Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						1	3	8	0	/	3	H	Signature	

Paper Reference(s)

1380/3H

Examiner's use only

Team Leader's use only

Edexcel GCSE

Mathematics (Linear) – 1380

Paper 3 (Non-Calculator)

Higher Tier

Monday 6 June 2011 – Afternoon

Time: 1 hour 45 minutes

Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers

Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
You must NOT write on the formulae page.
Anything you write on the formulae page will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 27 questions in this question paper. The total mark for this paper is 100.
There are 28 pages in this question paper. Any blank pages are indicated.
Calculators must not be used.

Advice to Candidates

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.

Turn over

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P 3 8 9 6 3 A 0 1 2 8

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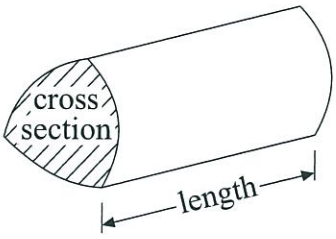
GCSE Mathematics (Linear) 1380

Formulae: Higher Tier

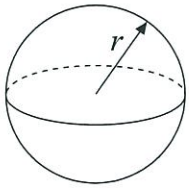
You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section × length



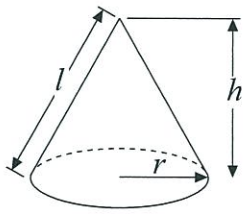
Volume of sphere $= \frac{4}{3}\pi r^3$

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

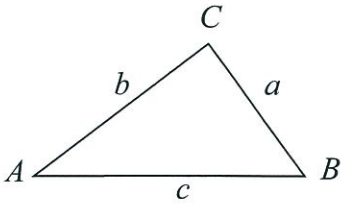


Volume of cone $= \frac{1}{3}\pi r^2 h$

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



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 $= \frac{1}{2}ab \sin C$

The Quadratic Equation

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

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

Leave blank

Answer ALL TWENTY SEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1. Here is a list of ingredients for making **10** Flapjacks.

Ingredients for 10 Flapjacks
80 g rolled oats
60 g butter
30 m*l* golden syrup
36 g light brown sugar

Work out the amount of each ingredient needed to make **15** Flapjacks.

Multiply each quantity by $\frac{15}{10}$ or $\frac{3}{2}$

$80 \times \frac{3}{2} = 40 \times 3 = 120g$ ..... 120 ..... g rolled oats

$60 \times \frac{3}{2} = 30 \times 3 = 90g$ ..... 90 ..... g butter

$30 \times \frac{3}{2} = 15 \times 3 = 45ml$ ..... 45 ..... m*l* golden syrup

$36 \times \frac{3}{2} = 18 \times 3 = 54g$ ..... 54 ..... g light brown sugar

(Total 3 marks)

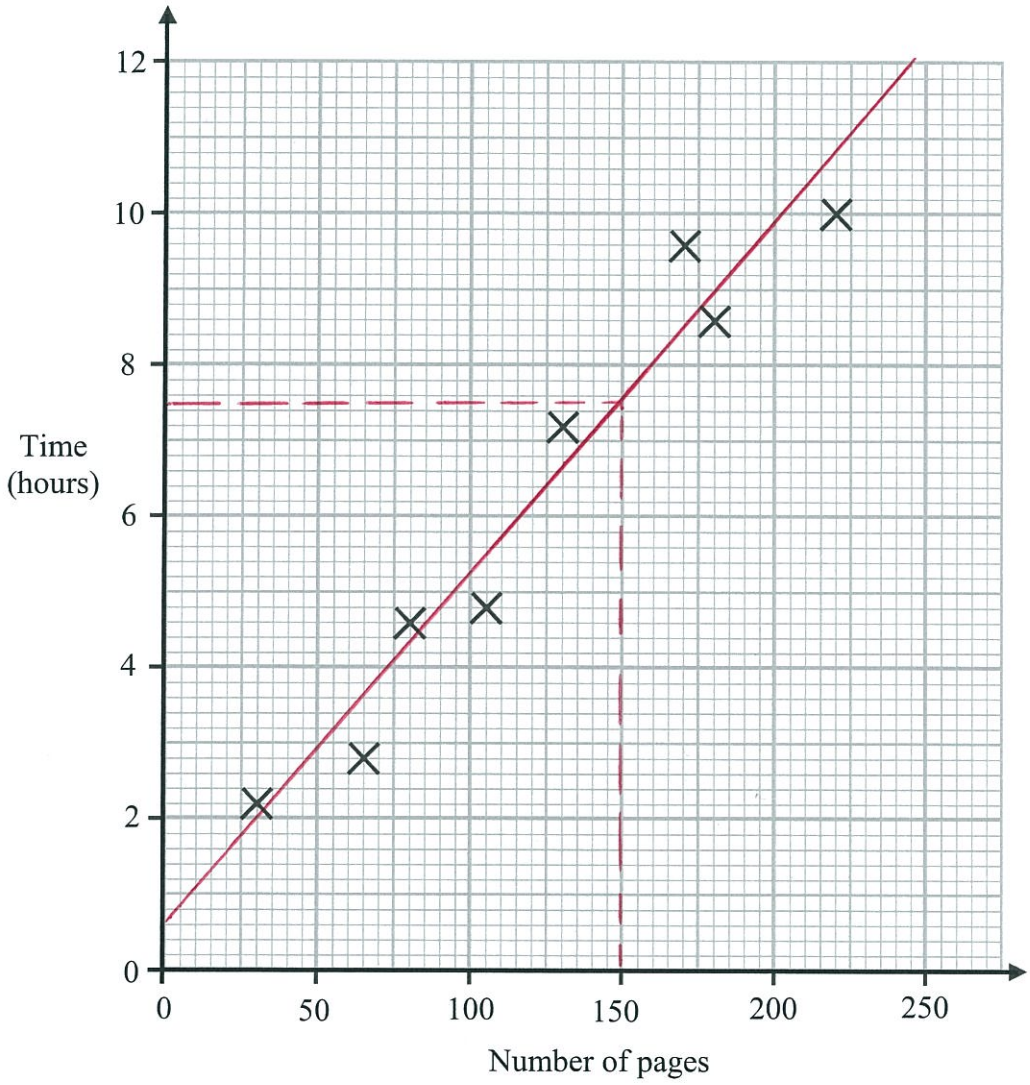
Q1

Leave blank

2. Harriet reads eight books.

For each book she recorded the number of pages and the time she takes to read it.

The scatter graph shows information about her results.



(a) Describe the relationship between the number of pages in a book and the time Harriet takes to read it.

Positive correlation.

(1)

Harriet reads another book.
The book has 150 pages.

(b) Estimate the time it takes Harriet to read it.

7.5 hours

(2)

Q2

(Total 3 marks)

Leave blank

3.

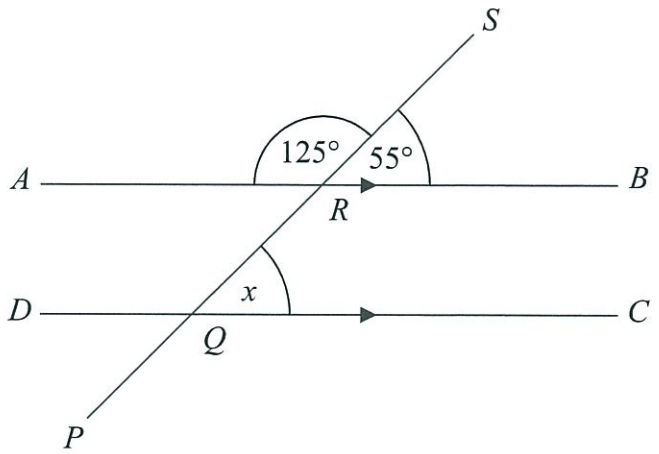


Diagram **NOT** accurately drawn

ARB is parallel to *DQC*.

PQRS is a straight line.

Angle *SRB* = 55°.

(i) Find the size of the angle marked *x*.

55 °

(ii) Give a reason for your answer.

x and $S\hat{R}B$ correspond and are equal.

(Total 2 marks)

Q3

4. Work out an estimate for $\dfrac{7.19 \times 19.7}{0.46}$

$\dfrac{7 \times 20}{0.5} = 140 \div \dfrac{1}{2}$

$= 140 \times \dfrac{2}{1} = 280$

280

(Total 3 marks)

Q4

Turn over

Leave blank

5. $h = 5t^2 + 2$

(a) (i) Work out the value of h when $t = -2$

$h = 5(-2)^2 + 2$
$= 5(4) + 2 = 20 + 2 = 22$

22

(ii) Work out a value of t when $h = 47$

$5t^2 = h - 2$
$\Rightarrow t^2 = \frac{h-2}{5}$
$\Rightarrow t = \pm\sqrt{\frac{h-2}{5}}$
When $h = 47$, $t = \pm\sqrt{\frac{47-2}{5}} = \pm\sqrt{9} = \pm 3$.

3

(3)

(b) $-1 \leqslant n < 4$

n is an integer.
Write down all the possible values of n.

$-1, 0, 1, 2, 3$

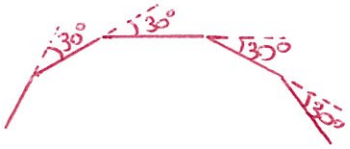
(2)

Q5

(Total 5 marks)

6. Each exterior angle of a regular polygon is 30°.

Work out the number of sides of the polygon.



Formula for exterior angle of any n-sided regular polygon is given by:

$e = \frac{360}{n}$

$\Rightarrow 30 = \frac{360}{n}$

$\Rightarrow 30n = 360$

and so $n = \frac{360}{30} = \frac{36}{3} = 12$

$\therefore$ Polygon has 12 sides.

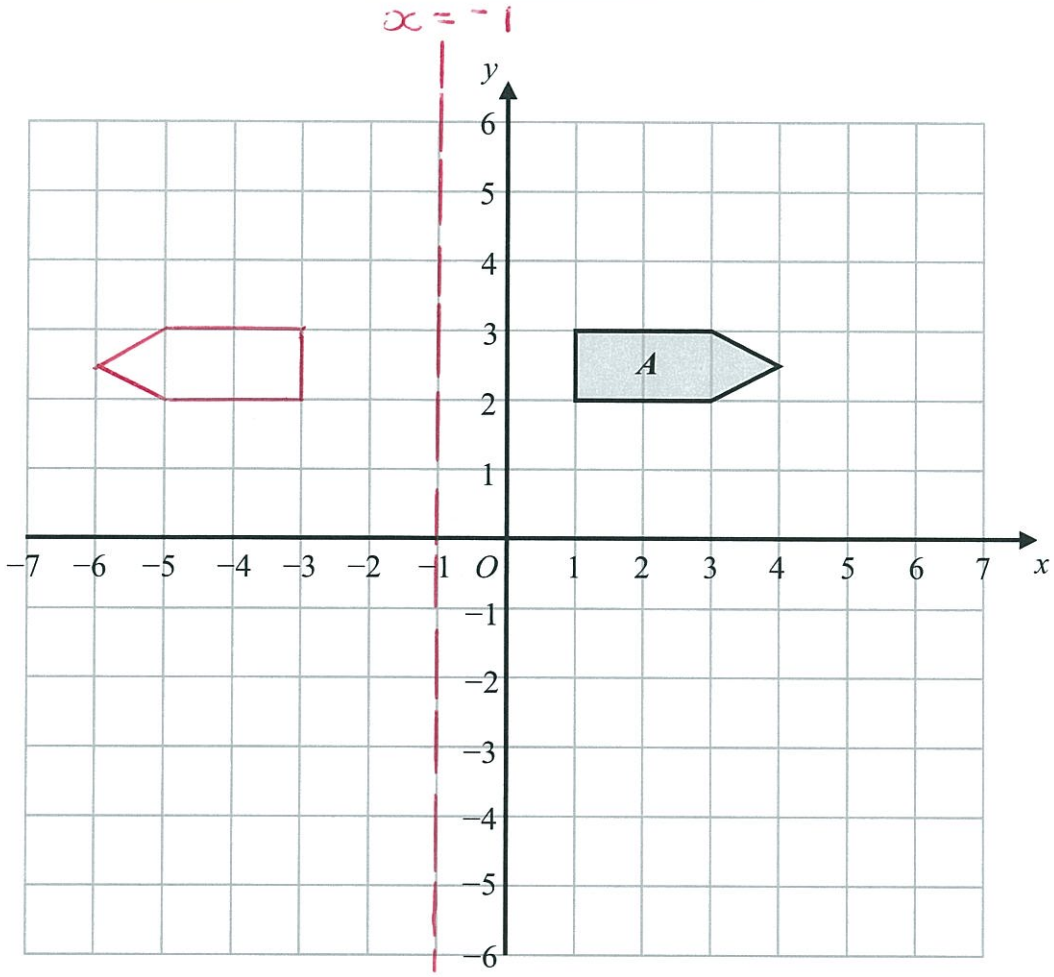
12

Q6

(Total 2 marks)

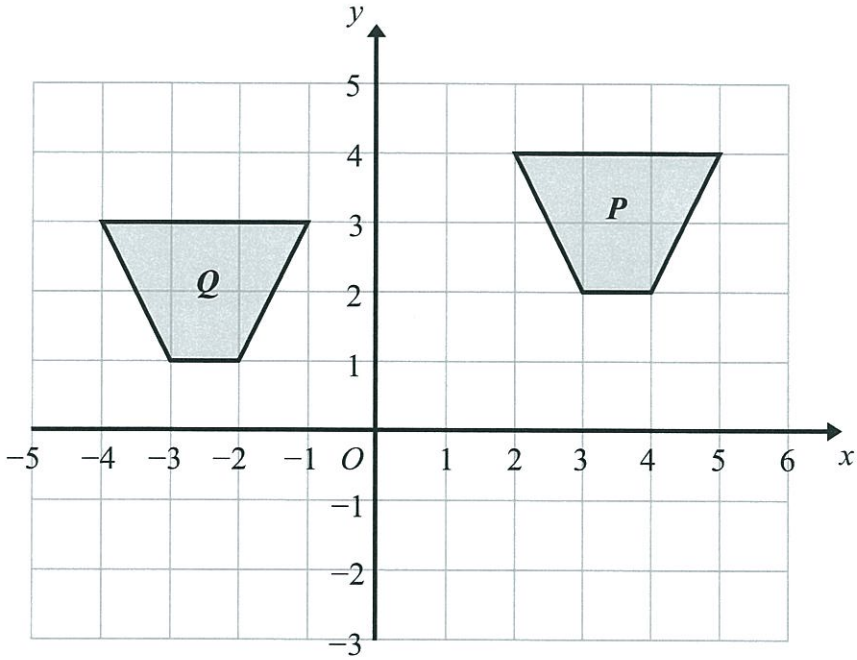
Leave blank

7.



(a) On the grid above, reflect shape ***A*** in the line $x = -1$

(2)



(b) Describe fully the single transformation that will map shape ***P*** onto shape ***Q***.

A translation by the vector $\begin{pmatrix} -6 \\ -1 \end{pmatrix}$

.....

(2)

(Total 4 marks)

Q7

Turn over

Leave blank

8. Sophie wants to find out the amount of time people exercise.
She will use a questionnaire.

(a) Design a suitable question for Sophie to use in her questionnaire.
You must include some response boxes.

How many hours on average would you estimate you engage in activities you would class as exercise in a typical week?

☐ None ☐ 1 – 2 hrs ☐ 3 – 4 hrs ☐ 5 – 7 hrs ☐ 8 – 10 hrs ☐ More than 10 hrs

(2)

Sophie asks the people at her swimming pool to complete her questionnaire.
This may **not** be a suitable sample.

(b) Give a reason why.

Her sample is likely to be biased towards those who are more active as it has not been stratified to make it representative of the population at large.

(1)

(Total 3 marks)

Q8

9. The nth term of a number sequence is given by $3n+1$

(a) Work out the first **two** terms of the number sequence.

$n \rightarrow$ 1 2
$3n+1 \rightarrow$ 4 7

4, 7

(1)

Here are the first four terms of another number sequence.

1 5 9 13

(b) Find, in terms of n, an expression for the nth term of this number sequence.

$n \rightarrow$ 1 2 3 4
$f(n) \rightarrow$ 1 5 9 13
Difference $\rightarrow$ 4 4 4

$f(n) = 4n - 3$

$4n - 3$

(2)

(Total 3 marks)

Q9

Leave blank

10.

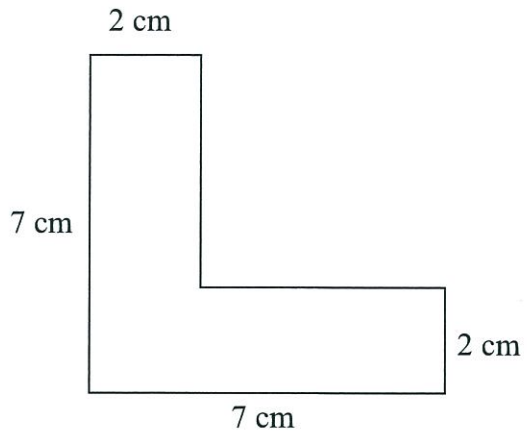


Diagram **NOT** accurately drawn

The diagram shows the cross-section of a solid prism.
The length of the prism is 2 m.

The prism is made from metal.
The density of the metal is 8 grams per cm^3.

Work out the mass of the prism.

(*) Density = $\frac{\text{Mass}}{\text{Volume}}$

Volume of prism = $\overbrace{\text{Cross-sectional surface area}}^{(2\times 7)+(5\times 2)=24\ cm^2}$ × length

= 24 × 200

= 4800 cm^3.

⇒ As per (*), $8 = \frac{\text{Mass}}{4800}$

⇒ Mass = 8 × 4800

= 38,400g

OR 38.4 kg

4800
× 8
38,400

38.4 kg

(Total 5 marks)

Q10

Turn over

Leave blank

11. Peter, Tarish and Ben share £54

Tarish gets three times as much money as Peter.
Ben gets twice as much money as Tarish.

How much money does Ben get?

We can easily infer from this information that Peter, Tarish and Ben share £54 in the ratio 1 : 3 : 6

The amount Ben gets is given by $\frac{6}{10}$ of 54

$= \frac{3}{5} \times 54 = \frac{162}{5} = £32.40$

£ 32.40

(Total 3 marks)

Q11

12. (a) Simplify

(i) $w^6 \times w^4$

$w^{(6+4)} = w^{10}$

w^{10}

(ii) $h^8 \div h^3$

$h^{(8-3)} = h^5$

h^5

(2)

(b) Simplify completely $\frac{12xy^3}{3x^2y^3}$ $= \frac{4}{x}$

If it helps, separate out as follows:

$\frac{12}{3} \times \frac{x}{x^2} \times \frac{y^3}{y^3} = 4 \times \frac{1}{x} \times \frac{1}{1}$

$= 4 \times \frac{1}{x} = \frac{4}{x}$

$\frac{4}{x}$

(2)

(Total 4 marks)

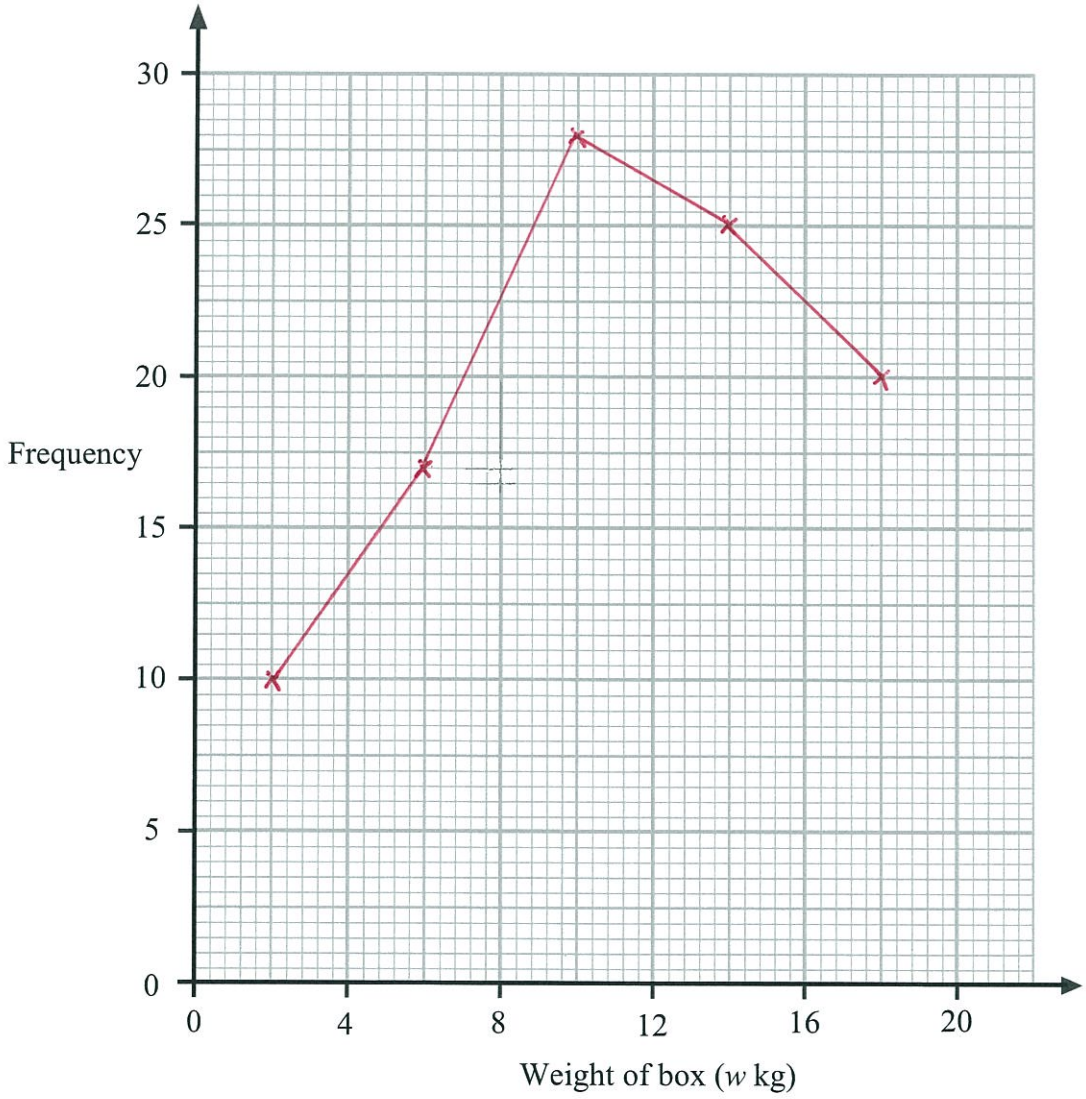
Q12

Leave blank

13. The table shows some information about the weights, in kg, of 100 boxes.

Weight of box (w kg)	**Frequency**
$0 < w \leqslant 4$	10
$4 < w \leqslant 8$	17
$8 < w \leqslant 12$	28
$12 < w \leqslant 16$	25
$16 < w \leqslant 20$	20

Draw a frequency polygon to show this information.



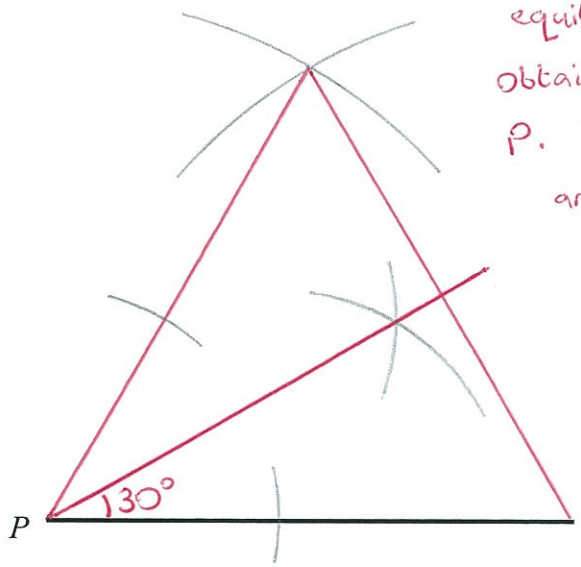
Q13

(Total 2 marks)

Turn over

Leave blank

14. Use ruler and compasses to **construct** an angle of 30° at P.
You **must** show all your construction lines.



First construct an equilateral triangle to obtain the angle 60° at P. Then construct the angle bisector of this angle to create an angle of 30°.

Q14

(Total 3 marks)

15. (a) Expand $x(x + 2)$

$x^2 + 2x$

(2)

(b) Expand and simplify $(x + 3)(x - 4)$

$x^2 - 4x + 3x - 12$
$= x^2 - x - 12$

$x^2 - x - 12$

(2)

(c) Factorise completely $2y^2 - 4y$

$2y(y - 2)$

$2y(y-2)$

(2)

(d) Factorise $x^2 - 9$ Difference of two squares: $a^2 - b^2 \equiv (a+b)(a-b)$

$x^2 - 9 \equiv x^2 - 3^2$
$= (x+3)(x-3)$

$(x+3)(x-3)$

(1)

Q15

(Total 7 marks)

Leave blank

16. (a) Work out $\frac{2}{3} \div \frac{5}{6}$

Give your fraction in its simplest form.

$\frac{2}{3} \div \frac{5}{6} = \frac{2}{3} \times \frac{6}{5}$

$= \frac{12}{15} = \frac{4}{5}$

$\frac{4}{5}$

(3)

(b) Work out $2\frac{1}{3} - 1\frac{2}{5}$

N.B: $2\frac{1}{3} = \frac{2(3)+1}{3} = \frac{7}{3}$

and $1\frac{2}{5} = \frac{1(5)+2}{5} = \frac{7}{5}$

$\frac{7}{3} - \frac{7}{5}$

$= \frac{(7 \times 5) - (3 \times 7)}{3 \times 5} = \frac{35 - 21}{15} = \frac{14}{15}$

$\frac{14}{15}$

(3)

(Total 6 marks)

Q16

Leave blank

17.

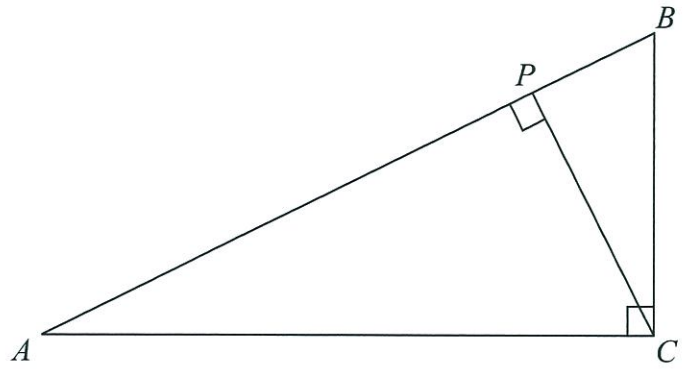
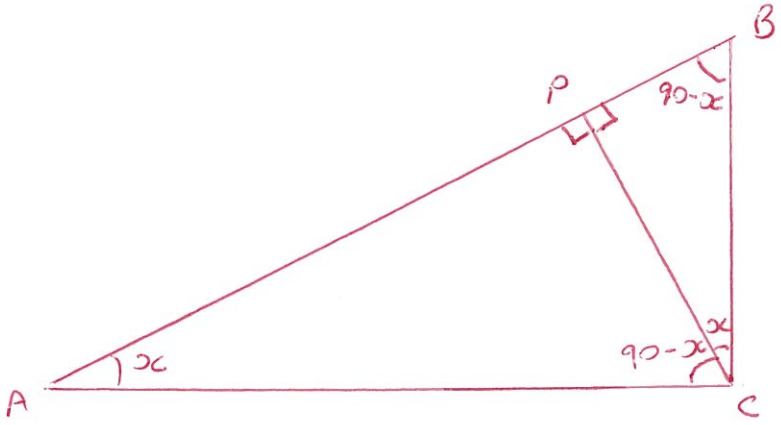


Diagram **NOT** accurately drawn

In the diagram,

ABC is a triangle,
angle *ACB* = 90°,
P lies on the line *AB*,
CP is perpendicular to *AB*.

Prove that the angles of triangle *APC* are the same as the angles of triangle *CPB*.



Call the angle at A 'x' and then determine all other angles in terms of x.

$A\hat{C}P = 180 - 90 - x = 90 - x$

$B\hat{C}P = 90 - (90 - x) = x$

$C\hat{B}P = 180 - 90 - x = 90 - x$

So $C\hat{A}P = B\hat{C}P = x$

$A\hat{C}P = C\hat{B}P = 90 - x$

and $A\hat{P}C = B\hat{P}C = 90°$

∴ Angles of triangle APC are the same as the angles of triangle CPB.

(Total 3 marks)

Q17

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18. The table shows information about the time, m minutes, it takes to show each of 120 films.

Time (m minutes)	Frequency
$70 < m \leqslant 80$	4
$80 < m \leqslant 90$	12
$90 < m \leqslant 100$	34
$100 < m \leqslant 110$	32
$110 < m \leqslant 120$	26
$120 < m \leqslant 130$	12

(a) Write down the modal class interval.

$90 < m \leqslant 100$

(1)

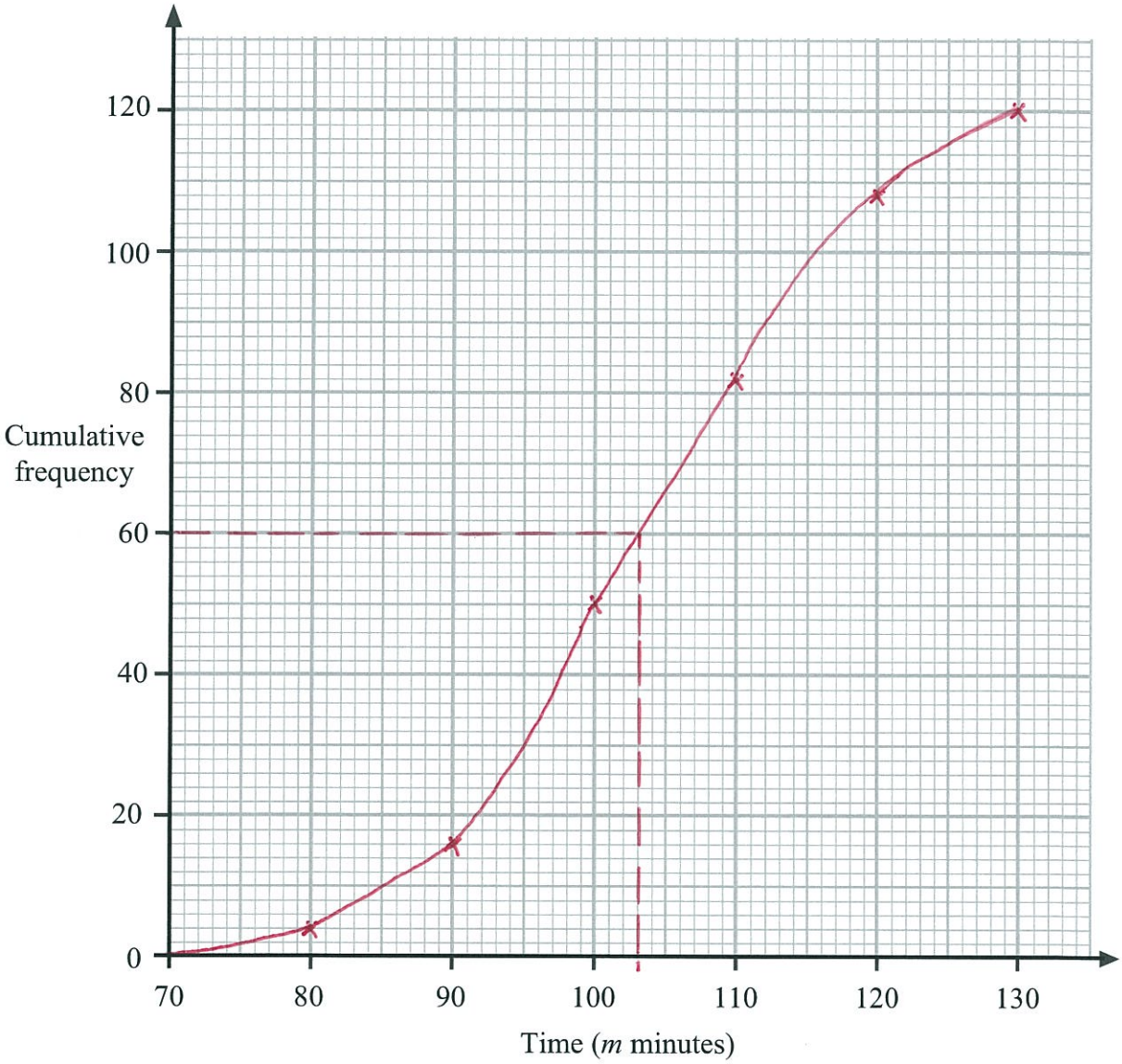
(b) Complete the cumulative frequency table.

Time (m minutes)	Cumulative frequency
$70 < m \leqslant 80$	4
$70 < m \leqslant 90$	16
$70 < m \leqslant 100$	50
$70 < m \leqslant 110$	82
$70 < m \leqslant 120$	108
$70 < m \leqslant 130$	120

(1)

Leave blank

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



(2)

(d) Use your graph to find an estimate for the median.

103 ..... minutes

(1)

Q18

(Total 5 marks)

Leave blank

19. Solve the simultaneous equations

$$4x + y = 10 \quad \cdots\cdots \quad (1)$$
$$2x - 3y = 19 \quad \cdots\cdots \quad (2)$$

Equation (2) × 2 : $2(2x - 3y) = 2(19)$

$\Rightarrow 4x - 6y = 38 \quad \cdots\cdots \quad (3)$

(3) − (1) : $-7y = 28$

$\Rightarrow y = \frac{28}{-7} = -4$

In equation (1), substituting $y = -4$, we get:

$4x - 4 = 10$

$\Rightarrow x = \frac{10+4}{4} = \frac{14}{4} = 3\frac{2}{4} = 3\frac{1}{2}$ or 3.5.

$x =$ 3.5

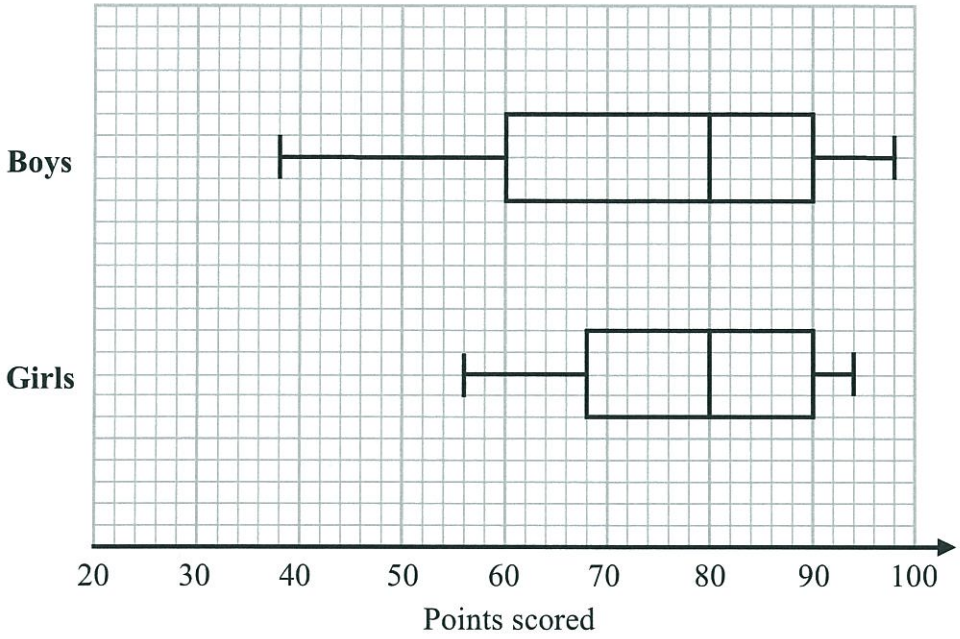
$y =$ −4

(Total 3 marks)

Q19

Leave blank

20. The box plots show information about the points scored by some students in a spelling competition.



Compare the distributions of the boys' scores and the girls' scores.

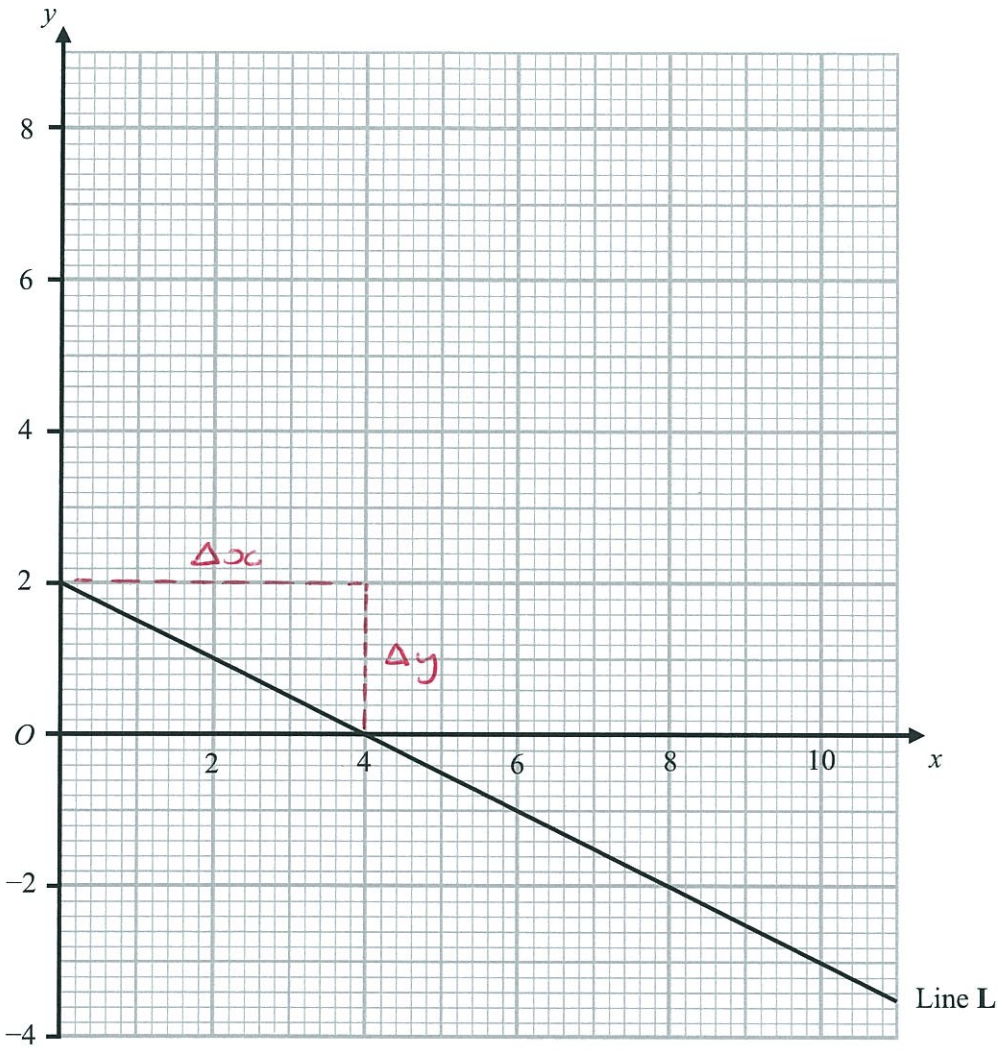
Although the median scores were the same for both the boys and the girls, the boys' scores had a larger range and interquartile range indicating they were more widely spread and less consistent than the girls' scores. **(Total 2 marks)**

Q20

Turn over

Leave blank

21.



Δy – delta y , Δx – delta x

N.B: Δy means 'change in y' and Δx means 'change in x'.

Line **L** is drawn on the grid.

(a) Work out the gradient of Line **L**.

$$\text{Gradient} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0-2}{4-0}$$

$$= \frac{-2}{4} = -\frac{1}{2}$$

$-\frac{1}{2}$

(2)

Another line, Line **M**, is parallel to Line **L** and passes through the point (6, 2).

(b) Find an equation for Line **M**.

$y = mx + c$ where gradient, $m = -\frac{1}{2}$, and $y = 2$ when $x = 6$.

$\Rightarrow 2 = -\frac{1}{2}(6) + c$

$\Rightarrow c = 2 + \frac{1}{2}(6) = 2 + 3 = 5$

$\therefore y = -\frac{1}{2}x + 5$ or $2y + x = 10$

$y = -\frac{1}{2}x + 5$

(2)

Q21

(Total 4 marks)

Leave blank

22. (a) Find the value of $27^{-\frac{2}{3}}$

$$\frac{1}{27^{\frac{2}{3}}} = \frac{1}{(\sqrt[3]{27})^2} = \frac{1}{3^2} = \frac{1}{9}$$

$\frac{1}{9}$

(2)

(b) Given that

$$\frac{8-\sqrt{18}}{\sqrt{2}} = a + b\sqrt{2}, \text{ where } a \text{ and } b \text{ are integers,}$$

find the value of a and the value of b.

$$\frac{8-\sqrt{18}}{\sqrt{2}} = \frac{\sqrt{2}(8-\sqrt{18})}{\sqrt{2}\cdot\sqrt{2}} = \frac{8\sqrt{2}-\sqrt{2}\cdot\sqrt{18}}{2}$$

$$= \frac{8\sqrt{2}-\sqrt{36}}{2} = \frac{8\sqrt{2}-6}{2} = 4\sqrt{2}-3$$

i.e. $-3 + 4\sqrt{2}$

$a =$ -3

$b =$ 4

(3)

(Total 5 marks)

Q22

Leave blank

23. Make k the subject of the formula $t = \dfrac{k}{k-2}$

$t(k-2) = k$

$tk - 2t = k$

$tk - k = 2t$

$\Rightarrow k(t-1) = 2t$

$\therefore k = \dfrac{2t}{t-1}$

$k = \dfrac{2t}{t-1}$

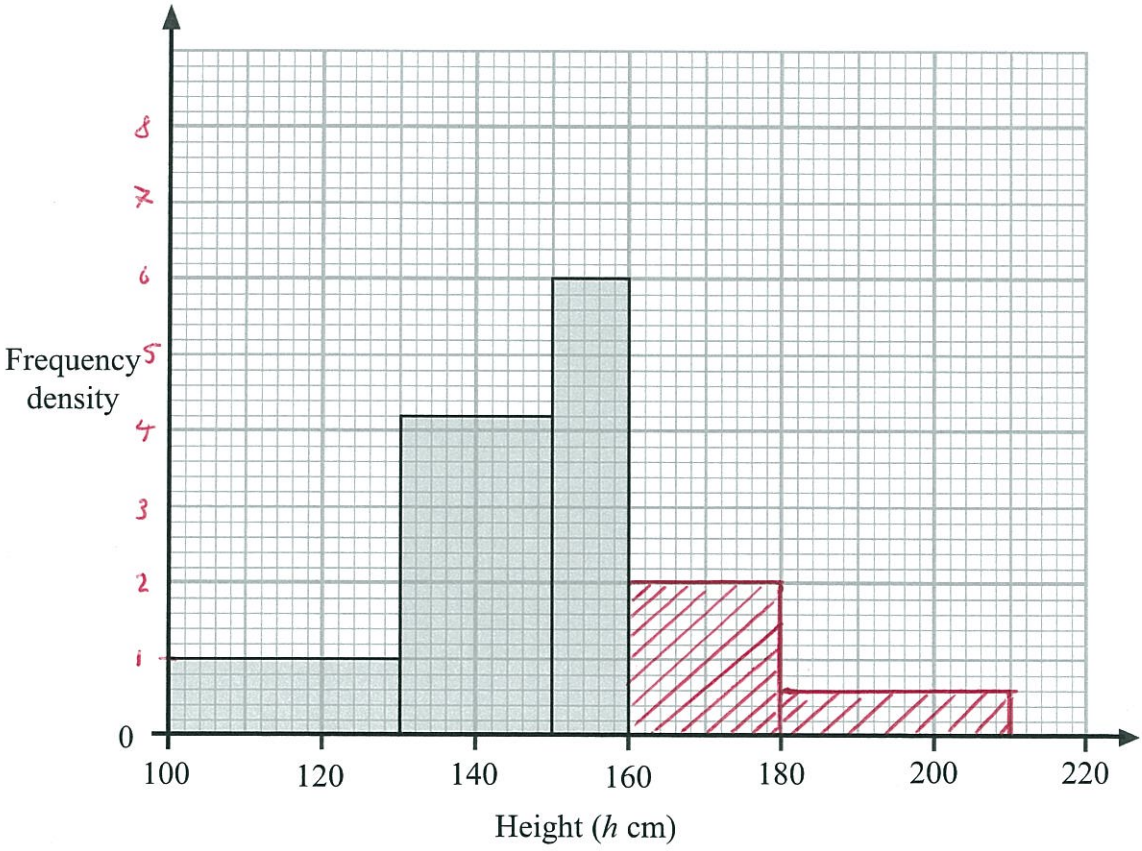
Q23

(Total 4 marks)

Leave blank

24. The incomplete table and histogram give some information about the heights (in cm) of some sunflowers.

Height (h cm)	Frequency	Freq. Density = Freq. / Class width
$100 < h \leqslant 130$	30	1
$130 < h \leqslant 150$	84	4.2
$150 < h \leqslant 160$	60	6
$160 < h \leqslant 180$	40	2
$180 < h \leqslant 210$	18	0.6



(a) Use the histogram to complete the table.

(2)

(b) Use the table to complete the histogram.

(2)

Q24

(Total 4 marks)

Turn over

Leave blank

25.

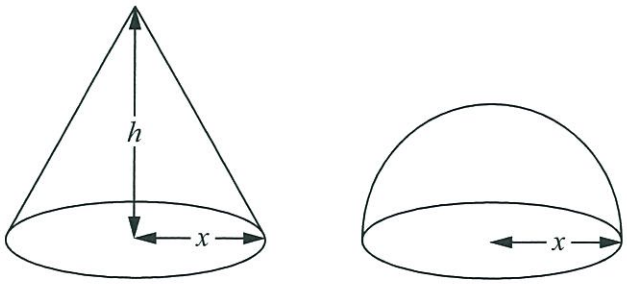


Diagram **NOT** accurately drawn

The diagram shows a solid cone and a solid hemisphere.

The cone has a base of radius x cm and a height of h cm.
The hemisphere has a base of radius x cm.
The surface area of the cone is equal to the surface area of the hemisphere.

Find an expression for h in terms of x.

$$\pi x^2 + \pi x\sqrt{h^2+x^2} = \pi x^2 + \frac{4\pi x^2}{2}$$

$$\Rightarrow \pi x\sqrt{h^2+x^2} = 2\pi x^2$$

$$\Rightarrow \sqrt{h^2+x^2} = \frac{2\pi x^2}{\pi x} = 2x$$

$$\Rightarrow h^2 + x^2 = 4x^2$$

$$\Rightarrow h^2 = 4x^2 - x^2 = 3x^2$$

$$\therefore h = \sqrt{3x^2} = \sqrt{3}\,x$$

$h = \sqrt{3}\,x$

.....

Q25

(Total 4 marks)

Leave blank

26.

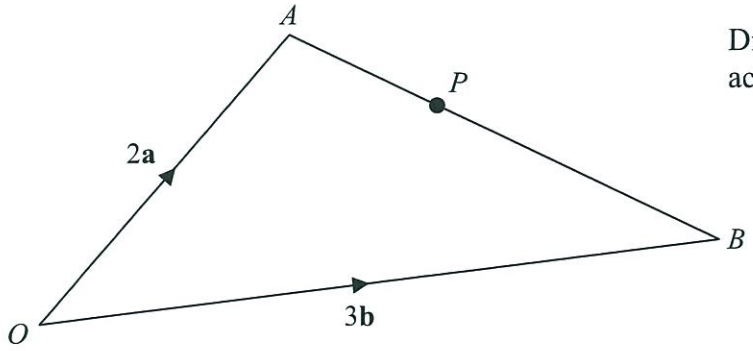


Diagram **NOT** accurately drawn

OAB is a triangle.

$\overrightarrow{OA} = 2\mathbf{a}$

$\overrightarrow{OB} = 3\mathbf{b}$

(a) Find $\overrightarrow{AB}$ in terms of **a** and **b**.

$\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB} = -2a + 3b$

OR $3b - 2a$

$\overrightarrow{AB} =$ $3b - 2a$

(1)

P is the point on *AB* such that $AP : PB = 2 : 3$

(b) Show that $\overrightarrow{OP}$ is parallel to the vector **a** + **b**.

$\overrightarrow{OP}$ is parallel to the vector $a + b$ if we can express $\overrightarrow{OP}$ as $k(a+b)$ where k is a scalar multiplier.

$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP} = 2a + \frac{2}{5}\overrightarrow{AB}$

$= 2a + \frac{2}{5}(3b - 2a) = 2a + \frac{6b}{5} - \frac{4a}{5}$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$. $\therefore$ $\overrightarrow{OP}$ is parallel to $a+b$.

(3)

(Total 4 marks)

Q26

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27. Solve the equation $\frac{x}{2} - \frac{2}{x+1} = 1$

$$\frac{x(x+1) - 2(2)}{2(x+1)} = 1$$

$$\Rightarrow x^2 + x - 4 = 2x + 2$$

$$x^2 - x - 6 = 0$$

$$(x+2)(x-3) = 0$$

$$\therefore x = -2 \text{ or } x = 3.$$

$x = -2$ or 3

Q27

(Total 4 marks)

TOTAL FOR PAPER: 100 MARKS

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