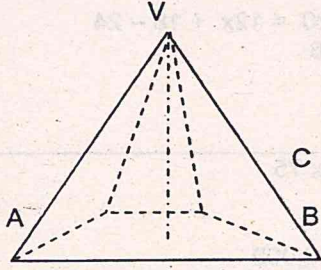
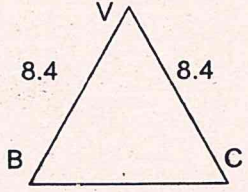


MANGU - 2017
MATHEMATICS PAPER 1

1.	<table><tr><th>Numerator</th><th>Denominator</th></tr><tr><td>$\frac{9}{4} - \frac{11}{3} + \frac{31}{6}$ $= \frac{27 + 62 - 44}{12}$ $= \frac{45}{12}$ $\frac{9}{4} - \frac{23}{6} + \frac{7}{3}$ $= \frac{27 + 28 - 46}{12} = \frac{3}{4}$ $\frac{15}{4} \times \frac{4}{3} = 5$</td><td>$\frac{5}{3} - \frac{1}{6} = \frac{10}{6} - \frac{1}{6} = \frac{9}{6} \times \frac{1}{4}$ $= \frac{3}{8} + \frac{11}{4} = \frac{25}{8}$ $= \frac{33}{8} - \frac{89}{12} + \frac{25}{6}$ $= \frac{99 + 100 - 178}{24} = \frac{7}{8}$ $\frac{25}{8} \times \frac{8}{7} = \frac{25}{7}$ $= \frac{5}{1} \times \frac{7}{25}$ $= \frac{7}{5}$</td></tr></table>	Numerator	Denominator	$\frac{9}{4} - \frac{11}{3} + \frac{31}{6}$ $= \frac{27 + 62 - 44}{12}$ $= \frac{45}{12}$ $\frac{9}{4} - \frac{23}{6} + \frac{7}{3}$ $= \frac{27 + 28 - 46}{12} = \frac{3}{4}$ $\frac{15}{4} \times \frac{4}{3} = 5$	$\frac{5}{3} - \frac{1}{6} = \frac{10}{6} - \frac{1}{6} = \frac{9}{6} \times \frac{1}{4}$ $= \frac{3}{8} + \frac{11}{4} = \frac{25}{8}$ $= \frac{33}{8} - \frac{89}{12} + \frac{25}{6}$ $= \frac{99 + 100 - 178}{24} = \frac{7}{8}$ $\frac{25}{8} \times \frac{8}{7} = \frac{25}{7}$ $= \frac{5}{1} \times \frac{7}{25}$ $= \frac{7}{5}$	<table><tr><td>$24 \times 3 - 3 = 69$ 69×40 $= 2760$ $N/D \quad \frac{2760}{28}$ $= 98.5714$</td><td>$24 + 6 \times 2 + 5 \times 4$ $4 \times 2 + 5 \times 4 = 28$</td></tr><tr><td>7</td><td>Original Costs New T = $\frac{x}{3} \times 1.12 = 0.3733x$ $L = \frac{x}{6} \times 1.18 = 0.1967x$ $T = \frac{8}{24}x = \frac{x}{3}$ R = $\frac{x}{2} \times 1.4$ $= 0.7x (0.3733x + 0.1967x + 0.7x)$ $L = \frac{4}{24}x = \frac{x}{6}$ $= 0.27 \times 100 = 27\%$ $R = \frac{12}{24}x = \frac{x}{2}$</td></tr><tr><td>8</td><td>$6(x-3) - 4(x-5) = 3(4x-6) - 24$ $6x - 18 - 4x + 20 = 12x + 18 - 24$ $2x + 2 = 12x - 6$ $10x = 8$ $x = \frac{4}{5}$</td></tr><tr><td>9</td><td>$\\$2000 = 2000 \times 75$ $= \text{Ksh } 150,000$ Spent 60,000 Remained ksh 90,000 100 Uganda shillingds $\Rightarrow$ Sh 4.50 $\frac{90,000}{90,000} \times 1000 = 2,000,000 \text{ Ush Or } 2 \text{ M sh } 4.50$</td></tr><tr><td>10</td><td>$8^{2x+2} + 8^{2x} = 1040$ Let $8^{2x} = y$ $8^{2x} \cdot 8^2 + 8^{2x} = 1040$ $64y + y = 1040$ $65y = 1040$ $y = 16$ $8^{2x} = 16$ $(2^3)^{2x} = 2^4$ $6x = 4$ $x = \frac{4}{6}$</td></tr><tr><td>11</td><td>$y = \frac{3}{2}x - \frac{4}{3}$ $G_1 = \frac{3}{2}$ $G_2 = -\frac{2}{3}$ $\frac{y + \frac{1}{3}}{x-3} = -\frac{2}{3}$ $y + \frac{1}{3} = -\frac{2}{3}(x-3)$ $y = -\frac{2}{3}x + 2 - \frac{1}{3}$ $\Rightarrow y = -\frac{2}{3}x + \frac{5}{3}$ Or $Y = -\frac{2}{3}x + \frac{5}{3}$</td></tr><tr><td>12</td><td>$6(\frac{2}{3})^2 + \frac{2}{3}k - 2 = 0$ $6(\frac{4}{9}) - 2 = -\frac{2}{3}k$ $\frac{8}{3} - 2 = -\frac{2}{3}k$ $\frac{2}{3} = -\frac{2}{3}k$ $K = -1$</td></tr></table>	$24 \times 3 - 3 = 69$ 69×40 $= 2760$ $N/D \quad \frac{2760}{28}$ $= 98.5714$	$24 + 6 \times 2 + 5 \times 4$ $4 \times 2 + 5 \times 4 = 28$	7	Original Costs New T = $\frac{x}{3} \times 1.12 = 0.3733x$ $L = \frac{x}{6} \times 1.18 = 0.1967x$ $T = \frac{8}{24}x = \frac{x}{3}$ R = $\frac{x}{2} \times 1.4$ $= 0.7x (0.3733x + 0.1967x + 0.7x)$ $L = \frac{4}{24}x = \frac{x}{6}$ $= 0.27 \times 100 = 27\%$ $R = \frac{12}{24}x = \frac{x}{2}$	8	$6(x-3) - 4(x-5) = 3(4x-6) - 24$ $6x - 18 - 4x + 20 = 12x + 18 - 24$ $2x + 2 = 12x - 6$ $10x = 8$ $x = \frac{4}{5}$	9	$\$2000 = 2000 \times 75$ $= \text{Ksh } 150,000$ Spent 60,000 Remained ksh 90,000 100 Uganda shillingds $\Rightarrow$ Sh 4.50 $\frac{90,000}{90,000} \times 1000 = 2,000,000 \text{ Ush Or } 2 \text{ M sh } 4.50$	10	$8^{2x+2} + 8^{2x} = 1040$ Let $8^{2x} = y$ $8^{2x} \cdot 8^2 + 8^{2x} = 1040$ $64y + y = 1040$ $65y = 1040$ $y = 16$ $8^{2x} = 16$ $(2^3)^{2x} = 2^4$ $6x = 4$ $x = \frac{4}{6}$	11	$y = \frac{3}{2}x - \frac{4}{3}$ $G_1 = \frac{3}{2}$ $G_2 = -\frac{2}{3}$ $\frac{y + \frac{1}{3}}{x-3} = -\frac{2}{3}$ $y + \frac{1}{3} = -\frac{2}{3}(x-3)$ $y = -\frac{2}{3}x + 2 - \frac{1}{3}$ $\Rightarrow y = -\frac{2}{3}x + \frac{5}{3}$ Or $Y = -\frac{2}{3}x + \frac{5}{3}$	12	$6(\frac{2}{3})^2 + \frac{2}{3}k - 2 = 0$ $6(\frac{4}{9}) - 2 = -\frac{2}{3}k$ $\frac{8}{3} - 2 = -\frac{2}{3}k$ $\frac{2}{3} = -\frac{2}{3}k$ $K = -1$
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	$\text{Eqn } 6x - x - 2 = 0$ $\Rightarrow x = \frac{2}{5}$ Or $x = -0.5$		
13	$\frac{AB}{\sin 80} = 16$ $AB = 16 \sin 80$ $= 15.76 \text{ cm}$ $\frac{BC}{\sin 40} = 16$ $BC = 16 \sin 40$ $BC = 10.28$ $A = \frac{1}{2} \times 15.76 \times 10.28 \sin 60$ $\frac{140.31}{2} \text{ cm}^2$ $= 70.15 \text{ cm}^2$	16	$AE : EC = 1 : 5$ $DE : EB = 1 : 5$ $\Rightarrow DE = \frac{1}{6} BD$ $\frac{1}{6} \times 12$ $= 2 \text{ cm}$
			SECTION B
14	 $VN = \sqrt{8.4^2 - 3^2}$ $= 6.156$ $= 7.85 \text{ cm}$  $VM = \sqrt{8.4^2 - 2^2}$ $= 6.656 = 8.16 \text{ cm}$ $\text{Total Area} = 6 \times 4 + \frac{1}{2} \times 4 \times 8.16 \times 2 + \frac{1}{2} \times 6 \times 7.85 \times 2$ $= 24 + 32.64 + 47.1$ $= 103.74 \text{ cm}^2$	17	Longer Diagonal = $10 \text{ cm} + 0.1$ DM $3.3 \text{ cm} + 0.1$ Construction of $< 52.5^\circ$ Line AB Locating C Line AD Area = BH $= 7 \times 3.3$ Area = 23.1 or $7 \times 3.4 = 23.8 \text{ cm}^2$ $7 \times 3.2 = 22.4 \text{ cm}^2$ $22.4 \leq A \leq 23.1$
15	$\frac{(2.9479)}{63.34} = 25.620 (63.34)$ $= 25.62 (0.01579)$ $= 0.40454$ $3 \sqrt{0.0169} = 3 \sqrt{16.9 \times 10^{-3}}$	18	(a) L_1 (1, 3) (2, 0) $m = \frac{3-0}{1-2} = 3$ $y = -3x + 6$ $\Rightarrow y + 3x \leq 6$ L_2 (1, 3) (0, -1) $m = \frac{3+1}{1-0} = 4$ $\frac{y-3}{x-1} = 4$ $y - x = -1$ $\Rightarrow y - x > -1$ L_3 L_2 (-1.5, 0) (1.5, 1.5) $m = \frac{1.5-0}{1.5+1.5} = \frac{1.5}{3}$ $\frac{y-0}{x+1.5} = \frac{1}{2}$ $2y - x = \frac{3}{2}$ $\Rightarrow 2y - x > \frac{3}{2}$

(b) $\text{Area} = (2 \times 1) \left(\frac{1}{2} \times \frac{1}{2} \times 2 \right) + \left(\frac{1}{2} \times \frac{1}{2} \times 1\frac{1}{2} + \frac{1}{2} \times 4\frac{1}{2} \right)$

$2 - \left(\frac{1}{2} \times \frac{3}{8} + \frac{1}{4} \right)$
 $\Rightarrow 2 - \frac{5}{8} = \frac{11}{8} \text{ units}$

19 a) **Before Breakdown**
 Mash had travelled for 2 hrs
 Coast had travelled for $1\frac{1}{2}$ hrs

$D_m = 2 \times 80 = 160\text{km}$
 $D_c = 1\frac{1}{2} \times 60 = 90\text{km}$

Within 45 min of coast bus
 Repair mash travelled

$\frac{45}{60} \times 80 = 60\text{km}$

Distance apart as at 9.45am

$= 450 - [160 + 60 + 90] = 140\text{km}$

Relative speed

$= 60\text{km/hr} + 80\text{km/hr}$
 $= 140\text{km/hr}$

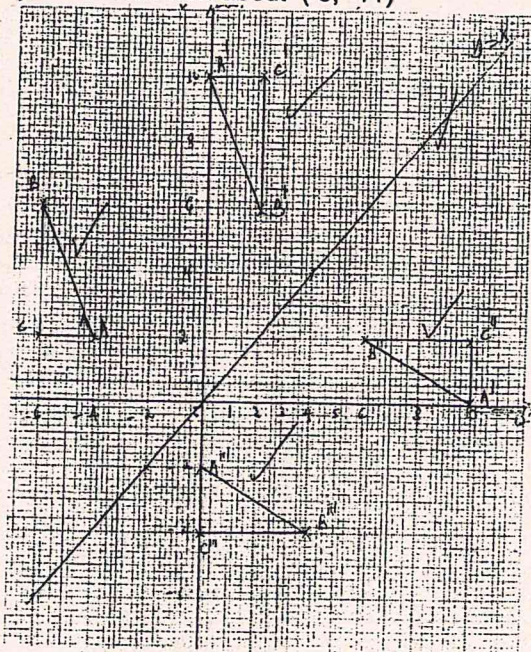
Time taken before they met $\frac{140}{140} = 1\text{hrs}$

Meeting time = 9.45am
 $\frac{1.00}{10.45 \text{ am}}$

b) Mash bus arrived = $7.00 + \frac{450}{80}$ 12.38pm
 Coast bus arrival = $7.30\text{am} + 45 + \frac{450}{60}$
 $= 8.15 + 7.30 = 3.45\text{pm}$

$1545 - 1238 = 3 \text{ hrs } 7 \text{ min}$

- 20 a) $A' (0, 10) B' (2, 6) C' (2, 10)$
 b) $A'' (10, 0) B'' (6, 2) C'' (10, 2)$
 c) Half turn about $(5, -11)$

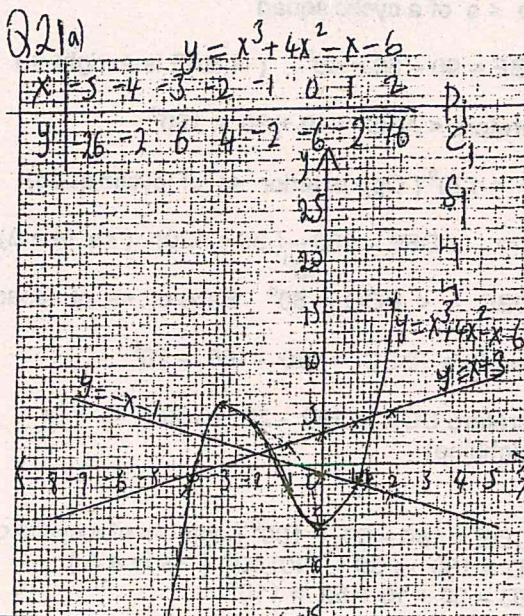


(c) (i) $x = 3.9$ or 1.2 or $1.2 (\pm 0.1)$

(ii) Required equation $3y = 3x - 3$
 $y = -x - 1$

$x = 3-7$ or -1 or 1

(iii) Required eqn $y = x + 3$
 $X = 3.9$ or 1.4 or 1.5



x	0	1	2	3	4	5	6	7	8	9	10
y	10	5	6	13	26	4	7	101	138	181	230

Area = $\frac{1}{2} (10 + 230 + 5 + 6 + 13 + 26 + 45 + 70 + 101 + 138 + 181)$
 $= 705 \text{ square units}$

x	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5
y	6.75	4.75	8.75	18.75	34.75	56.75	84.75	118.75	158.75	204.75

Area = $\frac{1}{2} \{ 6.75 + 4.75 + 8.75 + 18.75 + 34.75 + 56.75 + 84.75 + 118.75 + 158.75 + 204.75 \}$
 $= 697.5 \text{ Square units}$

$A = 10$

$(3x^3 - 8x^2 + 10x) dx$

$= \left[x^3 - 4x^2 + 10x \right]_0^{10}$

$= [x^3 - 4x^2 + 10x]_0^{10}$

$= 10^3 - 4(10)^2 + 10(10)$

Trapezoidal rule $705 - 700 = 5$

% Error = $\frac{5}{700} \times 100$

ii)	$= 0.714288714\%$ Mid ordinate $700 - 697.5 = 2.5$ $\frac{2.5}{70} \times 100 = 0.357142857\%$	
23	Angle $= 180 - 80 = 100^\circ$ Opp $\angle$s of a cyclic quad a) $\angle ABE = 90 - 50 = 40^\circ$ ($\angle BAE$ is a right $\angle$) Therefore $\angle ABC = 40 + 80 = 120^\circ$ b) $\angle CEF = 120^\circ$ (Opp exterior $\angle$s of cyclic quad) $\Rightarrow \angle DFE = 180 - (30 + 120)$ ($\angle$s in a Δ) 30° $\angle OBC = \angle BCO = 80^\circ$ Base of $\angle$s of Isosceles Δ) Therefore $\angle BOC = 180 - 160 = 20^\circ$ Therefore $\angle COE = 180 - 20 = 160^\circ$ ($\angle$s in a straightline) c) $\angle CDE = 180 - 80 = 100^\circ$ (opp $\angle$s of a cyclic quad) $\angle CED = 180 - (30 + 100) 50^\circ$ ($\angle$s in a Δ) $\angle AED = 50 + 10 + 50 = 110^\circ$ $\Rightarrow \angle ADE = 180 - (30 + 110) = 40^\circ$ d)	
24	a) $\frac{1}{3} \times \pi \times 5.2^2 h - \frac{\pi}{3} \times \left(\frac{5.2}{3}\right)^2 \times \frac{h}{3}$ $= \frac{2 \times 5.2^3 \pi}{3}$	

MANGU HIGH SCHOOL
JULY/ AUGUST EXAM 2017
MATHEMATICS PAPER 2
MARKING SCHEME

1. $\frac{XH}{2} - 3 = \frac{x-2}{5}$

$$5x(x+1) - 30 = 2x(x-2)$$

$$5x^2 + 5x - 30 = 2x^2 - 4x$$

$$3x^2 + 9x - 30 = 0$$

$$X^2 + 3x - 10 = 0$$

$$X^2 + 5x - 2x - 10 = 0$$

$$X(x+5) - 2(x+5) = 0$$

$$X(x+5) - 2(x+5) = 0$$

$$(x+5)(x-2) = 0$$

$$X = 2 \text{ or } -5$$

2. C.P = $160 \times \frac{100}{125}$ = sh 128

$$100n + 150(n-1) = 128$$

$$100n + 150n - 150 = 128$$

$$50n = -22$$

$$n = 11$$

$$25$$

$$\therefore N = 1 - n = 11:14$$

$$x : y = 11 : 14$$

$$x + y = 11 + 14$$

$$= 25$$

3. i) $\vec{ON} = \vec{OB} + \vec{BN}$
 $= \vec{b} + \frac{5}{9}\vec{BA}$
 $= \vec{b} + \frac{5}{9}(\vec{a} - \vec{b})$
 $= \frac{5}{9}\vec{a} - \frac{4}{9}\vec{b}$

ii) $\vec{Mn} = \vec{MB} + \vec{BN}$
 $= \frac{1}{3}\vec{b} + \frac{5}{9}(\vec{a} - \vec{b})$
 $= \frac{5}{9}\vec{a} - \frac{2}{9}\vec{b}$

4. $V_w = \frac{2.7(25) - 46}{4.6} = 13.67$

$$V_{\max} = \frac{2.75(25.5) - 4.55}{4.55} = 14.41$$

$$V_{\min} = \frac{2.65(24.5) - 4.65}{4.65} = 12.96$$

$$R.E = \frac{14.41 - 12.96}{243.67} = 0.05304$$

$$\%E = 0.05304 \times 100 = 5.304\%$$

5. Mean $\frac{66}{11} = 6$

x	f	d ² f
1	1	25
2	1	16
4	2	8
5	1	1
6	2	0
7	2	2
9	2	8
		<u>60</u>

$$5^2 = \frac{60}{11} = 5.455$$

6. i) $X(x + 8.4) = 16.8^2$

$$x^2 + 8.4x - 282.24 = 0$$

$$x = \frac{-8.4 \pm \sqrt{70.56 + 1128.96}}{2}$$

$$x = -21.52 \quad \therefore X = 13.12\text{cm}$$

ii) $\frac{13.12}{\sin 40} = \frac{16.8}{\sin A} = A = 55.37$

$$\therefore \angle APB = 180 - (55.39 + 40) = 84.61$$

7. $(2 - \frac{1}{x})^8 = 2^8 + 8(2)(-\frac{1}{x}) + 28(2^6)(-\frac{1}{x})^2 + 56(2^5)(-\frac{1}{x})^3 + 70(2^4)(-\frac{1}{x})^4 + \dots$

$$2 - \frac{1}{x} = 1.75$$

$$x = 4$$

$$(1.75)^8 = \frac{256 - 1024}{4} + \frac{1792 - 1792}{16} + \frac{1120}{64} + \frac{1120}{256}$$

$$= 256 - 256 + 112 - 28 + 4.375$$

$$= 88.375$$

$$= 88.4$$

8. $AP \leq PB$
 $CP \leq PD$
 $2 \leq OP \leq 3$

9. $\cos 2x = -\frac{1}{2}$
 $2x = 120^\circ, -120^\circ, 240^\circ, -240^\circ$
 $x = 60^\circ, -60^\circ, 120^\circ, -120^\circ$
 $x = \frac{\pi}{3}, -\frac{\pi}{3}, \frac{2\pi}{3}, -\frac{2\pi}{3}$

$$10. \frac{1}{\log_y 2} = 2 - \frac{1}{\log_x 2}$$

$$\log_2 y = 2 - \log_2 x$$

$$\log_2 yx = 2$$

$$yx = 4$$

$$y = \frac{4}{x}$$

$$11. x^2 + y^2 = 4$$

$$x + y = 2$$

$$y = 2 - x$$

$$\therefore X^2 + (2 - x)^2 = 4$$

$$X^2 + 4 - 4x + x^2 = 4$$

$$2x^2 - 4x = 0$$

$$\therefore X = 0 \text{ or } x = 2$$

$$\therefore \text{when } x = 0, y = 2$$

$$\text{When } x = 2, y = 0$$

$$12. \frac{n\sqrt{2x^n + r}}{4} = \frac{x}{r}$$

$$\frac{2xn + r}{4} = \frac{x}{r^n}$$

$$2x^n + r = \frac{4x^n}{r^n}$$

$$2x^n r^n + r^{n+1} = 4x^n$$

$$r^{n+1} = r^n (4 - 2r^n)$$

$$x = \frac{n\sqrt{r^{n+1}}}{4 - 2r^n}$$

$$13. \tan 36 = \frac{1.8 + x}{y}$$

$$\tan 33 = \frac{x}{y}$$

$$\therefore \tan 33 = \frac{1.8 + 2}{\tan 36}$$

$$0.0774x = 1.1684$$

$$x = 15.10\text{m}$$

$$\text{Distance} = \frac{x}{\tan 33} = 23.25\text{m}$$

$$14. P_0 = \frac{KQ}{R}$$

$$P_1 = \frac{K(1.05)Q}{R(0.9)}$$

$$P_1 = \frac{KQ(1.167)}{R}$$

$$P_1 = 116.7\% P_0$$

$$\therefore P_1 \text{ has increased by } 16.7\%$$

$$15. \frac{1}{(1 + \sqrt{3})^2} + \frac{1}{(1 - \sqrt{3})^2}$$

$$\frac{(1 - \sqrt{3})^2 + (1 + \sqrt{3})^2}{(1 - \sqrt{3})^2 (1 + \sqrt{3})^2}$$

$$91 \sqrt{3}^2 + 1 - \sqrt{3}^2$$

$$\frac{1 - 2\sqrt{3} + 3 + 1 + 2\sqrt{3} + 3}{(4 - 2\sqrt{3})(4 + 2\sqrt{3})}$$

$$= \frac{8}{4}$$

$$= 2$$

$$16. \text{Via S} = 60(30) + 60(60) \cos 60 = 3600\text{nm}$$

$$\text{Via } \Theta = 60(60) \cos 30 + 60(30) = 4918$$

$$\text{Difference} = 4918 - 3600 = 1318 = 1300\text{nm}$$

SECTION II

$$17. a) G.T = 12000 + 18000 + \frac{13000 \times 3}{20}$$

$$= \text{sh } 15750$$

$$\text{Tax}$$

$$65^0 \times 2 = 1300$$

$$1200 \times 3 = 3600$$

$$1712.5 \times 4 = 10850$$

$$T.I = 456.25$$

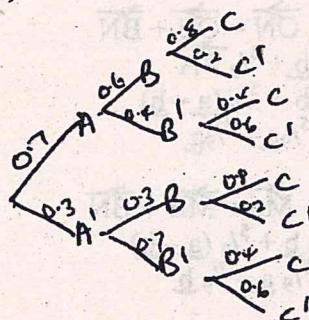
$$= \text{sh } 91250$$

$$91250 = 1.15Bs + 37000 - 2000$$

$$Bs = 48913$$

$$b) \text{Net income} = 48913 + 3700 - 12000 - 18000 - 13000 = \text{sh } 55913 - 13000 = 42913$$

18. a)



$$b) i) P(TC) = 0.7 \times 0.6 \times 0.8 = 0.336$$

$$ii) P(TC) = 0.7 \times 0.4 \times 0.6 + 0.3 \times 0.3 \times 0.2 + 0.3 \times 0.7 \times 0.4 = 0.168 + 0.018 + 0.084 = 0.27$$

$$\begin{aligned}\text{iii) } P(\text{at least } 1) &= 1 - P(\text{none}) \\ &= 1 - (0.3 \times 0.7 \times 0.6) \\ &= 1 - .0126 \\ &= 0.874\end{aligned}$$

$$\begin{aligned}\text{iv) } P(\text{none}) &= 0.3 \times 0.7 \times 0.6 \\ &= 0.126\end{aligned}$$

$$\begin{aligned}19. \text{ a) } YM &= \sqrt{5^2 - 3^2} \\ &= \sqrt{16} \\ &= 4\text{m}\end{aligned}$$

$$\begin{aligned}\text{b) } YQ &= \sqrt{4^2 - 15^2} \\ YQ &= 3.708\text{m}\end{aligned}$$

$$\begin{aligned}\text{c) } \tan \Theta &= 3.708 \\ \Theta &= 51.03^\circ\end{aligned}$$

$$\begin{aligned}\text{d) } \tan \alpha &= 3.708 \\ \alpha &= 67.98^\circ\end{aligned}$$

$$\begin{aligned}20. \text{ a) } 9^x &= 81 \\ 3^{2x+1} &= 9^x \\ 3^{2x} (3^2) &= 3^{2x} (3) (3^4) \\ 3^{4x} &= 3^{x+5} \\ 4x &= x+5 \\ x &= 2.5\end{aligned}$$

$$\begin{aligned}\text{b) } r &= \frac{81}{9^{2.5}} = \frac{81}{243} \\ &= \frac{1}{3}\end{aligned}$$

$$\begin{aligned}\text{c) } n &= 10 \\ a &= 729 \\ r &= 1/3\end{aligned}$$

$$\begin{aligned}S_{10} &= 729 \frac{[1 - (1/3)^{10}]}{1 - 1/3} = 729 (3/2) [1 - (1/3)^{10}] \\ &= 1093\end{aligned}$$

$$\begin{aligned}\text{d) } \ar 4, \ar 6 \\ 729(1/3)^4, 729(1/3)^6 \\ 9 \quad 1 \\ a = 9 \quad d = -8 \\ S_{20} &= 10[2(a) + 19(-8)] = 1340\end{aligned}$$

$$\begin{aligned}21. \text{ i) }) &= (2t-1)(t-1)(t-2) \\ t &= 1/2 \text{ or } 1 \text{ or } 2\end{aligned}$$

$$\begin{aligned}\text{ii) } S &= 2t^3 - 7t^2 + 7t - 2 \\ \text{Velocity} &= 6t^2 - 14t + 7 \\ \text{When } t &= 2\end{aligned}$$

$$\begin{aligned}V &= 24 - 28 + 7 \\ &= 3\text{m/s}\end{aligned}$$

$$\begin{aligned}a &= \frac{dv}{dt} = 12t - 14 \\ &= \frac{24 - 14}{1} \\ &= 10\text{m/s}^2\end{aligned}$$

$$\begin{aligned}\text{iii) } O &= 6t^2 - 14t + 7 \\ t &= \frac{14 \pm \sqrt{14^2 - 4(6)(7)}}{2(6)} \\ t &= \frac{14 \pm 5.292}{12} \\ t &= 0.7257 \text{ or } 1.6077\end{aligned}$$

$$\begin{aligned}\text{iv) } s &= [2(0.7257) - 1] [0.7257 - 1] \\ &= [0.4514] [-0.2743] [-1.2743] \\ &= 0.1578\text{m}\end{aligned}$$

$$\begin{aligned}22. \text{ a) } (1 \ 0) (1 \ 4 \ 3 \ 1) &= (1 \ 4 \ 3 \ 1) \\ (0 \ -1) (1 \ 1 \ 3 \ 3) &= (-1 \ -1 \ -3 \ -3)\end{aligned}$$

$$\begin{aligned}A^1(1, 1) B^1(4, -1) C^1(3, -3) D^1(1, -3) \\ \text{Reflection in line } y = 0\end{aligned}$$

$$\begin{aligned}\text{b) } (a \ c) (1 \ 4 \ 3 \ 1) &= (3 \ 12 \ 9 \ 3) \\ (b \ d) (-1 \ -1 \ -3 \ -3) &= (-3 \ -3 \ -9 \ -9)\end{aligned}$$

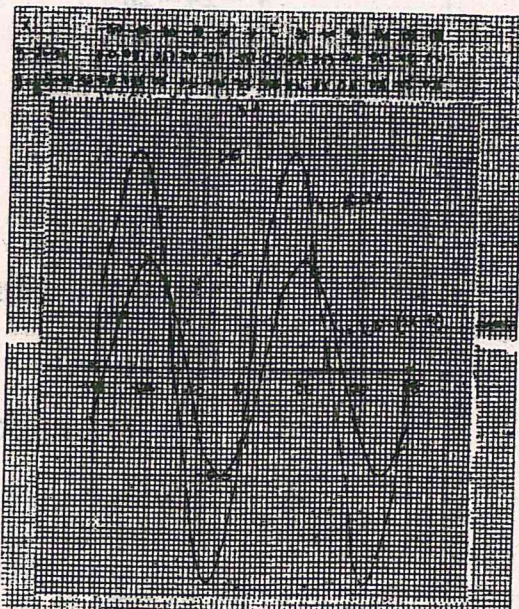
$$\begin{aligned}a - c &= 3 & b - d &= -3 \\ 4a - c &= 12 & 4b - d &= -3 - \\ -3a &= 9 & & \\ a &= 3 & -3b &= 0 \\ c &= 0 & b &= 0 \\ d &= 3 & & \\ \therefore (3 \ 0) & & & \\ (0 \ 3) & & & \end{aligned}$$

$$\text{Enlargement centre } (0 \ 0) \text{ S.F.} = 3$$

$$\begin{aligned}\text{c) } (a \ c) (3 \ 12 \ 9 \ 3) &= (1 \ 4 \ 3 \ 1) \\ (b \ d) (-3 \ -3 \ -9 \ -9) &= (1 \ 1 \ 3 \ 3)\end{aligned}$$

$$\begin{aligned}3a - 3c &= 1 & 3b - 3d &= 1 \\ 12a - 3c &= 4 & 12b - 3d &= 1 - \\ -9a &= -3 & -9b &= 0 \\ a &= 1/3 & b &= 0 \\ c &= 0 & d &= -1/3 \\ \therefore (1/3 \ 0) & & & \\ (0 \ 1/3) & & & \end{aligned}$$

23.



24. a) i) $2x + y \leq 20$
 ii) $10,000x + 25,000y \leq 180,000$
 $10x + 25y \leq 180$
 $2x + 5y \leq 36$

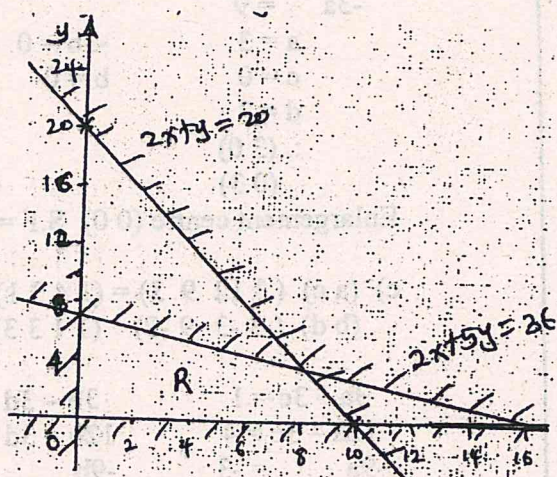
iii) $x \geq 0, y \geq 0$

Tables i)

x	0	10
y	20	0

ii)

x	3	5	0
y	6	5	7



- b) i) $2x + 3y = k$ objective function
 Trial and error at;
 $(10, 0) = 2(10) + 3(0) = 20\text{hrs}$
 $(9, 3) = 2(9) + 3(3) = 27\text{hrs}$
 $(0, 7) = 2(0) + 3(7) = 21\text{hrs}$
 $(8, 4) = 2(8) + 3(4) = 28\text{hrs}$

- ii) $2(8) + 3(4)$
 $16 + 12 = 28 \text{ man hours}$