

**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?

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

(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?

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

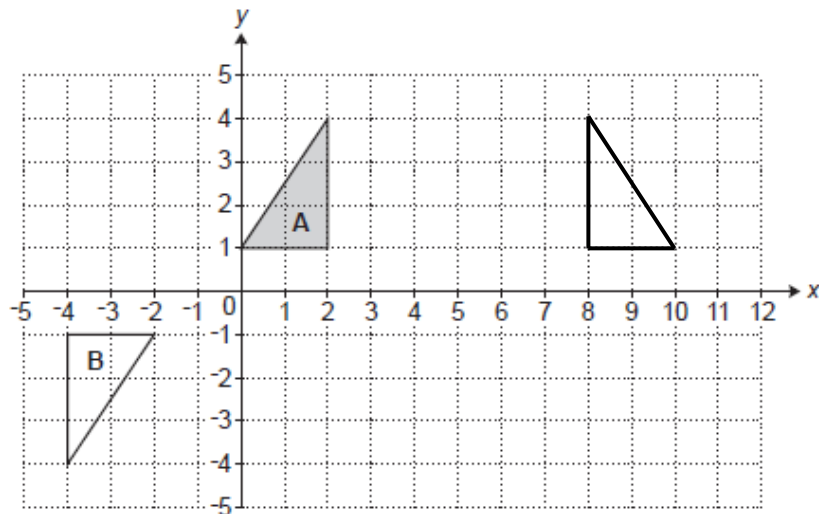
$$0.4 \times \text{total} = 1600$$

$$\text{total} = 4000$$

(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  $180^\circ$  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  $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$ .

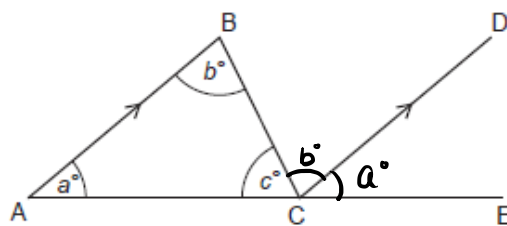
You may use the grid above to help you.

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  $a^\circ$ ,  $b^\circ$  and  $c^\circ$  are shown.



Not to scale

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

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

(b)

Use the diagram and the answer to part (a) to show that the angles of a triangle add up to  $180^\circ$ .  
Give a reason for each statement you make.

[3]

$\angle DCE = a^\circ$  according to F rule

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

$\angle BCA = c^\circ$

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

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

4

The area of a rectangle is  $56 \text{ m}^2$ , correct to the nearest  $\text{m}^2$ .  
The length of the rectangle is  $9.2 \text{ m}$ , correct to the nearest  $0.1 \text{ m}$ .

Calculate the smallest possible width of the rectangle.

Area:  $55.5 - 56.5$

$l$ :  $9.15 - 9.25$

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

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

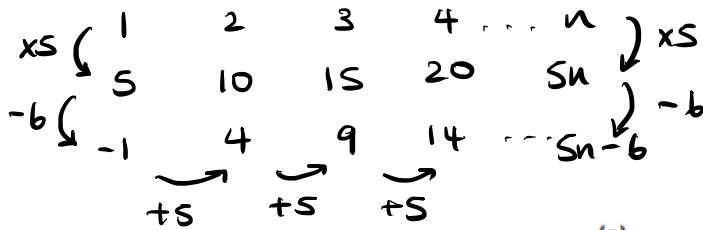
$$w = \frac{55.5}{9.25} = \boxed{6}$$

.....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) .....  $S_n - b$  ..... [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  $b$ .

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

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

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

$$\underline{36a + 6b = 126}$$

$$\begin{array}{r} 36a + 6b = 126 \\ - 18a + 6b = 18 \\ \hline 18a = 108 \end{array}$$

$$18a = 108$$

$$\underline{a = 6}$$

$$9 \times 6 + 3b = 9$$

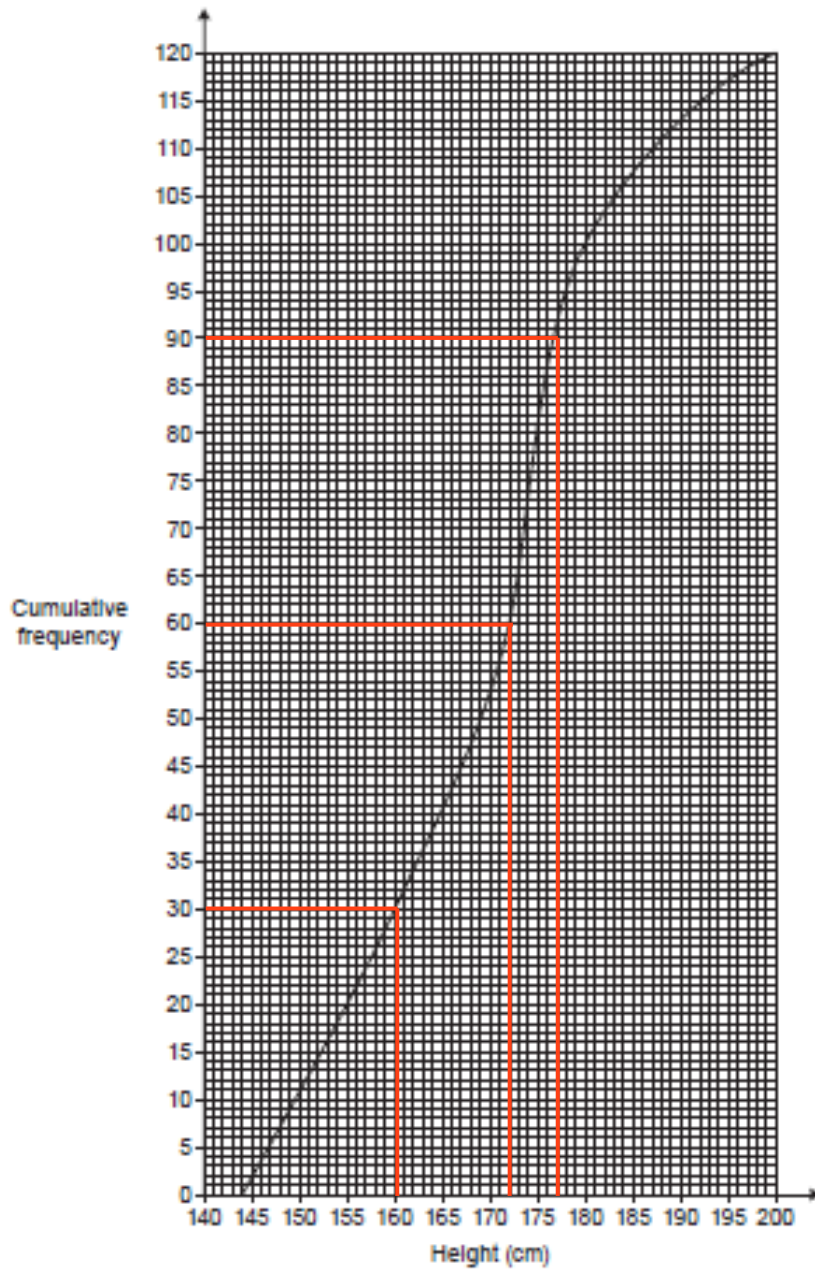
$$\underline{36 + 3b = 9}$$

$$3b = -27$$

$$\underline{b = -9}$$

(b)  $a = \frac{6}{\dots\dots\dots}$   
 $b = \frac{-9}{\dots\dots\dots}$  [5]

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



(i)

- (i) Find the median.

$$120 \div 2 = 60$$

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

- (ii) Find the interquartile range.

$$UQ = 90 \rightarrow 177$$

$$LQ = 30 \rightarrow 160$$

$$IQR = 177 - 160 = 17$$

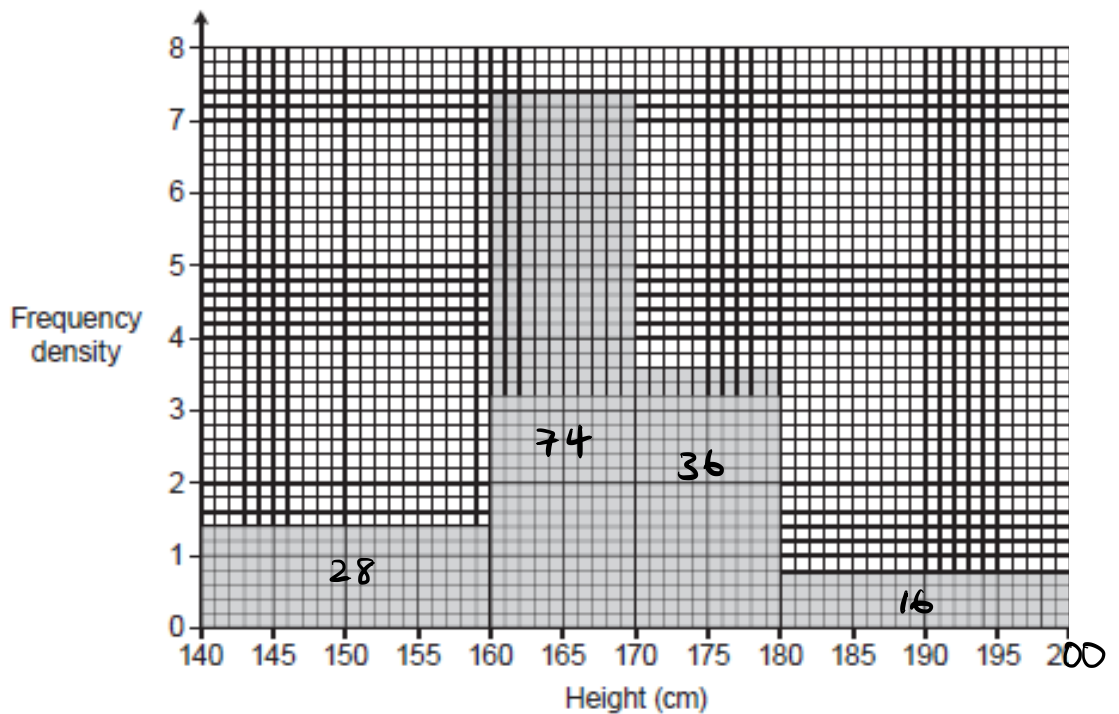
(ii) ..... 17 ..... cm [2]

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

$$120 - 100 = 20 = \text{number who are } \geq 180 \text{ cm}$$

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

(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.

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

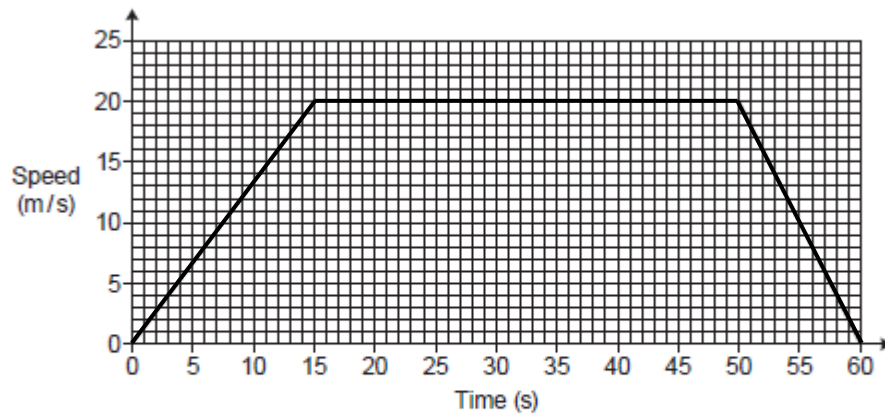
$$7.4 = \frac{48.5}{c.w.} \quad c.w. = 6.554$$

$$160 + 6.55 = \underline{\underline{166.55}}$$

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?

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

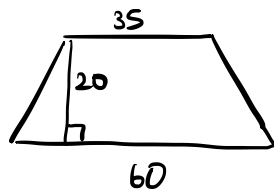
$$\frac{\text{final} - 0}{2} = 1.\dot{3} \quad \text{final} = \frac{8}{3} \quad \text{(a) } \dots\dots\dots \frac{8}{3} \dots\dots\dots \text{ m/s [1]}$$

(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.

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



$$= \underline{950 \text{ m}}$$

$$s = \frac{d}{t} = \frac{950}{60} = 15.\dot{8}\dot{3}$$

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



8

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

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

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

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

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

$$= \frac{-4 \pm 2\sqrt{31}}{6}$$

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

$$= 0.5225 \text{ or } -3.189$$

$$x = \dots 0.523 \dots \text{ or } x = \dots -3.19 \dots [4]$$

**Total Marks for Question Set : 49**

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