

24.3 MATHEMATICS

24.3.1 Mathematics Paper 1 (121/1)



MANYAM FRANCHISE
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$$\begin{aligned}
 1. \quad \frac{\sqrt[3]{675 \times 135}}{\sqrt{2025}} &= \frac{\sqrt[3]{3^3 \times 5^2 \times 3^3 \times 5}}{\sqrt{3^4 \times 5^2}} \\
 &= \frac{3^2 \times 5}{3^2 \times 5} \\
 &= 1
 \end{aligned}$$

(2 marks)

2. (a) 7532

(1 mark)

(b) 500

(1 mark)

$$\begin{aligned}
 3. \quad \frac{(p+q)(p+q)}{p(p^2-q^2)+q(p^2-q^2)} \\
 &= \frac{(p+q)(p+q)}{(p+q)(p+q)(p-q)} \\
 &= \frac{1}{(p-q)}
 \end{aligned}$$

(4 marks)

4. (a) $\angle ADE = \frac{180^\circ - 108^\circ}{2} = 36^\circ$

(1 mark)

(b) $\angle AEF = \{180^\circ - (108^\circ - 60^\circ)\} \div 2 = 66^\circ$

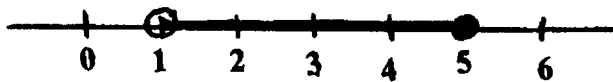
(1 mark)

(c) $\angle DAF = 108^\circ - (60^\circ + 36^\circ) = 12^\circ$

(1 mark)

5. $3 - 2x < x$
 $3 < 3x$
 $1 < x$
 $x \leq \frac{2x+5}{3}$

$3x \leq 2x + 5$
 $3x - 2x \leq 5$ or $x \leq 5$
 $1 < x \leq 5$



(4 marks)

6. $(3x+1)(3x-2) = 28$
 $3x^2 - x - 10 = 0$
 $(3x+5)(x-2) = 0$

$$x = 2 \text{ or } x = -\frac{5}{3}$$

$$\text{length } 3 \times 2 + 1$$

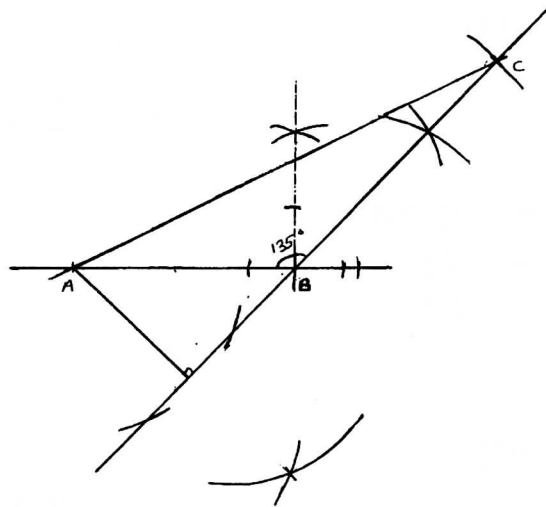
$$= 7\text{cm}$$

(3 marks)

7. 105000×9.74
 $= \text{sh } 1022700$
 $\frac{1022700 - 403879}{12.11}$
 $= \frac{618821}{12.11}$
 $= 51100 \text{ rands}$

(3 marks)

8. (a) and (b)



(3 marks)

9. $\frac{k-8}{3-k} = -3$
 $k = \frac{1}{2}$
 $\frac{y-8}{x-\frac{1}{2}} = -3$

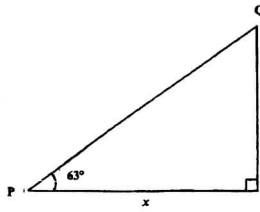
$$3x + y = 9\frac{1}{2}$$

(3 marks)

10 $6 \log_2 \sqrt[3]{2^6} + 10 \log_3 \sqrt[5]{3^5}$
 $= 6 \log_2 2^2 + 10 \log_3 3$
 $= 6 \times 2 + 10 \times 1$
 $= 12 + 10$
 $= 22$

(3 marks)

11.



Since $PR = PQ + RS$

$$PR = 3.6\text{m}$$

$$x = 1.8 \cos 63^\circ$$

$$= 1.8 \times 0.454$$

$$= 0.8172$$

$$QS = 3.6 - 2 \times 0.8172$$

$$= 3.6 - 1.6344$$

$$= 1.9656$$

$$= 1.966\text{m}$$

(3 marks)

12. (a)

$$p(-2,3) \longrightarrow p'(10,10)$$

$$T = \begin{pmatrix} 10 & - & -2 \\ 10 & - & 3 \end{pmatrix}$$

$$= \begin{pmatrix} 12 \\ 7 \end{pmatrix}$$

$$Q' = (1+12, 3+7)$$

$$= (13, 10)$$

(1 mark)

(b) $m \begin{pmatrix} -2 \\ 3 \end{pmatrix} - n \begin{pmatrix} 1 \\ 3 \end{pmatrix} = \begin{pmatrix} -12 \\ 9 \end{pmatrix}$

$$-2m - n = -12$$

$$3m - 3n = 9$$

$$m = n + 3$$

$$2(n+3) + n = 12$$

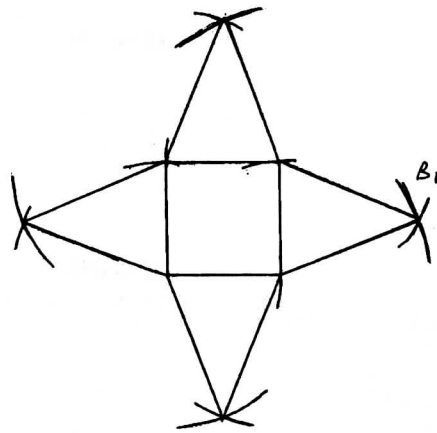
$$3n = 6$$

$$n = 2$$

$$m = 5$$

(3 marks)

13. (a)



(b) $3.7 \pm 0.1\text{cm}$

(2 marks)

(1 mark)

14. $2p + 3b = 78 \dots\dots(i)$
 $3p + 4b = 108 \dots\dots(ii)$

$8p + 12b = 312$

$9p + 12b = 324$

$p = 12$

$b = 18$

(3 marks)

15. Area A = 5×3.2
 B = 10×1.2

$\therefore 16:12 = f:6$

$12f = 96$

$f = 8$

(3 marks)

16. (a)

x	0	0.4	0.8	1.2	1.6	2.0
$y = \sqrt{4-x^2}$	2.00	1.96	1.83	1.60	1.20	0

(1 mark)

(b) Area of $\frac{1}{4}$ circle

$= \frac{1}{2}(0.4) \times \{(2+0) + 2(1.96+1.83+1.60+1.20)\}$

$= 3.036\text{cm}^2$

Area of circle

$= 4 \times 3.036$

$= 12.144\text{cm}^2$

(3 marks)

17. (a) 240×12000
 $= \text{sh } 2880000$

(2 marks)

(b) (i) total sales
 $12000 \times 1.25 \times 0.9 \times 240$
 $= \text{sh } 3240000$
 Percentage increase

$$= \frac{3240000 - 2880000}{2880000} \times 100$$

$$= 12.5\%$$

(3 marks)

(ii) new price

$$= 12000 \times 1.25 \times \frac{16}{15}$$

$$= 15000 \times \frac{16}{15}$$

$$= \text{sh } 16000$$

(1 mark)

(c) new number of sets $\frac{240(100-p)}{100}$

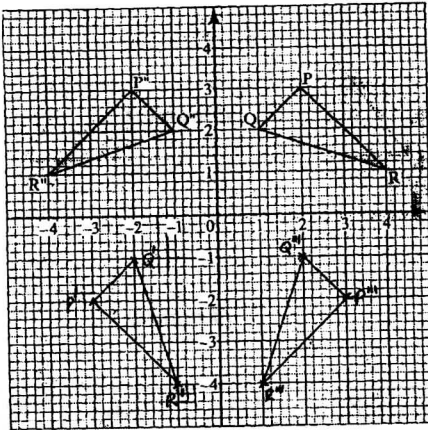
$$\text{new amount } 16000 \times \frac{240(100-p)}{100}$$

$$16000 \times \frac{240(100-p)}{100} = 2880000$$

$$P = 25\%$$

(4 marks)

18. (b) and (d)



(4 marks)

(a) Reflection on y axis (or line $x=0$)

(2 marks)

(c) negative quarter turn about (00) or about origin

(2 marks)

(e) Pairs of Δ s that are oppositely congruent

$$\Delta PQR \text{ and } \Delta P''Q''R''$$

$$\Delta P'Q'R' \text{ and } \Delta P'''Q'''R'''$$

$$\Delta PQR \text{ and } \Delta P'Q'R'$$

$$\Delta P''Q''R'' \text{ and } \Delta P'''Q'''R'''$$

(2 marks)

19. (a) height $= \sqrt{3^2 - 1.8^2}$
 $= 2.4$

$$\text{x-sectional area} = \frac{2.4}{2}(2 + 5.6)$$

$$= 9.12 \text{ cm}^2$$

$$\begin{aligned} \text{volume} &= 9.12 \times 8 \\ &= 72.96 \text{ cm}^3 \end{aligned} \quad (3 \text{ marks})$$

(b) mass in g = 72.96×5.75
 $= 419.52$ (2 marks)

(c) (i) v.s.f = $\frac{246.24}{72.96} = 3.375$
 l.s.f = $\sqrt[3]{3.375} = 1.5$
 $\therefore a.s.f = 1^2 : 1.5^2 \rightarrow 1 : 2.25$
 Area of x - section = 9.12×2.25
 $= 20.25 \text{ cm}^2$ (3 marks)

(ii) $\frac{5}{2} \times \frac{419.52 \text{ g}}{246.24 \text{ cm}^3}$
 $= 4.259 \text{ g/cm}^3$ (2 marks)

20. (a) (i) Distance of bus from Nairobi
 $500 - 2.5 \times 60$
 $= 350 \text{ Km.}$ (2 marks)

(ii) Let distance required be x km
 For bus $x = 150 + 60t$
 For car $x = 100t$
 $\therefore 100t = 150 + 60t$
 $t = 3 \frac{3}{4} \text{ h}$
 Hence, distance required = $100 \times 3 \frac{3}{4} = 375 \text{ km}$ (4 marks)

(b) Distance yet to be covered
 $= 500 - 375 = 125 \text{ km}$
 Time taken by bus
 $= \frac{125}{60}$
 $= 2 \text{ h } 5 \text{ min (or } 125 \text{ min)}$
 New speed of car
 $= \frac{125}{\frac{(125 - 25)}{60}}$
 $= 75 \text{ Km/h}$ (4 marks)

21. (a) (i) Length AE = $100 \tan 30^\circ$
 $= 100 \times 0.5774$
 $= 57.74$ (2 marks)

(ii) Length AD:
 $AC = \sqrt{57.74^2 + 57.74^2}$
 $= 81.66$

$$AD^2 = 81.66^2 + 80^2 - 2 \times 81.66 \times 80 \cos 100^\circ$$

$$= 6668 + 6400 - 2 \times 81.66 \times 80 \times 0.1736$$

$$AD = \sqrt{15336}$$

$$= 123.8$$

(3 marks)

(iii) Perimeter = $AB + BE + EC + CD + DA$

$$AB = \sqrt{100^2 + 57.74^2}$$

$$= \sqrt{13334}$$

$$= 115.5$$

$$\text{Perimeter} = 115.5 + 100 + 57.74 + 80 + 123.8$$

$$= 477.04$$

$$= 477.0 \text{ (4 s.f.)}$$

(3 marks)

(b) Rolls of wire

$$\text{Length} = 477.04 + 57.74 + 81.66$$

$$= 616.44$$

$$= 616.4$$

$$\text{Rolls to be bought} = \frac{(616.4 - 3 \times 2.8) \times 5}{480}$$

$$= 6.333$$

$$= 7 \text{ rolls}$$

(2 marks)

22. (a) $OL = 3 \binom{1}{6}$

$$= \binom{3}{18}$$

$$ON = \frac{2}{3} \binom{15}{6}$$

$$= \binom{10}{4}$$

$$LN = ON - OL$$

$$= \binom{10}{4} - \binom{3}{18}$$

$$= \binom{7}{-14}$$

(3 marks)

(b) $OM = OL + \frac{3}{7} LN$

$$= \binom{3}{18} + \frac{3}{7} \binom{7}{-14}$$

$$\begin{aligned}
&= \begin{pmatrix} 3 \\ 18 \end{pmatrix} + \begin{pmatrix} 3 \\ -6 \end{pmatrix} \\
&= \begin{pmatrix} 6 \\ 12 \end{pmatrix} \\
&= M(6,12)
\end{aligned}$$

(2 marks)

(c) (i) $OT = \frac{7}{6}OM$

$$= \frac{7}{6} \begin{pmatrix} 6 \\ 12 \end{pmatrix}$$

$$= \begin{pmatrix} 7 \\ 14 \end{pmatrix}$$

(1 mark)

(ii) $LT = \begin{pmatrix} 7 \\ 14 \end{pmatrix} - \begin{pmatrix} 3 \\ 18 \end{pmatrix}$

$$= \begin{pmatrix} 4 \\ -4 \end{pmatrix}$$

$$LB = \begin{pmatrix} 15 \\ 6 \end{pmatrix} - \begin{pmatrix} 3 \\ 18 \end{pmatrix}$$

$$= \begin{pmatrix} 12 \\ -12 \end{pmatrix}$$

$$LB = 3LT$$

L is the common point.

(4 marks)

23. (a) slant height

$$l = \sqrt{3^2 + 4^2}$$

$$= 5\text{cm}$$

Surface area C

Cone $= \pi \times 3 \times 5$

Cylinder $= \pi \times 6 \times 8$

Hemisphere $= 2\pi \times 3 \times 3$

Total Surface area $= 15\pi + 48\pi + 18\pi$

$$= 81\pi \text{ or } 254.5\text{cm}^2$$

(4 marks)

(b) 15cm : 600cm

$$1: 40$$

$$\text{a.s.f} = 40^2$$

$$= 1600$$

Area of container

$$= 1600 \times 254.5 \text{ cm}^2$$

$$= \frac{1600 \times 254.5}{10000} \text{ m}^2$$

$$= 40.72 \text{ m}^2$$

Paint needed

$$\begin{aligned} &= \frac{40.72}{20} \times 0.75 \\ &= 1.527 \text{ litres} \end{aligned}$$

(6 marks)

24. (a) $S = 5^3 - 5 \times 5^2 + 3 \times 5 + 4$
 $= 19\text{m}$

(2 marks)

(b) $V = \frac{ds}{dt} = 3t^2 - 10t + 3$
 $= 3 \times 5^2 - 10 \times 5 + 3$
 $= 28\text{m/s}$

(3 marks)

(c) Momentarily at rest $v = 0$
 $3t^2 - 10t + 3 = 0$
 $(3t - 1)(t - 3) = 0$
 $t = \frac{1}{3}$ or $t = 3$

(3 marks)

(d) acceleration when $t = 2$

$$\begin{aligned} a &= \frac{dv}{dt} = 6t - 10 \\ &= 6 \times 2 - 10 \\ &= 2\text{m/s}^2 \end{aligned}$$

(2 marks)

24.3.2 Mathematics Paper 2 (121/2)

1.

Number	→	Log.
36.72	→	1.5649
0.46 ²	→	$2(\bar{1}.6628) = \bar{1}.3256$
185.4	→	$\frac{0.8905_{(1)}}{2.2682}$
		$\bar{2}.6223^{(4)}$
		$\frac{\bar{2}.6223}{3} = \bar{3} + \frac{1.6223}{3}$
3.474×10^{-1}	←	$\bar{1}.5408$ $= 0.3474^{(3)}$

(4 marks)

2.

$$p = r^2(1 - as^2)$$

$$s^2 = \frac{1}{a}\left(1 - \frac{p}{r^2}\right)$$

$$s = \pm \sqrt{\frac{1}{a}\left(1 - \frac{p}{r^2}\right)}$$

(3 marks)

3.

$\angle PTO = 90^\circ$ **OR** $\angle RTN = 90^\circ$
OR $\angle TOR = 110^\circ$ **OR** $\angle TOP = 70^\circ$
 $\angle RST = 55^\circ$

(2 marks)

4. Writing each number to one significant figure: $788 \approx 800$ and $0.006 = 0.006$
 Thus, $800 \times 0.006 = 4.8$
 $\% \text{ error} = \frac{4.8 - (788 \times 0.006)}{788 \times 0.006} \times 100 \%$
 $= \frac{0.072}{4.728} \times 100\%$
 $= 1.523\% \text{ or } (1.52284264\%)$

(3 marks)

5.

$$\bar{x} = \frac{9 + 11 + 12 + 13 + 11 + 10}{6}$$

$$(x - \bar{x})^2 = 4, 0, 1, 4, 0, 1$$

$$s^2 = \frac{4 + 0 + 1 + 4 + 0 + 1}{6}$$

$$= 10 \div 6 = 1\frac{2}{3}$$

(3 marks)

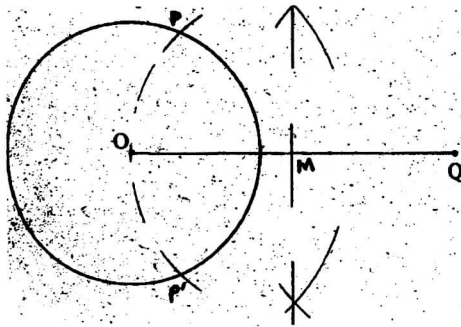
$$6. \quad \frac{(3\sqrt{2} - \sqrt{3})(2\sqrt{3} + \sqrt{2})}{(2\sqrt{3} - \sqrt{2})(2\sqrt{3} + \sqrt{2})}$$

$$= \frac{6\sqrt{6} + 6 - 6 - \sqrt{6}}{12 - 2}$$

$$= \frac{1}{2}\sqrt{6}$$

(3 marks)

7.



(2 marks)

$$8. \quad \text{Tax on the first sh } 9680 = \frac{10}{100} \times 9680 = 968$$

$$\text{Monthly income in shillings} = \frac{(1916 - 968)}{15} \times 100 + 9680$$

$$= 6320 + 9680$$

$$= \text{Shs. } 16,000$$

(3 marks)

$$9. \quad q^2 + \left(\frac{1}{3}\right)^2 + \left(\frac{2}{3}\right)^2 = 1^2$$

$$q^2 = 1 - \frac{5}{9} = \frac{4}{9}$$

$$q = \pm \frac{2}{3}$$

(2 marks)

$$10. \quad (a) \quad \text{Coordinates of A: } \left(\frac{5+3}{2}, \frac{5+1}{2}\right)$$

$$= A(4, 3)$$

(1 mark)

$$(b) \quad r^2 = (5-2)^2 + (5-1)^2$$

$$r = 5$$

$$\text{Equation } (x-1)^2 + (y-2)^2 = 5^2$$

$$x^2 - 2x + 1 + y^2 - 4y + 4 = 25$$

$$x^2 + y^2 - 2x - 4y - 20 = 0 \quad (3 \text{ marks})$$

$$11. \quad \left(2 + \frac{1}{\sqrt{2}}\right)^5 = 2^5 + 5(2^4)\left(\frac{1}{\sqrt{2}}\right) + 10(2^3)\left(\frac{1}{\sqrt{2}}\right)^2 + 10(2^2)\left(\frac{1}{\sqrt{2}}\right)^3 + 5(2)\left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^5$$

$$\left(2 - \frac{1}{\sqrt{2}}\right)^5 = 2^5 - 5(2^4)\left(\frac{1}{\sqrt{2}}\right) + 10(2^3)\left(\frac{1}{\sqrt{2}}\right)^2 - 10(2^2)\left(\frac{1}{\sqrt{2}}\right)^3 + 5(2)\left(\frac{1}{\sqrt{2}}\right)^4 - \left(\frac{1}{\sqrt{2}}\right)^5$$

$$\left(2 + \frac{1}{\sqrt{2}}\right)^5 + \left(2 - \frac{1}{\sqrt{2}}\right)^5 = 2\left[2^5 + 10(2^3)\left(\frac{1}{\sqrt{2}}\right)^2 + 5(2)\left(\frac{1}{\sqrt{2}}\right)^4\right]$$

$$= 64 + 80 + 5$$

$$= 149 \quad (4 \text{ marks})$$

$$12. \quad t = k \frac{x}{\sqrt{y}} \Rightarrow t_1 = k \frac{0.96x}{\sqrt{1.44y}}$$

$$= 0.8t$$

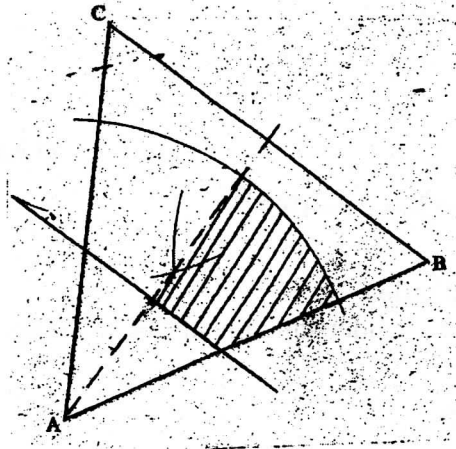
$$\text{Decrease} = t - 0.8t$$

$$= 0.2t$$

$$\% \text{ decrease} = \frac{0.2t}{t} \times 100\%$$

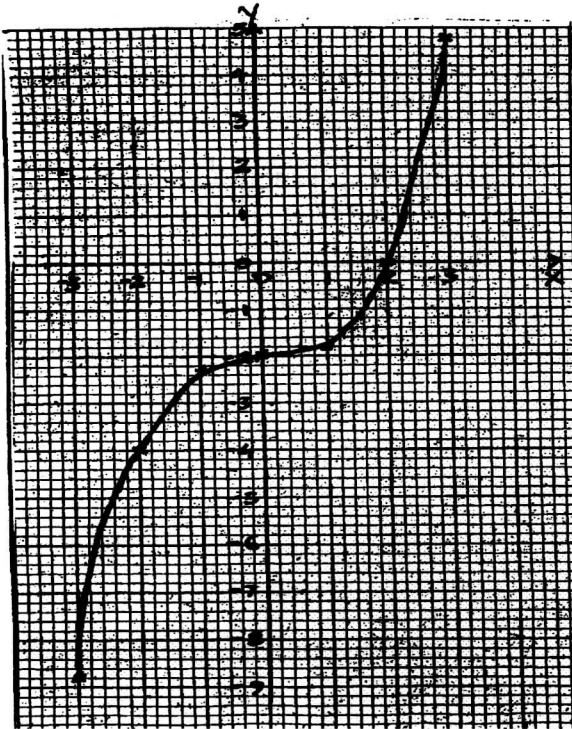
$$= 20\% \quad (4 \text{ marks})$$

13.



(4 marks)

14.



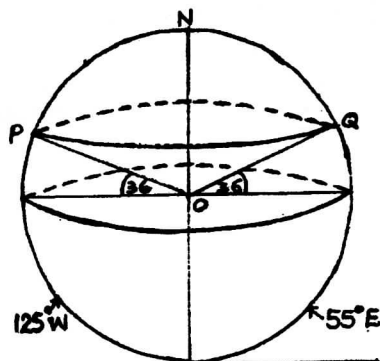
(3 marks)

15.
$$v = \int a dt = 10t - \frac{2}{2}t^2 + c$$
 at $t = 0, v = 9 \Rightarrow c = 9$
 $\therefore v = 10t - t^2 + 9$
 at $t = 3, v = 10(3) - 3^2 + 9$
 $= 30 \text{ m/s}$

(3 marks)

16. Required angle $POQ = 180 - (36 \times 2) = 108^\circ$
 Distance $PQ = 108 \times 60$
 $= 6480 \text{ nautical miles}$

The figure below would assist to understand the above working.

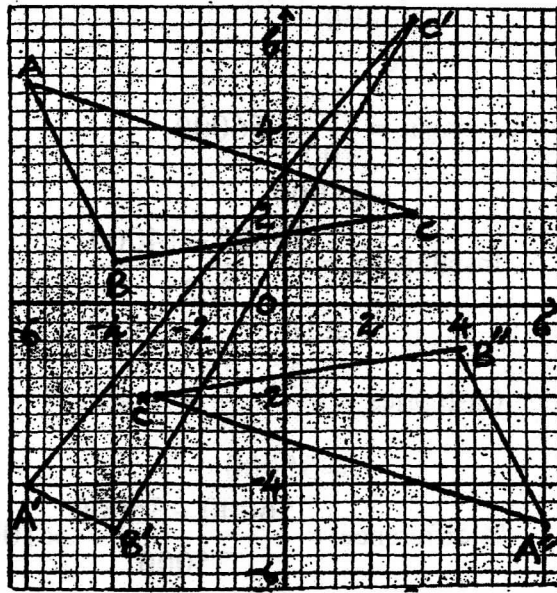


(3 marks)

17. (a) (i) Principal = $358400 - (12800 \times 3)$

- $= 320000$ (2 marks)
- (ii) $r = \frac{12800}{320000} \times 100\%$
 $= 4\%$ (2 marks)
- (b) (i) Deposit $= \frac{25}{100} \times 56000$
 $= 14000$
 Instalments $= \frac{56000 - 14000}{2625}$
 $= 16$ (3 marks)
- (ii) Cash price $= \frac{100 - 12.5}{100} \times 40000$
 $= 35000$
 % difference $= \frac{56000 - 35000}{35000} \times 100\%$
 $= 60\%$ (3 marks)
18. (a) Let width of the path be x
 Area $= (10 + 2x)(8 + 2x) = 168$
 $\Leftrightarrow 80 + 20x + 16x + 4x^2 = 168$
 $4x^2 + 36x - 88 = 0$
 $\Leftrightarrow x^2 + 9x - 22 = 0$
 $(x - 2)(x + 11) = 0$
 $x = 2$ or -11
 Width of path $= 2\text{m}$ (4 marks)
- (b) (i) Area covered by small slabs
 $= \frac{14}{68} \times 12 - (10 \times 8 + 4(2 \times 2))$
 No. of slabs $= \frac{72}{0.5 \times 0.5}$
 $= 288$ (3 marks)
- (ii) Cost of slabs
 Large $= 600 \times 4$
 $= 2400$
 Small $= 50 \times 288$
 $= 14400$
 Total cost $= 2400 + 14400$
 $= \text{sh}16, 800$ (3 marks)
19. (a) (i) Using the mapping of $A(-6,5)$ onto $A'(-6,-4)$ by a shear with

y - axis invariant, candidates were expected to draw triangle $A'B'C'$, the image of ABC as shown below:



(3 marks)

(ii) Since the shear maps $I(1,0) \rightarrow I'\left(1,1\frac{1}{2}\right)$ then the matrix

representing the shear is $\begin{pmatrix} 1 & 0 \\ 1\frac{1}{2} & 1 \end{pmatrix}$ (2 marks)

(b) (i) $\begin{pmatrix} -1 & 0 \\ 1\frac{1}{2} & -1 \end{pmatrix} \begin{pmatrix} A' & B' & C' \\ -6 & -4 & 3 \\ -4 & -5 & 6\frac{1}{2} \end{pmatrix} = \begin{pmatrix} A'' & B'' & C'' \\ 6 & 4 & -3 \\ -5 & -1 & -2 \end{pmatrix}$ (3 marks)

(ii) From the figure, it can be noted that a single transformation that maps ABC onto $A''B''C''$ is half turn about $(0, 0)$ or an enlargement with scale factor -1 about the origin. (2 marks)

20.

Possibility space

$y \setminus x$	1	2	3	4	5	6	7	8
1		*	*	*	*	o	o	o
2			x	o	*	x	o	o
3	o			x	*	*	*	o
4		o			*	o	*	*
5			o			*	o	*
6	o			o			*	o
7	o	o			o			*
8	o	o	o			o		

(a) (i) $P(|x - y| = 2) = \frac{12}{64} = \frac{3}{16}$ (2 marks)

(ii) $P(|x - y| \geq 5) = \frac{12}{64} = \frac{3}{16}$ (2 marks)

(iii) $P(x \geq y) = \frac{28}{64} = \frac{7}{16}$ (2 marks)

(b) (i) $k + 2k + 3k + 4k + 5k + 6k = 1$
 $21k = 1$
 $k = \frac{1}{21}$ (2 marks)

(ii) $P(11) = \frac{5}{21} \times \frac{6}{21} + \frac{6}{21} \times \frac{5}{21}$
 $= \frac{60}{441} = \frac{20}{147}$ (2 marks)

21. (a) Alcohol volume in the mixture

$$= \frac{60}{100} \times 80 = 48 \text{ litres}$$

$$\text{New proportion of alcohol} = \frac{48}{80 + x}$$

$$\therefore \frac{48}{80 + x} = \frac{40}{100}$$

$$x = 40$$

(4 marks)

(b) % of alcohol in the new solution is

$$\frac{48}{120 + 30} \times 100 = \frac{48}{150} \times 100$$

$$= 32$$

(2 marks)

(c) Alcohol volume in the mixture in litres

$$= 5 \times \frac{32}{100} + 2 \times \frac{60}{100}$$

$$= 1.6 + 1.2 = 2.8$$

$$\text{The ratio} = (7 - 2.8) : 2.8$$

$$= 4.2 : 2.8$$

$$= 3 : 2$$

(4 marks)

22. (a) $a \times ar \times ar^2 = 64$

$$a^3 r^3 = 64$$

$$r = \sqrt[3]{\frac{64}{a^3}}$$

$$= \frac{4}{a}$$

(3 marks)

(b) (i) $a + a \times \frac{4}{a} + a \left(\frac{4}{a}\right)^2 = 14$

$$a^2 - 10a + 16 = 0$$

$$a = 8 \text{ or } 2$$

$$\therefore r = \frac{1}{2} \text{ or } 2$$

$$8, 4, 2, 1$$

$$2, 4, 8, 16$$

(5 marks)

(ii) The product $= 8 \times \left(\frac{1}{2}\right)^{50-1} \times 2 \times 2^{50-1}$

$$= 16$$

(2 marks)

23. (a) $300x + 180y \leq 18000$

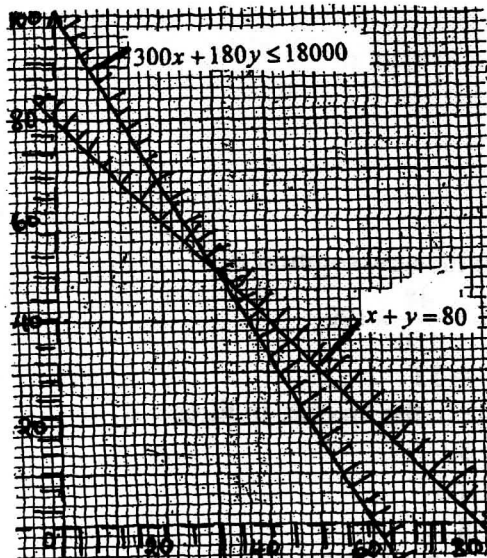
$$5x + 3y \leq 300$$

$$x + y \leq 80$$

$$x > 0, y > 0$$

(3 marks)

(b)



(4 marks)

(c) $x = 30, y = 50$

$$\text{Maximum profit in sh.} = 50 \times 4000 + 30 \times 6000$$

$$= 380000$$

(3 marks)

24 (a) $3x = 4 - x^2$
 $(x + 4)(x - 1) = 0$

$$x = -4 \text{ or } x = 1$$

\therefore The coordinates of P (1,3)

The coordinates of Q (-4,-12)

(4 marks)

(b) (i)
$$\int_{-4}^{-2} (4 - x^2) dx = \left[4x - \frac{1}{3} x^3 \right]_{-4}^{-2}$$

$$= \left(4x - 2 - \frac{1}{3} \times (-2)^3 \right) - \left(4x - 4 - \frac{1}{3} (-4)^3 \right)$$

$$= 10 \frac{2}{3} \quad (2 \text{ marks})$$

(ii) The shaded area below x-axis

$$= \frac{1}{2} \times 4 \times 12 - 10 \frac{2}{3}$$

$$= 13 \frac{1}{3} \quad (2 \text{ marks})$$

(iii) Shaded area $= 13 \frac{1}{3} + \left[4x - \frac{1}{3} x^3 \right]_{-2}^0$

$$= 13 \frac{1}{3} + 0 - \left[4x - 2 - \frac{1}{3} (-8) \right]$$

$$= 13 \frac{1}{3} + 5 \frac{1}{3}$$

$$= 18 \frac{2}{3} \quad (2 \text{ marks})$$