

**Wednesday 4 November 2015 – Morning**

**GCSE MATHEMATICS B**

**J567/03** Paper 3 (Higher Tier)

Candidates answer on the Question Paper.

**OCR supplied materials:**  
None

**Other materials required:**

- Geometrical instruments
- Tracing paper (optional)

**Duration:** 1 hour 45 minutes



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The quality of written communication is assessed in questions marked with an asterisk (\*).
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

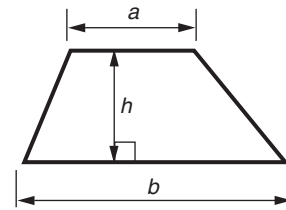
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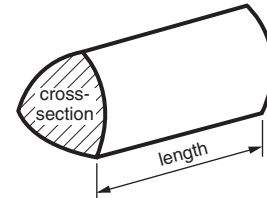
No calculator can be used for this paper

## Formulae Sheet: Higher Tier

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



**Volume of prism** = (area of cross-section)  $\times$  length

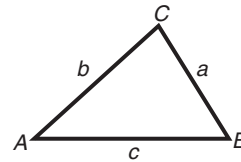


**In any triangle ABC**

**Sine rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

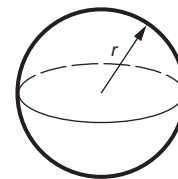
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of triangle** =  $\frac{1}{2}ab \sin C$



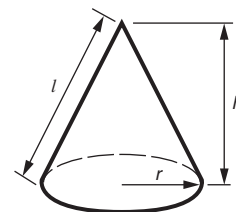
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**Surface area of sphere** =  $4\pi r^2$



**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

**Curved surface area of cone** =  $\pi r l$



**The Quadratic Equation**

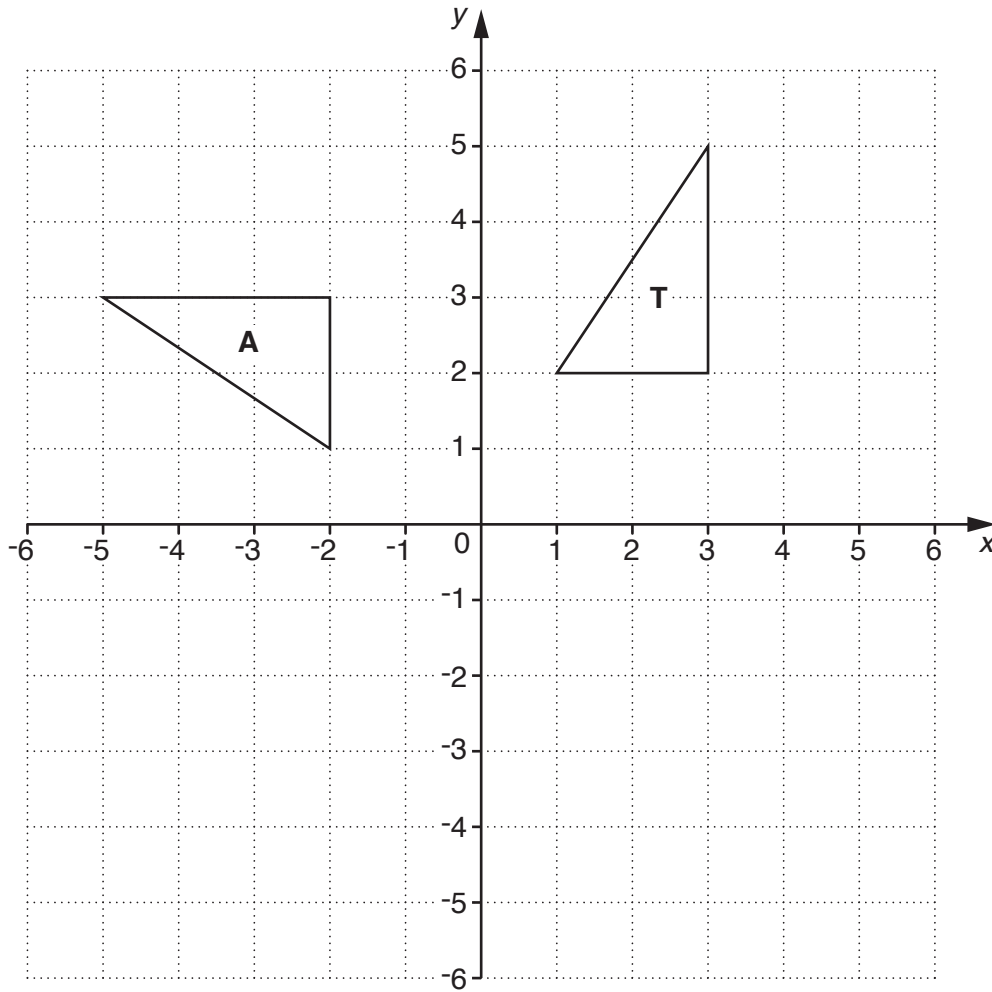
The solutions of  $ax^2 + bx + c = 0$ ,  
where  $a \neq 0$ , are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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Answer **all** the questions.

- 1 The diagram shows two triangles on a square grid.



- (a) Translate triangle **T** by the vector  $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$ .

Label the image **P**.

[2]

- (b) Rotate triangle **T** through  $180^\circ$  about centre  $(-1, 0)$ .

Label the image **R**.

[2]

- (c) Describe the **single** transformation that maps triangle **T** onto triangle **A**.

..... [3]

2 Here are the first four terms of a sequence.

11    19    27    35

Write an expression for the  $n$ th term of this sequence.

..... [2]

3 (a) Harry makes a pastry mixture using butter and flour in the ratio 1 : 2.

Work out how much butter he needs to make 600g of the mixture.

(a) ..... g [2]

(b) Pru makes a croissant mixture using butter and flour in the ratio 4 : 5.

Work out how much butter she needs to mix with 200g of flour.

(b) ..... g [2]

4 (a) Find the value of  $4x^2 - 3$  when

(i)  $x = 5$ ,

(a)(i) ..... [1]

(ii)  $x = -10$ .

(ii) ..... [1]

(b) Multiply out the brackets.

$$10(2x + 5)$$

(b) ..... [1]

(c) Factorise.

$$5a + 20$$

(c) ..... [1]

(d) Solve.

$$5x - 7 = 3x + 16$$

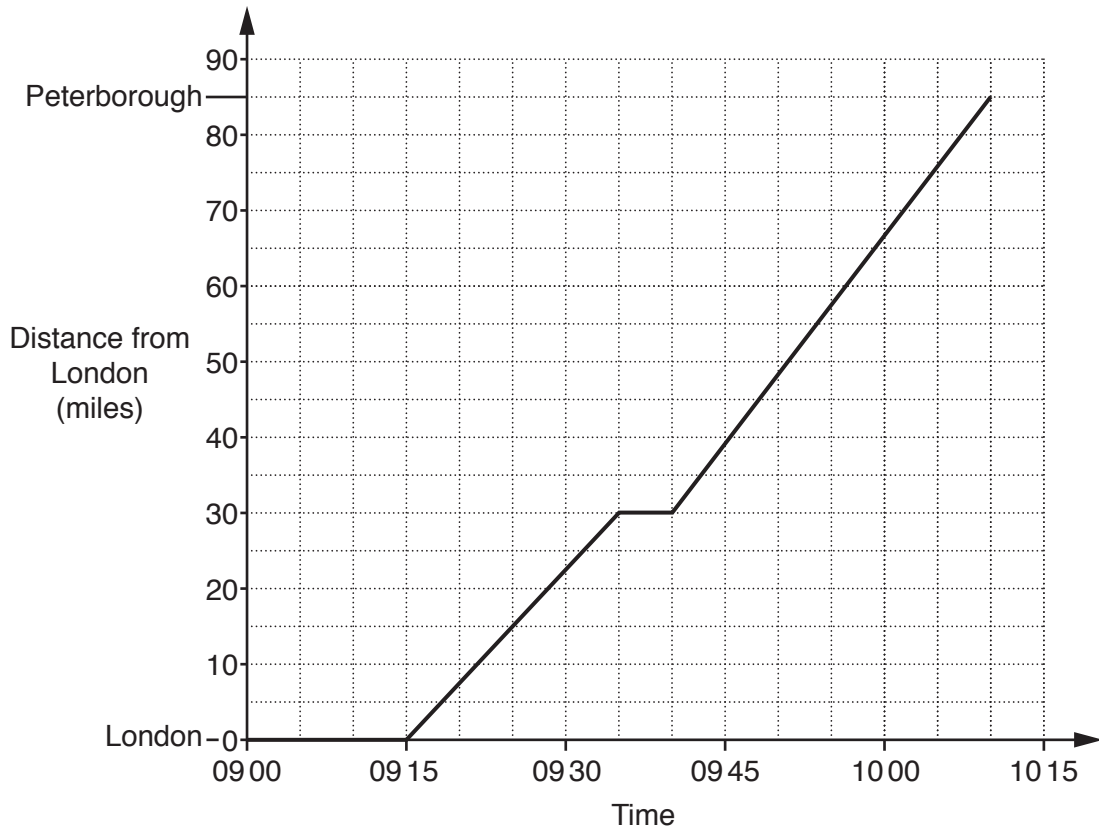
(d)  $x =$  ..... [3]

6

(e) Rearrange  $y = 5x^2 - 3$  to make  $x$  the subject.

(e) ..... [3]

- 5 The graph shows the journey of a train from London to Peterborough. On the journey the train makes a stop at Stevenage.



Use the graph to answer these questions.

- (a) What time does the train arrive at Stevenage?

(a) ..... [1]

- (b) Work out the average speed of the train between Stevenage and Peterborough. Give your answer in miles per hour.

(b) ..... mph [2]

- (c) Another train leaves Peterborough at 09 25 and takes 45 minutes to get to London. It travels at a constant speed.

Show this on the graph.

[2]

- (d) At what time do the two trains pass each other?

(d) ..... [1]

6 The mean of  $a, b, c$  is 5.

Find an expression for the mean of  $b$  and  $c$  in terms of  $a$ .

..... [3]

7 In the table there are five statements.

The statements are true for some numbers and false for other numbers.

For each statement give an example for which it is true and an example for which it is false.

Choose numbers which are between 0 and 20.

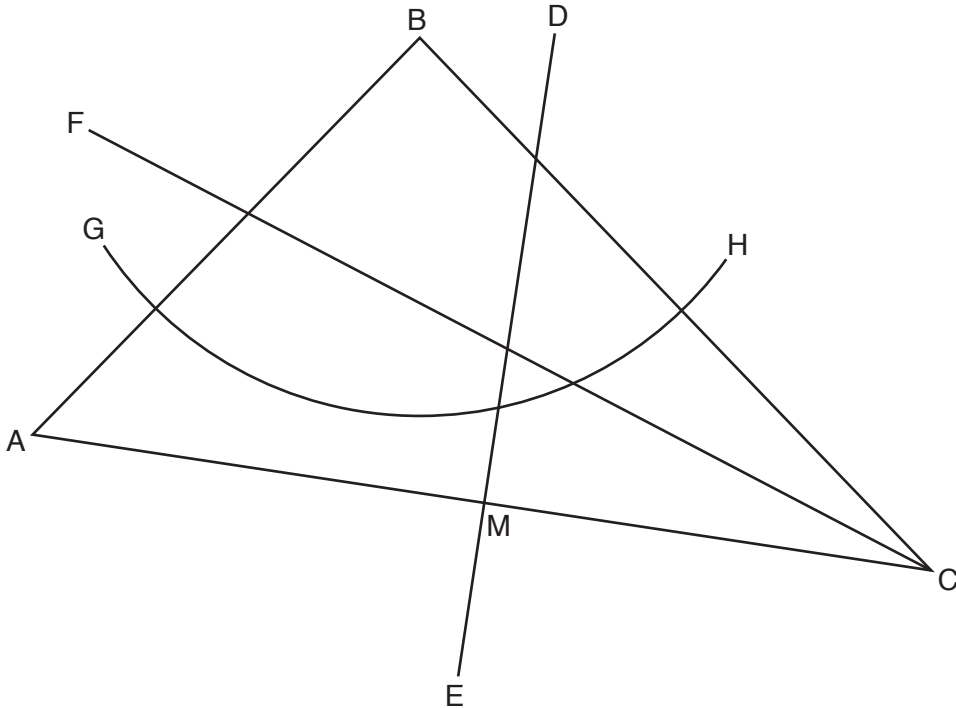
The first one has been done for you.

Statement	True	False
Prime numbers are odd.	5	2
The square of a number is larger than the number.	.....	.....
The highest common factor (HCF) of <b>two numbers</b> is smaller than both numbers.	..... and .....	..... and .....
A number has an even number of factors.	.....	.....
The reciprocal of a number is smaller than the number.	.....	.....

[4]



- 8 The diagram shows triangle ABC.  
 M is the midpoint of AC.  
 DE intersects AC at right angles.  
 CF bisects angle ACB.  
 Arc GH is part of the circle with centre B and radius 5 cm.



(a) Complete this statement for the line DE.

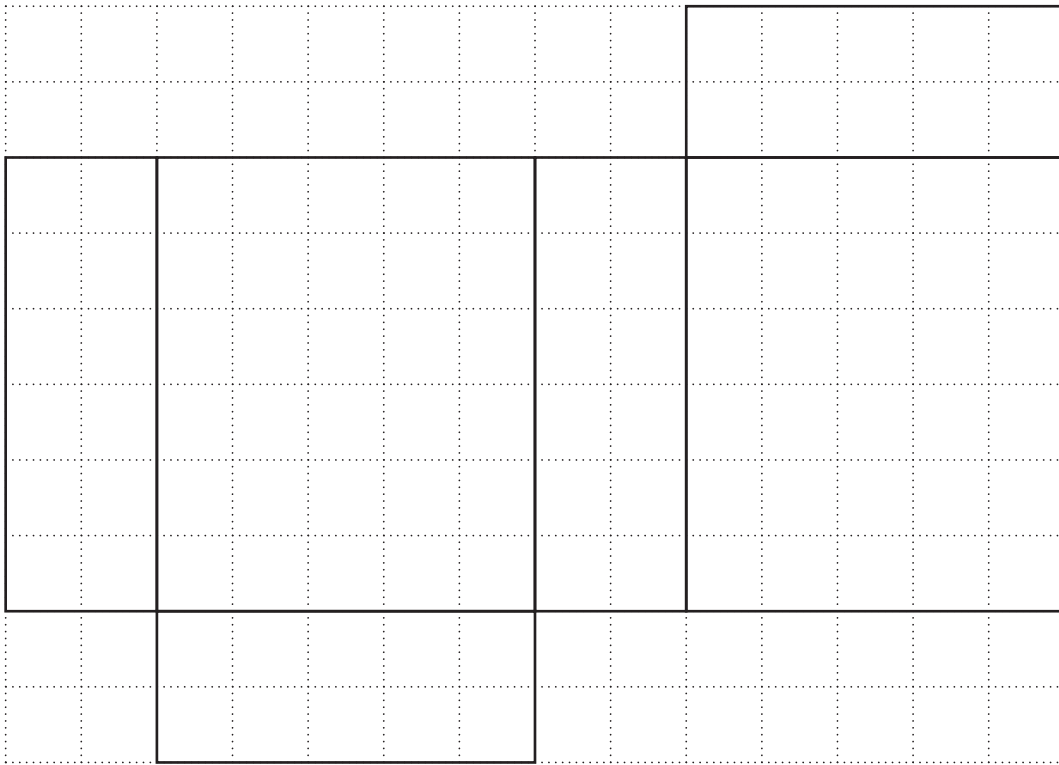
DE is the ..... of AC. [2]

(b) Shade the region inside triangle ABC which is:

- nearer to A than C
- nearer to AC than to BC
- no further than 5 cm from B.

[2]

- 9 A net of a cuboid is drawn on a one-centimetre square grid.



Work out the volume of the cuboid.  
Give the units of your answer.

..... [3]

10 Mustafa carries out a consumer survey in his town.

(a) He wants to find out the ages of the people in his survey.

Criticise each of the following two questions.

(i)

How old are you?  
Write your age in the box.                      Age =

.....  
..... [1]

(ii)

What is your age?  
Put a tick in the correct box.

0–20       20–40       40–60       over 60

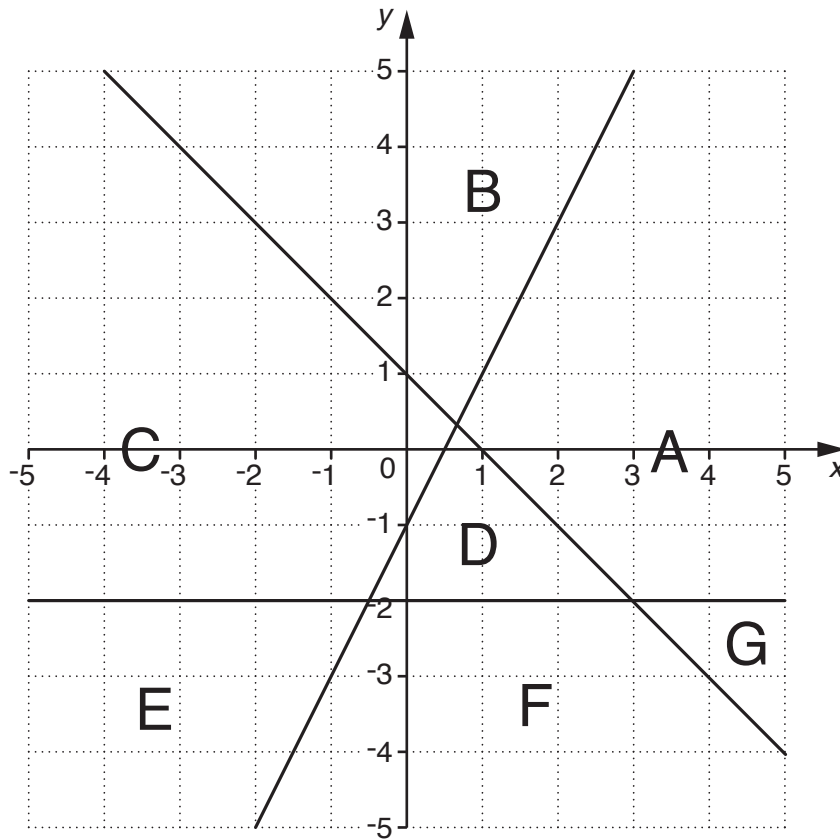
.....  
..... [1]

(b) Mustafa wants to find out how many pints of milk each household buys in a week.

Write a question he could use and include suitable option boxes.  
Use 20 pints as the maximum number in a week.

[2]

11 A, B, C, D, E, F and G represent regions.



(a) Which of these regions satisfy the inequality  $y \geq 2x - 1$ ?

(a) ..... [1]

(b) Region A is defined by three inequalities. One of these is  $y \geq -2$ .

Write down the other two inequalities.

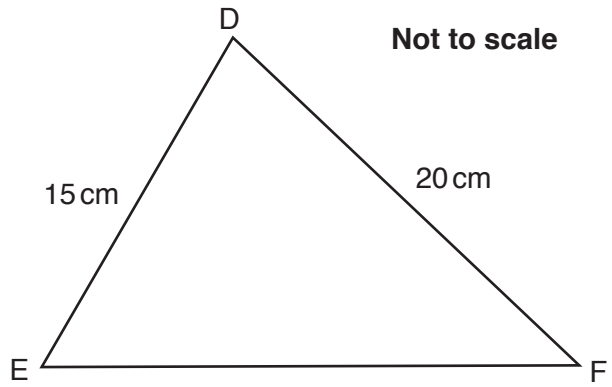
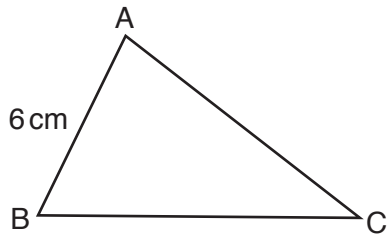
(b) .....

..... [3]



14

13 Triangles ABC and DEF are similar.



Work out the length of AC.

..... cm [3]

14 (a) Factorise.

$$x^2 - 100$$

(a) ..... [1]

(b) Solve by factorisation.

$$x^2 + 21x - 100 = 0$$

(b) ..... [3]

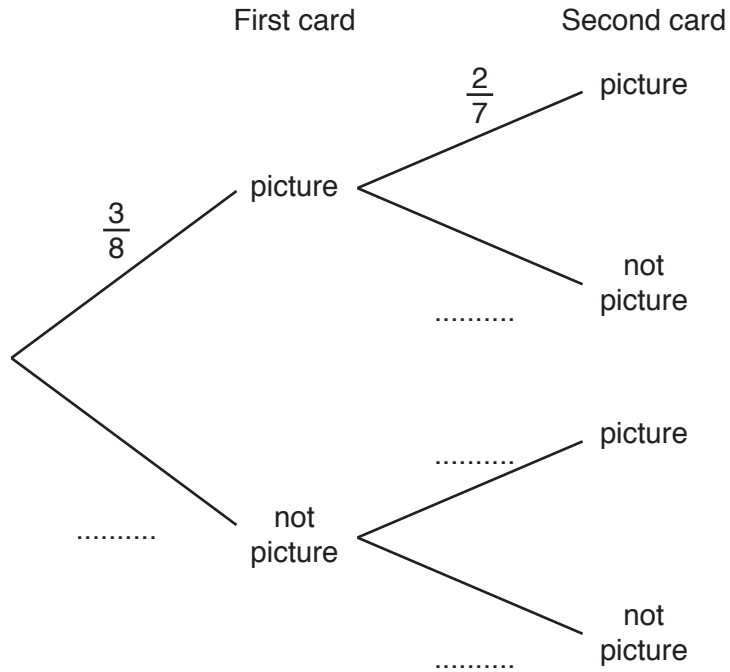
(c) Write as a single fraction, simplifying your answer.

$$\frac{8}{x-3} + \frac{2}{x+5}$$

(c) ..... [3]

- 15 Gemma has 8 playing cards: 6, 7, 8, 9, 10, Jack, Queen and King. The Jack, Queen and King are called picture cards. She mixes the cards up and picks two cards at random and keeps them both.

(a) Complete the tree diagram below.



[2]

(b) Work out the probability that at least one of her two cards is a picture card.

(b) ..... [3]



16 The point (6, 4) is translated to the point (166, 74) using two translations.

The first translation is by vector  $h \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ .

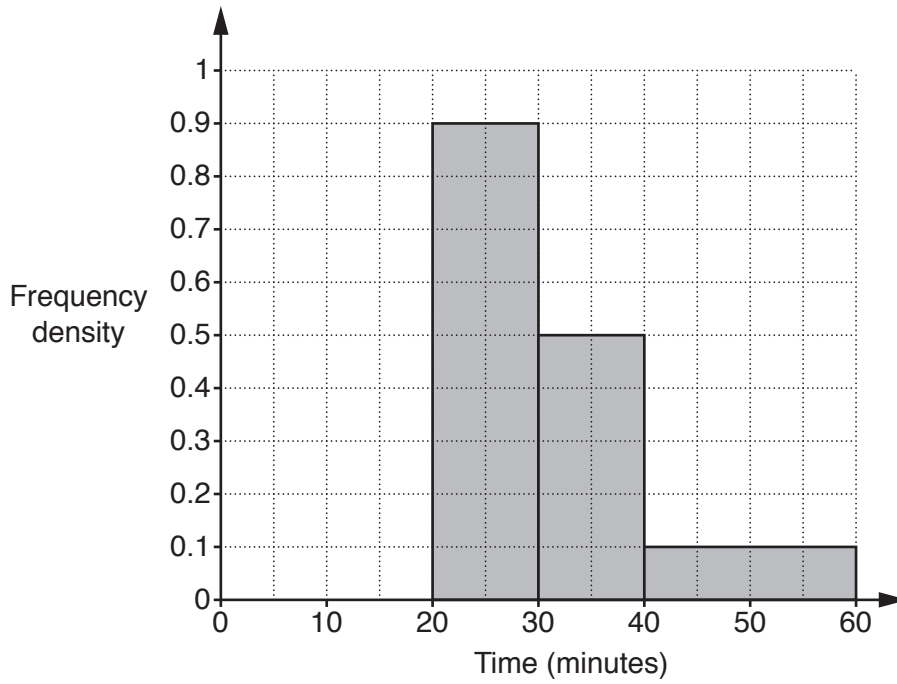
The second translation is by vector  $k \begin{pmatrix} 4 \\ -1 \end{pmatrix}$ .

Work out the values of  $h$  and  $k$ .

$h = \dots\dots\dots$

$k = \dots\dots\dots$  [5]

17 Isobel gives a puzzle to some people and records how long they take to solve it. Some of her results are summarised in the histogram.



(a) Four people took 20 minutes or less to solve it.

Complete the histogram.

[1]

(b) Work out the percentage of the people who took 30 minutes or more.

(b) .....% [4]

18 Work out, giving your answers in standard form.

(a)  $(6.8 \times 10^4) \div (2 \times 10^{-3})$

(a) ..... [2]

(b)  $(3 \times 10^4) \times (4 \times 10^5)$

(b) ..... [2]

19 (a) Work out.

$$16^{-\frac{3}{2}}$$

(a) ..... [3]

(b) Write as a fraction in its simplest form.

$$0.\dot{5}0\dot{4}$$

(b) ..... [3]

- 20  $y$  is inversely proportional to the square of  $x$ .  
 $y = 10$  when  $x = 5$ .

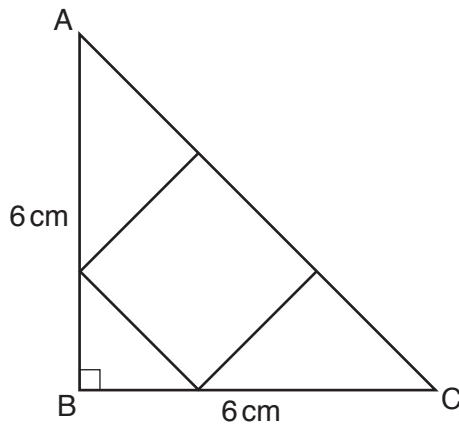
Express  $y$  in terms of  $x$ .

..... [3]

21 The diagram shows an isosceles right-angled triangle ABC.

AB = BC = 6 cm

A square is drawn inside the triangle so that its corners are on the three sides as shown in the diagram.



- (a) Show that the side of the square is  $2\sqrt{2}$ .  
Show your working clearly.

[5]

- (b) Work out the area of the square in its simplest form.

(b) ..... cm<sup>2</sup> [1]

END OF QUESTION PAPER

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