
MATHEMATICS PAPER 1

ANSWERS

KCSE 2010

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30.3.1 Mathematics (121/1)

$$1. \quad \frac{-2(5+3-9+3+5)}{-3 \times 5 + (-2) \times 4} = \frac{-14}{7} = -2$$

(3 marks)

$$2. \quad \text{Total fraction } \frac{3}{8} + \frac{2}{5} = \frac{31}{40}$$

$$\text{Remaining fraction} = \frac{9}{40}$$

$$\text{Original amount} = \text{Sh. } 12,330 \times \frac{40}{9}$$

$$= \text{Sh. } 54,800$$

$$\text{Tatu's fees} = \text{Sh. } \frac{2}{5} \times 54,800$$

$$= \text{Sh. } 21,920$$

(4 marks)

$$3. \quad \text{Gradient} = -\frac{1}{2}$$

$$\frac{y+2}{x-3} = -\frac{1}{2}$$

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

(3 marks)

4. Let the distance be d km

$$\frac{d}{75} \text{ or } \frac{d}{95}$$

$$\frac{d}{75} - \frac{d}{95} = \frac{20}{60}$$

$$d = 118.75 \text{ km}$$

(3 marks)

5. Let odd integers be

$$x, (x+2), (x+2+2)$$

$$x + (x+2) + (x+2+2) > 219$$

$$3x > 213$$

$$x > 71$$

The numbers are 73, 75, 77

(3 marks)

6. (a) $\text{Sh. } 77.24 \times 100,000$
 $= \text{sh. } 7\,724\,000$

(b) $\frac{\text{Sh. } 77.24 \times 100000}{122.27}$
 $= \text{Sh. } 63\,172$

(4 marks)

7. $RQ = -r + P + \frac{1}{3}r$
 $= P - \frac{2}{3}r$

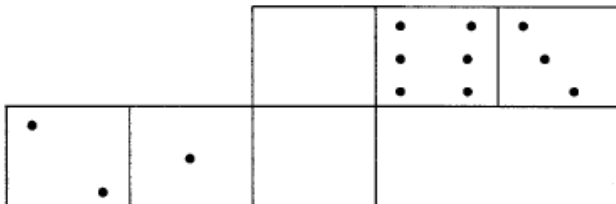
$$OM = r + \frac{1}{2}\left(P - \frac{2}{3}r\right)$$
$$= \frac{2}{3}r + \frac{1}{2}P$$

(3 marks)

8. $27^{\frac{2}{3}} \times \left(\frac{81}{16}\right)^{-\frac{1}{4}} = (3^3)^{\frac{2}{3}} \times \left(\frac{3^4}{2^4}\right)^{-\frac{1}{4}}$
 $= 3^2 \times \left(\frac{3}{2}\right)^{-1}$
 $= 3^2 \times \frac{2}{3}$
 $= 6$

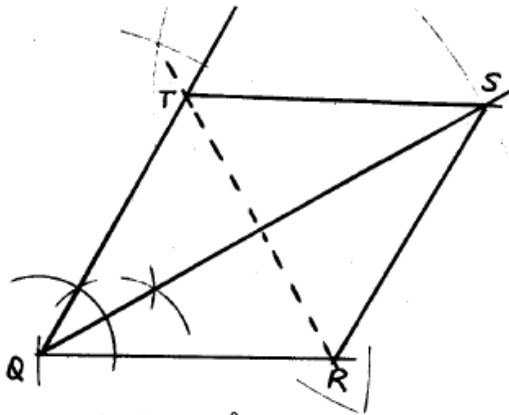
(3 marks)

9.



(2 mark)

10.



$\angle TQR = 60^\circ$, $QS = 10\text{cm}$ and bisects $\angle TQR$

Mediator of QS drawn or $\angle RSQ = \angle QST = \angle RQS$

Rhombus completed

11. No. Of oranges for Friday

$$1948 - (650 + 750 + 240) = 208$$

(3 marks)

No. Of oranges for Saturday

$$208 + 560 = 768$$

$$\begin{aligned} \text{Amount} &= \text{Sh. } 8 \times 768 \\ &= \text{Sh. } 6,144 \end{aligned}$$

(4 marks)

$$\begin{aligned} 12. \quad \frac{x^2 + x - 4xy - 4y}{(x+1)(4y^2 - xy)} &= \frac{x(x+1) - 4y(x+1)}{(x+1)(y)(4y-x)} \\ &= \frac{(x-4y)(x+1)}{(x+1)(-y)(x-4y)} \\ &= -\frac{1}{y} \end{aligned}$$

$$13. \quad \sin 3\theta = \cos 2\theta$$

$$\sin 3\theta = \sin (90^\circ - 2\theta)$$

$$3\theta = 90^\circ - 2\theta$$

$$5\theta = 90^\circ$$

$$\theta = 18^\circ$$

(3 marks)

(3 marks)

14. $2\pi r^2 + 2\pi rh = 154$

$r = h$

$2\pi r^2 + 2\pi r^2 = 154$

$2\pi r^2 = 154$

$r = \sqrt{\frac{154}{4 \times 3.142}}$

$= 3.500$

$d = 2r = 3.500 \times 2$

$= 7.00$

(3 marks)

15. Let $OC = r$

$\therefore CD = \frac{2}{3}r$ and $EF = \frac{2}{3}(r+5)$

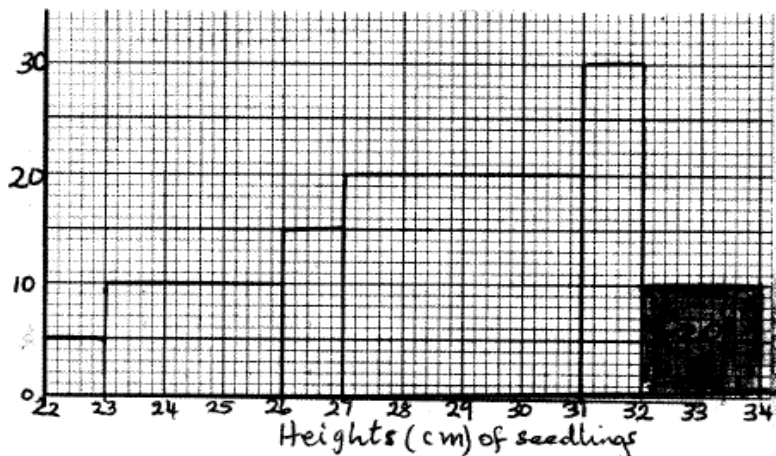
$\frac{2}{3}r + \frac{2}{3}(r+5) + 5 + 5 = 24$

$\frac{4}{3}r = 10\frac{2}{3}$

$r = 8$

(3 marks)

16.



Total No. of seedlings

$= 5 \times 1 + 10 \times 3 + 15 \times 1 + 20 \times 4 + 30 \times 1 + 10 \times 2$

$= 5 + 30 + 15 + 80 + 30 + 20$

$= 180$

% height $h : 23 \leq h < 27$

$= \left(\frac{30 + 15}{180} \right) \times 100\% = 25\%$

(3 marks)

SECTION II

17. (a) Total sales = Sh. 360 × 500
= Sh. 180,000

$$\text{Commission} = \text{Sh } (180000 - 100000) \times \frac{2}{100} = \text{Sh } 1600$$

Total earnings = Sh (12000 + 1600) = Sh 13600

(b) (i) New salary = Sh 12000 + $12000 \times \frac{10}{100}$

Or $\text{Sh } 12000 \times \frac{110}{100} = \text{Sh } 13200$

Commission paid= sh(17600 - 13200) = Sh 4400

$$\text{Commission is paid on Sh } 4400 \times \frac{100}{2} = \text{Sh } 220000$$

Total sales = Sh 220000 + 100000 = 320000

$$\text{No. of bags sold} = \frac{320000}{500} = 640$$

18. (a) (i) Int. vol. of the box $= 150 \times 80 \times 40 \text{ cm}^3$
 $= 480000 \text{ cm}^3$

$$\begin{aligned}\text{Ext. Vol.} &= 152 \times 82 \times 42 \text{ cm}^3 \\ &= 523488 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Vol. of wood} &= 523488 - 480000 \\ &= 43488 \text{ cm}^3\end{aligned}$$

$$(ii) \quad \text{Mass of box} = \frac{43488 \times 0.6}{1000}$$

$$= 26.0928$$

$$= 26.1$$

(b) (i) No. of tins $= \frac{150}{10} + \frac{80}{10} + \frac{40}{20} = 240$

(ii) Total mass $= 26.1 + \frac{240 \times 120}{1000} = 54.9 \text{ kg}$

(10 marks)

(10 marks)

19. (a) $\text{Det } |45 - 42| = 3$

$$\text{Inverse } A^{-1} = \frac{1}{3} \begin{pmatrix} 9 & -6 \\ -7 & 5 \end{pmatrix}$$

(b) (i)

$$\begin{pmatrix} 5 & 6 \\ 7 & 9 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 & 4 & 4 & 0 \\ 3 & 5 & 6 & 0 \end{pmatrix}$$

(ii)

$$\begin{pmatrix} 5 & 6 \\ 7 & 9 \end{pmatrix} \begin{pmatrix} \frac{3}{3} & \frac{-2}{3} \\ \frac{-7}{3} & \frac{5}{3} \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{3}{3} & \frac{-2}{3} \\ \frac{-7}{3} & \frac{5}{3} \end{pmatrix} \begin{pmatrix} 2 & 4 & 4 & 6 \\ 3 & 5 & 6 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{3 \times 2440 - 2 \times 3560}{3} \\ \frac{-7}{3} \times 2440 + \frac{5}{3} \times 3560 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 200 \\ 240 \end{pmatrix}$$

(c) Total cost of books = $36 \times 200 + 50 \times 240 = 19200$

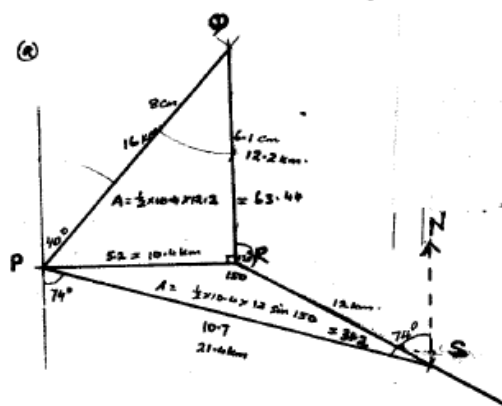
Total cost with discount

$$= \frac{36 \times 200 \times 95}{100} + \frac{50 \times 200 \times 92}{100} = 17880$$

$$\% \text{ discount} = \left(\frac{19200 - 17880}{19200} \right) \times 100 = 6.875\%$$

(10 marks)

20.



- (b) (i) Distance of P from S = 10.7 cm
= 21.4 km
- (ii) Angle PSN = 74°
Bearing of P from S = 286°
- (c) Area of $\Delta PQR = \frac{1}{2} \times 10.4 \times 12.2 = 63.44 \text{ km}^2$
Area of $\Delta PRS = \frac{1}{2} \times 10.4 \times 12 \sin 150 = 31.2 \text{ km}^2$
Area of ranch PORS = 63.44 + 31.2 = 96.64 km²

(10 marks)

21. (a) (i) A takes $\frac{180}{x+10}$

(ii) B takes $\frac{180}{x}$

(b) $\frac{180}{x} - \frac{180}{x+10} = \frac{3}{2}$

$$180(x+10) - 180x = \frac{3}{2}x(x+10)$$

$$360(x+10) - 360x = 3x(x+10)$$

$$360x + 3600 - 360x = 3x^2 + 30x$$

$$x^2 + 10x - 1200 = 0$$

$$(x-30)(x+40) = 0$$

$$x = 30 \text{ or } x = -40$$

$$\text{Speed of A} = 30 + 10 = 40$$

(c) Time taken by A = $\frac{48}{40} \times 60 = 72 \text{ min}$

Time taken by B = $\frac{48}{30} \times 60 = 96 \text{ min}$

Time for B = $96 - 10 = 86 \text{ min}$

Difference in time = $86 - 72 \text{ min}$
 = 14 min

(10 marks)

22. (a) (i) Reflection in the line PR or ER
 (ii) Enlargement centre E
 Scale factor = -1
 (iii) Rotation about point R through 90° clockwise

- (b) (i) $\begin{array}{l} R \longrightarrow S \\ C \longrightarrow A \end{array}$
 (ii) $\begin{array}{l} R \longrightarrow Q \\ C \longrightarrow E \end{array}$

(10 marks)

23.

No. of Kgs of meat	Frequency (f)	Mid-points (x)	Fx	CF
1 – 5	2	3	6	2
6 – 10	3	8	24	5
11 – 15	6	13	78	11
16 – 20	8	18	144	19
21 – 25	3	23	69	22
26 – 30	2	28	56	24
31 – 35	1	33	33	25
	$\sum f = 25$		$\sum fx = 410$	

- (a) Modal frequency = 8

(b) Mean = $\frac{410}{25} = 16.4$

- (c) CF: 2, 5, 11, 19, 22, 24, 25
 Median = $15.5 + \frac{2}{8} \times 5 = 16.75$

(10 marks)

24. (a) (i) Area of base x^2
Or Area of sides = $4xh$.

$$x^2 + 4xh = 432$$

$$h = \frac{432 - x^2}{4x}$$

(ii) Vol. = x^2h

$$= x^2 \left(\frac{432 - x^2}{4x} \right)$$

(ii) Vol = $108x - \frac{1}{4}x^3$

$$\frac{dv}{dx} = 108 = \frac{3}{4}x^2$$

$$108 - \frac{3}{4}x^2 = 0$$

$$x = 12$$

(iii) Vol. = $108x - \frac{1}{4}x^3$

$$= 108 \times 12 - \frac{1}{4} \times 12^3$$

$$= 864 \text{ cm}^3$$

(1 marks)