

Name:

School:

Mark:

Mill Hill School

13+ Entrance Examination – Mathematics

January 2014

Time: 1 hour

Materials required for examination

Ruler, protractor, compasses, pen, pencil, eraser

Calculators must NOT be used.

Information for candidates

The paper consists of two sections, A and B. Try to answer as many questions as possible from both sections. The marks for individual questions and the parts of questions are shown : e.g 1 mark. There are 25 questions in this question paper, 21 in section A and 5 in section B. The total mark for this paper is 65.

Advice to candidate

Show all stages in any calculations.

Work steadily through the paper.

Do not spend too long on one question. If you cannot answer a question, leave it and attempt the next one.

Return at the end to those you have left out.

1. Fred has a bag of sweets.

Contents
3 yellow sweets
5 green sweets
7 red sweets
4 purple sweets
1 black sweet

He is going to take a sweet from the bag at random.

- (a) What is the **probability** that Fred will get a **black** sweet?
- (b) Write the missing **colour** in the sentence below.

1 mark

The probability that Fred will get a _____ sweet is $\frac{1}{4}$

1 mark

2. A rectangle has an area of 24cm^2

How long could the sides of the rectangle be?

Give three **different** examples.

_____ cm and _____ cm

_____ cm and _____ cm

_____ cm and _____ cm

2 marks

3. Look at this equation.

$$y = 2x + 10$$

(a) When $x = 4$, what is the value of y ?

1 mark

(b) When $x = -4$, what is the value of y ?

1 mark

(c) Which equation below gives the same value of y for both $x = 4$ and $x = -4$? Put a ring round the correct equation.

$y = 2x$

$y = 2 + x$

$y = x^2$

$y = \frac{x}{2}$

1 mark

4. (a) Here is an expression.

$$2a + 3 + 2a$$

Which expression below shows it written as simply as possible?

Put a ring round the correct one.

$7a$

$7 + a$

$2a + 5$

$4a + 3$

$4(a + 3)$

_____ 1 mark

(b) Here is a different expression.

$$3b + 4 + 5b - 1$$

Write this expression as simply as possible.

_____ 1 mark

5. (a) A triangle has **three equal sides**.

Write the sizes of the **angles** in this triangle.

_____° , _____° , _____°

_____ 1 mark

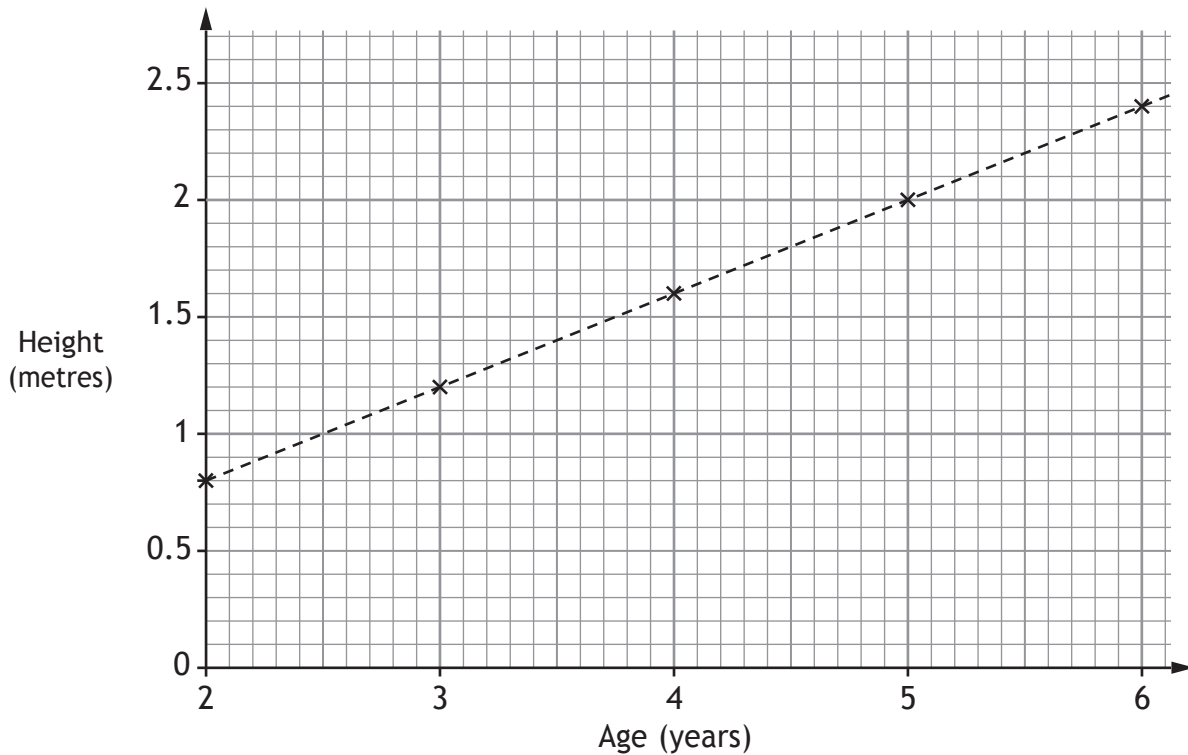
(b) A **right-angled triangle** has **two equal sides**.

Write the sizes of the **angles** in this triangle.

_____° , _____° , _____°

_____ 1 mark

6. The graph shows the average heights of fir trees of different ages.



The table shows the cost of fir trees of different heights.

	120cm to 159cm	160cm to 199cm	200cm to 239cm
Cost	£20.00	£25.00	£30.00

(a) One of these fir trees is $5 \frac{1}{2}$ years old.

How much is it likely to cost?

£

1 mark

(b) One of these fir trees costs
£25.00 How old is the tree likely
 to be?

Between _____ and _____ years old

1 mark

7. Kate buys 24 cans of lemonade.

She buys the cans in packs of 4

Each pack costs £1.20



Pack of 4
Cost £1.20

Steve buys 24 cans of lemonade.

He buys the cans in packs of 6

Each pack costs £1.60



Pack of 6
Cost £1.60

Kate pays more for her 24 cans than Steve pays for his 24 cans.

How much more?

_____ p

2 marks

8. Solve these equations.

$$32x + 53 = 501$$



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

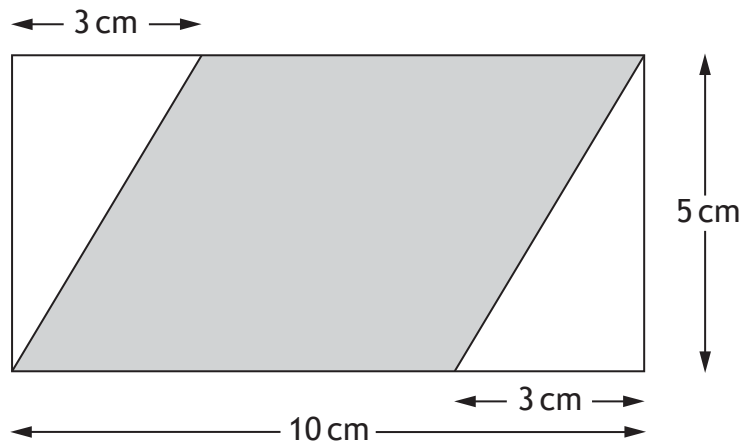
1 mark

$$375 = 37 + 26y$$

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

1 mark

9. The diagram shows a shaded parallelogram drawn inside a rectangle.



Not drawn
accurately

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

You **must** give the correct unit with your answer.

2 marks

10. Work out the missing numbers.

In each part, you can use the first line to help you.

(a)

$$\begin{array}{r} 16 \times 15 = 240 \\ \text{✎ } 16 \times \underline{\hspace{2cm}} = 480 \end{array}$$

1 mark

(b)

$$\begin{array}{r} 46 \times 44 = 2024 \\ \text{✎ } 46 \times 22 = \underline{\hspace{2cm}} \end{array}$$

1 mark

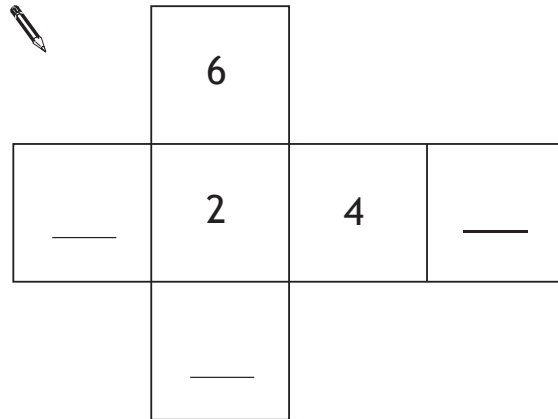
(c)

$$\begin{array}{r} 600 \div 24 = 25 \\ \text{✎ } 600 \div \underline{\hspace{2cm}} = 50 \end{array}$$

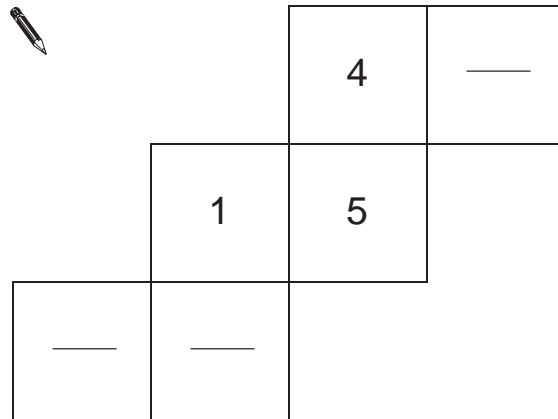
1 mark

11. The diagrams show nets for dice.
Each dice has six faces, numbered 1 to 6

Write the missing numbers so that the numbers on opposite faces add to 7



_____ 1 mark



_____ 1 mark

12. Work out :

a) $2 + 3^2 \times 2 =$

1 mark

b) $4^2 + 2^2 \div 4 =$

1 mark

13. Work out the number of boys and girls in each class below.

(a) In class 8M, there are **27 pupils**.

There are **twice as many boys** as girls.

Number of boys	Number of girls
-----	-----

 1 mark

(b) In class 8K, there are **28 pupils**.

There are **two more boys** than girls.

Number of boys	Number of girls
-----	-----

 1 mark

(c) In class 8T, there are **9 boys**.

The ratio of boys to girls is **1:2**

Number of boys	Number of girls
-----	-----

 1 mark

14. Here is some information about all the pupils in class 9A.

	girls	boys
right-handed	13	14
left-handed	1	2

A teacher is going to choose a pupil from 9A at random.

- (a) What is the probability that the pupil chosen will be a **girl**?

 1 mark

- (b) What is the probability that the pupil chosen will be **left-handed**?

 1 mark

- (c) The teacher chooses the pupil at random. She tells the class the pupil is **left-handed**.

What is the probability that this left-handed pupil is a **boy**?

 1 mark

15. Write these expressions as simply as possible.

$$9 - 3k + 5k = \dots\dots\dots$$

 1 mark

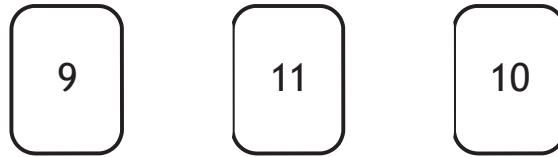
$$k^2 + 2k + 4k = \dots\dots\dots$$

 1 mark

$$3k \times 2k = \dots\dots\dots$$

 1 mark

16. (a) Look at these three numbers.



Show that the **mean** of the three numbers is **10**

1 mark

Explain why the **median** of the three numbers is **10**

1 mark

(b) Four numbers have a mean of 10 and a median of 10, but **none** of the numbers is 10

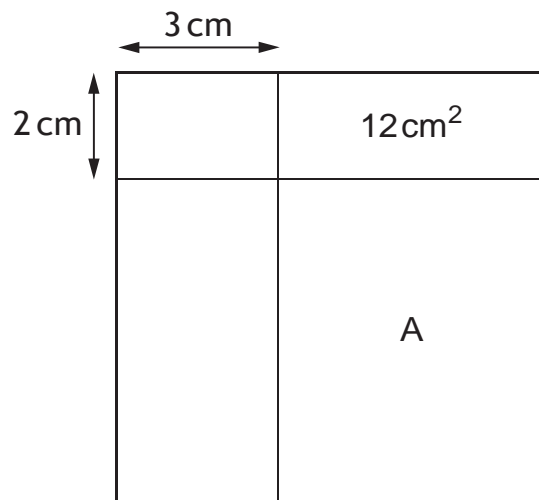
What could the four numbers be?

Give an example.

Four empty rounded rectangular boxes are arranged horizontally, intended for the student to write an example of four numbers.

1 mark

17. The diagram shows a **square**.
Two straight lines cut the square into four
rectangles. The area of one of the rectangles is
shown.



Not drawn
accurately

Work out the area of the rectangle marked A.

..... cm²

2 marks

18. (a) Look at this information.

Two numbers **multiply** to make zero.

One of the statements below is true. Tick(✓) the true statement

Both numbers must be zero.

At least one number must be zero.

Exactly one number must be zero.

Neither number can be zero.

1 mark

(b) Now look at this information.

Two numbers **add** to make zero.

If **one** number is **zero**, what is the other number?

.....

1 mark

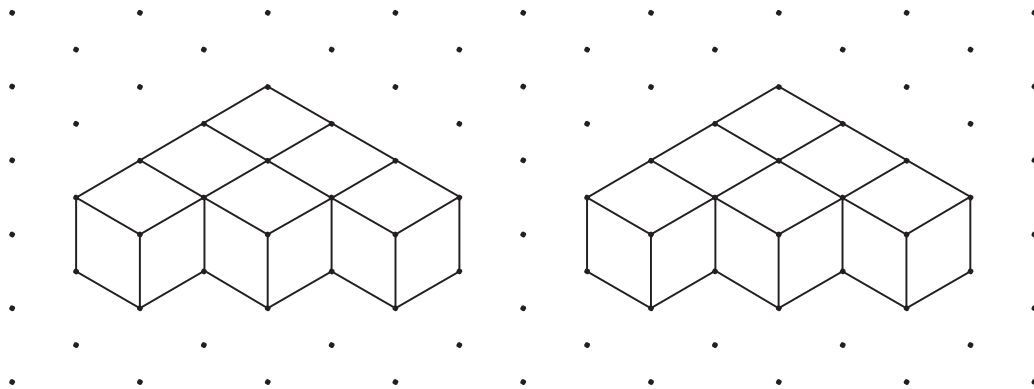
If **neither** number is **zero**, give an example of what the numbers could be.



..... and

1 mark

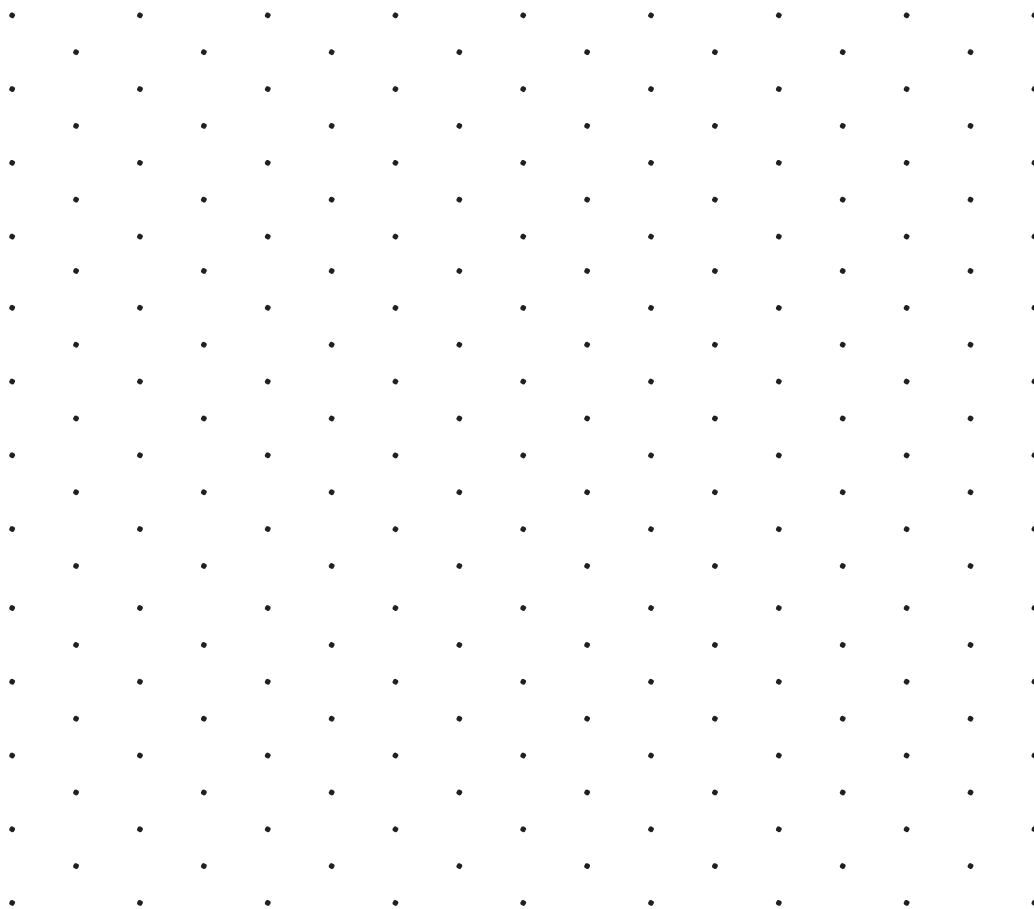
19. I join six cubes face to face to make each 3-D shape below.



Isometric grid

Then I join the 3-D shapes to make a cuboid.

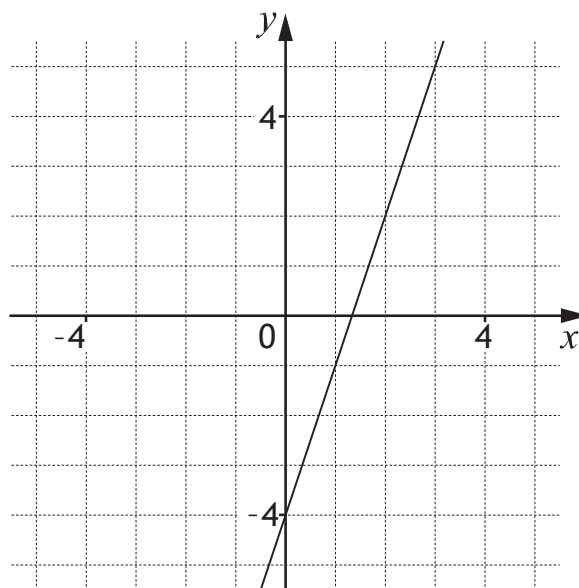
Draw this cuboid on the grid below.



2 marks

Isometric grid

20. The graph shows the straight line with equation $y = 3x - 4$



- (a) A point on the line $y = 3x - 4$ has an **x-coordinate of 50**
What is the **y-coordinate** of this point?

1 mark

- (b) A point on the line $y = 3x - 4$ has a **y-coordinate of 50**
What is the **x-coordinate** of this point?

1 mark

- (c) Is the point $(-10, -34)$ on the line $y = 3x - 4$?

Yes No

Show how you know.

1 mark

21. Work out

$$\frac{1}{4} + \frac{1}{3} =$$

1 mark

$$\frac{3}{5} - \frac{1}{15} =$$

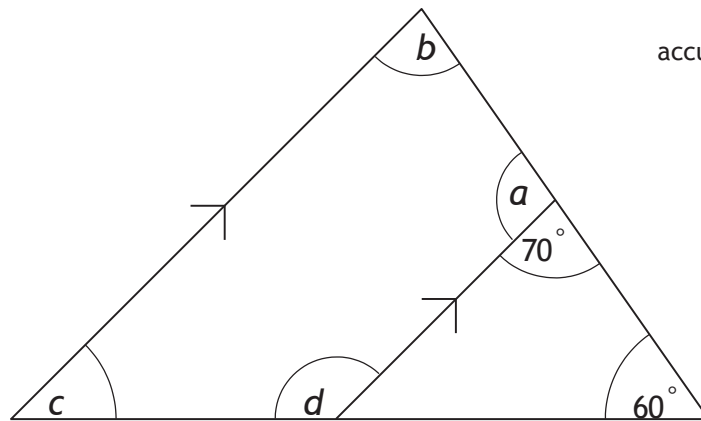
1 mark

1 mark

End of Section A

SECTION B

1. Look at the diagram, made from four straight lines. The lines marked with arrows are parallel.



Not drawn
accurately

Work out the sizes of the angles marked with letters and give reasons.

$$a = \underline{\hspace{2cm}}^\circ$$

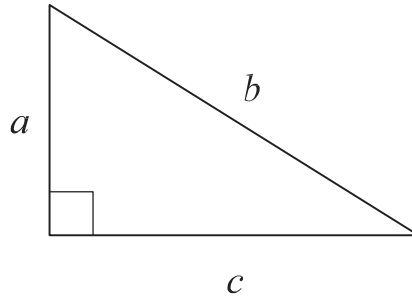
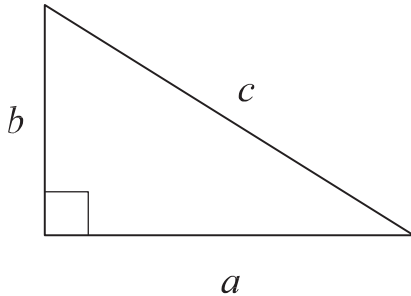
$$b = \underline{\hspace{2cm}}^\circ$$

$$c = \underline{\hspace{2cm}}^\circ \quad d = \underline{\hspace{2cm}}^\circ$$

4 marks

2. (a) In which triangle below does

$a^2 + b^2 = c^2$ Tick (✓) the correct triangle.

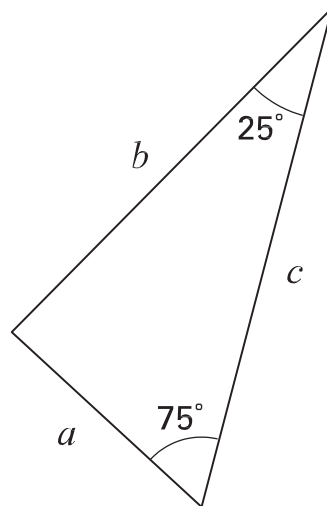
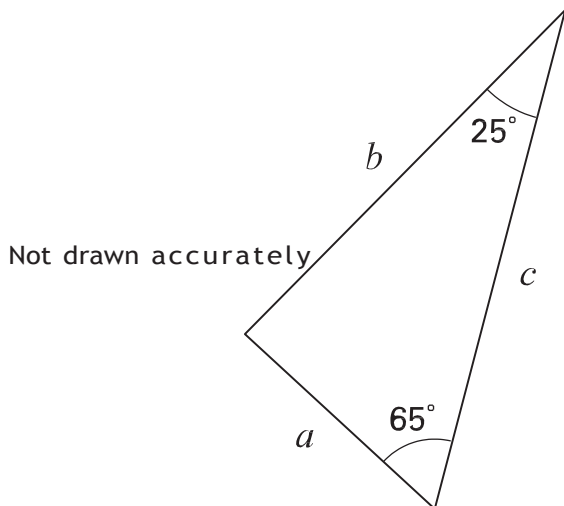


(a) For the **other** triangle, write an equation linking a , b and c

1 mark

(b) In which triangle below does

$a^2 + b^2 = c^2$? Tick (✓) the correct triangle.

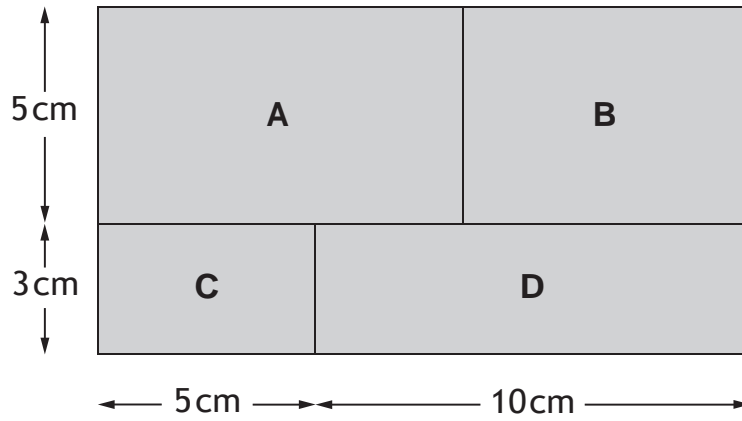


For the **other** triangle, explain why $a^2 + b^2$ does not equal c^2

1 mark

3. The diagram shows a shaded rectangle.

It is divided into four smaller rectangles, labelled A, B, C and D.



Not
drawn
accurately

The ratio of area C to area B is 1 : 2

Calculate area A.

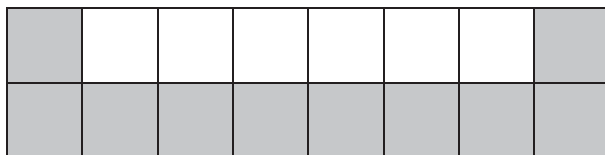
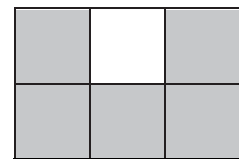
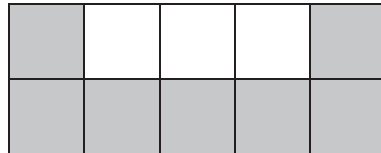
_____ cm²

2 marks

4. Each pattern below shows a square grid that is 2 squares high.

Only one square at each end of the top row is shaded.

All squares in the bottom row are shaded.



Imagine one of these patterns that has n squares in the bottom row.

Write an expression for the **fraction** of the pattern that is shaded.

5. Alan has a guessing game on his computer.
He estimates that the probability of **winning** each game is **0.35**

Alan decides to play **20** of these games.

(a) How many of these games should he expect to **win**?

1mark

Sue played the same computer game.

She won **12** of the games she played, and so
she estimated the probability of winning each game to be **0.4**

(b) How many games did Sue play? Show
your working.

2marks

The manufacturers of another guessing game claim that the probability of
winning each game is **0.65**

Karen plays this game **200** times and **wins 124** times. She says:

‘The manufacturers must be wrong’.

(c) Do you agree with her? Tick (✓) Yes or No.

Yes No

Explain your answer.

1 mark

End of Section B

