OCR
Oxford Cambridge and RSA

GCSE (9-1) Mathematics

J560/05 Paper 5 (Higher Tier)

Question Set 3

1. **(a)** Work out.

$$\frac{3}{4}+\frac{1}{6}$$

Give your answer in its simplest form.

$\frac{3}{4}+\frac{1}{6}=\frac{9}{12}+\frac{2}{12}=\frac{11}{12}$

(a) $\frac{11}{12}$ **[2]**

(b) By writing each number correct to 1 significant figure, use estimation to show that

$\frac{40\times20}{\sqrt{100}}=\frac{800}{10}=80$ $\frac{39.6\times20.2}{\sqrt{99.2}}\approx 80.$ **[3]**

2. Given that $168=2^3\times3\times7$, find the lowest common multiple (LCM) of 168 and 30.

$30=2\times3\times5$

LCM of 168 and 30 $=2^3\times3\times5\times7$

$=840$

840 **[3]**

3. Martina has answered some questions on algebra.
In each question, she has made an error.

Describe her error and give the correct answer to each problem.

(a) Question 1 Simplify. $2a \times a \times a$

Martina's answer $4a$

Martina's error is adding all the a (like $2a + a + a$) instead of multiplying

Correct answer = $2a^3$ **[2]**

(b) Question 2 Simplify. $\frac{x^{10}}{x^2}$

Martina's answer x^5

Martina's error is dividing 2 from 10 to get 5 as the power of x instead of subtracting them

Correct answer = x^8 **[2]**

(c) Question 3 $s = ut + \frac{1}{2}at^2$

Find s when $u = 0$, $t = 5$ and $a = 6$.

Martina's solution $s = 0 \times 5 + \frac{1}{2} \times 6 \times 5^2$

$s = 0 + 15^2$

$s = 225$

Martina's error is multiplying 3 ($\frac{1}{2} \times 6 = 3$) with 5 (from 5^2) before calculating the power on 5

Correct answer = 75 **[2]**

4. Sundip and Emma have some money.
The ratio of Sundip's money to Emma's money is 3 : 5.
Emma spends £450 of her money.
The ratio of Sundip's money to Emma's money is now 2 : 3.

Find how much money Sundip has.

Sundip original money value = $3x$
Emma original money value = $5x$

Sundip new = $3x$
Emma new = $5x - 450$

$3x : 5x - 450 = 2 : 3$

$2(5x - 450) = 3 \times 3x$

$10x - 900 = 9x$

$10x - 9x = 900$

$x = 900$

Sundip = $3x = 3 \times 900 = 2700$

£ 2700 [4]

5. **(a)** The scale 1 cm represents 25 m can be written in the form 1 : k.

Find the value of k.

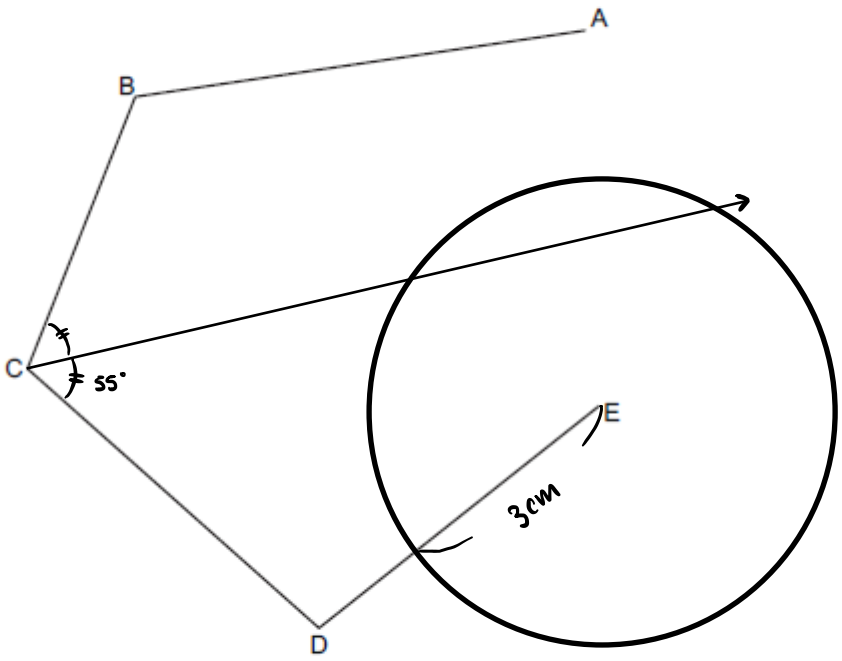
25m = 2500 cm

1m = 100cm

(a) k = 2500 **[1]**

(b) The scale drawing represents a harbour.

Scale: 1cm represents 25 m



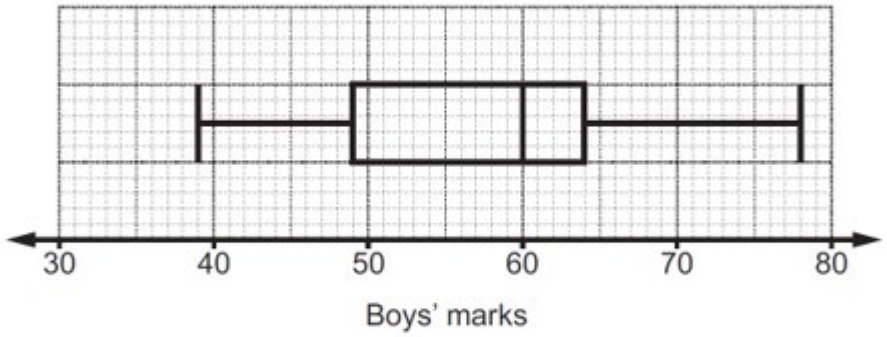
A boat leaves the harbour from point C and sails on a path that is equidistant from BC and CD.
The harbour rules do not allow boats to sail within 75 m of point E.

Find by construction whether the path of the boat will follow the harbour rules.
Show all your construction lines.

The path crosses within 75m of point E thus it does not follow the habour rule **[5]**

6.

The box plot shows the distribution of the marks scored by some boys in a test.



(a) Find the interquartile range.

64 − 49 = 15

(a) 15 [2]

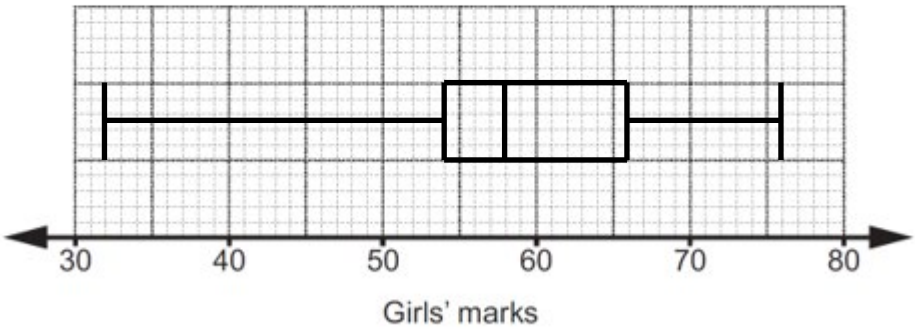
(b) The marks for some girls in the same test are summarised below.

- median = 58
- lowest mark = 32
- range = 44
- upper quartile = 66
- interquartile range = 12

highest mark = 44 + 32 = 76

lower quartile = 66 − 12 = 54

Draw a box plot to show the distribution of the marks scored by the girls.



[3]

(c) Eleanor says

The boys did better, on average, in the test as they had a bigger interquartile range.

Is her statement correct?
Explain your reasoning.

No as having greater interquartile range means the boys' marks are more spread apart [2]

7. y is inversely proportional to the square root of x.
$y = 7$ when $x = 25$.

Find the value of y when $x = 100$.

$y \propto \frac{1}{\sqrt{x}} \quad y = \frac{k}{\sqrt{x}}$

$7 = \frac{k}{\sqrt{25}} = \frac{k}{\sqrt{5^2}} = \frac{k}{5} \quad (\times 5)$

$k = 7 \times 5 = 35$

$y = \frac{35}{\sqrt{100}} = \frac{35}{\sqrt{10^2}} = \frac{35}{10}$

$= 3.5$

$y =$ 3.5 **[3]**

8. **(a)** Write $x^2 - 6x + 11$ in the form $(x-a)^2 + b$.

$(x-a)^2 = x^2 - 2ax + a^2$

$x^2 - 2 \times 3x + 11 \qquad a = 3$

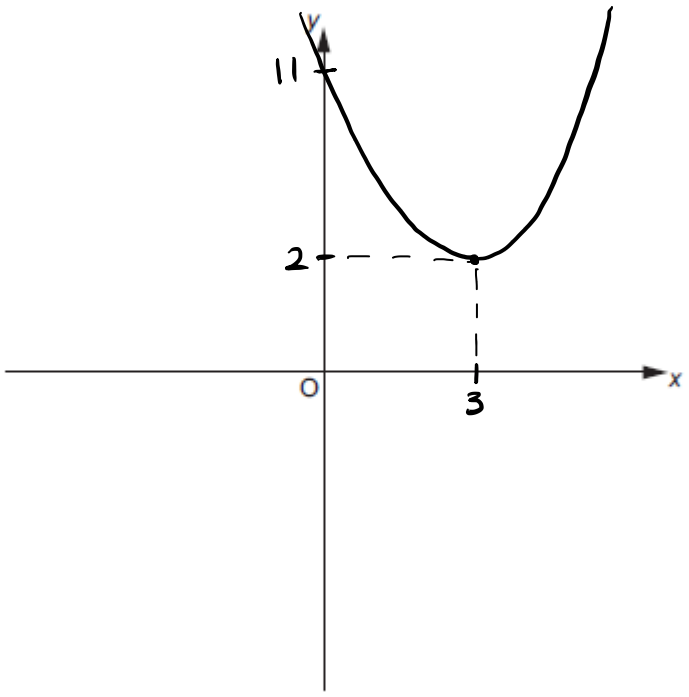
$= x^2 - 2 \times 3x + 3^2 - 3^2 + 11$

$= (x-3)^2 - 9 + 11$

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

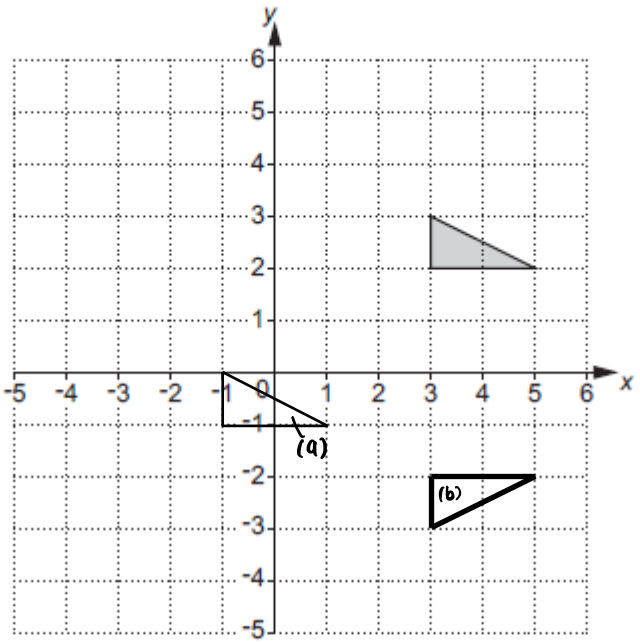
(a) $(x-3)^2 + 2$ **[3]**

(b) Sketch the graph of $y = x^2 - 6x + 11$.
Show clearly the coordinates of any turning points.



[3]

9. You may use this coordinate grid to help you answer the following questions.



Describe fully the **single** transformation that is equivalent to

(a) a translation of $\begin{pmatrix} -7 \\ 2 \end{pmatrix}$ followed by a translation of $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$.

a translation $\begin{pmatrix} -4 \\ -3 \end{pmatrix}$

[2]

(b) a reflection in the line $y = x$ followed by a rotation of 90° clockwise around (0, 0).

a reflection in the line $y = 0$

[3]

10. In this question all units are in cm.

A circle has equation $x^2 + y^2 = 36$.

(a) Write down the radius and centre of the circle.

$x^2 + y^2 = r^2$

$r = \sqrt{36} = 6$

(a) radius: 6 cm

centre: (0, 0) **[2]**

(b) The distinct points A (a, $\sqrt{11}$) and B (b, $\sqrt{11}$) lie on the circumference of the circle.

Work out the length AB.

$x^2 + (\sqrt{11})^2 = 36$

$x^2 + 11 = 36$

$x^2 = 25$

$x = \pm 5$

a and b = 5, -5

$\overline{AB} = 5 - (-5)$

$= 10$

(b) 10 cm **[4]**

Total Marks for Question Set 3: 51

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