FOUNDED 1900
THE ENGLISH SCHOOL
A SECOND CENTURY OF EXCELLENCE

MID-PROGRAMME ENTRY INTO YEAR 4 EXAMINATIONS 2020

MATHEMATICS
Time allowed: 2 hours

Instructions to candidates

Answer all the questions in the spaces provided.

Without sufficient working, correct answers may be awarded no marks.

Information to candidates

This paper has 26 questions.

There are 20 pages in this question paper.

Full marks may be obtained for answers to all questions.

The total marks for this paper is 120.

The marks for each question is shown in round brackets, e.g. **(2)**

Calculator may be used.

Advice for candidates

Write your answers neatly and in good English.

Work steadily through the paper.

Do not spend too long on one question.

Show all stages in any calculations.

Materials required for the paper

Calculator, ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

NAME: _____MARK:_____

1. In Year 3 of Hogwarts school, 35% take woodwork only, 25% take metalwork only and 20% take both subjects.

   i) What percentage of Year 3 students study neither? Show all your steps.

…….....(2)

   ii) There are 180 Year 3 students at Hogwarts school. Calculate how many students take both subjects. Show all your steps.

…….....(2)

   iii) The Year 3 students at Hogwarts school is estimated to decrease to 162 next year. Calculate the percentage decrease. Show all your steps.

…….....(2)

TOTAL FOR Q1 = 6

2. The ratio of the length to the width of a rectangle is 6 : 5.

   i) If the length of the rectangle is 8.4 cm, what is the width?
   Show all your steps.

…….....(2)

   ii) Hence, if the width of the rectangle (from part (i)) is given to the nearest unit, and the length of 8.4 cm is given to 1 decimal place, calculate the lower bound of the area of the rectangle.
   Show all your steps.

…….....(2)

TOTAL FOR Q2 = 4

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3. The probability of buying a winning ticket is $\frac{2}{155}$.
   If I buy 620 tickets, how many of them will be winning tickets?
   Show all your steps.

…….....(2)

TOTAL FOR Q3 = 2

4. This question is about straight lines.

i) Complete the following tables: (2)

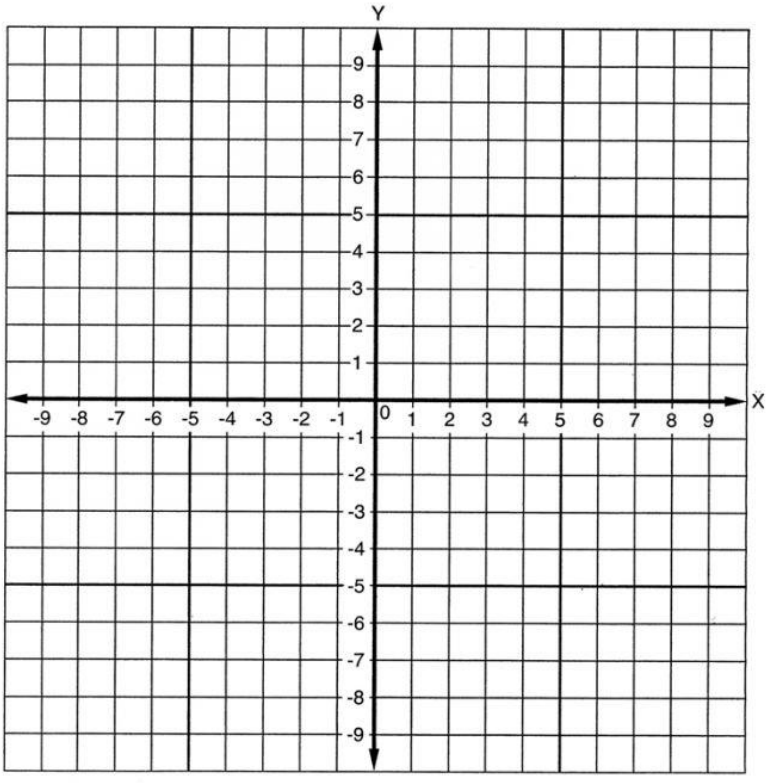
LINE 1: **2y + 2x – 10 = 0**

x	**- 2**	**1**	**3**	**5**
y = 5 – x				

LINE 2: **y = 7 – 3x**

x	**-1**	**0**	**1**	**4**
y = 7 – 3x				

ii) Plot Line 1 and Line 2 on the same graph paper below. (2)



iii) Using your graph or otherwise, write down the solution to the simultaneous equations: (2)

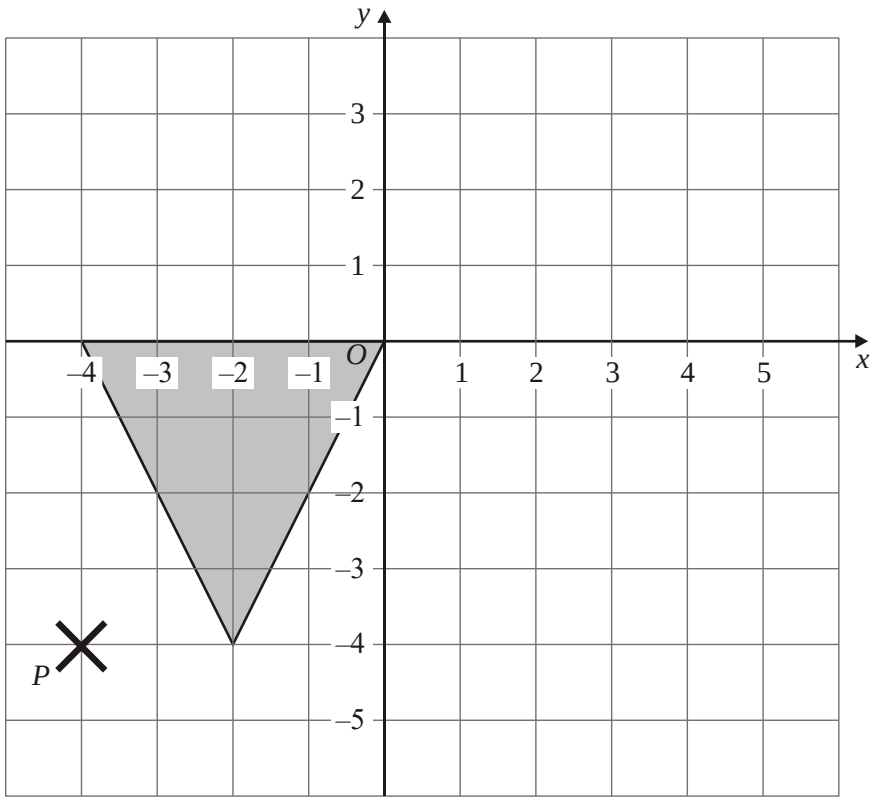
2y + 2x – 10 = 0 and y = 7 – 3x

x =…….....

y =…….....

TOTAL FOR Q4 = 6

5. Enlarge the triangle below using a scale factor of ½ , about the centre marked *p*.

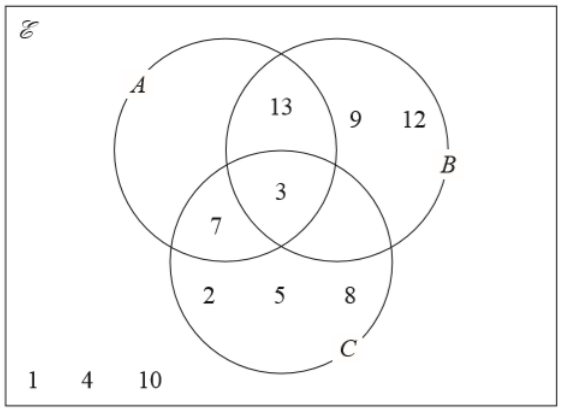


TOTAL FOR Q5 = 2

6. You are given the following information.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$
$A = \{3, 7, 11, 13\}$
$B = \{3, 6, 9, 12, 13\}$
$C = \{2, 3, 5, 6, 7, 8\}$

i) Complete the Venn diagram below. (1)



ii) List the members of the set $B' \cap C$ …….....(1)

iii) List the members of the set $(A \cup C)' \cap B$ …….....(1)

iv) Find $n(A' \cap B')$ …….....(1)

TOTAL FOR Q6 = 4

7. You are given that hours of work, *h*, is directly proportional to income earned, € *i*.
   If 18 hours of work give you €10, find a formula of *h* in terms of *i*.
   Show all your steps.

…….....(3)

TOTAL FOR Q7 = 3

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8. The shape below is a parallelogram. All the angles shown are in degrees.

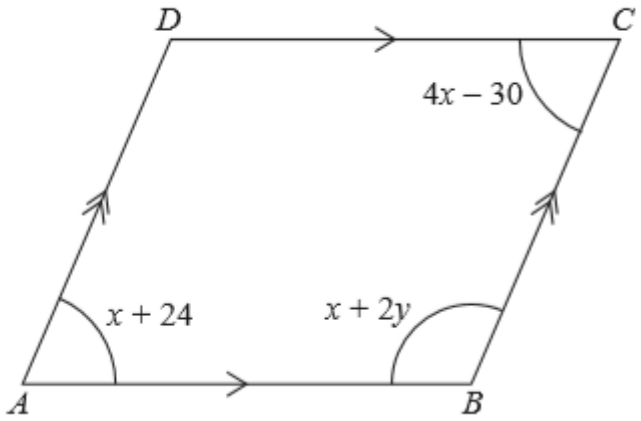

Diagram **NOT** accurately drawn

Work out the value of *x* and *y*. Show all your steps.

x =…….....

y =……...

TOTAL FOR Q8 = 4

9. Solve the following algebraic equations for *x*.
Show all your steps. Give your answers as simplified fractions, where necessary.

i) $\frac{5x-8}{3} = \frac{x+1}{9}$

…….....(3)

ii) $4x + 5 = \frac{2}{3}(15x - 33)$

…….....(3)

TOTAL FOR Q9 = 6

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10. Simplify fully the following algebraic expressions.
Show all your steps. Give your answer in factorised form, where necessary.

i) $-9(x + 5y) + 5(4x - 9y) - x =$

…….....(2)

ii) $\frac{8x-2}{5x-1} + \frac{2x-1}{2} =$

…….....(3)

iii) $\frac{(xy)^3}{5x} \times \frac{2yx}{4x^3} =$

…….....(3)

TOTAL FOR Q10 = 8

11. Solve the following quadratic equations. Show all your steps.

i) $x^2 + 2x - 24 = 0$

…….....(2)

ii) $4x^2 - 2500 = 0$

…….....(2)

TOTAL FOR Q11 = 4

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12. Make the letter in the bracket, the subject of the formula.
Show all your steps.

$m = \frac{2}{p^2} + 5 \qquad [p]$

…….....(3)

TOTAL FOR Q12 = 3

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13. Solve the following inequality. Show all steps. Show your solution on a number line.

$$3(x - 2) + 4 \leq x + 8 < 5 - (6x - 7)$$

…….....(5)

TOTAL FOR Q13 = 5

14.

The table gives the surface areas, in square kilometres, of five seas.

Sea	Surface area in square kilometres
Mediterranean Sea	2.97×10^6
East China Sea	1.25×10^6
Baltic Sea	4.22×10^5
Red Sea	4.38×10^5
Okhotsk Sea	1.59×10^6

i) Work out the difference between the largest surface area and the smallest surface area, in square kilometres, for these five seas. Give your answer in standard form.

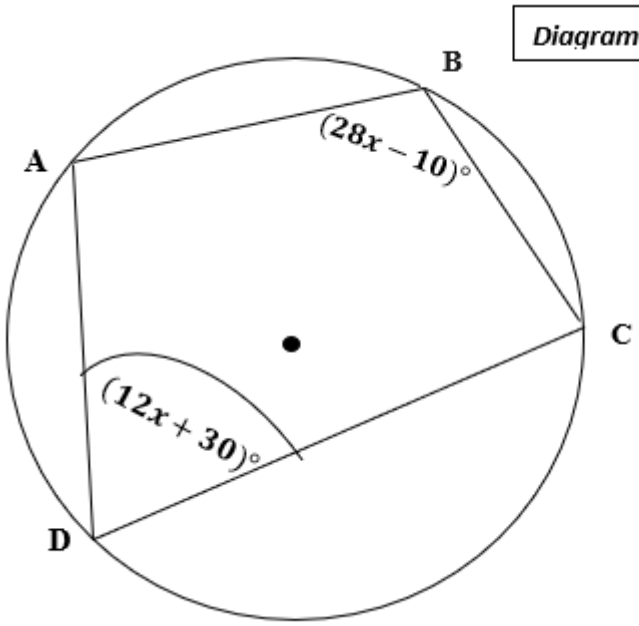
…….....(2)

ii) The surface area of the East China sea is k times the surface area of the Baltic sea. Work out the value of k. Give your answer to the nearest whole number.

…….....(2)

TOTAL FOR Q14 = 4

15. Calculate the value of x, showing clear calculations and giving a reason.



Reason:……

x =…….....

TOTAL FOR Q15 = 5

16. The HCF of 140 and x is 20.
The LCM of 140 and x is 420.
Find the value of x. Show clear steps.

…….....(3)

TOTAL FOR Q16 = 3

17.

The table shows information about the lengths of time that 120 people spent in a supermarket.

Time (t minutes)	Frequency
$0 < t \leqslant 10$	8
$10 < t \leqslant 20$	17
$20 < t \leqslant 30$	25
$30 < t \leqslant 40$	40
$40 < t \leqslant 50$	22
$50 < t \leqslant 60$	8

i)

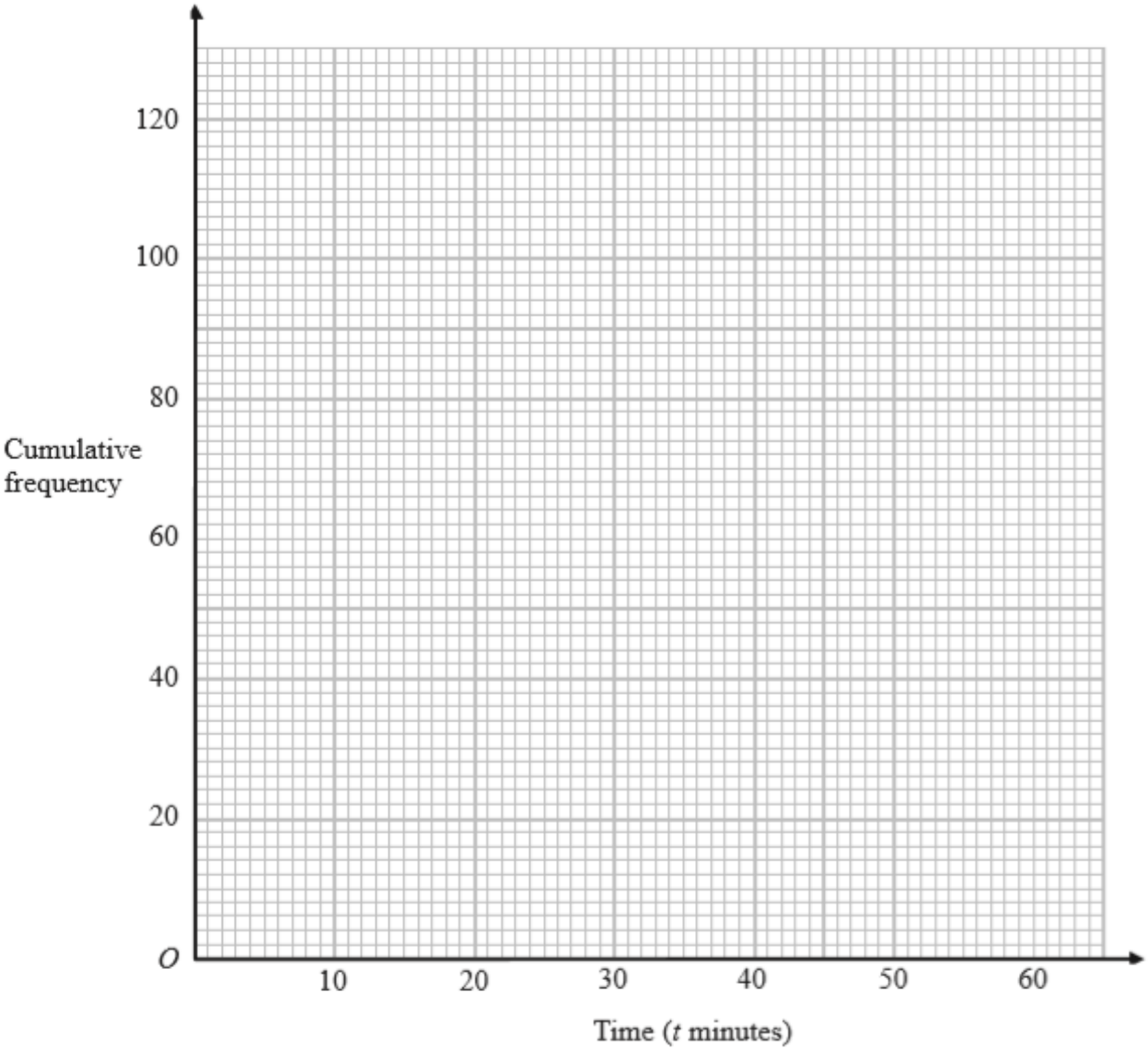
Complete the cumulative frequency table.

Time (t minutes)	Cumulative frequency
$0 < t \leqslant 10$	
$0 < t \leqslant 20$	
$0 < t \leqslant 30$	
$0 < t \leqslant 40$	
$0 < t \leqslant 50$	
$0 < t \leqslant 60$	

(1)

QUESTION CONTINUES ON THE NEXT PAGE

ii) On the grid below, draw a cumulative frequency graph for your table. (2)



iii) Use your graph to estimate the Inter Quartile Range of the time spent in the supermarket by these people.

…….....(3)

TOTAL FOR Q17 = 6

18. Here is a regular 10-sided polygon. Work out the value of x. Show your working clearly.

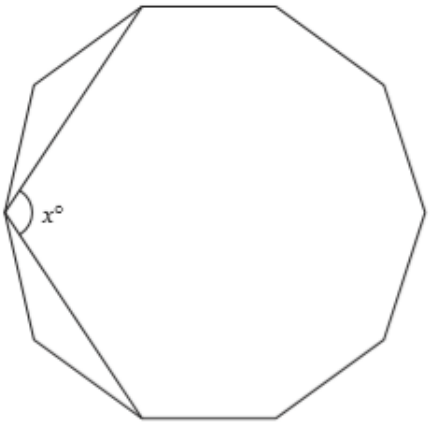


Diagram **NOT** accurately drawn

…….....(4)

TOTAL FOR Q18 = 4

19.

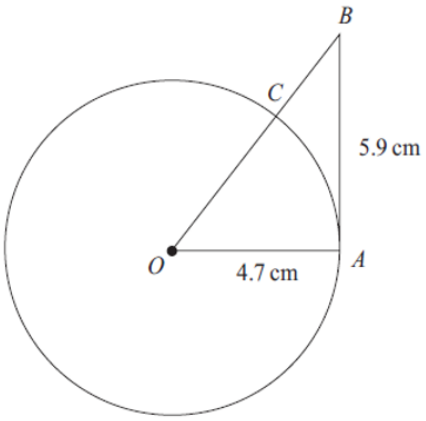


Diagram **NOT** accurately drawn

i) Calculate the value of **BC**, giving your answer correct to 2 significant figures.
Show all your steps.

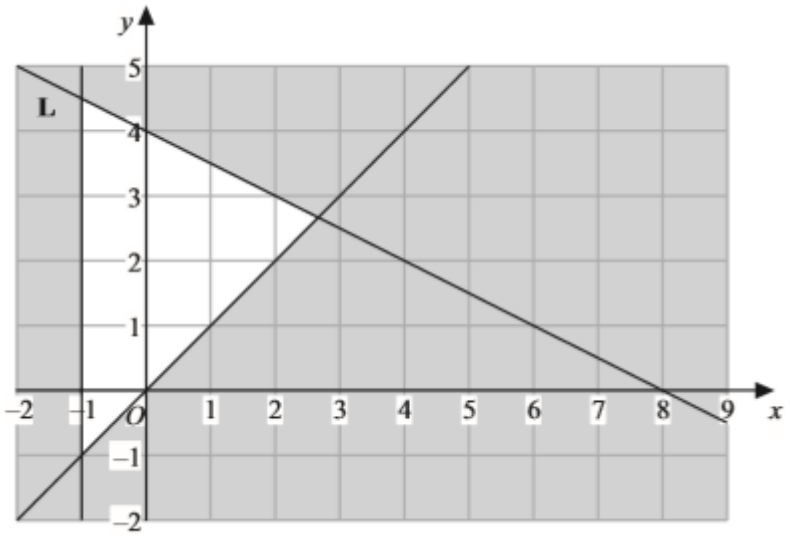
…….....(2)

ii) Calculate the value of the angle **OBA**, giving your answer correct to the nearest degree.
Show all your steps.

…….....(2)

TOTAL FOR Q19 = 4

20. Find the three inequalities that define the **unshaded** region.



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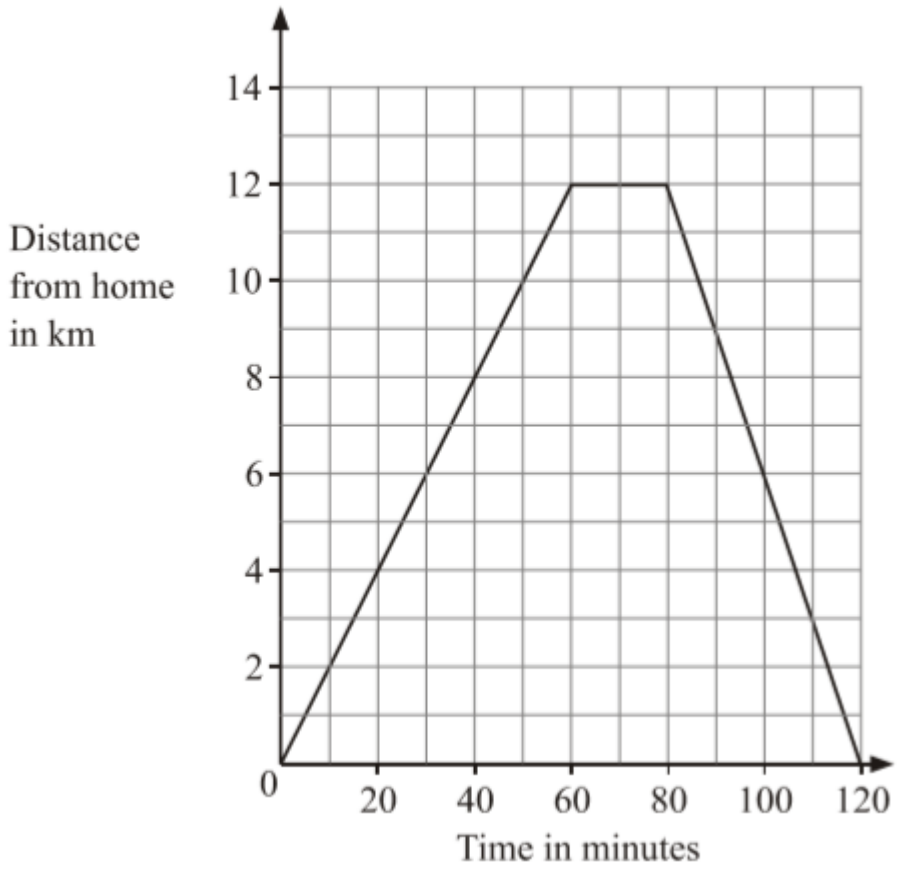
…….....

TOTAL FOR Q20 = 4

21. This is the distance-time graph of Maggie's journey.



i) For how many minutes did Maggie stop? ……minutes (1)

ii) Find her distance from home after 40 minutes. ...……km (1)

iii) Between which two times of Maggie's journey was she travelling the fastest?
Justify your answer with calculations.

…….....(3)

iv) Calculate Maggie's average speed (excluding stops), in km/h.

…….....km/h (2)

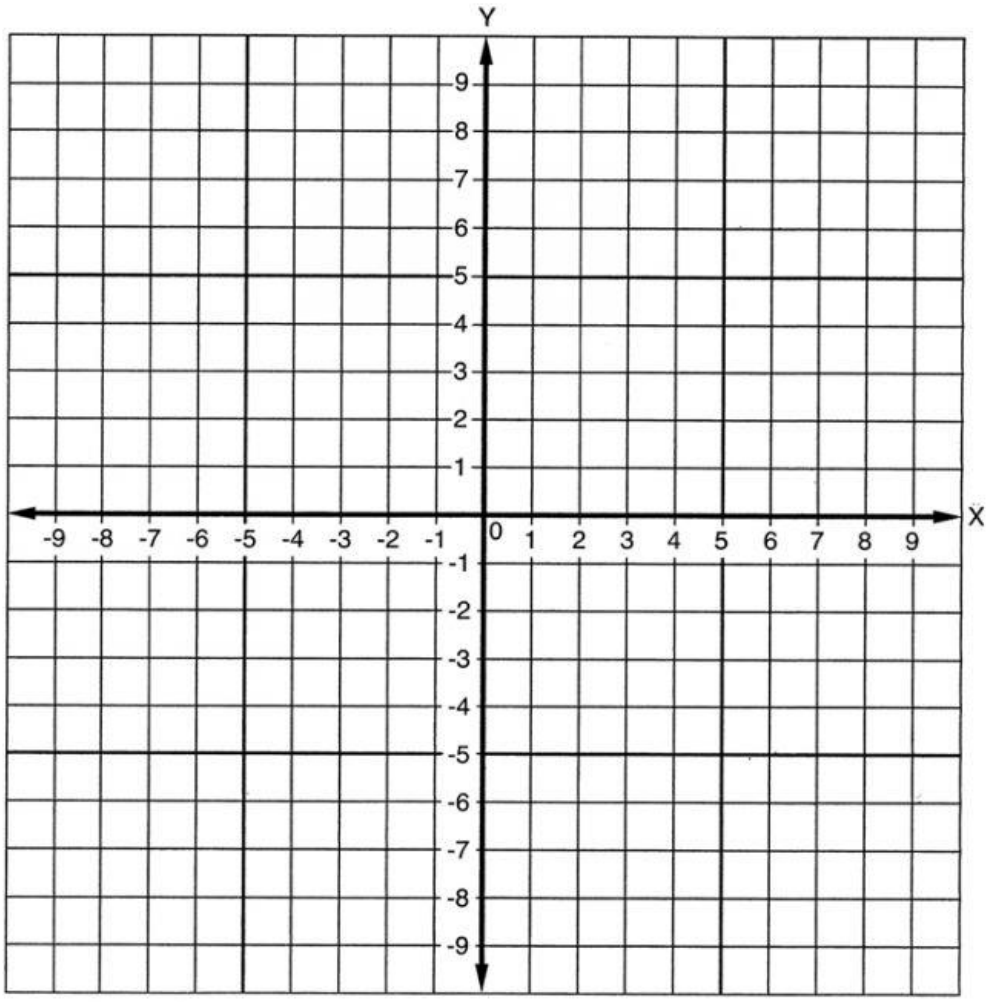
TOTAL FOR Q21 = 7

22.

i) Complete the following table to find the points (x, y), using your calculator. (2)

x	**-4**	**-3**	**-2**	**-1**	**0**	**1**	**2**
$\boldsymbol{y = x^2 + 2x - 2}$							

ii) Plot the points on the graph paper below. (2)



iii) Write down the coordinates of the minimum point of the curve.

…….....(2)

iv) Find the solutions of $\boldsymbol{x^2 + 2x - 2 = 1}$

…….....(2)

TOTAL FOR Q22 = 8

23. *ABCD* and *APQR* are two similar quadrilaterals.

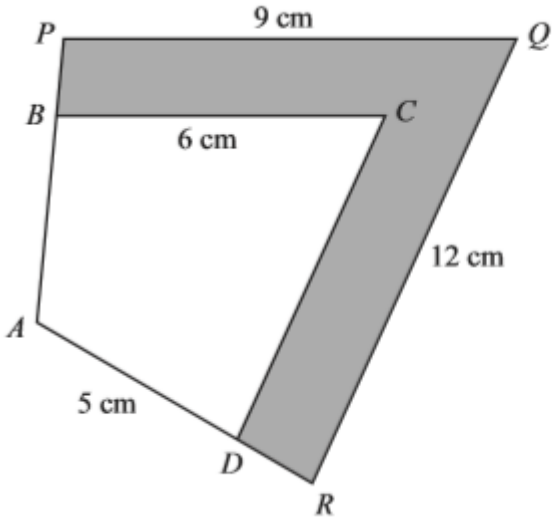


Diagram **NOT** accurately drawn

i) Calculate the value of side ***DC***. Show all your steps.

…….....(2)

ii) The area of shape *ABCD* is 32 cm^2. Calculate the area of the **shaded region.**

…….....(3)

TOTAL FOR Q23 = 5

24. The parking times in hours (p) for 118 cars in a car park are summarised in the table.

p	Frequency (f)		
$0 < p \leq 1$	16		
$1 < p \leq 2$	24		
$2 < p \leq 4$	30		
$4 < p \leq 6$	24		
$6 < p \leq 12$	24		
Totals	118		

i) What type of data is 'parking times'?

…….....(1)

ii) Work out an estimate for the mean parking time of the cars. You may use the table.
Give your answer to 3 significant figures.

…….....(3)

iii) Write down the modal class of parking times.

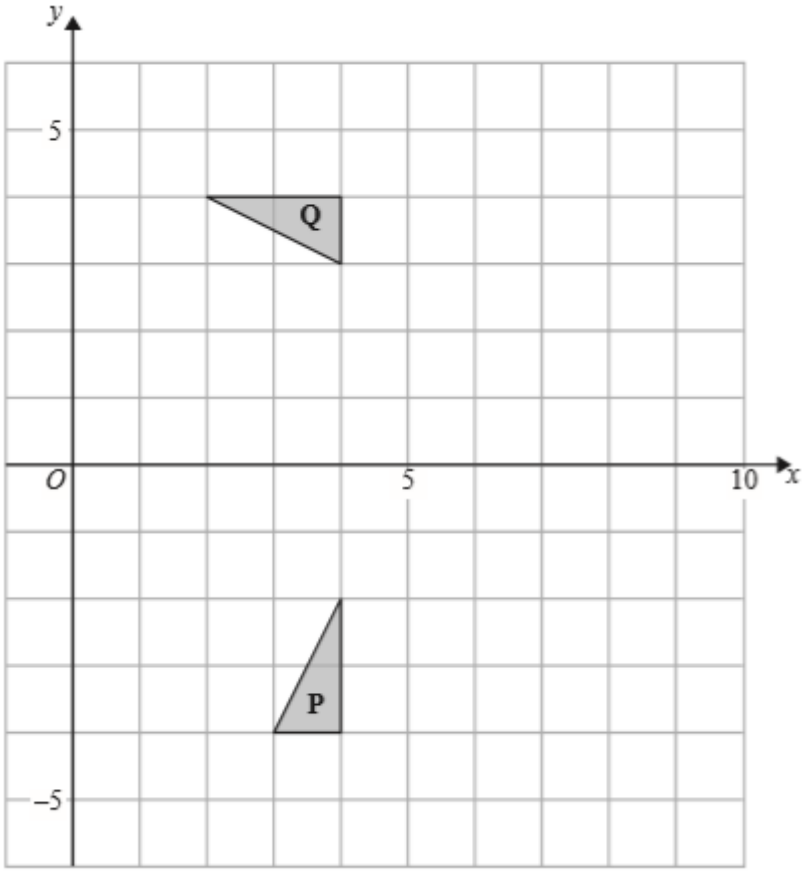
…….....(1)

iv) Write down the range.

…….....(1)

TOTAL FOR Q24 = 6

25.



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

……(3)

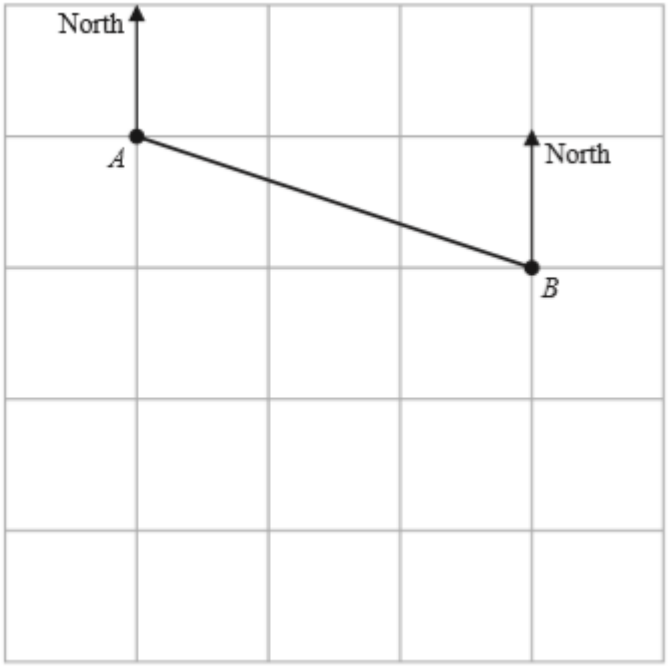
ii) On the grid, translate triangle **P** using the vector $\begin{pmatrix}3\\5\end{pmatrix}$. Label the new triangle **R.** (1)

TOTAL FOR Q25 = 4

PLEASE TURN OVER FOR THE LAST QUESTION

26. The diagram shows town **A** and town **B** on a map.
Town **C** is due South of town **A.**
The bearing of town **C** from town **B** is 235°.

i) Mark town **C** on the map. (1)



ii) The bearing of town **D** from town **B** is 168°. Find the bearing of town **B** from town **D.**

…….....(2)

TOTAL FOR Q26 = 3

TOTAL MARKS = 120
END OF PAPER