GCSE (9 – 1) Mathematics

J560/04 Paper 4 (Higher Tier)

Question Set 2

1. (a) Anne, Barry and Colin share a prize in the ratio 3 : 4 : 5.
Colin gives $\frac{1}{3}$ of his share to a charity.

What fraction of the whole prize does Colin give to the charity?

Colin : $\frac{5}{3+4+5} = \frac{5}{12} \times \frac{1}{3} = \frac{5}{36}$

(a) $\frac{5}{36}$ [3]

(b) Delia, Edwin and Freya share some money in the ratio 5 : 7 : 8.
Freya's share is £1600.

How much money did they share?

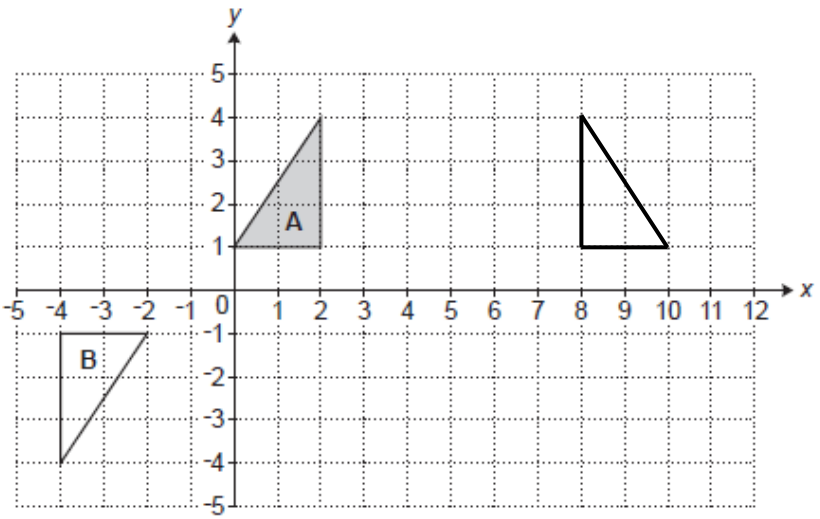
$\frac{8}{5+7+8} \times \text{total} = 1600$

$0.4 \times \text{total} = 1600$

$\text{total} = 4000$

(b) £ 4000 [2]

2 (a) Triangle **A** and triangle **B** are drawn on the coordinate grid.



(a) Describe fully the **single** transformation that maps triangle **A** onto triangle **B**.

A 180° rotation (in any direction) around (-1, 0) [3]

(b) Describe fully the **single** transformation that is equivalent to:

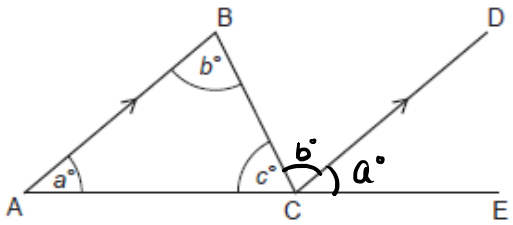
- a reflection in the line $x = 3$, followed by
- a translation by $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$.

You may use the grid above to help you.

A reflection in the line $x = 5$

[3]

3 **(a)** The diagram shows triangle ABC.
CD is parallel to AB.
A, C and E lie in a straight line.
Angles of size $a°$, $b°$ and $c°$ are shown.



Not to scale

(a) Insert $a°$, $b°$ or $c°$ to make this statement true.
Give a reason for your answer.

Angle DCE = $a°$ because of the F rule ($\angle BAC$ is equal to $\angle DCE$ as $\overline{AB}$ & $\overline{CD}$ are parallel) [2]

(b) Use the diagram and the answer to part **(a)** to show that the angles of a triangle add up to 180°.
Give a reason for each statement you make. **[3]**

$\angle DCE = a°$ according to F rule

$\angle BCD = b°$ according to Z rule ($\angle BCD$ is equal to $\angle ABC$)

$\angle BCA = c°$

At point C, $\angle DCE$, $\angle BCD$ and $\angle BCA$ add up to 180° $(a° + b° + c°)$

$a°$, $b°$ and $c°$ make up the total internal angles of $\triangle ABC$ thus angles of triangle add up to 180°.

4 The area of a rectangle is 56 m^2, correct to the nearest m^2.
The length of the rectangle is 9.2 m, correct to the nearest 0.1 m.

Calculate the smallest possible width of the rectangle.

Area: $55.5 - 56.5$

l: $9.15 - 9.25$

$l \times w = \text{Area}$

$w = \frac{\text{Area}}{l}$

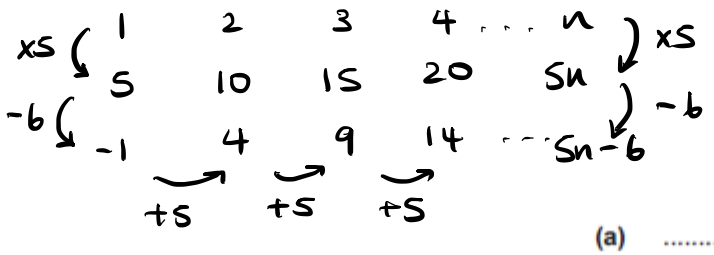
$w = \frac{55.5}{9.25} = 6$

6 m **[4]**

5 **(a)** Here are the first four terms of a sequence.

-1 4 9 14

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



(a) ..... 5n-6 ..... [2]

(b) The *n*th term of another sequence is given by

$an^2 + bn$

The third term is 9 and the sixth term is 126.

Find the value of *a* and the value of *b*.

$n=3 \rightarrow 9 \quad a\times 3^2 + b\times 3 = 9$

$9a + 3b = 9 \quad (\times 2)$

$n = 6 \rightarrow 126 \quad a\times 6^2 + b\times 6 = 126$

$36a + 6b = 126$

$36a + 6b = 126$

$-\ 18a + 6b = 18$

$18a = 108$

$a = 6$

$9\times 6 + 3b = 9$

$36 + 3b = 9$

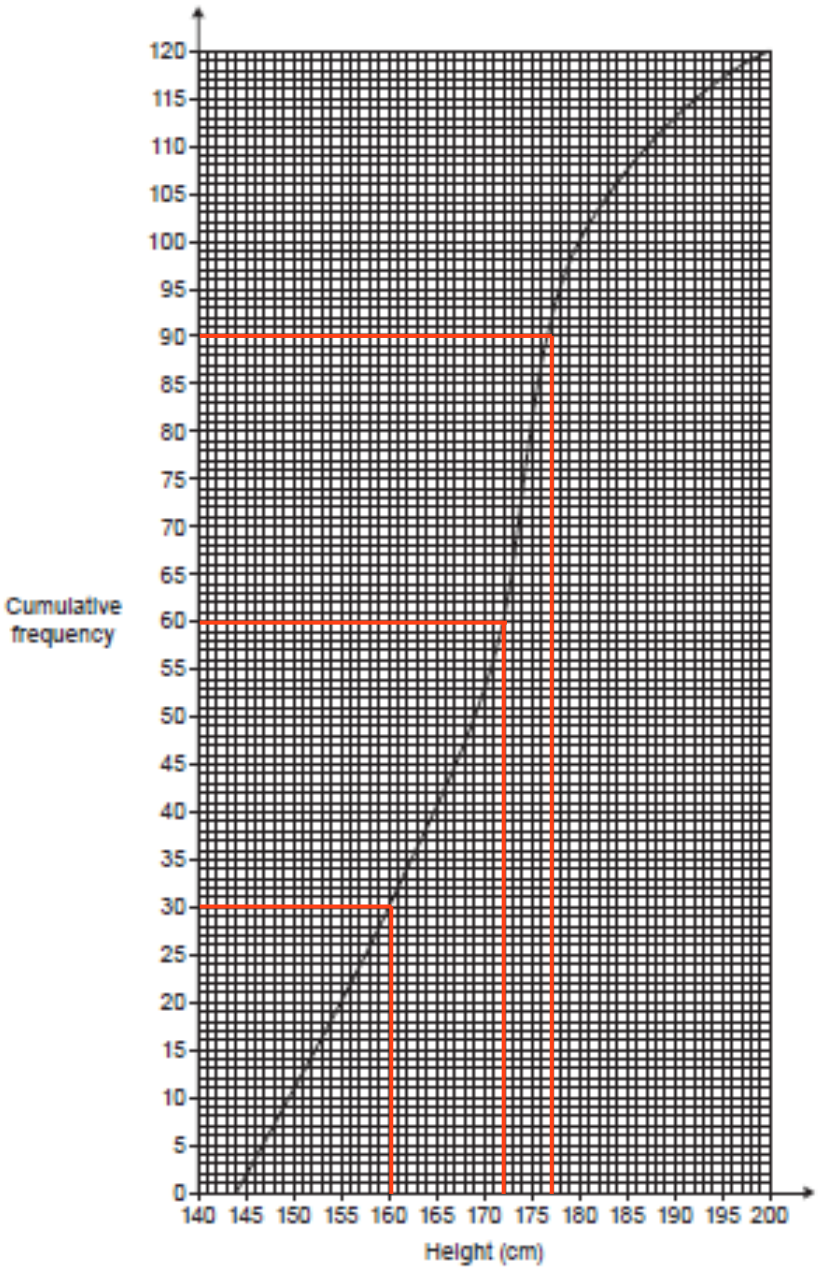
$3b = -27$

$b = -9$

(b) a = ... 6 .....

b = ... -9 ..... [5]

6 **(a)** The cumulative frequency graph shows the distribution of the heights of members of a rowing club.



(i) (i) Find the median.

120 ÷ 2 = 60

(a)(i) 172 cm **[1]**

(ii) Find the interquartile range.

UQ = 90 → 177
LQ = 30 → 160
IQR = 177 − 160 = 17

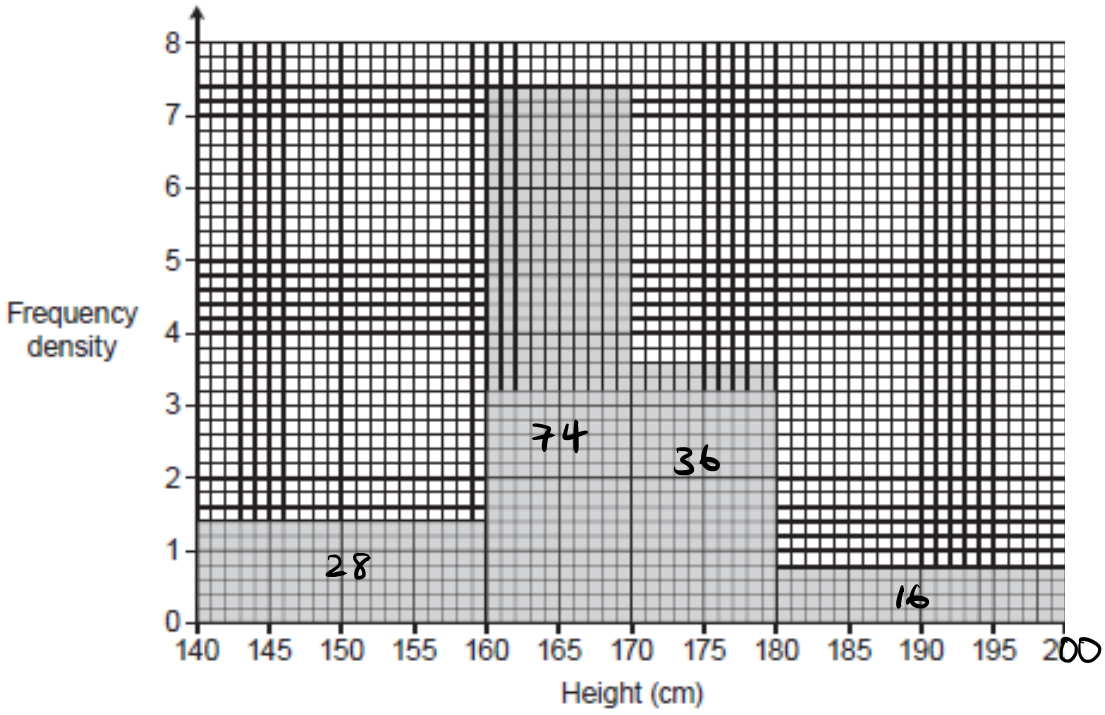
(ii) 17 cm **[2]**

(iii) Calculate the percentage of the members who are at least 180 cm tall.

$120 - 100 = 20$ = number who are $\geqslant 180$ cm

$\frac{20}{120} \times 100 = 16.\dot{6}$ (iii) 16.67 % [3]

(b)) The histogram summarises the heights of the 153 members of a swimming club.



Which club has the greater median height?
You must show all your working.

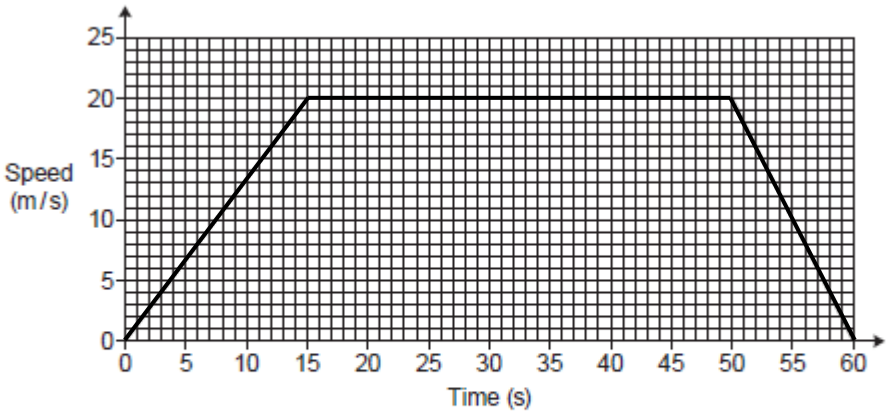
$\frac{153}{2} = 76.5$ $76.5 - 28 = 48.5 = f.$

$7.4 = \frac{48.5}{c.w.}$ $c.w. = 6.554$

$160 + 6.55 = 166.55$

The rowing club has higher median than swimming club ($172 > 166.55$)

7 **(a)** The graph shows the speed of a train during the first 60 seconds of motion.



(a) What is the speed of the train after 9 seconds?

ave. speed = $\frac{\text{final} - \text{initial}}{2} = \frac{12}{9} = 1.\dot{3}$

$\frac{\text{final} - 0}{2} = 1.\dot{3}$ final = $\frac{8}{3}$

(a) ..... $\frac{8}{3}$ ..... m/s **[1]**

(b) What does the straight line suggest about the speed of the train over the first 15 seconds?

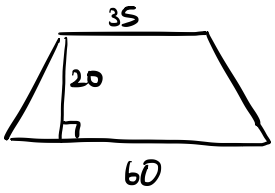
The train is constantly accelerating.

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

(c) Work out the average speed of the train, in m/s, during the 60 seconds.

Area = distance = $(35+60) \times 20 \times \frac{1}{2}$

= 950 m



$s = \frac{d}{t} = \frac{950}{60} = 15.8\dot{3}$

(c) ..... 15.83 ..... m/s **[5]**

8 Solve this equation algebraically.
Give your solutions correct to 2 decimal places.

$3x^2 + 8x - 5 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $\quad a = 3 \quad b = 8 \quad c = -5$

$= \frac{-8 \pm \sqrt{8^2 - 4 \times 3 \times -5}}{2 \times 3}$

$= \frac{-8 \pm \sqrt{124}}{6}$

$= \frac{-8 \pm 2\sqrt{31}}{6_3}$

$= \frac{-4 \pm \sqrt{31}}{3}$

$= 0.5225$ or -3.189

$x =$ 0.523 or $x =$ −3.19 [4]

Total Marks for Question Set : 49