

THE G C SCHOOL OF CAREERS



MATHEMATICS DEPARTMENT SCHOOL YEAR 2019-2020

SAMPLE EXAMINATION PAPER FORM 3

| | |
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| <u>Name:</u> | |
|--------------|--|

INFORMATION TO CANDIDATES

Full marks may be obtained for answers to ALL questions.

This paper has **23** questions.

The total marks for this paper is **135**. The marks for parts of questions are shown in round brackets.

You may use a calculator.

ADVICE TO CANDIDATES

You must show sufficient working to make your methods clear to the examiner.

Answers without working may gain no credit.

1. Evaluate the following. Show sufficient workings.

(a) $3^{-3} =$

(2 marks)

(b) $25^{\frac{1}{2}} =$

(2 marks)

(c) $\left(\frac{16}{9}\right)^{\frac{3}{2}} =$

(3 marks)

2. The width of a rectangle is x cm and its length is $(x + 2)$ cm.

The diagonal of the rectangle is 4 cm longer than its width.
Form an equation in x and solve it to find the value of x .

(5 marks)

3. Solve the equation $2x^2 - 8x + 7 = 0$. Give your answers correct to 3 significant figures.

(5 marks)

4. (a) Factorise the expression $6x^2 + 13x - 5$ completely.

(2 marks)

(b) Simplify fully $\frac{x^2 - 2x - 15}{x^2 - 5x} \div \frac{x^2 - 9}{2x - 6}$.

(5 marks)

5. Solve the following equations.

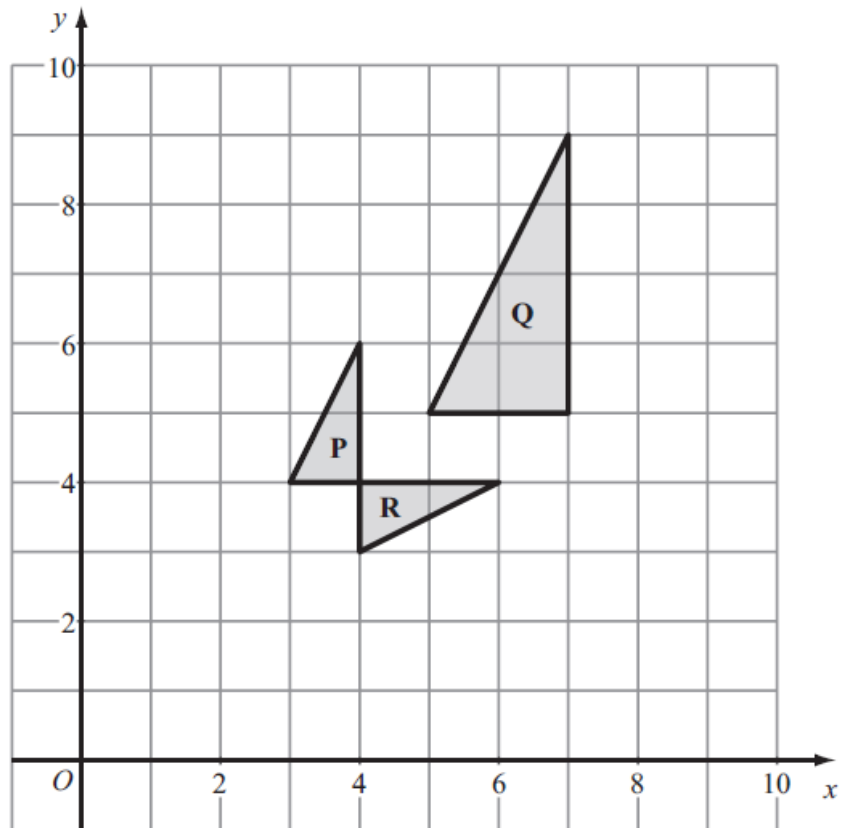
(a) $3x(x - 4)(1 - x) = 0$

(3 marks)

(b) $5x^2 + 2x = 3$

(4 marks)

6.



(a) Describe fully the single transformation that maps triangle **P** onto triangle **Q**.

Answer: _____

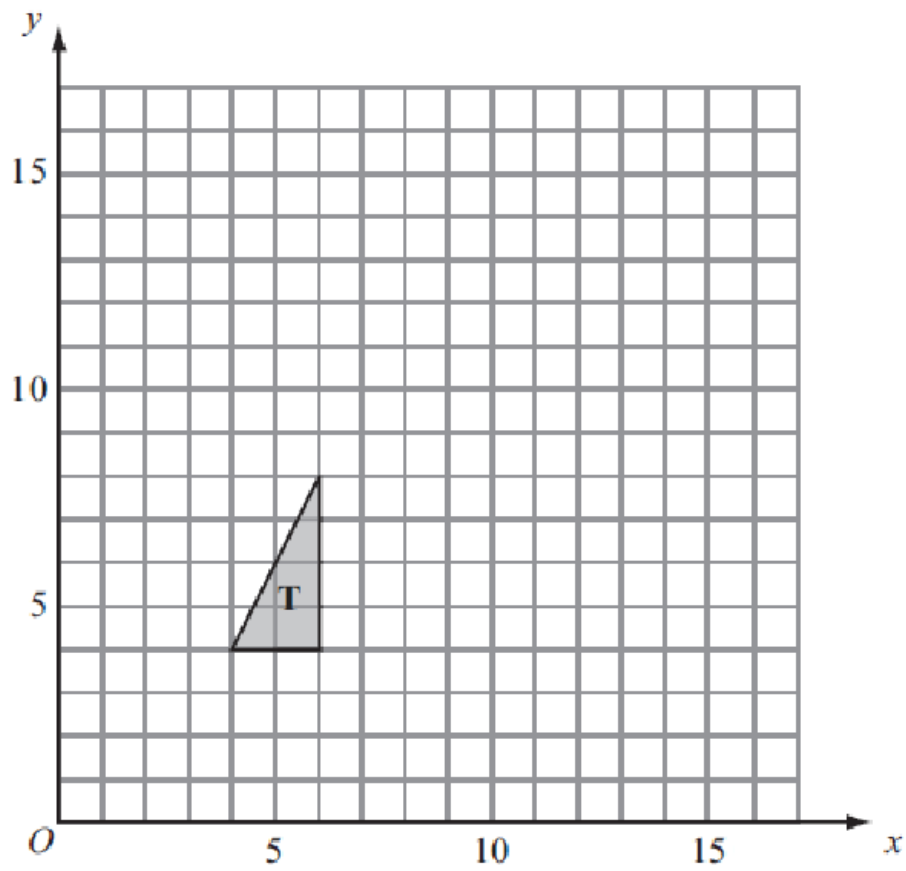
(2 marks)

(b) Describe fully the single transformation that maps triangle **P** onto triangle **R**.

Answer: _____

(2 marks)

7.



(a) On the grid, translate triangle **T** $\begin{pmatrix} 9 \\ -2 \end{pmatrix}$ to form image **P**.

(2 marks)

(b) Rotate triangle **T**, 90° clockwise, about the point $(10,4)$ to form image **Q**.

(2 marks)

8. A, B, C and D are points on a circle. ABE and DCE are straight lines.

AT is a tangent to the circle. DCE is parallel to AT .
 Angle $EAT = 47^\circ$. Angle $BAD = 56^\circ$.

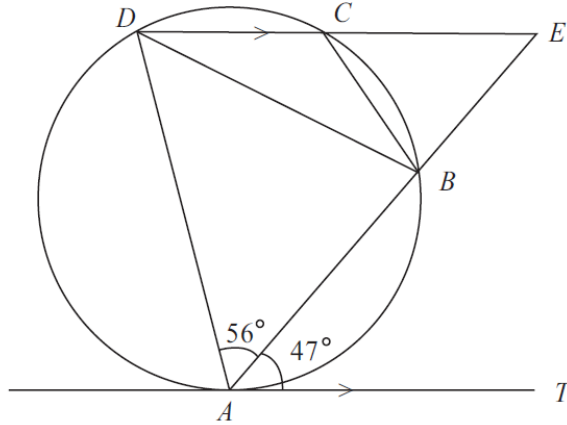


Diagram **NOT** accurately drawn

(a) Find the size of angle AED .
 Give a reason for your answer.

(2 marks)

(b) Find the size of angle BCD .
 Give a reason for your answer.

(2 marks)

(c) Find the size of angle ADB .
 Give a reason for your answer.

(2 marks)

9. Solve the quadratic inequality $x^2 - 4x - 21 \leq 0$.

(4 marks)

10. D is inversely proportional to the square root of H .

Given that $D = 5$ and $H = 225$,

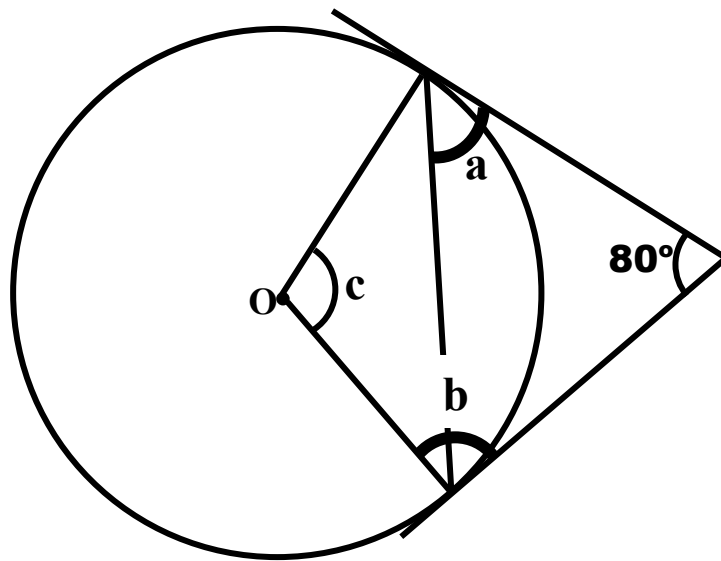
(a) Find a formula for D in terms of H .

(3 marks)

(b) Calculate D when $H = 25$.

(1 mark)

11. Find the angles marked with letters. **O** is the centre of the circle



i. $a = \underline{\hspace{2cm}}$

Give a reason for your answer.

(2 marks)

ii. $b = \underline{\hspace{2cm}}$

Give a reason for your answer.

(2 marks)

iii. $c = \underline{\hspace{2cm}}$

Give a reason for your answer.

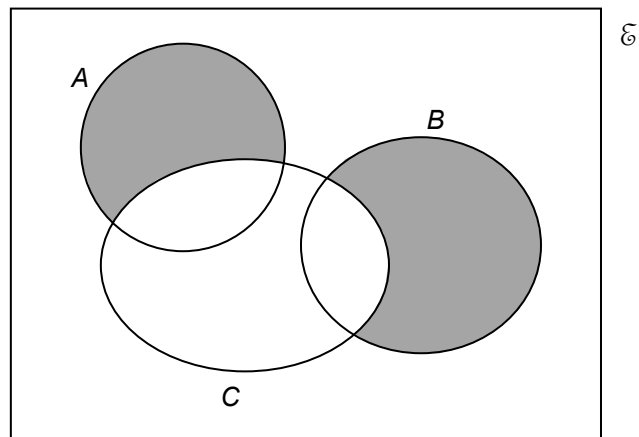
(2 marks)

12. Express the following recurring decimal as fraction in its simplest form.

$$0.\dot{3}2\dot{1}$$

(3 marks)

13. Describe, in set notation, the region shaded in the Venn diagram given below.



(1 mark)

14.

- (a) By writing these numbers correct to 1 significant figure, work out an estimate for the following. Show all your working.

$$\frac{79.98 + 11.11}{7.12 - 2.84}$$

(3 marks)

- (b) By writing these numbers in standard form correct to 1 significant figure, work out an estimate for the following in standard form to 1 significant figure. Show all your working.

$$\frac{39861 \times \sqrt{912}}{0.0214}$$

(3 marks)

15. In a school, students must take at least one of these subjects: Maths, Physics or Chemistry.
In a group of 50 students, 7 take all three subjects, 9 take Physics and Chemistry only, 8 take Maths and Physics only and 5 take Maths and Chemistry only. Of these 50 students, x take Maths only, x take Physics only and $x + 3$ take Chemistry only.

(a) Draw a Venn diagram showing the above information.

(4 marks)

(b) Construct an equation and solve it to find the value of x .

(3 marks)

(c) Hence, find the number of students taking Maths.

(1 mark)

17. Find the value of x , if $8^{2x-1} = 2^{2x+5}$.

(3 marks)

18. ABE and CDE are straight lines. BE = 4cm, CD = 9cm and DE = 3cm.

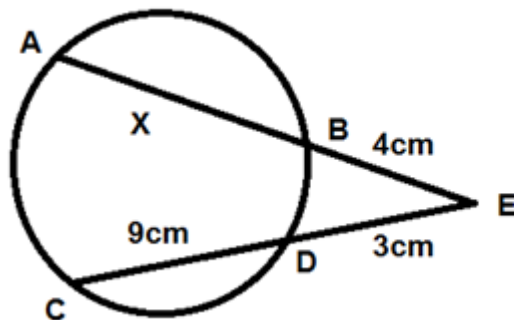


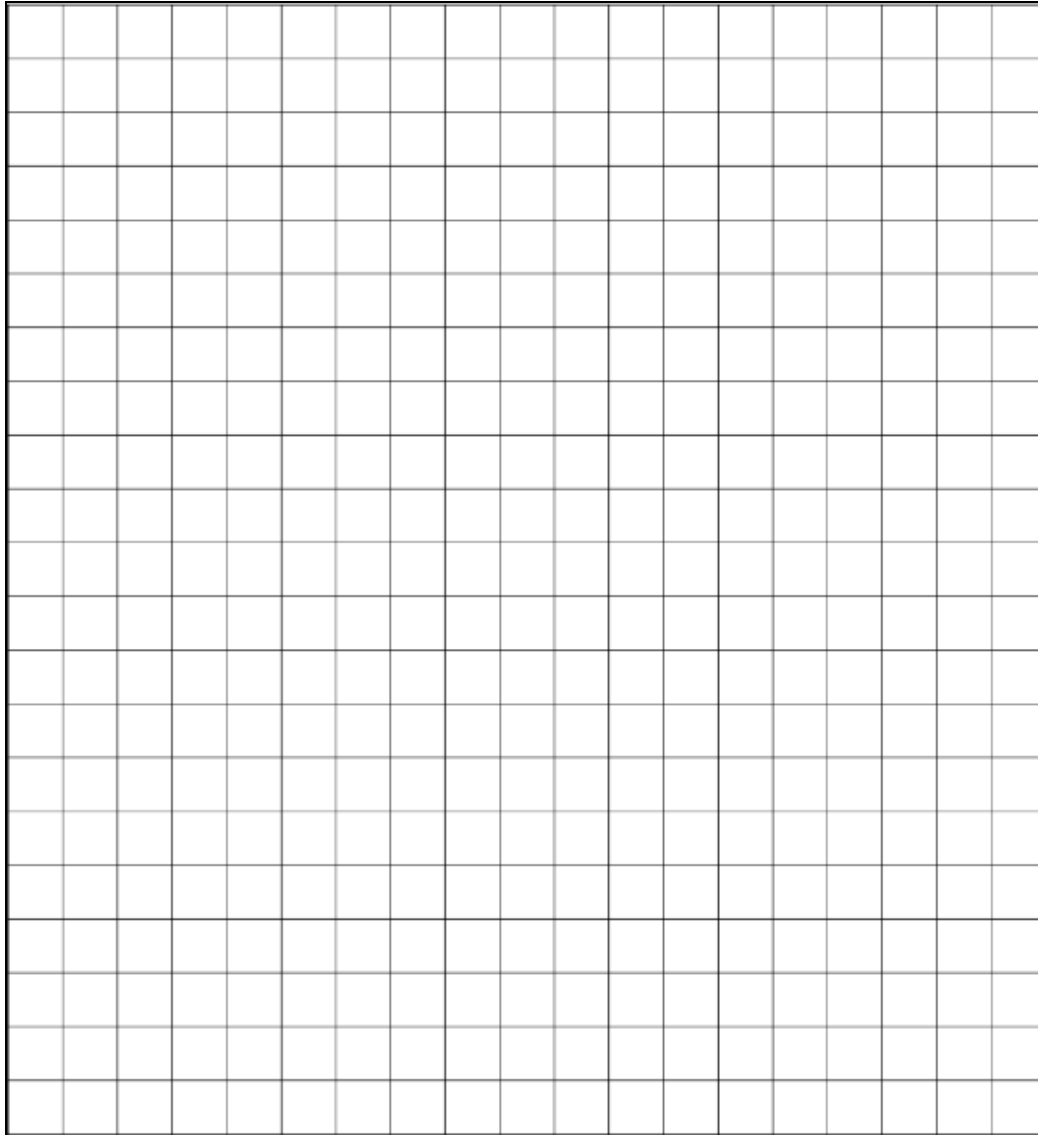
Diagram not
accurately drawn

Given that $AB = x$, find x .

(3 marks)

19.

(a) Draw the graph of $y = x^2 - 2x + 1$, for $-3 \leq x \leq 3$.



(3 marks)

(b) Use your graph to find an estimate for the minimum value of y .

(1 mark)

(c) Write down the equation of the line of symmetry.

(1 mark)

(d) Draw a suitable line in order to find the solutions of the equation

$$x^2 - 2x + 1 = 4$$

(2 marks)

(e) Draw a suitable line in order to find the solutions of the equation

$$x^2 - x = 1$$

(3 marks)

20.

$$a = \frac{v - u}{t}$$

$v = 37.6$ correct to 3 significant figures.

$u = 11.3$ correct to 3 significant figures.

$t = 8.4$ correct to 2 significant figures.

Work out the upper bound for the value of a .
Show your working clearly.

(5 marks)

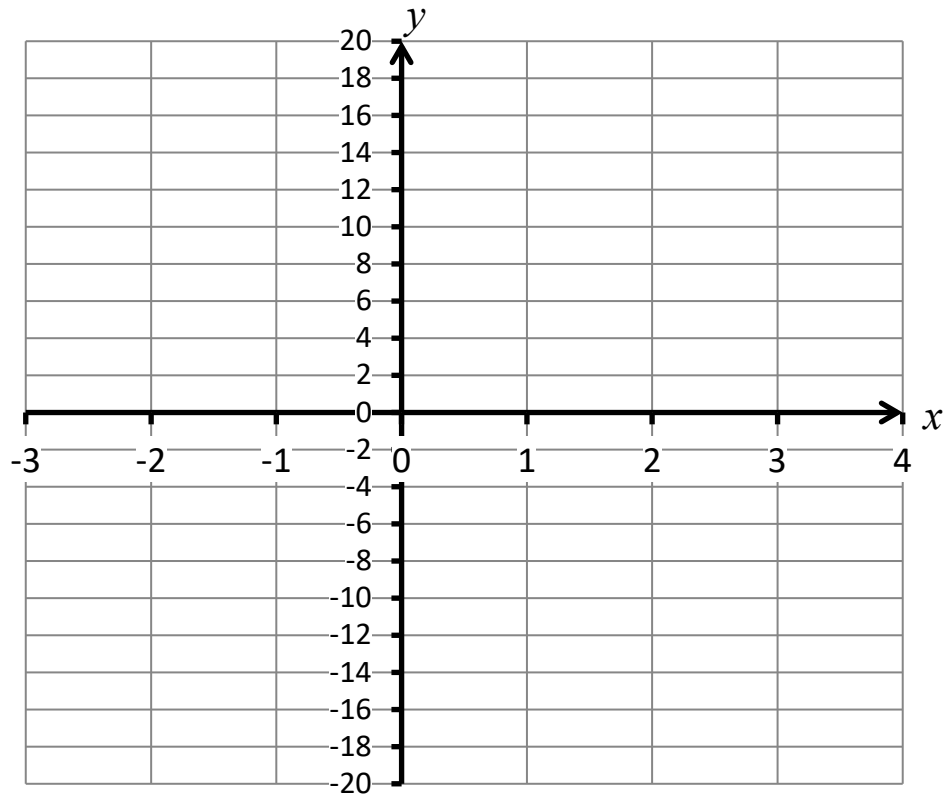
21.

(a) Complete the table of values for $y = x^3 - 12x + 2$.

| | | | | | | | | |
|-----|----|----|----|---|----|---|----|----|
| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | 11 | | 13 | 2 | -9 | | -7 | 18 |

(1 mark)

(b) On the grid given below, draw the graph of $y = x^3 - 12x + 2$, for the values of x from -3 to 4.



(2 marks)

(c) Use your graph to find **the number of solutions** to the equation

$$x^3 - 8x - 6 = 0.$$

Show clearly all your workings.

(4 marks)

22. Here is a list of the number of goals scored by a netball team in each of its first 9 games of the season.

5 8 5 2 2 1 3 2 8

(a) Find the mode.

(1 mark)

(b) Work out the range.

(1 mark)

(c) Find the median number of goals scored.

(3 marks)

(d) Find the inter-quartile range of the number of goals scored

(3 marks)

(e) Work out the mean number of goals scored.

(3 marks)

(f) The number of goals scored by the team in its 10th game was 7.

(i) Will the mean number of goals scored in all 10 games be more, less or the same as the mean found in (d)?

Tick (✓) the appropriate box.

more

less

the same

(ii) Give a reason for your answer.

(2 marks)

23. The table shows some information about the times, in minutes, 60 people took to get to work.

| Time (x minutes) | Frequency | | |
|---------------------|-----------|--|--|
| $0 < x \leq 10$ | 5 | | |
| $10 < x \leq 30$ | 11 | | |
| $30 < x \leq 50$ | 23 | | |
| $50 < x \leq 80$ | 13 | | |
| $80 < x \leq 100$ | 8 | | |

(a) Calculate an estimate for the mean.

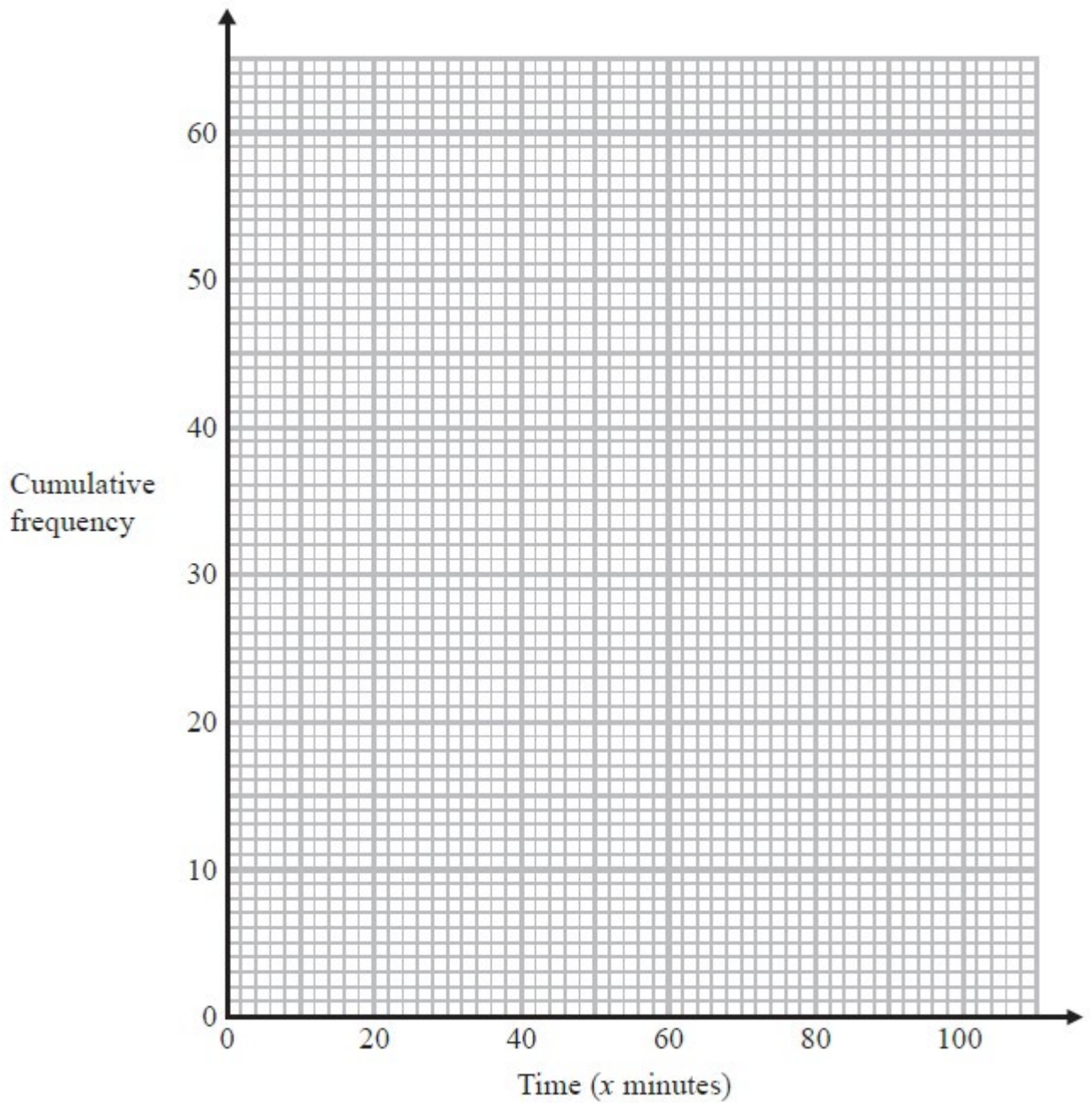
(4 marks)

(b) Complete the cumulative frequency table.

| Time (x minutes) | Cumulative frequency |
|---------------------|----------------------|
| $0 < x \leq 10$ | |
| $0 < x \leq 30$ | |
| $0 < x \leq 50$ | |
| $0 < x \leq 80$ | |
| $0 < x \leq 100$ | |

(1 mark)

(c) On the grid draw a cumulative frequency graph for your table.



(2 marks)

(d) Find an estimate for the number of people who took **more** than 1 hour to travel to work.

(2 marks)

THE END