SEPTEMBER 2022 MOCK MARKING SCHEME

MATHEMATICS 1

OBJECTIVE TEST

ANSWERS

1.	C	{7, 13}
2.	B	$Q \subset P$
3.	B	45
4.	D	an isosceles triangle
5.	D	9
6.	C	$1\frac{2}{5}$
7.	C	¢ 4,000.00
8.	D	$^5/_8$, 0.62 , $^9/_{16}$
9.	C	¾
10.	C	0.76
11.	A	¢ 1,020.00
12.	C	18 km
13.	D	16 days
14.	C	GH¢ 9.65
15.	B	¢ 39,000.00
16.	A	1:200
17.	D	$^5/_8$
18.	B	4
19.	C	¢ 245,000.00
20.	C	60°
21.	B	1.5
22.	A	7.5 cm
23.	D	$x \leq 2$
24.	C	52°
25.	D	$3\frac{3}{4}$
26.	B	$\frac{2}{5}$
27.	C	Equilateral triangle
28.	B	$38\frac{1}{2}$ cm^2
29.	D	GH¢ 4.50
30.	B	$Q(-5, -4)$
31.	C	3
32.	B	4
33.	B	0.3125
34.	D	18.84
35.	B	5
36.	D	250 cm
37.	B	16.7 %
38.	A	17^0
39.	B	10
40.	D	36

MATHEMATICS 2

PAPER 2

ANSWERS

1. (a)

B = {20, 21, 22, 23, …, 30}

D = {1, 3, 7, 9, 21, 63}

(i) $B \cap D = \{21\}$

(ii) $B \cup D = \{1, 3, 7, 9, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 63\}$

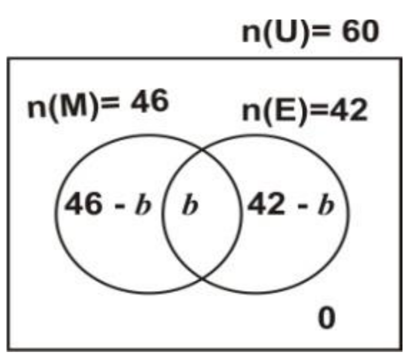
(b) (i)

Let n(U) = No. of students in the class

n(M) = No. of students that passed Maths

n(E) = No. of students that passed English

b = No. of students that passed both Maths and English



(ii) From the diagram above,

$$46 - b + b + 42 - b + 0 = 60$$

$$\Rightarrow \quad 46 + 0 + 42 - b + 0 = 60$$

$$\Rightarrow \quad 46 + 42 - b = 60$$

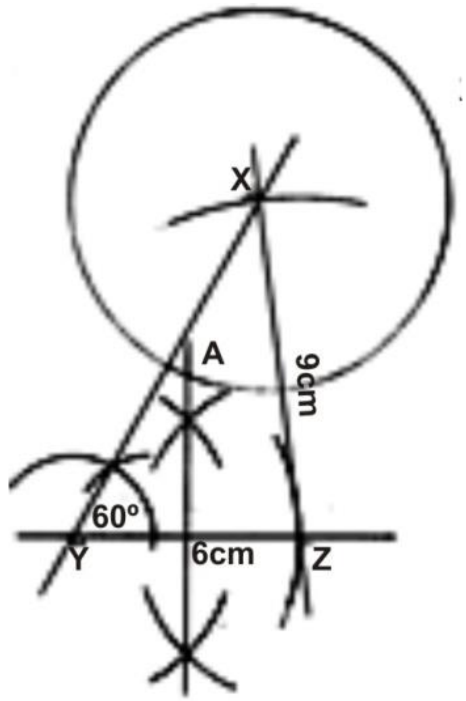
$$\Rightarrow \quad 88 - b = 60$$

$$\Rightarrow \quad 88 - 60 = b$$

$$\Rightarrow \quad \underline{\underline{b = 28}}$$

$\therefore$ 28 students passed in both subjects

2.



(a) |XY| ≈ 10.3 cm

(b) |YA| ≈ 5.7 cm

3. **(a)** Total expenses = Income tax + property tax + repairs

= (15% of ¢240,000) + (25% of ¢240,000) + ¢10,000

$$= \left(\frac{15}{100} \times ¢240{,}000\right) + \left(\frac{25}{100} \times ¢240{,}000\right) + ¢10{,}000$$

= ¢36,000 + ¢60,000 + ¢10,000

= ¢106,000

$\Rightarrow$ The landlady's total expenses = ¢106,000.00

(b) The remainder = Total Amount – Expenses

= ¢240,000.00 – ¢106,000.00

= ¢134,000.00

(c) Percentage of the rent spent on repairs

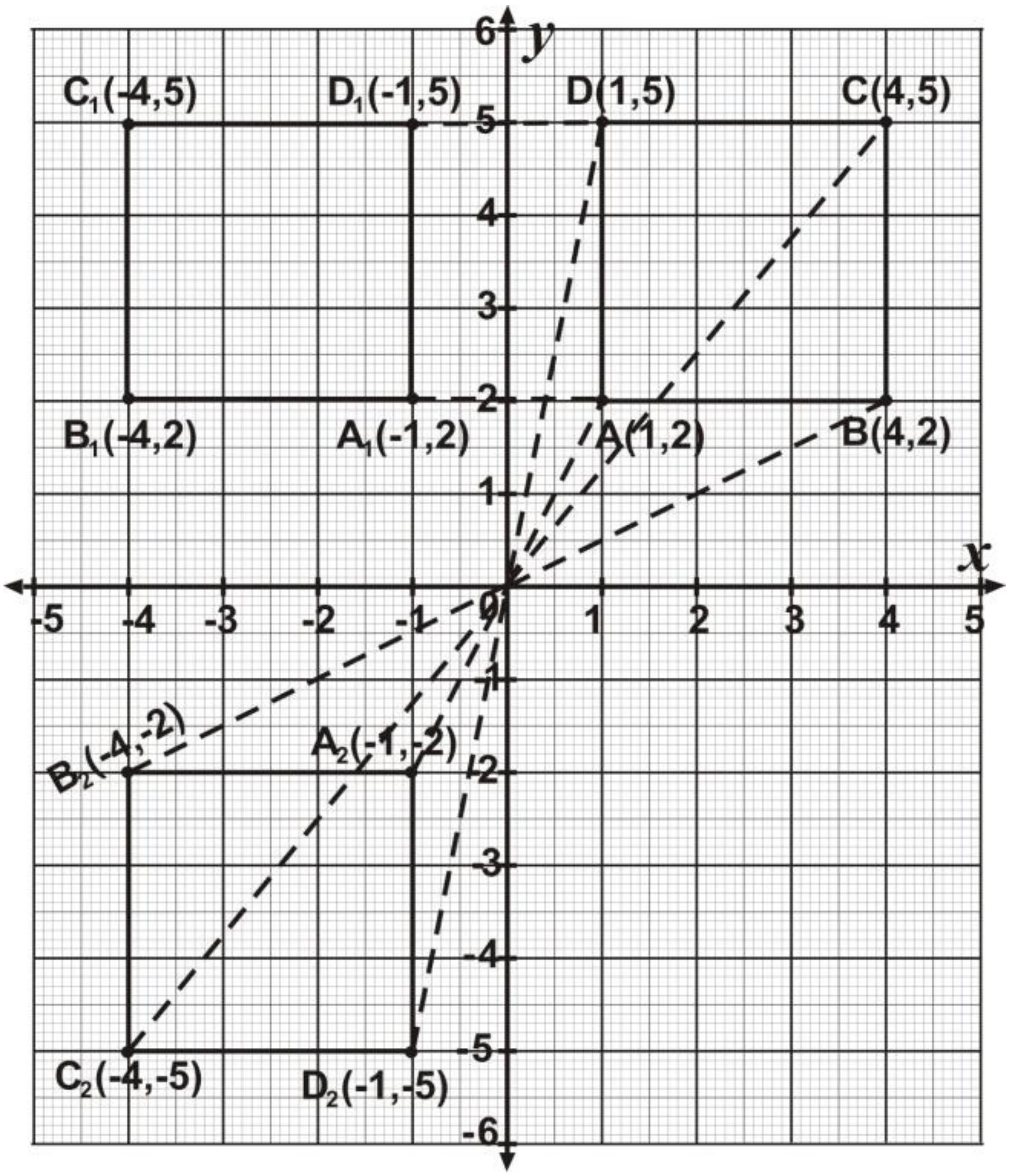
$$= \frac{\text{Amount on repairs}}{\text{Total income from rent}} \times 100\%$$

$$= \frac{10,000}{240,000} \times 100\%$$

$$= \frac{25}{6}\%$$

$$= \underline{\underline{4\tfrac{1}{6}\%}} \quad \text{or} \quad \approx \underline{\underline{4.167\%}}$$

4. **Approach 1** (By Inspection / Construction)



(ii) **Approach 2** (The rule / formula)

Reflecting (x, y) in the y-axis

$$\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} -x \\ y \end{pmatrix}$$

$$OA\begin{pmatrix} 1 \\ 2 \end{pmatrix} \rightarrow OA_1\begin{pmatrix} -1 \\ 2 \end{pmatrix}, \quad \therefore\ A_1(-1, 2)$$

$$OB\begin{pmatrix} 4 \\ 2 \end{pmatrix} \rightarrow OB_1\begin{pmatrix} -4 \\ 2 \end{pmatrix}, \quad \therefore\ B_1(-4, 2)$$

$$OC\begin{pmatrix} 4 \\ 5 \end{pmatrix} \rightarrow OC_1\begin{pmatrix} -4 \\ 5 \end{pmatrix}, \quad \therefore\ C_1(-4, 5)$$

$$OD\begin{pmatrix} 1 \\ 5 \end{pmatrix} \rightarrow OD_1\begin{pmatrix} -1 \\ 5 \end{pmatrix}, \quad \therefore\ D_1(-1, 5)$$

∴ Plot and join A_1(-1,2), B_1(-4,2), C_1(-4,5) and D(-1,5) as the image of ABCD under a reflection in the y axis.

(iii) **Enlargement from (0,0) by scale factor k**

$$\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow k\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} kx \\ ky \end{pmatrix}$$

$$OA\begin{pmatrix} 1 \\ 2 \end{pmatrix} \rightarrow OA_2\begin{pmatrix} -1\times 1 \\ -1\times 2 \end{pmatrix} = \begin{pmatrix} -1 \\ -2 \end{pmatrix}, \quad \therefore\ A_2(-1, -2)$$

$$OB\begin{pmatrix} 4 \\ 2 \end{pmatrix} \rightarrow OB_2\begin{pmatrix} -1\times 4 \\ -1\times 2 \end{pmatrix} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}, \quad \therefore\ B_2(-4, -2)$$

$$OC\begin{pmatrix} 4 \\ 5 \end{pmatrix} \rightarrow OC_2\begin{pmatrix} -1\times 4 \\ -1\times 5 \end{pmatrix} = \begin{pmatrix} -4 \\ -5 \end{pmatrix}, \quad \therefore\ C_2(-4, -5)$$

$$OD\begin{pmatrix} 1 \\ 5 \end{pmatrix} \rightarrow OD_2\begin{pmatrix} -1\times 1 \\ -1\times 5 \end{pmatrix} = \begin{pmatrix} -1 \\ -5 \end{pmatrix}, \quad \therefore\ D_2(-1, -5)$$

∴ Plot and join A_2(-1,-2), B_2(-4,-2), C_2(-4,-5) and D_2 (-1,-5) as the image of triangle ABCD under an enlargement by scale factor -1 from the origin (as shown above)

(iv) The single transformation that maps $A_2B_2C_2D_2$ onto $A_1B_1C_1D_1$ is reflection in the x-axis

5. **(i)** Total no. of workers = 3 + 7 + 8 + 4 + 5 + 3

= 30

(ii) Modal age = the most occurring age

= 29 years

(iii) Finding Mean age using the table,

Age in years (x)	No. of workers (f)	f x
19	3	57
24	7	168
29	8	232
34	4	136
39	5	195
44	3	132
	Σf = 30	**Σfx= 920**

$$\text{The mean age} = \frac{\Sigma f x}{\Sigma f} = \frac{920}{30}$$

$$= 30\tfrac{2}{3}\ years \approx 30.67\ \text{years}$$

(b) (i)

$$I = \frac{P \times T \times R}{100},$$ making T the subject

$$\Rightarrow 100\,I = P\,T\,R$$ Cross-multiplying

$$\Rightarrow \frac{100\,I}{P\,R} = \frac{P\,T\,R}{P\,R}$$

$$\Rightarrow \frac{100\,I}{P\,R} = T$$

$$\Rightarrow T = \frac{100\,I}{P\,R}$$

(ii) **T** $= \dfrac{100\,I}{P\,R}$

$= \dfrac{100 \times 40{,}000}{64{,}000 \times 25}$ 1

$= \dfrac{5}{2}$ 1

= **2 ½ years** 1

6. (a) **Volume of cylinder = Area of base × height** 1

Approach 1 (Substitution first)

$V = \pi r^2 \times h$

$\Rightarrow 220cm^3 = \frac{22}{7} \times (2.5cm)^2 \times h$ 1

$\Rightarrow 220cm^3 = \frac{22}{7} \times 2.5cm \times 2.5cm \times h$ 1

$\Rightarrow \dfrac{220cm^3 \times 7}{22 \times 2.5cm \times 2.5cm} = h$ ½

$\Rightarrow \dfrac{10cm^3 \times 7}{2.5cm \times 2.5cm} = h$ ½

$\Rightarrow \dfrac{70\ cm^3}{6.25\ cm^2} = h$ 1

$\Rightarrow \dfrac{70\ cm^3}{6\frac{1}{4}\ cm^2} = h$

$\Rightarrow \dfrac{70\ cm^3}{25/4\ cm^2} = h$

$\Rightarrow \dfrac{4 \times 70\ cm^3}{25\ cm^2} = h$

$$\Rightarrow \quad \frac{4 \times 14\ cm^3}{5\ cm^2} = h$$

$$\Rightarrow \quad \frac{56\ cm^3}{5\ cm^2} = h$$

$$\Rightarrow \quad 11\tfrac{1}{5}\ cm = 11.2\text{ cm} = h$$

$\Rightarrow$ The height of the cylinder = $11^1/_5$ cm or 11.2cm

Alternatively, from the 5th step

$$\frac{70\ cm^3}{6.25\ cm^2} = h$$

$$\Rightarrow \quad \frac{7000\ cm^3}{625\ cm^2} = h$$

$$\Rightarrow \quad \frac{56\ cm^3}{5\ cm^2} = h$$

$$\Rightarrow \quad 11\tfrac{1}{5}\ cm = 11.2\text{ cm} = h$$

$\Rightarrow$ The height of the cylinder = $11^1/_5$ cm or 11.2cm

6. **(a)** **Approach 2** (making *h* the subject first)

$$V = \pi r^2 \times h$$

$$\Rightarrow \quad \frac{V}{\pi r^2} = h$$

$$\Rightarrow \quad \frac{220\,cm^3}{\frac{22}{7} \times (2.5\,cm)^2} = h$$

$$\Rightarrow \quad \frac{7 \times 220\ cm^3}{22 \times 2.5cm \times 2.5cm} = h$$

$$\Rightarrow \quad \frac{7 \times 10\ cm^3}{2.5cm \times 2.5cm} = h$$

$\Rightarrow \quad \dfrac{70\ cm^3}{6.25\ cm^2} \quad = \quad h$

$\Rightarrow \quad \dfrac{7000\ cm^3}{625\ cm^2} \quad = \quad h$

$\Rightarrow \quad \dfrac{56\ cm^3}{5\ cm^2} \quad = \quad h$

$\Rightarrow \quad 11\tfrac{1}{5}\ cm \quad = \quad h$ or

$\Rightarrow \quad 11.2$ cm $\quad = \quad h$

$\Rightarrow$ The height of the cylinder = $11^1/_5$ cm or 11.2cm

(b) **METHOD 1** (Using relation between exterior angle and no. of sides)

Since interior angle = 140°,

$\Rightarrow$ Exterior angle = 180° - 140° = 40°

Therefore Number of sides (n) = $\dfrac{360^o}{40^o}$

= 9 sides.

(b) **METHOD 2** (Using relation between interior angle and no. of sides)

For a regular polygon, each interior angle = $\dfrac{180^0(n-2)}{n}$, where n = no. of sides

$\Rightarrow \quad 140° \quad = \quad \dfrac{180^0(n-2)}{n}$

$\Rightarrow \quad 140°\,n \quad = \quad 180°\,(n-2)$

$\Rightarrow \quad 140°\,n \quad = \quad 180°n - 360°$

$\Rightarrow \quad 360° \quad = \quad 180°\,n - 140°n$

$\Rightarrow \quad 360° \quad = \quad 40°\,n$

$\Rightarrow \quad \dfrac{360°}{40^0} \quad = \quad n$

$\Rightarrow \quad 9 \quad = \quad n$

$\therefore$ The polygon has 9 sides