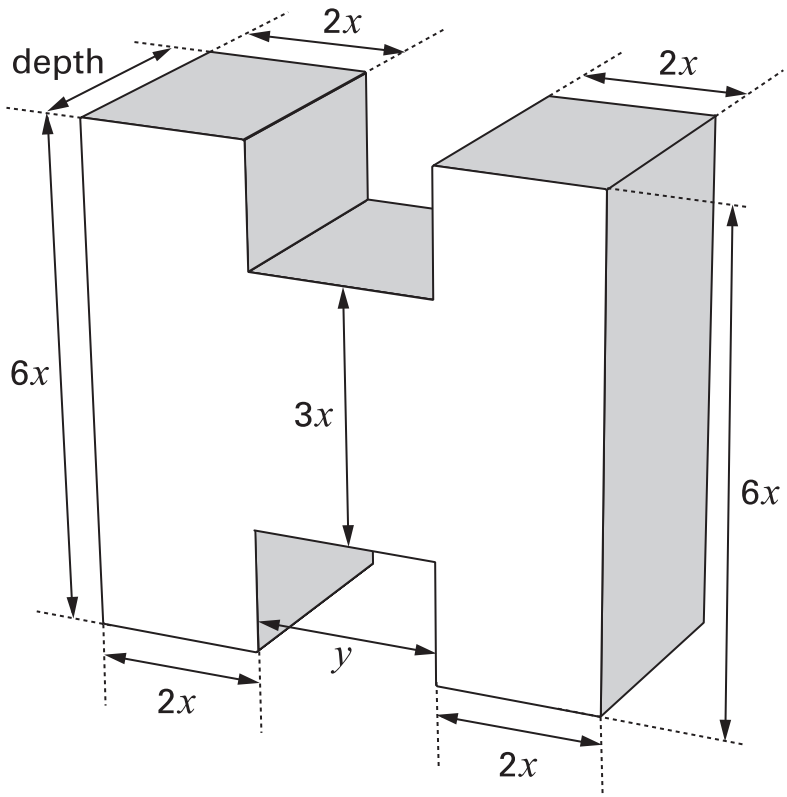
. . . . .

. . . . . : . . . .

3 marks

Please turn over

18. This prism was made from three cuboids.



Not drawn accurately

(a) Show that the area of the cross-section of the prism is $\mathbf{24x^2 + 3xy}$

1 mark

(b) The volume of the prism is $\mathbf{3x^2(8x + y)}$

What is the depth of the prism?

Show your working.

2 marks

END OF TEST