8.0 MATHEMATICS (121 & 122)

8.1 Mathematics Alt. A Paper 1 (121/1)

1. $$\frac{2\frac{1}{5}+\frac{2}{3}\times\frac{15}{4}-4\frac{1}{6}}{1\frac{1}{4}-\frac{12}{5}\times\frac{3}{4}+3\frac{3}{4}}=\frac{\frac{8}{15}}{3\frac{1}{5}}=\frac{1}{6}$$

(3marks)

2. $\sqrt{11.25^2-6.75^2}=9$

Perimeter $= 2(9+6.75)$

$= 31.5$

(2marks)

3. Let d be distance covered

$$\frac{3d}{5}-\frac{d}{2}=\frac{d}{10}$$

$$\%\text{ change}=\frac{\frac{d}{10}}{\frac{d}{2}}\times 100\%$$

$$=\frac{d}{10}\times\frac{2}{d}\times 100\%$$

$= 20\%$

(3marks)

4. $60 = 2^2 \times 3 \times 5$

$42 = 2 \times 3 \times 7$

Side of room $= 2^2 \times 3 \times 5 \times 7 = 420\text{cm}$

Least area $= 4.2\text{m} \times 4.2\text{m} = 17.64\ \text{m}^2$

(3marks)

5. $\sin(x+60°) = \cos 2x$

$x + 60 + 2x = 90°$

$3x = 30°$

$x = 10°$

$\tan(x+60°) = \tan 70°$

$= 2.75$

(3marks)

6.

$$\frac{4x-9x^3}{3x^2-4x-4} = \frac{x(2-3x)(2+3x)}{(3x+2)(x-2)}$$
$$= \frac{x(2-3x)}{x-2}$$

(3marks)

7. Internal Dimensions: 40, 20 and 15

Volume unoccupied = $40\times20\times15 - 8000$

$= 4000$

Height above water level = $\frac{4000}{40\times20} = 5\text{cm}$

(4marks)

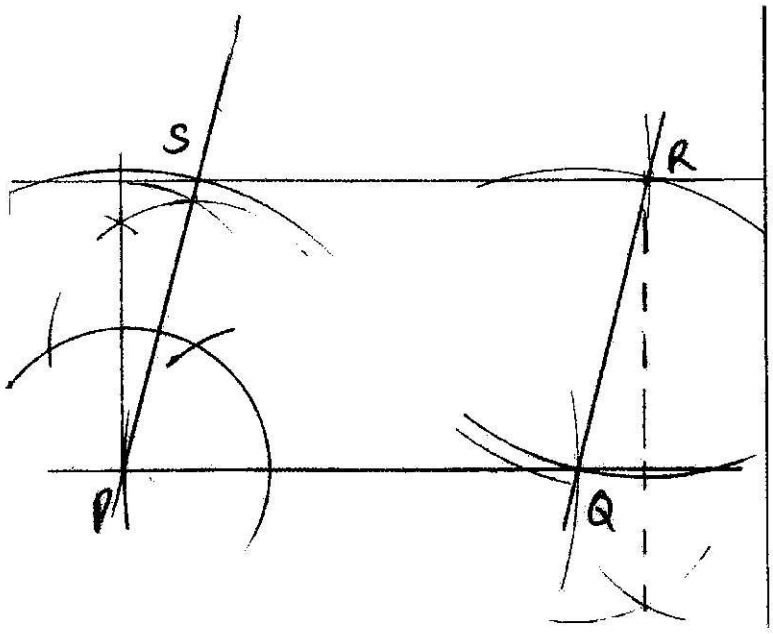
8. $2x^2y^2 - 5xy - 12 = 2x^2y^2 - 8xy + 3xy - 12$

$= 2xy(xy-4) + 3(xy-4)$

$= (2xy+3)(xy-4)$

(2marks)

9.



Perpendicular distance between PQ and SR = 3.9cm

(4marks)

10.

Mass (kg) ,x	40 – 44	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69	70 – 74
No. of people, f	1	2	12	10	2	2	1
Midpoint of x	42	47	52	57	62	67	72
fx	42	94	624	570	124	134	72

$$\text{mean mass}, \bar{x} = \frac{\sum fx}{\sum x} = \frac{1660}{30} = 55\frac{1}{3}\text{Kg}$$

(3 marks)

11. Selling price before discount = Sh. $\frac{5880}{98} \times 100\%$

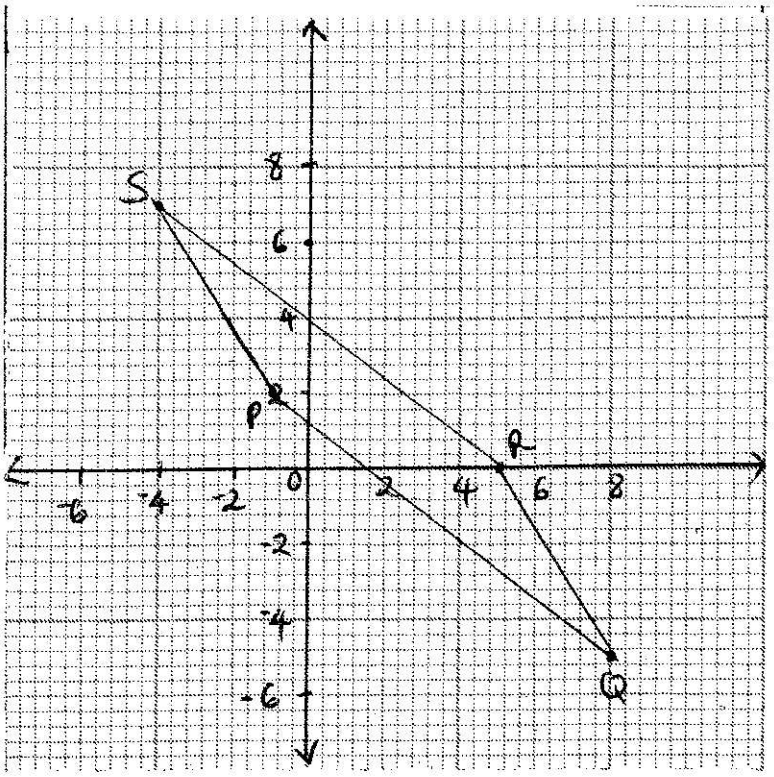
= Sh. 6000

Price at which shopkeeper bought the suit = Sh. $\frac{6000}{120} \times 100\%$

= Sh 5000

(3 marks)

12.



$QS = \sqrt{12^2 + 12^2} = 16.97$

(3 marks)

13. Let Mambo's salary be x and Simba's salary be y

$$\frac{1}{6}x+\frac{1}{5}y=14820$$

$$\frac{1}{8}x+\frac{1}{12}y=8675$$

$$5x+6y=444600$$

$$3x+2y=208200$$

$$5x+6y=444600$$

$$9x+6y=624600$$

$$4x=180000$$

$$x=45000$$

(4 marks)

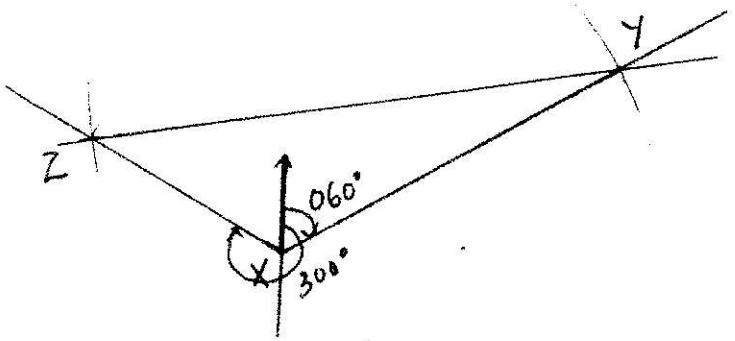
14. a) $10500 = 2^2 \times 3 \times 5^3 \times 7$

b) P x $10500 = 2^3 \times 3^3 \times 5^3 \times 7^3$

Smallest value of $P = 2 \times 3^2 \times 7^2 = 882$

(3 marks)

15.



Distance XZ = 3 × 10 = 30 Km

(4 marks

16 L.S.F. = 8: 24 = 1: 3

V.S.F = 1: 27

Volume of frustum = $160 \times 27 - 160$

$= 4160\,\text{cm}^3$

(3 marks)

17. (a) (i) Surface area of the solid $= \pi \times 6 \times 10 + \frac{4}{3} \times \pi \times 6^2 = 414.49$

(ii) Height of cone = $\sqrt{100 - 36} = 8$

$\therefore$ Volume of the solid $= \frac{1}{3} \times \pi \times 6^2 \times 8 + \frac{1}{2} \times \frac{4}{3} \times \pi \times 6^3$

$= 753.98\ \text{cm}^3$

(b) Mass of solid in kg $= \frac{1.3 \times 753.98}{1000} = 0.98\text{kg}$

(10 marks)

18. (a) (i) Let distance covered by bus be b km

$\therefore$ Time by train $= \frac{700 - b}{50}$

Time by bus $= \frac{b}{75}$

$\therefore \frac{700 - b}{50} + \frac{b}{75} = 11\frac{1}{2} - \frac{1}{2}$

$\frac{2100 - 3b + 2b}{150} = 11$

$2100 - b = 11 \times 150$

$b = 2100 - 1650$

$= 450$

(ii) Time taken by train $= \frac{700 - 450}{50} = 5$ h

Total time before departure of bus = 5 h + 30 min

19. (a) $\begin{pmatrix} 0 & 1 \\ 2 & p \end{pmatrix}\begin{pmatrix} -1.5 & -0.5 \\ p & p-2 \end{pmatrix} = \begin{pmatrix} p & p-2 \\ -3+p^2 & -1+p^2-2p \end{pmatrix}$

$$-p + p^3 - 2p^2 = p^3 - 2p^2 - 3p + 6$$

$$-p = -3p + 6$$

$$p = 3$$

(b) (i) $x + 30y = 50000$

$x + 40y = 56000$

(ii) $\begin{pmatrix} 1 & 30 \\ 1 & 40 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 50000 \\ 56000 \end{pmatrix}$

$$\frac{1}{10}\begin{pmatrix} 40 & -30 \\ -1 & 1 \end{pmatrix}\begin{pmatrix} 1 & 30 \\ 1 & 40 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{10}\begin{pmatrix} 40 & -30 \\ -1 & 1 \end{pmatrix}\begin{pmatrix} 50000 \\ 56000 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{10}\begin{pmatrix} 320000 \\ 6000 \end{pmatrix}$$

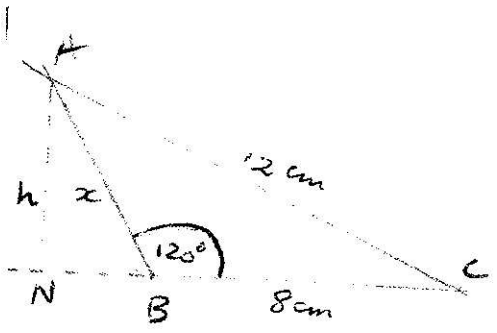
$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 32000 \\ 6000 \end{pmatrix}$$

$x = 32000$

$y = 600$

(iii) $\dfrac{68000 - 32000}{600} = 60$

20.



21. a) ordinates

$x = 0 \quad y_1 = 1$
$x = 1 \quad y_2 = 6$
$x = 2 \quad y_3 = 9$
$x = 3 \quad y_4 = 10$
$x = 4 \quad y_5 = 9$
$x = 5 \quad y_6 = 6$
$x = 6 \quad y_7 = 1$

$$\text{Area} = \frac{1}{2} \times 1 \times \{1 + 1 + 2(6 + 9 + 10 + 9 + 6)\} = \frac{1}{2}(82) = 41$$

(b) (i) $\int_0^6 -x^2 + 6x + 1 = \left[-\frac{1}{3}x^3 + \frac{6}{2}x^2 + x\right]_0^6 = -72 + 108 + 6 = 42$

(ii) $\frac{42 - 41}{42} \times 100\% = 2.38\%$

(10 marks)

22. (a) $V = \frac{ds}{dt} = 6t^2 - 10t + 4$

When t = 3,

$v = 6(9) - 10(3) + 4 = 28$ m/s

(b) $v = 0 \Rightarrow 6t^2 - 10t + 4 = 0$

$3t^2 - 5t + 2 = 0$

$(3t - 2)(t - 1) = 0$

$t = \frac{2}{3}$ or $t = 1$

(c) $t = \frac{2}{3}$: $s = 2\left(\frac{2}{3}\right)^3 - 5\left(\frac{2}{3}\right)^2 + 4\left(\frac{2}{3}\right) + 2 = 3.04$m

t = 1; $s = (1)^3 - 5(1)^2 + 4(1) + 2 = 3$m

(d) $a = \frac{dv}{dt} = 12t - 10$

$t = 3 : a = 12(3) - 10 = 26$

(10 marks)

23. (a) (i) $\mathbf{BC} = \mathbf{BD} + \mathbf{DC}$

$= -\mathbf{d} - \mathbf{a} + 2\mathbf{a}$

$= \mathbf{a} - \mathbf{d}$

(ii) $\mathbf{AX} = \mathbf{k}\,\mathbf{AC} \Rightarrow \mathbf{AX} = \mathrm{k}\,(\mathbf{2a} - \mathbf{d})$

(iii) $\mathbf{DX} = h\mathbf{DB} \Rightarrow \mathbf{DX} = \mathrm{h}\,(\mathbf{d} + \mathbf{a})$

(b) $\mathbf{AX} = -\mathbf{d} + \mathbf{hd} + \mathrm{ha}$

$\mathbf{AX} = \mathbf{d}\,(\mathbf{h} - \mathbf{1}) + h\mathbf{a}$

$\mathbf{AX} = \mathbf{2ka} - \mathbf{kd}$

$\therefore \mathbf{d}\ (\mathrm{h} - 1) + \mathrm{ha} = 2\mathrm{k}\mathbf{a} - \mathrm{k}\mathbf{d}$

$h = 2k$ and $h - 1 = -k$

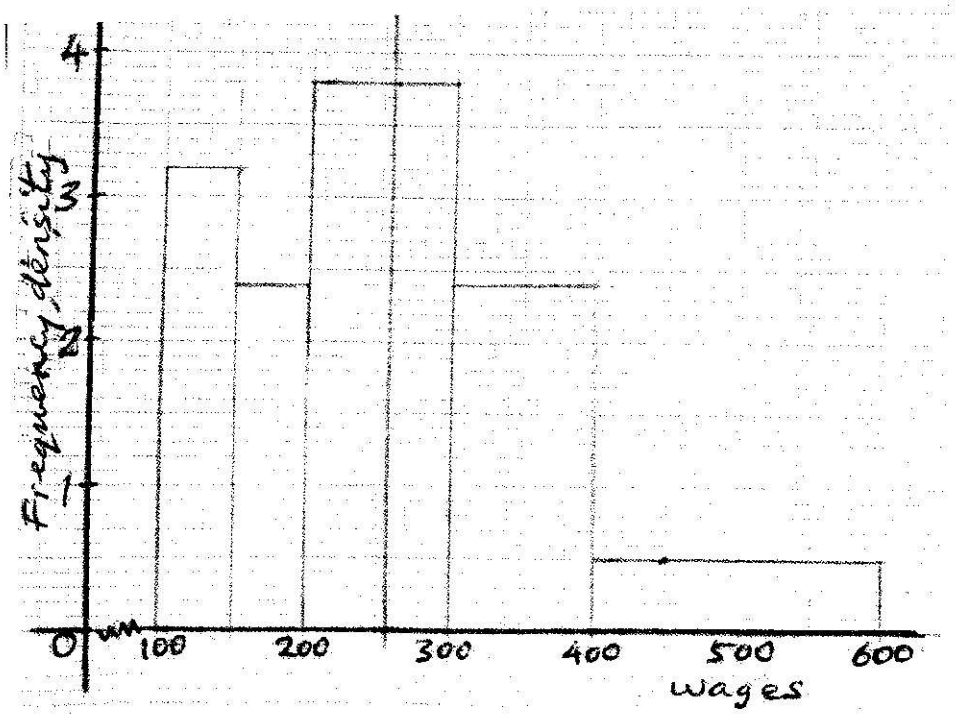
$h = -k + 1$ $\quad 2k = -k + 1$

$3k = 1$

$k = \frac{1}{3}$

$h = 2k \Rightarrow h = 2 \times \frac{1}{3} = \frac{2}{3}$ ***(10 marks)***

24 (a)



(b) (i) median class: 200 – 300

(c) Number of workers who earn Sh. 450 or less per day = 900 + 50 × 0.5 = 925

(10 marks)