Ed | iGCSE | June '24 | 1H

Answer ALL TWENTY FIVE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Here are eight numbers written in order of size

h 6 7 8 j 16 k k

where h, j and k are integers.

The median of the eight numbers is 10

The mode of the eight numbers is 18 → k

The range of the eight numbers is 13

Work out the value of h, the value of j and the value of k

$18 - 13 = 5 = h$

$$\frac{8+j}{2} = 10$$

$$8 + j = 20$$

$h =$ 5

$j =$ 12

$k =$ 18

(Total for Question 1 is 3 marks)

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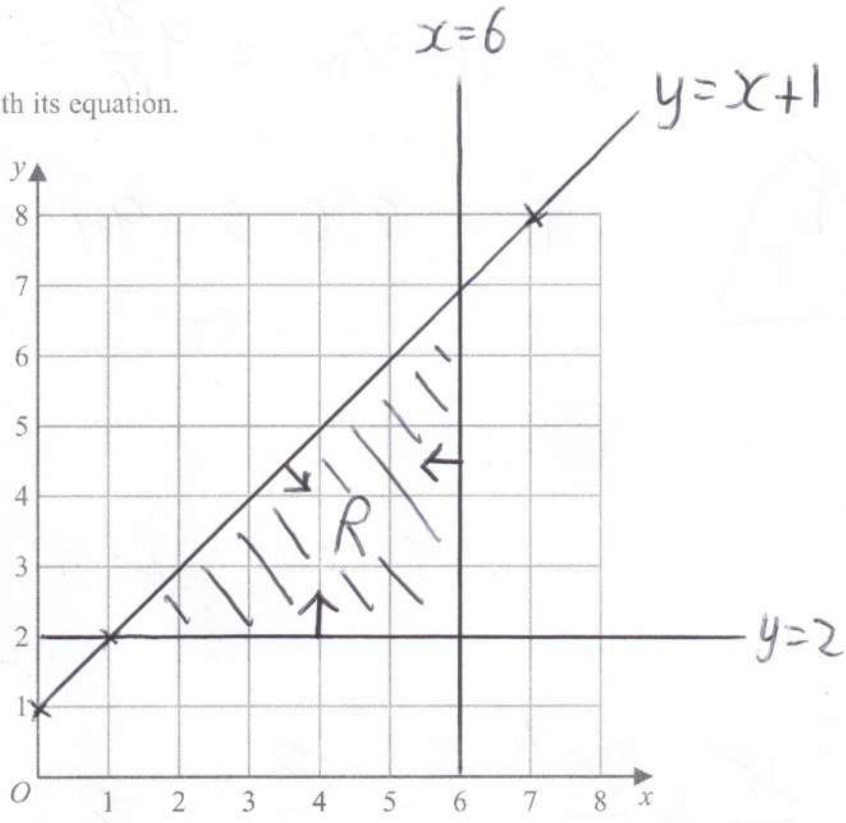
2 (a) On the grid, draw the straight line with equation

(i) $y = 2$

(ii) $x = 6$

(iii) $y = x + 1$

Label each line with its equation.



(3)

(b) Show, by shading on the grid, the region that satisfies all three of the inequalities

$y \geqslant 2$ $x \leqslant 6$ $y \leqslant x + 1$

Label the region **R**

(1)

(Total for Question 2 is 4 marks)

3 A plane takes 9 hours 36 minutes to fly from New Delhi to Perth.

The plane flies at an average speed of 820 km/h.

Work out the total distance the plane flies.

$S = 9\text{hr}\,36\text{m} = 9\frac{36}{60} = 9.6$

$D = 820 \times 9.6$

7872 km

(Total for Question 3 is 3 marks)

4 Show that $2\frac{4}{7} \times 3\frac{1}{9} = 8$

$\frac{\cancel{18}^{2}}{\cancel{7}_{1}} \times \frac{\cancel{28}^{4}}{\cancel{9}_{1}} = \frac{8}{1} = 8$

(Total for Question 4 is 3 marks)

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5 The diagram shows triangle *ABC*

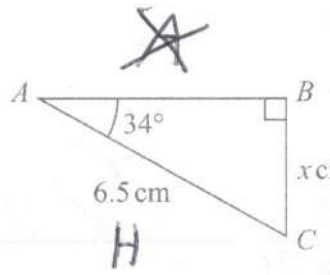

Diagram **NOT** accurately drawn

Work out the value of x
Give your answer correct to one decimal place.

SOH

$x = \sin 34 \times 6.5$

$= 3.634...$

$x =$ 3.6 cm

(Total for Question 5 is 3 marks)

6 Change a speed of w metres per second to a speed in kilometres per hour.
Give your answer in terms of w in its simplest form.

$$\frac{w \times 3600}{1000} = \frac{18w}{5}$$

3.6w kilometres per hour

(Total for Question 6 is 3 marks)

7 The diagram shows a 6-sided shape *ABCDEF*

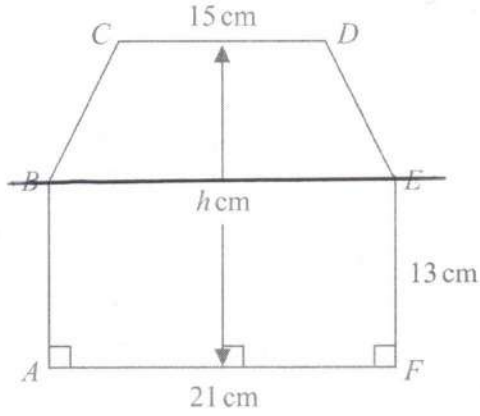

Diagram **NOT** accurately drawn

$AF = 21$ cm $CD = 15$ cm $AB = FE = 13$ cm

The perpendicular height of the shape is h cm
CD is parallel to AF

The area of the shape is 390 cm^2

Work out the value of h

$$390 = (21 \times 13) + \tfrac{1}{2}(21+15) \times (h-13)$$
$$390 = 273 + 18(h-13)$$
$$117 = 18h - 234$$
$$351 = 18h$$

$$h = \frac{351}{18} = \frac{39}{2}$$

$h =$ 19.5

(Total for Question 7 is 4 marks)

8 Ishir plants 600 bulbs in a garden.
He plants tulip bulbs, crocus bulbs and daffodil bulbs so that

number of tulip bulbs : number of crocus bulbs : number of daffodil bulbs = 9 : 4 : 2

45% of the tulip bulbs are for yellow flowers.

$\frac{5}{8}$ of the crocus bulbs are for yellow flowers.

All of the daffodil bulbs are for yellow flowers.

Work out the number of bulbs that are for yellow flowers.

T C D
9 4 2
$\frac{9}{15}$ $\frac{4}{15}$ $\frac{2}{15}$

Yellow $\frac{45}{100}$ $\frac{5}{8}$

$$Y = 600 \times \left(\frac{2}{15} + \frac{4}{15} \times \frac{5}{8} + \frac{9}{15} \times \frac{45}{100} \right)$$

$$= 600 \times \frac{57}{100}$$

342

(Total for Question 8 is 5 marks)

9 Giovanni invests 4500 koruna in a savings account for 4 years.
He gets 2.4% per year compound interest.

Work out how much money Giovanni will have in the savings account at the end of 4 years.
Give your answer correct to the nearest koruna.

4500×1.024^4

$= 4947.80...$

4948

..... koruna

(Total for Question 9 is 3 marks)

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10 Solve the simultaneous equations

$$6x + 4y = 1$$
$$3x + 5y = 8$$

Show clear algebraic working.

$-①$
$-②$

① $6x + 4y = 1$ −
② $\times 2$ $6x + 10y = 16$

$$-6y = -15$$

$$y = \frac{-15}{-6} = 2.5$$

② $\Rightarrow$ $3x + 5 \times 2.5 = 8$

$$3x = -4.5$$
$$x = -1.5$$

$x = -1.5$

$y = 2.5$

(Total for Question 10 is 3 marks)

11 (i) Factorise $x^2 + 9x - 22$

$(x + 11)(x - 2)$

(2)

(ii) Hence, solve $x^2 + 9x - 22 = 0$

$x = -11, x = 2$

(1)

(Total for Question 11 is 3 marks)

12 Ali uses a fitness tracker to count the number of steps he walks each day for 7 days.

For the first 4 days, his mean number of steps is 11 800
For the next 3 days, his mean number of steps is 13 207

Work out his mean number of steps for the 7 days.

$4 \times 11800 = 47200$
$3 \times 13207 = 39621$
86821

$86821 \div 7 = 12403$

(Total for Question 12 is 3 marks)

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13 The table gives information about the distances, in km, that 70 teachers travel to school.

Distance (d km)	Frequency
$0 < d \leqslant 10$	7
$10 < d \leqslant 20$	17
$20 < d \leqslant 30$	18
$30 < d \leqslant 40$	14
$40 < d \leqslant 50$	10
$50 < d \leqslant 60$	4

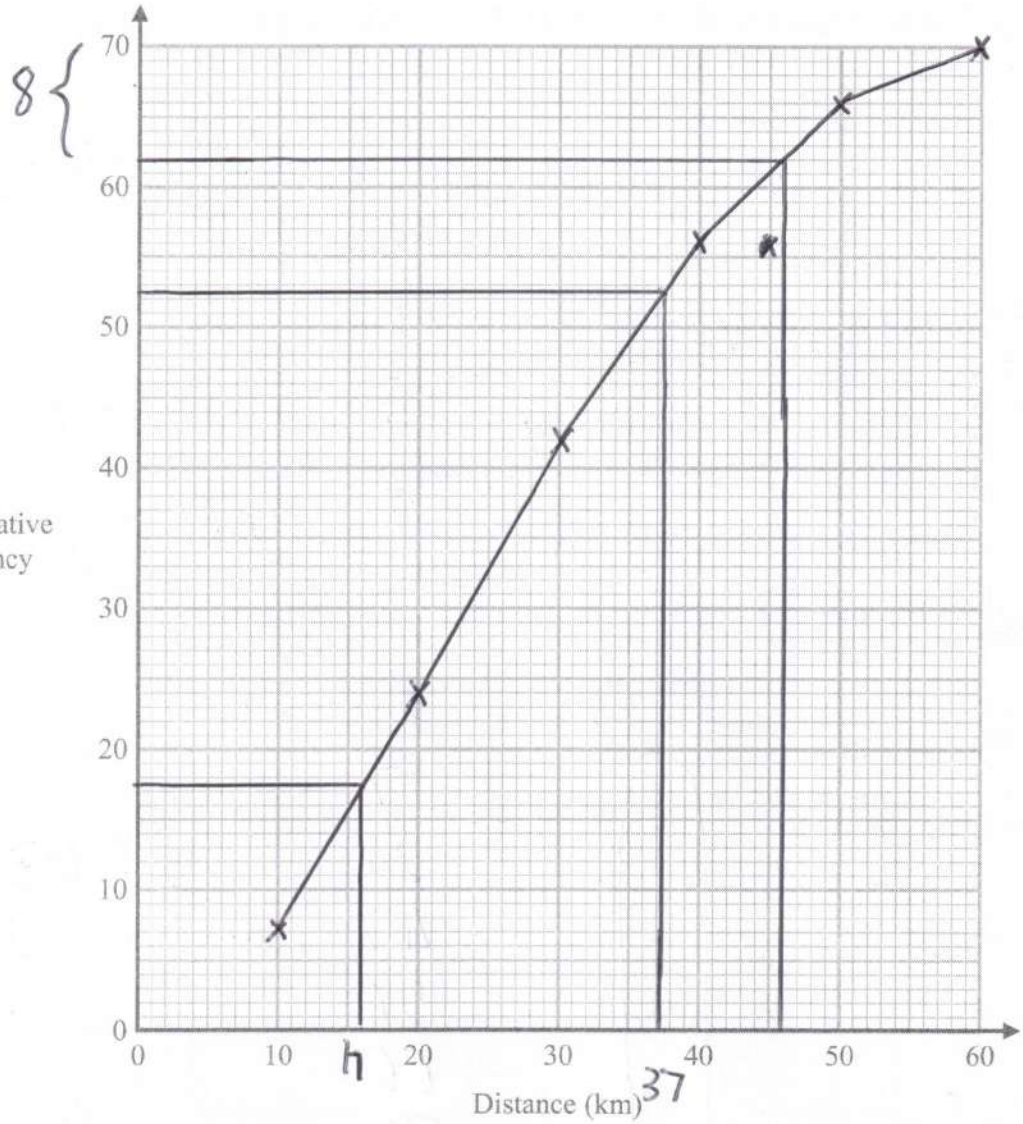
(a) Complete the cumulative frequency table.

Distance (d km)	Cumulative frequency
$0 < d \leqslant 10$	7
$0 < d \leqslant 20$	24
$0 < d \leqslant 30$	42
$0 < d \leqslant 40$	56
$0 < d \leqslant 50$	66
$0 < d \leqslant 60$	70

(1)

(b) On the grid opposite, draw a cumulative frequency graph for your table.

(2)



(c) Use your graph to find an estimate for the interquartile range of the distances.

[ms: 18-22]

37-17 = 20

..... km

(2)

(d) Use your graph to find an estimate for the number of teachers who travel more than 46 km.

[ms: 6-9]

8

(2)

(Total for Question 13 is 7 marks)

14 (a) Show that $3y(2y + 5)(y + 7)$ can be written in the form $ay^3 + by^2 + cy$ where a, b and c are integers.

$3y(2y^2 + 14y + 5y + 35)$

$3y(2y^2 + 19y + 35)$

$6y^3 + 57y^2 + 105y$

(3)

(b) Solve $\frac{2x + 3}{5} + \frac{6x - 5}{4} = \frac{163}{100}$ (×100)

Show clear algebraic working.

$20(2x + 3) + 25(6x - 5) = 163$

$40x + 60 + 150x - 125 = 163$

$190x = 228$

$x = \frac{228}{190} = \frac{6}{5}$

$x =$ 1·2

(4)

(Total for Question 14 is 7 marks)

15 (a) Make g the subject of $e = \sqrt{\dfrac{7g+5}{11+2g}}$

$$e^2 = \frac{7g+5}{11+2g}$$

$$e^2(11+2g) = 7g+5$$

$$11e^2 + 2e^2g = 7g + 5$$

$$2e^2g - 7g = 5 - 11e^2$$

$$g(2e^2-7) = 5-11e^2$$

$$g = \frac{5-11e^2}{2e^2-7}$$

(4)

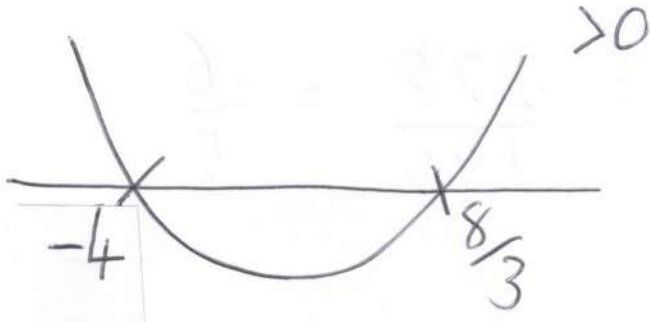
(b) Solve the inequality $3y^2 + 4y - 32 > 0$
Show your working clearly.

$ac = -96$

$3y^2 + 12y \mid -8y - 32$

$3y(y+4) \mid -8(y+4)$

$(y+4) \mid (3y-8)$



$y < -4, \; y > \frac{8}{3}$

(3)

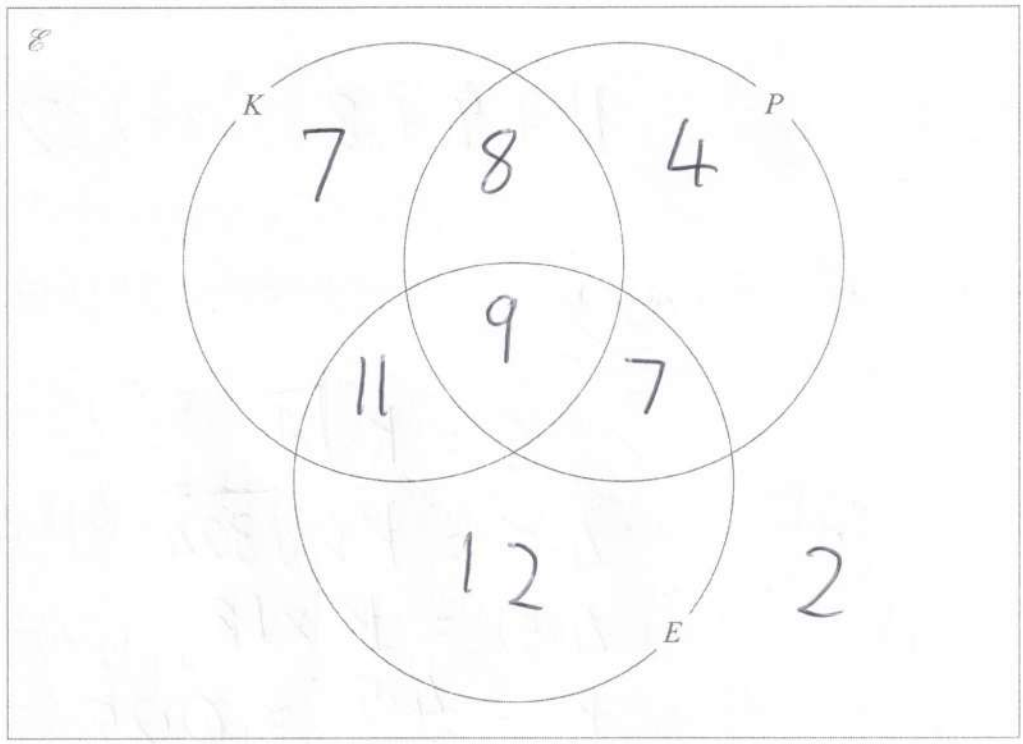
(Total for Question 15 is 7 marks)

16 60 art students were asked if they would like to attend workshops for knitting (K), for photography (P) or for embroidery (E)

Of these students

9 chose knitting, photography and embroidery
17 chose knitting and photography
16 chose photography and embroidery
20 chose knitting and embroidery
28 chose photography
39 chose embroidery
2 chose none of the workshops

(a) Using this information, complete the Venn diagram to show the numbers of students in each subset.



(3)

One of the students is chosen at random.

Given that this student chose photography,

(b) find the probability that this student also chose knitting.

$\frac{17}{28}$

(2)

(c) Find $n(P \cap K')$

$4+7$ 11

(1)

(d) Find $n([P \cup E] \cap K)$

$11+9+8$ 28

(1)

(Total for Question 16 is 7 marks)

17 Q is directly proportional to the square root of d

$Q = 4.5$ when $d = 324$

Find a formula for Q in terms of d

$Q = K\sqrt{d}$

$4.5 = K \times \sqrt{324}$

$4.5 = K \times 18$

$K = \frac{4.5}{18} = 0.25$

$Q = 0.25\sqrt{d}$

(Total for Question 17 is 3 marks)

18 The straight line **P** has equation $5y + 2x = 7$

Find the gradient of a straight line that is perpendicular to **P**

P: $5y = -2x + 7$

$y = -\frac{2}{5}x + \frac{7}{5}$

$m_{\perp} = -\frac{5}{2}$

(Total for Question 18 is 2 marks)

19 $G = \dfrac{c}{2f - 3h}$

$c = 8$ correct to the nearest whole number
$f = 6.62$ correct to 2 decimal places
$h = 1.2$ correct to 1 decimal place

Work out the lower bound for the value of G
Give your answer correct to 3 decimal places.
Show your working clearly.

(c) $8 < \begin{matrix} 8.5 \\ 7.5 \end{matrix}$

(f) $6.62 < \begin{matrix} 6.625 \\ 6.615 \end{matrix}$

(h) $1.2 < \begin{matrix} 1.25 \\ 1.15 \end{matrix}$

$G\downarrow = \dfrac{c\downarrow}{2f\uparrow - 3h\uparrow}$

$= \dfrac{7.5}{(2 \times 6.625) - (3 \times 1.15)}$

$= \dfrac{75}{98} = 0.7653\ldots$

$= 0.765$

(Total for Question 19 is 3 marks)

20 Given that $k = x - y$ and $x = \frac{1}{4y}$

express $\frac{5k}{x+2}$ in the form $\frac{a - by^2}{c + dy}$ where a, b, c and d are integers.

$$\frac{5K}{x+2} = \frac{5(x-y)}{\frac{1}{4y}+2} = \frac{5\left(\frac{1}{4y}-y\right)}{\frac{1}{4y}+\frac{8y}{4y}}$$

$$= \frac{5\left(\frac{1}{4y}-\frac{4y^2}{4y}\right)}{\frac{1}{4y}+\frac{8y}{4y}}$$

$$= \frac{5(1-4y^2)}{1+8y}$$

$$= \frac{5-20y^2}{1+8y}$$

(Total for Question 20 is 3 marks)

22 The straight line **L** has equation $x + y = 5$

The curve **C** has equation $2x^2 + 3y^2 = 210$

Find the coordinates of the points where **L** and **C** intersect.
Show clear algebraic working.

$x = 5 - y$

$2(5-y)^2 + 3y^2 = 210$

$2(25 + y^2 - 10y) + 3y^2 = 210$

$50 + 2y^2 - 20y + 3y^2 = 210$

$5y^2 - 20y - 160 = 0$

$y^2 - 4y - 32 = 0$

$(y - 8)(y + 4) = 0$

$y = 8$

$x = 5 - 8$

$= -3$

$y = -4$

$x = 5 - -4$

$= 9$

(9, -4) (-3, 8)

(Total for Question 22 is 5 marks)

23 Simplify $\dfrac{30 \times 25^{2x+7}}{\sqrt{180} \times \left(\sqrt{5}\right)^{4x+9}}$

Give your answer in the form 5^w where w is an expression in terms of x
Show each stage of your working clearly.

$$\frac{6 \times 5 \times (5^2)^{2x+7}}{\sqrt{36} \times \sqrt{5} \times \left(5^{\frac{1}{2}}\right)^{4x+9}}$$

$$= \frac{6 \times 5^1 \times 5^{4x+14}}{6 \times 5^{\frac{1}{2}} \times 5^{2x+\frac{9}{2}}}$$

$$= \frac{5^{4x+15}}{5^{2x+5}}$$

$$w = (4x+15) - (2x+5)$$

$$w = 2x + 10$$

(Total for Question 23 is 3 marks)

Turn over for Question 24

24

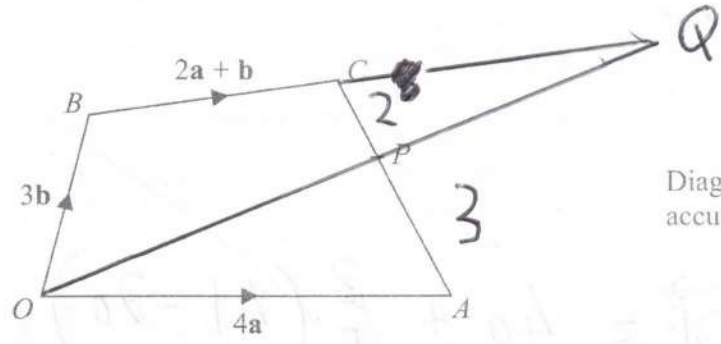


Diagram **NOT** accurately drawn

The diagram shows a quadrilateral $OACB$ in which

$\overrightarrow{OA} = 4\mathbf{a}$ $\overrightarrow{OB} = 3\mathbf{b}$ $\overrightarrow{BC} = 2\mathbf{a} + \mathbf{b}$

(a) Find $\overrightarrow{AC}$ in terms of **a** and **b**
Give your answer in its simplest form.

$\overrightarrow{AC} = -4a + 3b + 2a + b$

$\overrightarrow{AC} =$ $4b - 2a$

(2)

The point P lies on AC such that $AP : PC = 3 : 2$

The point Q is such that OPQ and BCQ are straight lines.

(b) Using a vector method, find $\overrightarrow{OQ}$ in terms of **a** and **b**
Give your answer in its simplest form.
Show your working clearly.

$\overrightarrow{OP} = 4a + \frac{3}{5}(4b - 2a)$

$= \frac{14}{5}a + \frac{12b}{5}$

OR

$\overrightarrow{OP} = 3b + 2a + b + \frac{2}{5}(-4b + 2a)$

$= \frac{14a}{5} + \frac{12b}{5}$

$\overrightarrow{OQ} = m\left(\frac{14a}{5} + \frac{12b}{5}\right) = 3b + n(2a + b)$

(a) $\frac{14}{5}m = 2n$ so $n = \frac{7}{5}m$

(b) $\frac{12}{5}m = 3 + n$

$12m = 15 + 7m$

$m = 3$

$\overrightarrow{OQ} = 3\left(\frac{14a}{5} + \frac{12b}{5}\right)$

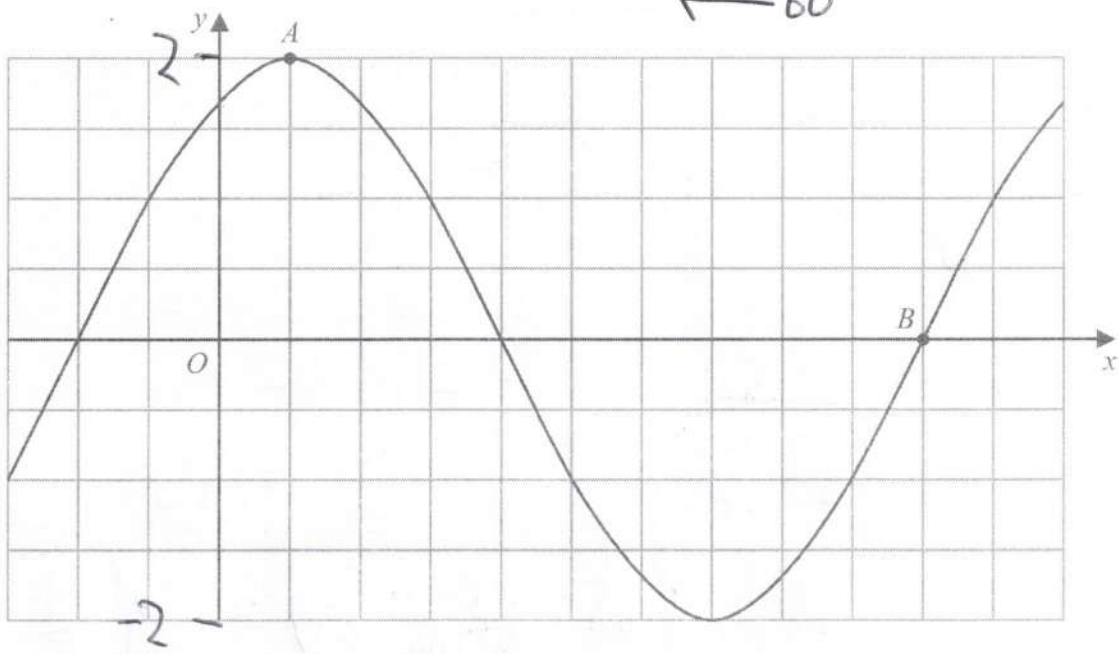
$\overrightarrow{OQ} = \frac{42}{5}a + \frac{36}{5}b$

(4)

(Total for Question 24 is 6 marks)

Turn over for Question 25

25 The diagram shows a sketch of the graph of $y = 2\sin(x + 60)°$



(i) Find the coordinates of the point A

(30 , 2)

(1)

(ii) Find the coordinates of the point B

(300 , 0)

(1)

(Total for Question 25 is 2 marks)

TOTAL FOR PAPER IS 100 MARKS