30.3 MATHEMATICS (121)

30.3.1 Mathematics (121/1)

1. $$\frac{-2(5+3-9\div 3+6)}{-3\times 5+(-2)\times 4}=\frac{-14}{7}=-2$$

(3marks)

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

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

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

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

Tatu's fees $= \text{Sh. } \frac{2}{5}\times 54800$

$= \text{Sh. } 21920$

(4 marks)

3. 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

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

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

$$d=118.75km$$

(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) Sh. 77.24 x 100000
= sh. 7 724 000

(b) $\frac{Sh.77.24 \times 100000}{122.27}$

= Sh. 63 172

(4 marks)

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

$= P - \frac{2}{3}r$

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

$= \frac{2}{3}r + \frac{1}{2}P$

(3 marks)

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

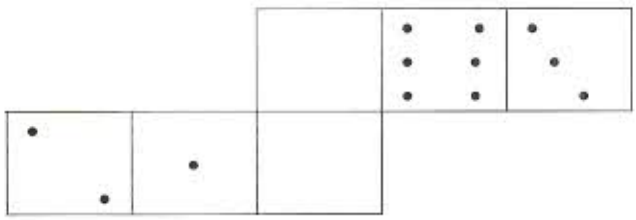
$= 3^2 \times \left(\frac{3}{2}\right)^{-1}$

$= 3^2 \times \frac{2}{3}$

$= 6$

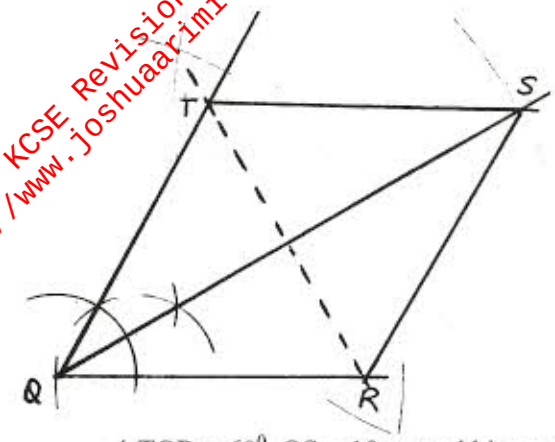
(3 marks)

9.



(2 mark

10.



$\angle TQR = 60^0$, QS = 10cm and bisects $\angle TQR$

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

Rhombus completed

(3 marks)

11. No. Of oranges for Friday

$1948 - (650 + 750 + 240)$

$= \quad 208$

No. Of oranges for Saturday

$208 + 560$

$= \quad 768$

Amount = Sh. 8 x 768

= Sh. 6,144

(4 marks)

12. $$\frac{x^2 + x - 4xy - 4y}{(x+1)(4y^2 - xy)} = \frac{x(x+1) = 4y(x+1)}{(x+1)(y)(4y - x)}$$

$$= \frac{(x - 4y)(x+1)}{(x+1)(-y)(x - 4y)}$$

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

(3 marks)

13. $\text{Sin } 3\theta = \cos 2\theta$

$\text{Sin } 3\theta = \text{Sin } (90^0 - 2\theta)$

$3\theta = 90^0 - 2\theta$

$5\theta = 90^0$

$\theta = 18^0$

(3 marks)

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

$r = h$

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

$2\pi r^2 = 154$

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

$= 3.500$

$d = 2r = 3.500x2$

$= 7.00$

(3 marks)

15. Let OC = r

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

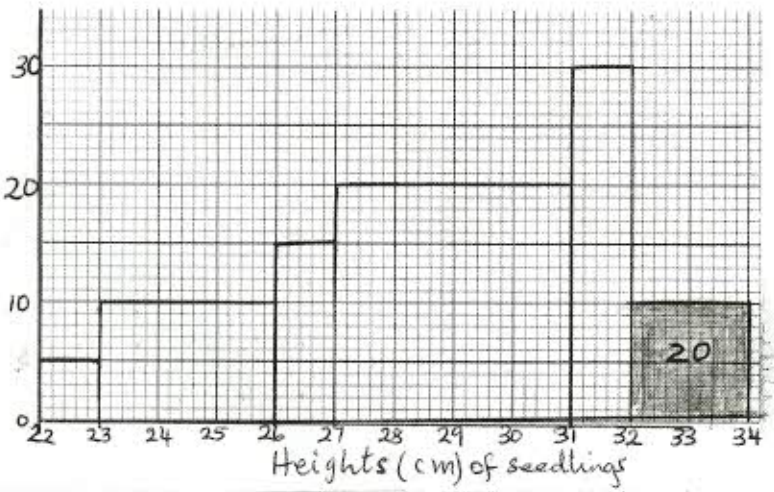
$\frac{2}{3}r + \frac{2}{3}(r+5) + 5 + 5 = 24$

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

$r = 8$

(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 $h: 23 \le h \angle 27$

$= \left(\frac{30+15}{180}\right)\times 100\% = 25\%$ (3 marks)

SECTION II

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

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

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

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

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

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

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

Total sales = Sh 220000 + 100000 =320000

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

(10 marks)

18. (a) (i) Int. vol. of the box $=150\times80\times40cm^3$
$=480000cm^3$

Ext. Vol. $=152\times82\times42cm^3$
$=523488cm^3$

Vol. of wood $=523488-480000$
$=43488cm^3$

(ii) Mass of box $=\frac{43488\times0.6}{1000}$

$=26.0928$
$=26.1$

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

(ii) Total mass $=26.1+\frac{240\times120}{1000}=54.9kg$

(10 marks)

19. (a) Det $\begin{vmatrix} 4 & 5 \\ -4 & 2 \end{vmatrix} = 36$

Inverse $A^{-1} = \frac{1}{36}\begin{pmatrix} 2 & -5 \\ 4 & 4 \end{pmatrix}$

(b) (i)

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

(ii)

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

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

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

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

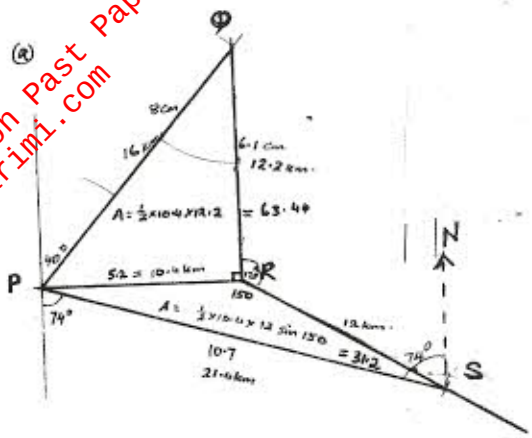
Total cost with discount

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

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

(10 marks)

20.



(b) (i) Distance of P from S = 10.7 cm
= 21.4 km

(ii) Angle PSN = 74^0
Bearing of P from S = 286^0

(c) Area of $\Delta PQR = \frac{1}{2} \times 10.4 \times 12.2 = 63.44 km^2$

Area of $\Delta PRS = \frac{1}{2} \times 10.4 \times 12 \sin 150 = 31.2 km^2$

Area of ranch PORS = 63.44 + 31.2 = 96.64 km^2

(10 marks)

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

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

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

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

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

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

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

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

$x = 30$ or $x = -40$

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 $= 96 - 10 = 86$ min

Difference in time $= 86 - 72$ 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 90^0 clockwise

(b) (i) R → S
C → A

(ii) R → Q
C → E

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

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

$$= 864cm^3$$

(1 marks)