

30.3 MATHEMATICS (121)

30.3.1 Mathematics (121/1)



MANYAM FRANCHISE
Discover! Learn! Apply

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

(3 marks)

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

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

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

= Sh. 54,800

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

= 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 $\frac{d}{95}$

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

$d = 118.75 \text{ km}$

(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)
$$\begin{aligned} \text{Sh. } 77.24 \times 100,000 \\ = \text{sh. } 7\,724\,000 \end{aligned}$$

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

(4 marks)

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

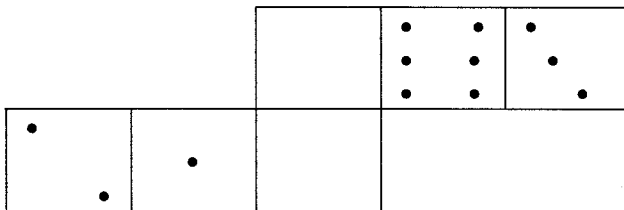
$$\begin{aligned} OM &= r + \frac{1}{2}\left(P - \frac{2}{3}r\right) \\ &= \frac{2}{3}r + \frac{1}{2}P \end{aligned}$$

(3 marks)

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

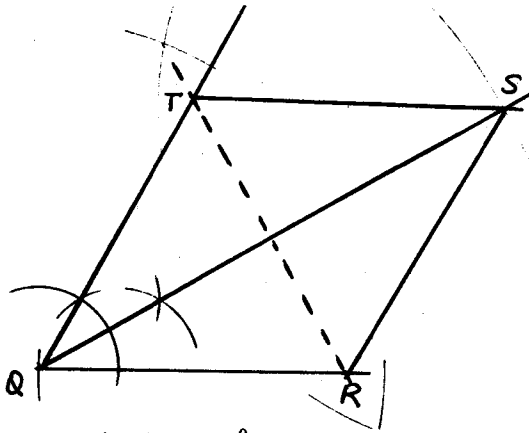
(3 marks)

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 (3 marks)

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

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. $\sin 3\theta = \cos 2\theta$ (3 marks)

$$\begin{aligned} \sin 3\theta &= \sin (90^\circ - 2\theta) \\ 3\theta &= 90^\circ - 2\theta \\ 5\theta &= 90^\circ \\ \theta &= 18^\circ \end{aligned}$$

(3 marks)

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

$r = h$

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

$2\pi r^2 = 154$

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

$= 3.500$

$d = 2r = 3.500 \times 2$

$= 7.00$

(3 marks)

15. Let $OC = r$

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

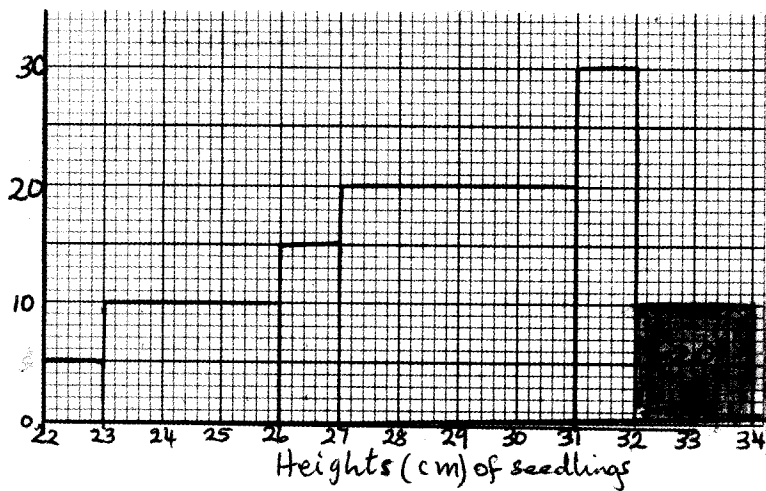
$\frac{2}{3}r + \frac{2}{3}(r + 5) + 5 + 5 = 24$

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

$r = 8$

(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

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

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

(10 marks)

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

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

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

(10 marks)

19. (a) Det $|45 - 42| = 3$

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

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

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

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

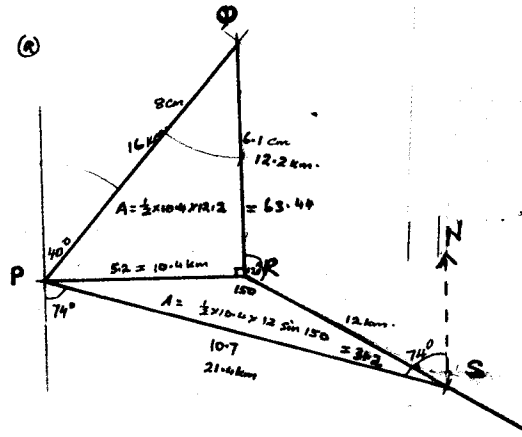
Total cost with discount

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

% 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 $\triangle PQR = \frac{1}{2} \times 10.4 \times 12.2 = 63.44 \text{ km}^2$
Area of $\triangle PRS = \frac{1}{2} \times 10.4 \times 12 \sin 150 = 31.2 \text{ km}^2$

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

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

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

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

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

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

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

Speed of A = 30+10=40

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

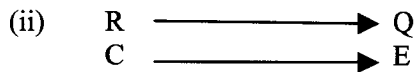
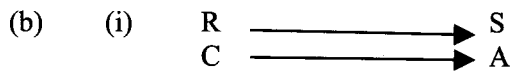
Time taken by B = $\frac{48}{30} \times 60 = 96$ min

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° clockwise



(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 cm^3

(1 marks)

30.3.2 Mathematics Paper 2 (121/2)

1. $\frac{(7.55 \times 5.25) - (7.45 \times 5.15)}{2 \times 7.5 \times 5.2} \times 100 = 1.628$

(3 marks)

2. $\frac{4}{\sqrt{5} + \sqrt{2}} - \frac{3}{\sqrt{5} - \sqrt{2}}$
= $\frac{4(\sqrt{5} - \sqrt{2}) - 3\sqrt{5} + \sqrt{2}}{(\sqrt{5} + \sqrt{2})(\sqrt{5} - \sqrt{2})}$
= $\frac{4\sqrt{5} - 4\sqrt{2} - 3\sqrt{5} - 3\sqrt{2}}{3}$
= $\frac{\sqrt{5} - 7\sqrt{2}}{3}$

(3 marks)

3. $\angle OCT = 36^\circ$ (Alt. \angle s equal)
 $\angle OTC = 36^\circ$ (Base \angle s of isosceles Δ)
 $\angle CTB = 90^\circ - 36^\circ = 54$

(3 marks)

4. Let ratio x to y be a:b

$$\frac{68a + 53b}{a + b} = 62$$

$$\Rightarrow 6a = 9b$$

$$\therefore a : b = 9 : 6$$

$$= 3 : 2$$

(2 marks)

5. Let the width be x m

$$\text{Length} = 2x - 2$$

$$\text{Area} = (2x - 2)x = 60$$

$$x^2 - x - 30 = 0$$

$$(x - 6)(x + 5) = 0$$

$$x = 6$$

$$\therefore \text{length} = 2 \times 6 - 2 = 10 \text{ cm}$$

(3 marks)

6. One person can build $\frac{1}{5}$ x 3 huts in 21 days.

10 people can build 6 huts in 21 days.

x people can build 6 huts in 15 days

$$x = \frac{21}{15} \times 10 = 14 \text{ people}$$

(2 marks)

7. $R = \frac{3800 \times 100}{40000 \times 5} = 1.9\%$

$$A = \frac{3940 \times 100}{7.5 \times 1.9} = 24000$$

(3 marks)

8. Upper quartile = $49.5 \times \frac{5}{20} \times 10 = 52$

$$\text{Lower quartile} = 19.5 + \frac{16}{10} \times 10 = 29.5$$

$$\text{Quartile deviation} = \frac{52 - 29.5}{2} = 11.25$$

(4 marks)

$$9. \quad P(ww) = \frac{2}{5} \times \frac{1}{4} = \frac{1}{10}$$

$$P(bb) = \frac{2}{7} \times \frac{1}{6} = \frac{1}{21}$$

(2 marks)

$$10. \quad (a) \quad \begin{pmatrix} 1 & k \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 3+2k \\ 2 \end{pmatrix}$$

$$x \text{ ordinate} = 3+2k$$

$$(b) \quad 3+2k=4 \Rightarrow k = \frac{1}{2}$$

$$\text{Or} \quad 3+2k=0 \Rightarrow k = \frac{-3}{2}$$

(4 marks)

$$11. \quad (a) \quad S = \frac{3}{2}t^2 - \frac{1}{3}t^3 + C$$

$$(b) \quad \text{When } t=0, s=0$$

$$\therefore C=0$$

$$S = \frac{3}{2}t^2 - \frac{1}{3}t^3 = 0$$

$$t^2 \left(\frac{3}{2} - \frac{1}{3}t \right) = 0$$

$$t=0 \quad \text{Or} \quad t=4.5$$

$$t=4.5$$

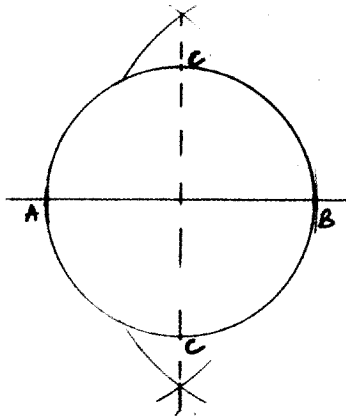
(4 marks)

$$12. \quad (a) \quad \begin{aligned} (2-x)^5 &= 2^5 - 5(2)^4 x + 10(2)^3 x^2 \\ &\quad - 10(2)^2 x^3 + 5(2)x^4 - x^5 \\ &= 32 - 80x + 80x^2 - 40x^3 + 10x^4 - x^5 \end{aligned}$$

$$(b) \quad \begin{aligned} (2-0.2)^5 &= 32 - 80(0.2) + 80(0.2)^2 - 40(0.2)^3 \\ &= 32 - 16 + 3.2 - 0.32 = 18.88 \end{aligned}$$

(4 marks)

13.



- (a) Locus of P
 (b) \perp bisector of AB
 Positions of CV indicated

(3 marks)

14. $3y - y = \frac{p}{q + \frac{1}{x}}$

$$2y \left(q + \frac{1}{x} \right) = p$$

$$q + \frac{1}{x} = \frac{p}{2y}$$

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

$$x = \frac{2y}{p - 2yq}$$

(3 marks)

15. $\log \left(\frac{15 - 5x}{10} \right) = \log 3x - 2$

$$\frac{15 - 5x}{10} = 3x - 2$$

$$15 - 5x = 30x - 20$$

$$x = 1$$

(3 marks)

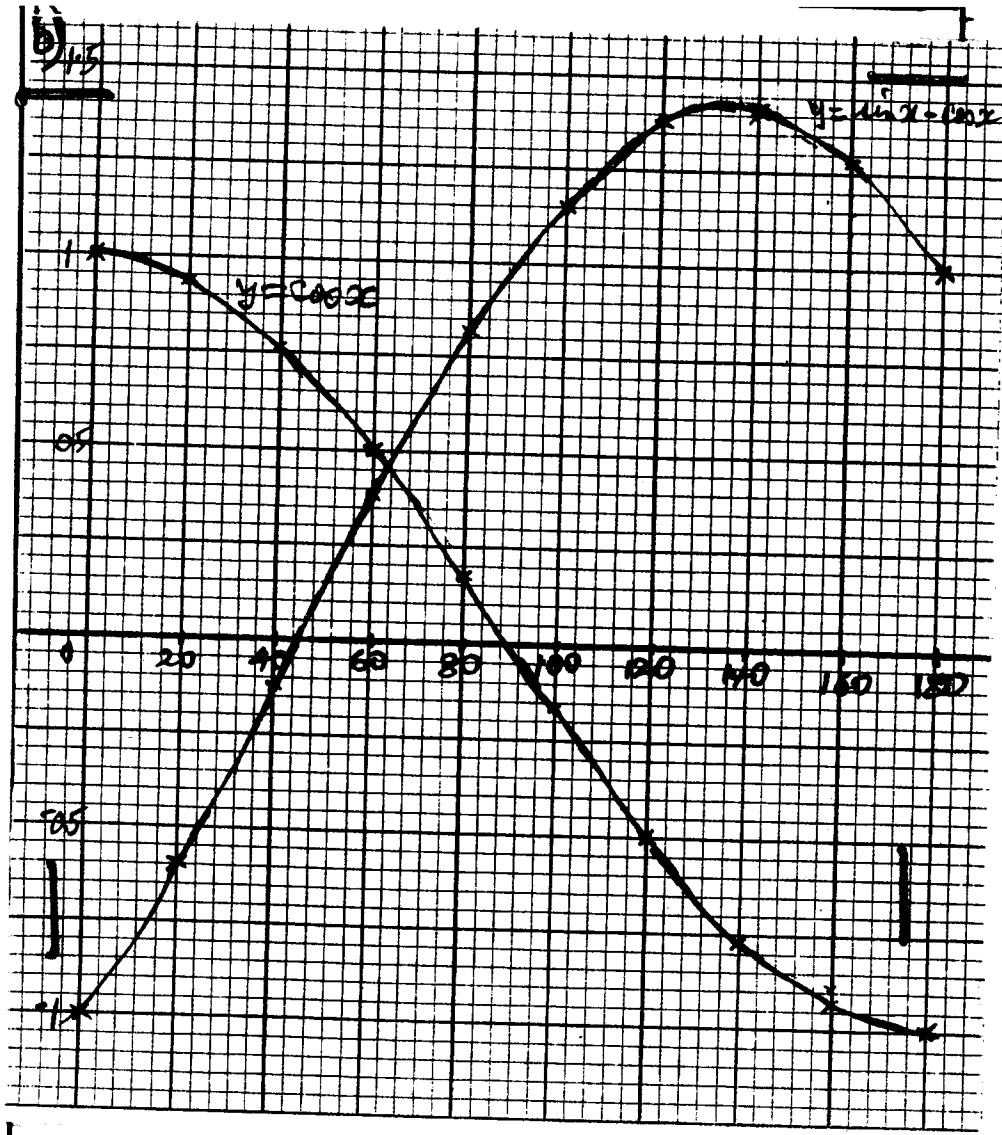
16. (a) Coordinates of centre (1, -1)
 Radius: $r^2 = 1^2 + 3^2 = 10 \Rightarrow r = \sqrt{10}$

- (b) Equation
 $(x - 1)^2 + (y + 1)^2 = 10$
 $x^2 - 2x + 1 + y^2 + 2y + 1 = 10$
 $x + y^2 - 2x + 2y = 8$

(4 marks)

17.

x°	0°	20°	40°	60°	80°	100°	120°	140°	160°	180°
$\cos x^\circ$					0.17		-0.5		-0.94	
$\sin x^\circ - \cos x^\circ$			-0.13			1.15		1.41		



- (c) (i) $\sin x^\circ - \cos x^\circ = 1.2$
 $x^\circ = 104,166$
- (ii) $\cos x^\circ = \frac{1}{2} \sin x^\circ$
 $\Rightarrow \cos x^\circ = \sin x^\circ - \cos x^\circ = 63^\circ$
- (iii) $\cos 63^\circ = 0.45$

(10 marks)

18. (a) $OB = 3p + 3r$
 $AJ = 2p + 2r$
- (b) $OX = m(OB) = m(3p + 3r)$
 $OX = 2r + p + n(2p - 2r)$

(iii) $m(3p+3r) = 2r-2nr+p+2np$
 $3mp+3mr = r(2-2n)+p(1+2n)$
 $3mp = (1+2n)p$
 $3m = 1+2n$ (i)
 $3mr = r(2-2n)$
 $3m = 2-2n$ (ii)

$$1-2n = 2-2n$$

$$4n = 1 \Rightarrow n = \frac{1}{4}$$

Subst. for $n = \frac{1}{4}$ in (i)

$$3m = 1 + 2 \times \frac{1}{4}$$

$$3m = 1\frac{1}{4} \Rightarrow m = \frac{3}{2 \times 3} = \frac{1}{2}$$

The ratio in which x divides AJ

$$AX = nAJ = \frac{1}{4}AJ$$

Ratio 1 : 3

19. (a) (i) Angle subtended (longitude)

$$16 + 24 = 40^\circ$$

$$\begin{aligned} \text{Arc AB} &= 60 \times 40 \times \cos 34^\circ \\ &= 1989.69 \approx 1990 \text{ nm} \end{aligned}$$

- (ii) Arc AC : latitude difference

$$= 26 + 24 = 60$$

$$\therefore \text{Arc AC} = 60 \times 60 \text{ nm} = 3600$$

- (b) (i) local time at B

$$1330 + \frac{40}{15} \text{ h}$$

$$1330 + 2\text{h}40 \text{ min}$$

$$1610\text{h}$$

- (ii) time taken to travel from A to B

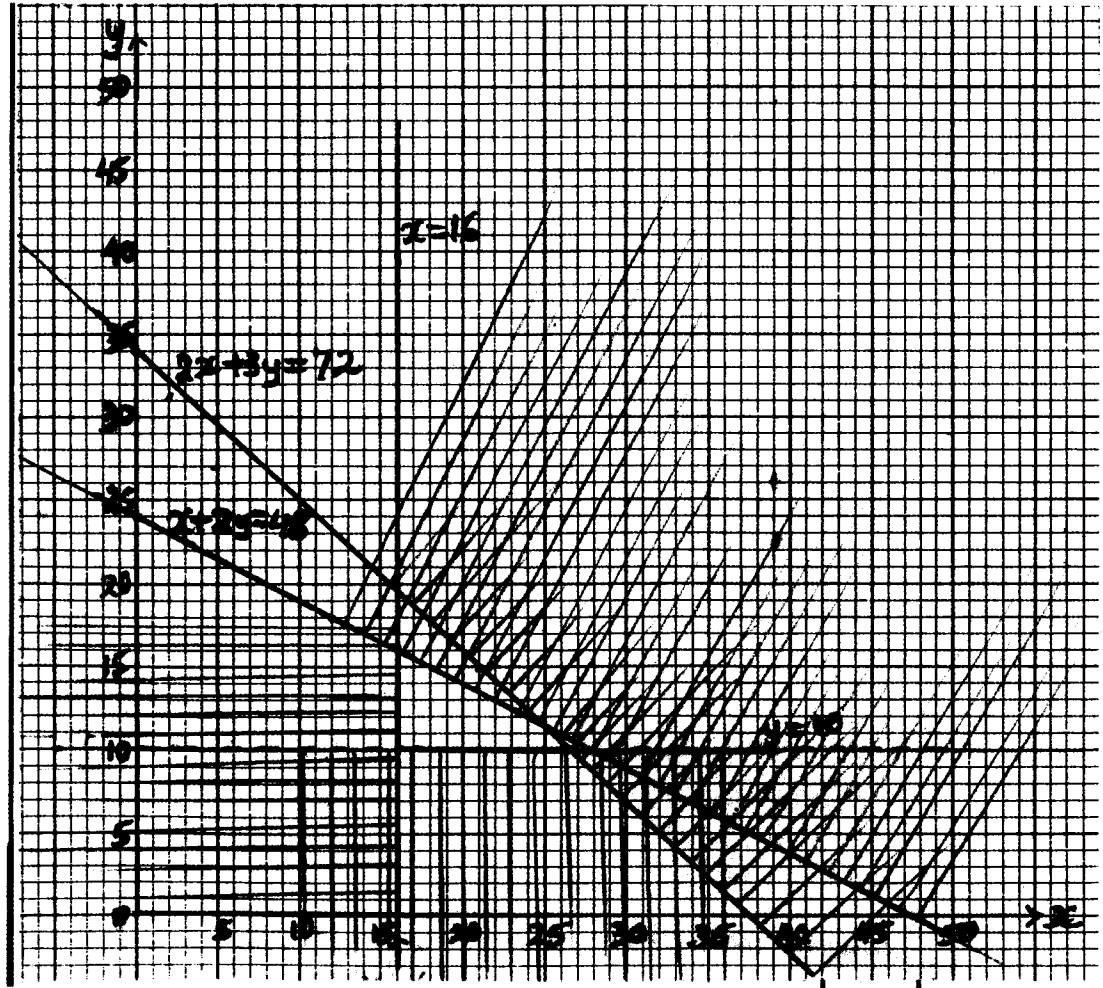
$$= \frac{1990}{40} = 49\text{h}45 \text{ min.}$$

(10 marks)

Time of arrival:
 Wednesday at 1610 + 1h 45 min
 = Wednesday 1755h

(10 marks)

20. (a) $4x + 6y \geq 144$
 $100x + 200y \leq 4800$
 $x \geq 16$
 $y > 10$
- (b)



$2x + 3y \geq 72$ drawn and shaded
 $x + 2y \leq 48$ drawn and shaded
 $x \geq 15$
 $y > 10$

- (c) At least 2 points on vertical axis inspected
 Substituting in equation

$$p = 40 \times 100y = 40 \times 16 + 100 \times 16$$

$$= 640 + 1600 = 2240$$

(10 marks)

21. (a) Let number of rows be r and number of persons per row be p

$$pr = 600 \Rightarrow p = \frac{600}{r}$$

$$(r+5)(p-6) = 600$$

$$(r+5)\left(\frac{600}{r} - 6\right) = 600$$

$$(r+5)(600 - 6r) = 600r$$

$$600r - 6r^2 + 3000 - 30r = 600r$$

$$r^2 + 5r - 500 = 0$$

$$(r+25)(r-20) = 0$$

$$r = 20$$

- (b) No. of rows in new arrangement
 $20 + 25 = 25$

No. of empty spaces per row with 450 people seated

$$\frac{600 - 450}{45} = 6$$

22. (a)

(10 marks)

$$T_6 = p + 5c$$

$$T_5 = p + 4d$$

$$p + 4d = p + 5c$$

$$4d = 5c$$

$$d = \frac{5}{4}c$$

- (b)

$$p + 3d - (p + 3c) = 1\frac{1}{2}$$

$$3d - 3c = 1\frac{1}{2}$$

$$\frac{15}{4}c - 3c = 1\frac{1}{2}$$

$$\frac{3}{4}c = \frac{3}{2} \Rightarrow c = 2$$

$$d = 2\frac{1}{2}$$

(c)

$$S_1 = \frac{1}{2}n(a + \ell) = \frac{1}{2}n(2p + 10) \\ = 3(2p + 10) = 6p + 30$$

$$S_2 = \frac{1}{2}n(2p + 10) = 2.5(2p + 10) = 5p + 25$$

$$(6p + 30) - (5p + 25) = 10$$

$$p + 5 = 10$$

$$p = 5$$

(10 marks)

23. (a)

$$5 = k_1t + k_2t^2$$

$$80 = 2k_1 + 4k_2 \dots\dots\dots(i)$$

$$135 = 3k_1 + 9k_2 \dots\dots\dots(ii)$$

$$(ii) \times 2 \Rightarrow 270 = 6k_1 + 18k_2$$

$$(i) \times 3 \Rightarrow \frac{\pm 240 = \pm 6k_1 \pm 12k_2}{30 = 6k_2 \Rightarrow k_2 = 5}$$

Substitute for k_2 in (i)

$$80 = 2k_1 + 4 \times 5$$

$$60 = 2k_1 \Rightarrow k_1 = 30$$

Expression: $S = 30t + 5t^2$

(b) (i) distance when $t = 5$ seconds
 $S = 30 \times 5 + 5 \times 25 = 275$

(ii)

$$560 = 30t + 5t^2 \\ 5t^2 + 30t - 560 = 0 \\ t + 6 - 112 = 0 \\ (t + 14)(t - 8) = 0$$

Time taken, $t = 8$ seconds

(10 marks)

24. (a) (i)

$$\angle OSR = 90 - 50 = 40$$

$$\therefore \angle ORS = 40$$

(ii)

$$\begin{aligned}\angle RTS &= 30^\circ \text{ and } \angle RPS = 50^\circ \\ \therefore \angle USP &= 30^\circ + 50^\circ = 80^\circ\end{aligned}$$

(iii) $\angle PQR = 180^\circ - 50^\circ = 130^\circ$

(b) (i)

$$\begin{aligned}PT \times TR &= TS^2 \\ (7+x)(7) &= 9^2 \\ 7x &= 81 - 49 = 32 \\ x &= \frac{32}{7} = 4.57\end{aligned}$$

(ii)

$$\begin{aligned}\angle ORP &= 40^\circ \\ \cos 40^\circ &= \frac{\frac{1}{2} \times 4.57}{r} \\ r &= \frac{\frac{1}{2} \times 4.57}{\cos 40} = 2.98\end{aligned}$$

(10 marks)

30.3.3 Mathematics Alt. B Paper 1 (122/1)

1.
$$\begin{aligned}270 \div (90 \times 2) + 7 \times 4 - 40 \div 5 \\ = 270 \div 180 + 28 - 8 \\ = 21 \frac{1}{2}\end{aligned}$$

2 marks

2.
$$\begin{aligned}7056 &= 2^4 \times 3^2 \times 7^2 \\ \sqrt{7056} &= 2^2 \times 3 \times 7 \\ &= 84\end{aligned}$$

2 marks

3.
$$\begin{aligned}\frac{2(-2) + 3(3+5)}{4 \times 3 \times 5} \\ = \frac{-4 + 24}{60} \\ = \frac{1}{3}\end{aligned}$$

2 marks

4. Width of floor = $\sqrt{37.7^2 - 35.2^2}$
 \therefore area of floor = $\sqrt{37.7^2 - 35.2^2} \times 35.2$
 $= 475.2 \text{ m}^2$

3 marks

5.

NO.	LOG
43.2	1.6355
0.015	+
	<u>2.1861</u>
	1.8116
	-
$\sqrt[3]{0.00679}$	$\bar{3}.8319+3$ $\bar{1}.2773$
3.422	0.5343

6. $\angle CBG = 180^\circ - 120^\circ = 60^\circ$
 $\angle ECB = 90^\circ$
 $\angle BGC = 30^\circ$

3 marks

7.
$$\frac{3\frac{1}{3} + \frac{6}{7} \times \frac{49}{9}}{44 - 35}$$

$$= \frac{\frac{8}{9}}{10}$$

$$= \frac{8 \times 10}{9} = 8\frac{8}{9}$$

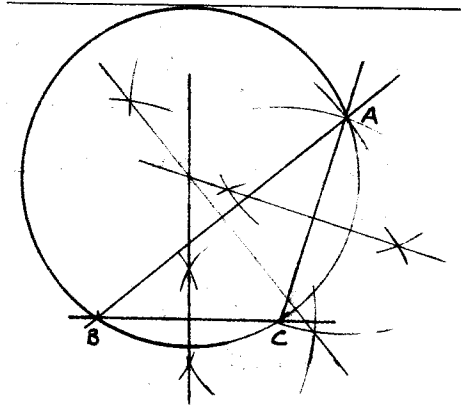
3 marks

8. Volume of water in m^3
 $= \frac{21000}{100} = 21 \text{ m}^3$

Height of water
 $= \frac{21}{4 \times 3.5} = 1.5 \text{ m}$

3 marks

9.



Construction of ΔABC
 Construction of \perp as bisectors
 Construction of circle

3 marks

10. $3x - 2 < 10 + x \leq 2 + 5x$
 $3x - 2 < 10 + x$
 $2x < 12$
 $x < 6$

$$10 + x \leq 2 + 5x$$

$$-4x < -8$$

$$-x < -2$$

$$x \geq 2$$

$$\therefore 2 \leq x < 6$$

3 marks

11. Length of \perp a , $h = 12 \sin 36^\circ$
 $= 7.05$

$$\therefore \text{area of trapezium}$$

$$= \frac{20 + 8}{2} \times 7.05$$

$$= 98.75 \text{ cm}^3$$

4 marks

12. Ratio of increase: $1200:800$
 $= 3:2$

Original price for a pair of trousers

$$\frac{t}{2700} = \frac{2}{3}$$

$$t = \frac{2}{3} \times 2700 = 1800$$

3 marks

13. Shaded area

$$= \frac{150}{360} \times \pi \times 10.5^2 - \frac{1}{2} \times 10.5^2 \sin 150^\circ$$

$$= 144.3169125 - 27.5625$$

$$= 116.7544125 \approx 116.8 \text{ cm}^2$$

4 marks

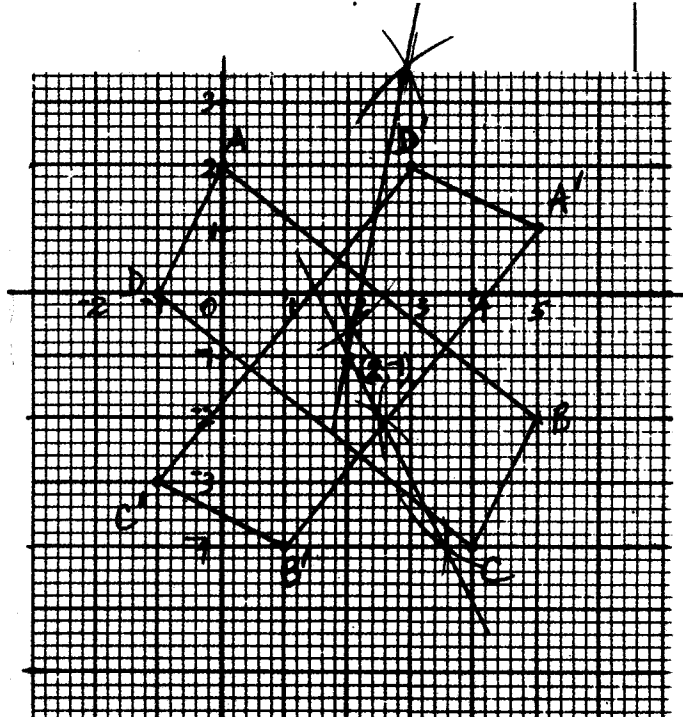
14. $25 = 5^2$; $30 = 2 \times 3 \times 5$; $35 = 5 \times 7$

$$\text{LCM} = 2 \times 3 \times 5^2 \times 7$$

$$\text{Time} = \frac{1050}{60} = 17.5h$$

4 marks

15.



a) Construction of at least 2 mediators

Centre of rotation (2,-1)

b) Angle of rotation -90°

3 marks

16. Commission earned

$$\frac{2}{100} \times 30000 + \frac{3.5}{100} \times (84000 - 30000)$$

$$= 600 + 1890 = 2490$$

Total earnings

$$12000 + 2490 = 14490$$

4 marks

17. a) 2400×120

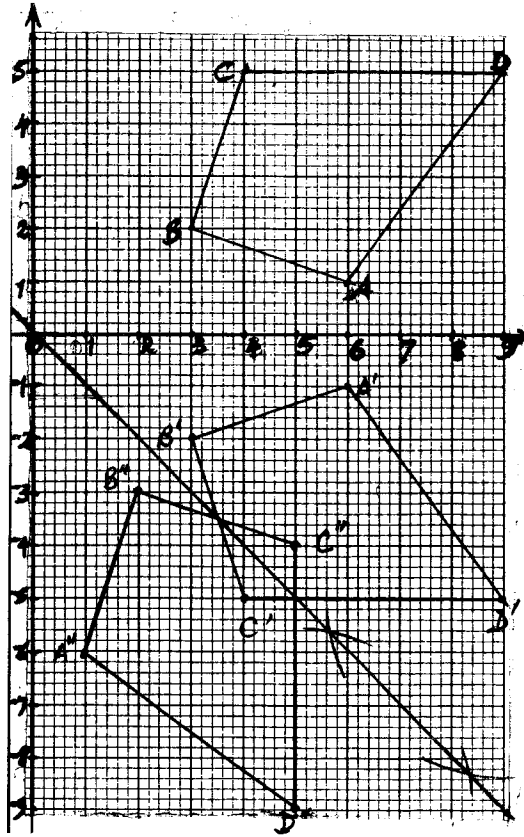
$$= 288000$$

b) Amount left
 $288000 - 13500$
 In Tsh. = 153000×16.5
 $= 2524500$
 Amount in Tsh spent
 $\frac{40}{100} \times 2524500 = 1009800$

c) Remaining amount in £
 $= \frac{60}{100} \times \frac{153000 \times 16.5}{1980}$
 $= \text{£ } 765$

18.

10 marks



a) Drawing image A'B'C'D'

b) (i) image A''B''C''D''
 (ii) mediator(s)

c) (i) equation of line

$$\text{Gradient } \frac{-5 - -3.5}{5 - 3.5} = -1$$

$$\therefore \text{equation } y = -x$$

- (ii) $I(1,0) \rightarrow I'(0,-1); J(0,1) \rightarrow J'(1,0)$
 \therefore matrix of reflection in

$$y = -x \text{ is } \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$$

10 marks

19. a)

$$\begin{aligned} & (7x+5)(x+10) \\ &= 7x^2 + 70x + 5x + 50 \\ &= 7x^2 + 75x + 50 \end{aligned}$$

b)

$$\begin{aligned} 7x^2 + 75x + 50 &= 600 \\ 7x^2 - 35x + 110x - 550 &= 0 \\ (7x+110)(x-5) &= 0 \\ x &= 5 \end{aligned}$$

\therefore perimeter

$$\begin{aligned} &= 2(7 \times 5 + 5) + 2(5 + 10) \\ &= 80 + 30 = 110m \end{aligned}$$

c) $\frac{110}{5} = 22$

10 marks

20. a)

$$\begin{aligned} & \text{Cross sectional area} \\ &= \pi \times (0.3^2 - 0.26^2) \\ &= 0.070371675 \approx 0.07 \end{aligned}$$

b)

(i) External surface area

$$\begin{aligned} & \pi \times 2 \times 0.3 \times 6.5 + 2 \times 0.07 \\ &= 12.25221135 + 0.14 \\ &= 12.39 \end{aligned}$$

(ii) Internal surface area

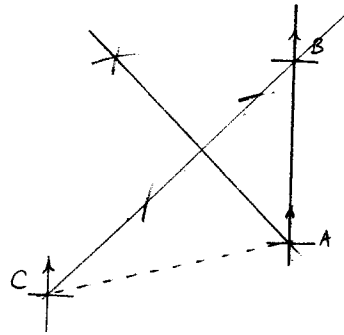
$$\begin{aligned} &= \pi \times 2 \times 0.26 \times 6.5 \\ &= 10.61858317 \approx 10.62 \end{aligned}$$

(iii) Total surface area

$$\begin{aligned} & 12.39 + 10.62 \\ &= 23.01m^2 \end{aligned}$$

10 marks

21.



- a) Location of B
Location of C
- b) Distance of A from C
5.5
 $5.5 \times 100 = 550 \text{ km}$

Bearing of A from C = 255°
- c) Shortest distance of A from BC
Drawing \perp ar
Measuring 2.8 cm
Actual distance = $2.8 \times 100 = 280 \text{ km}$

10 marks

- 22.
- a) $64 \text{ m}^3 = 64 \times 1000000$
 $= 64000000 \text{ cm}^3$
 - b) v.s.f. $= \frac{64000000}{512} = 125000$

d.s.f. $= \sqrt[3]{125000} = 50$

A.s.f. $= 50^2 = 2500$
 - c) Amount of paint required
 $= 2500 \times 0.004 = 10$

- 23.
- a) Cost = $10 \times 120 = 1200$
distance travelled:

$$\frac{1}{2} \times 10 \times 20 = 100 \text{ m}$$

- b) average velocity:

$$\begin{aligned} \text{distance: } & 10 \times 25 + \frac{1}{2} \times 25 \times 20 \\ & = 250 + 250 = 500 \end{aligned}$$

10 marks

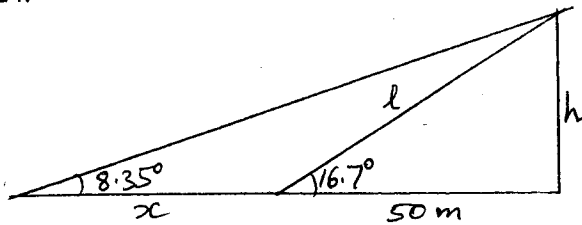
$$\therefore \text{velocity} = \frac{500}{45 - 20} = 20 \text{ m/s}$$

c) acceleration: $\frac{0-30}{60-45} = \frac{-30}{15} = -2 \text{ m/s}^2$

4 4 4 4

10 marks

24.



a) (i) $\frac{h}{50} = \tan 16.7^\circ$

$$h = 50 \tan 16.7^\circ = 15.00071889$$

$$= 15.00 \text{ m}$$

(ii) $\frac{50}{l} = \cos 16.7$

$$l = \frac{50}{\cos 16.7} = 52.20173912$$

$$= 52.20 \text{ m}$$

b) $\frac{15}{50+x} = \tan 8.35$

$$50+x = \frac{15}{\tan 8.35}$$

$$50+x = 102.1968412$$

$$x = 102.1968412 - 50$$

$$= 52.20 \text{ m}$$

10 marks