

PROPOSED MARKING GUIDE.
BECO MTC 2 2023.

GRANT. K MP
0702741835

1. $x = \frac{L.C.M. \times G.C.F}{\text{one of the numbers}}$

$$x = \frac{144 \times 12}{48}$$

$$x = 36$$

\therefore The other number is 36.

04

2.

$$\vec{PQ} = \begin{pmatrix} -3 \\ 5 \end{pmatrix} \quad P(2, 9)$$

$$\vec{PQ} = \vec{OQ} - \vec{OP}$$

$$\begin{pmatrix} -3 \\ 5 \end{pmatrix} = \vec{OQ} - \begin{pmatrix} 2 \\ 9 \end{pmatrix}$$

$$\vec{OQ} = \begin{pmatrix} -3 \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ 9 \end{pmatrix}$$

$$= \begin{pmatrix} -1 \\ 14 \end{pmatrix}$$

$$|\vec{OQ}| = \sqrt{(-1)^2 + 14^2}$$

$$= \sqrt{197}$$

= 14.04 units

04

3.

a) $g^{-1}(x) = 3x^2 - 2$

$$\text{Let } 3x^2 - 2 = y$$

$$3x^2 = y + 2$$

$$x^2 = \frac{y+2}{3}$$

$$x = \sqrt{\frac{y+2}{3}}$$

$$\therefore g(x) = \sqrt{\frac{x+2}{3}}$$

b)

$$g(25)$$

$$g(25) = \sqrt{\frac{25+2}{3}} = \sqrt{9}$$

$$= 3$$

$$= \sqrt{\frac{27}{3}}$$

04

$$4. \frac{\log 125 + \log 49 - \log 25 - \log 7}{\log 35}$$

$$= \frac{(\log 125 + \log 49) - (\log 25 + \log 7)}{\log 35}$$

$$= \frac{\log(125 \times 49) - \log(25 \times 7)}{\log 35}$$

$$= \frac{\log 6125 - \log 175}{\log 35}$$

$$= \frac{\log \left(\frac{6125}{175} \right)}{\log 35}$$

$$= \frac{\log 35}{\log 35}$$

$$= 1$$

04

$$5. 1\text{cm} = 250,000\text{cm}.$$

$$1\text{cm}^2 = 6.25 \times 10^{10}\text{cm}^2$$

$$4.8\text{cm}^2 = (4.8 \times 6.25 \times 10^{10})\text{cm}^2$$

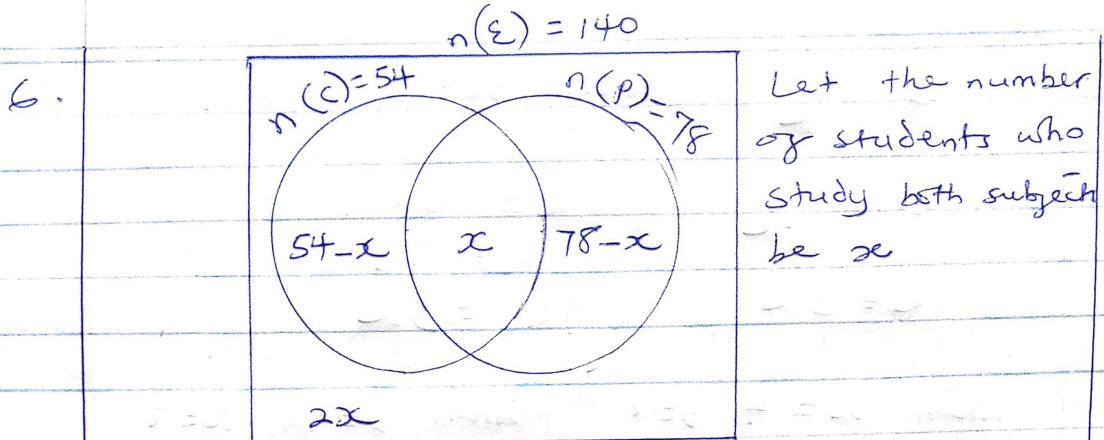
$$= 3 \times 10^{11}\text{cm}^2$$

$$3 \times 10^{11}\text{cm}^2 \text{ to } \text{km}^2$$

$$= \frac{3 \times 10^{11}}{1 \times 10^10}$$

$$= 30\text{km}^2$$

04



Let the number
of students who
study both subjects
be x

$$78 + 54 - x + 2x = 140$$

$$132 + x = 140$$

$$x = 8$$

04

7. Let the original cost of the plot be y

$$\frac{(100-8)}{100} \text{ of } y = 6,900,000$$

$$\frac{92y}{100} = 6,900,000$$

$$92y = 6,900,000,000$$

$$y = 7,500,000$$

\therefore The original cost of the land was
Rs. 7,500,000.

04

$$V = \pi r^2 h$$

8.

$$r = \frac{21}{2} = 10.5 \text{ cm.}$$

$$5544 = 22 \times 10.5^2 \times h$$

$$5544 = 346.5h$$

$$h = 16 \text{ cm.}$$

04

9. $y \propto \frac{1}{x}$ when $x = 6, y = 12$

$$y = \frac{k}{x} \quad k = 6 \times 12$$

$$k = 72 \quad 72 = yx$$

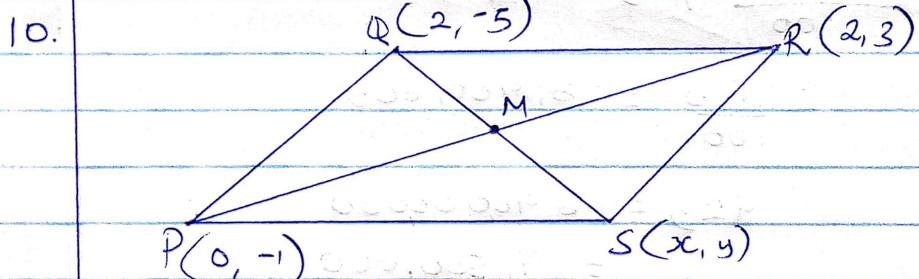
when $x = 4, y = ?$ when $y = 72, x = ?$

$$72 = 4y \quad 72 = 72x$$

$$y = 18 \quad x = 1$$

x	1	6	4
y	72	12	18

04



Midpoint of \overline{PR} = midpoint of \overline{QS} .

$$\left(\frac{0+2}{2}, \frac{-1+3}{2} \right) = \left(\frac{2+x}{2}, \frac{-5+y}{2} \right)$$

$$(1, 1) = \left(\frac{2+x}{2}, \frac{-5+y}{2} \right)$$

$$1 = \frac{2+x}{2} \quad 1 = \frac{-5+y}{2}$$

$$2 = 2+x$$

$$x = 0$$

$$2 = -5+y$$

$$-7 = -5+y$$

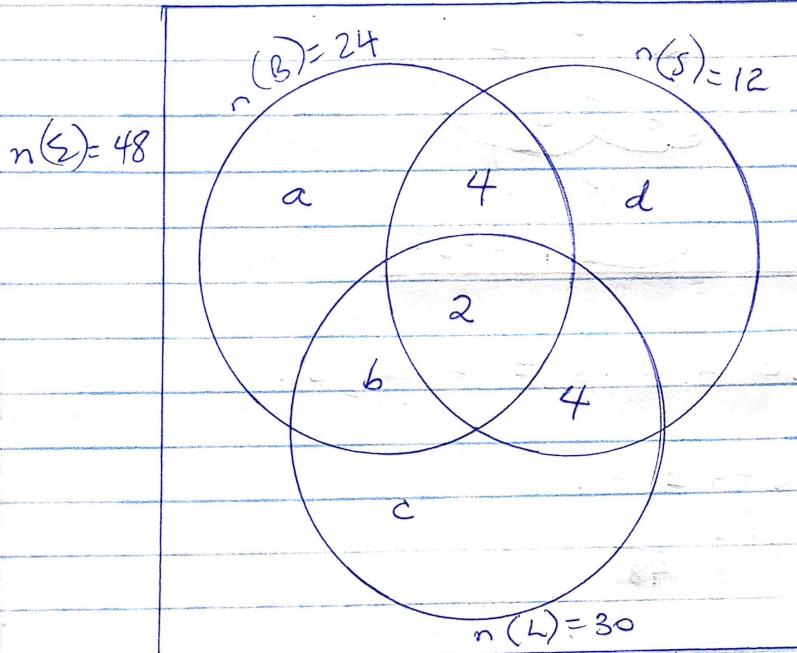
$$\therefore S(0, 7)$$

04

SECTION B .

11. Let B represent dogs that are black

a) S represent dogs with short tails
 L represent dogs with long hair .



For $n(S)$ only .

$$d = 12 - (4 + 2 + 4)$$

$$d = 12 - 10$$

$$d = 2$$

Consider $n(B)$

$$a + b + 4 + 2 = 24$$

$$a + b = 18 \quad \text{---} \textcircled{1}$$

Consider $n(L)$.

$$b + c + 2 + 4 = 30$$

$$b + c = 24 \quad \text{---} \textcircled{2}$$

consider $n(S)$

$$n(S) + (a + b) + c = 48$$

$$12 + 18 + (24 - b) = 48$$

$$54 - b = 48$$

$$b = 6$$

$$\text{from } \textcircled{2} \quad b + c = 24$$

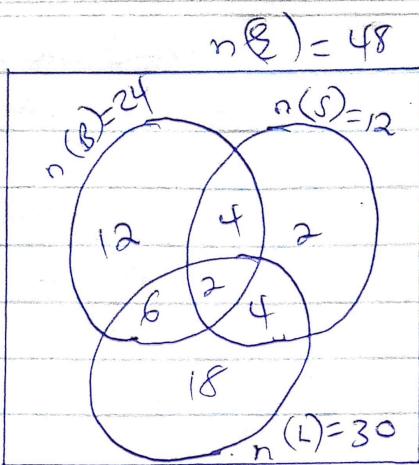
$$6 + c = 24$$

$$c = 18$$

$$\text{from } \textcircled{1} \quad a + b = 18$$

$$a + 6 = 18$$

$$a = 12$$



b) $n(B \cap L \cap S') = 6$ dogs.

c) $2 + 4 = 6$.

$$P = \frac{6}{48}$$

$$= \frac{1}{8}$$

12

12 a) i) $g(y) = 3y + 3$ $gh(y) = 6y + 11$
 let $h(y)$ be $ay + b$.

$$gh(y) = 3(ay + b) + 3.$$

$$6y + 11 = 3ay + 3b + 3$$

$$6y + 11 = 3ay + (3b + 3)$$

$$6 = 3a \quad | \quad 11 = 3b + 3$$

$$a = 2 \quad | \quad 3b = 8$$

$$b = \frac{8}{3}.$$

$$h(y) = 2y + \frac{8}{3}$$

$$= \frac{6y + 8}{3}$$

ii) $h(0)$

$$= 0 + \frac{8}{3}$$

$$= \frac{8}{3}.$$

b) $f(x) = 2 + \log x$, $g(x) = 2(10^x) + 3$

i) $f(x) = 4$.

$$2 + \log x = 4$$

$$\log x = 2$$

$$x = 10^2$$

$$x = 100.$$

ii) $gf(100)$

$$gf(x) = 2(10^{2+\log x}) + 3.$$

$$gf(100) = 2[10^{2+\log 100}] + 3$$

$$= 2[10^{2+2}] + 3$$

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

$$= 20003.$$

12

13) $C = a + bn$.

$$C = 600,000, n = 50$$

$$600,000 = a + 50b \quad \text{---} ①$$

$$C = 1,080,000, n = 100$$

$$1,080,000 = a + 100b \quad \text{---} ②$$

$$\textcircled{2} - \textcircled{1}$$

$$1,080,000 - 600,000 = a + 100b - a - 50b$$

$$480,000 = 50b$$

$$b = 9600$$

from ①

$$600,000 = a + \frac{50}{100}(9600)$$

$$600,000 = a + 480,000$$

$$a = 120,000.$$

$$C = 120,000 + 9600n.$$

b)

$$n = 200$$

$$C = 120,000 + 9600 \times 200$$
$$C = 2,040,000 \text{ F.}$$

for 200 copies:

$$\text{Sales} = 200 \times 18000$$
$$= 3,600,000 \text{ F.}$$

Tax of 10%:

$$\frac{10}{100} \times 3,600,000$$

$$100$$

$$= 360,000 \text{ F.}$$

$$\text{Sales after tax} = 3,240,000 \text{ F.}$$

$$\text{Profit} = 3,240,000 - 2,040,000$$
$$= 1,200,000 \text{ F.}$$

12

14) a) $\vec{AB} = \begin{pmatrix} -8 \\ 15 \end{pmatrix}$

$$|\vec{AB}| = \sqrt{(-8)^2 + 15^2}$$

$$= \sqrt{64 + 225} = \sqrt{289}$$

$$= \sqrt{549} = 23.4 \text{ units}$$

$$= 17 \text{ units}$$

i) $\vec{AB} = \vec{OB} - \vec{OA}$

$$\begin{pmatrix} -8 \\ 15 \end{pmatrix} = \vec{OB} - \begin{pmatrix} 10 \\ 1 \end{pmatrix}$$

$$\vec{OB} = \begin{pmatrix} -8 \\ 15 \end{pmatrix} + \begin{pmatrix} 10 \\ 1 \end{pmatrix}$$

$$= \begin{pmatrix} 2 \\ 16 \end{pmatrix}$$

$$\therefore B(2, 16)$$

b) $C(42, 16)$ $\vec{CD} = 3\vec{AB}$.

$$\vec{CD} = 3 \begin{pmatrix} -8 \\ 15 \end{pmatrix}$$

$$= \begin{pmatrix} -24 \\ 45 \end{pmatrix}$$

$$\vec{CD} = \vec{OB} - \vec{OC}$$

$$\begin{pmatrix} -24 \\ 45 \end{pmatrix} = \vec{OB} - \begin{pmatrix} 42 \\ 16 \end{pmatrix}$$

$$\vec{OB} = \begin{pmatrix} -24 \\ 45 \end{pmatrix} + \begin{pmatrix} 42 \\ 16 \end{pmatrix}$$

$$= \begin{pmatrix} 18 \\ 61 \end{pmatrix}$$

Coordinates of D, are (18, 61)

ii)

$$\vec{AD} = \vec{AC} + \vec{CD}$$

$$4 \left[\begin{pmatrix} 42 \\ 16 \end{pmatrix} - \begin{pmatrix} 10 \\ 1 \end{pmatrix} \right] + \begin{pmatrix} -24 \\ 45 \end{pmatrix}$$

$$\begin{pmatrix} 32 \\ 15 \end{pmatrix} + \begin{pmatrix} -24 \\ 45 \end{pmatrix}$$

$$\vec{AD} = \begin{pmatrix} 8 \\ 60 \end{pmatrix}$$

c) i) $E(k, 16)$

$$\vec{AE} = \begin{pmatrix} k \\ 16 \end{pmatrix} - \begin{pmatrix} 10 \\ 1 \end{pmatrix}$$

$$= \begin{pmatrix} k-10 \\ 15 \end{pmatrix}$$

ii) $\vec{AE} : \vec{AD}$

$$\begin{pmatrix} k-10 \\ 15 \end{pmatrix} : \begin{pmatrix} 8 \\ 60 \end{pmatrix}$$

$$4k - 40 = 8$$

$$4k = 48$$

$$k = 12$$

$$4 \begin{pmatrix} k-10 \\ 15 \end{pmatrix} = \begin{pmatrix} 8 \\ 60 \end{pmatrix}$$

15. a) For a cyclist:

	140km								
P	0	20	40	60	80	100	120	140	Q
T(hr)	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	
(a.m) ← → (p.m)									

For a 10m.y.

	140km						
P	0	50	50	80	110	140	Q
T(hr)	10:00	11:00	11:30	12:30	1:30	2:30	
a.m P.m							

b) i) At 1:30 p.m.,

ii) 110km from P.

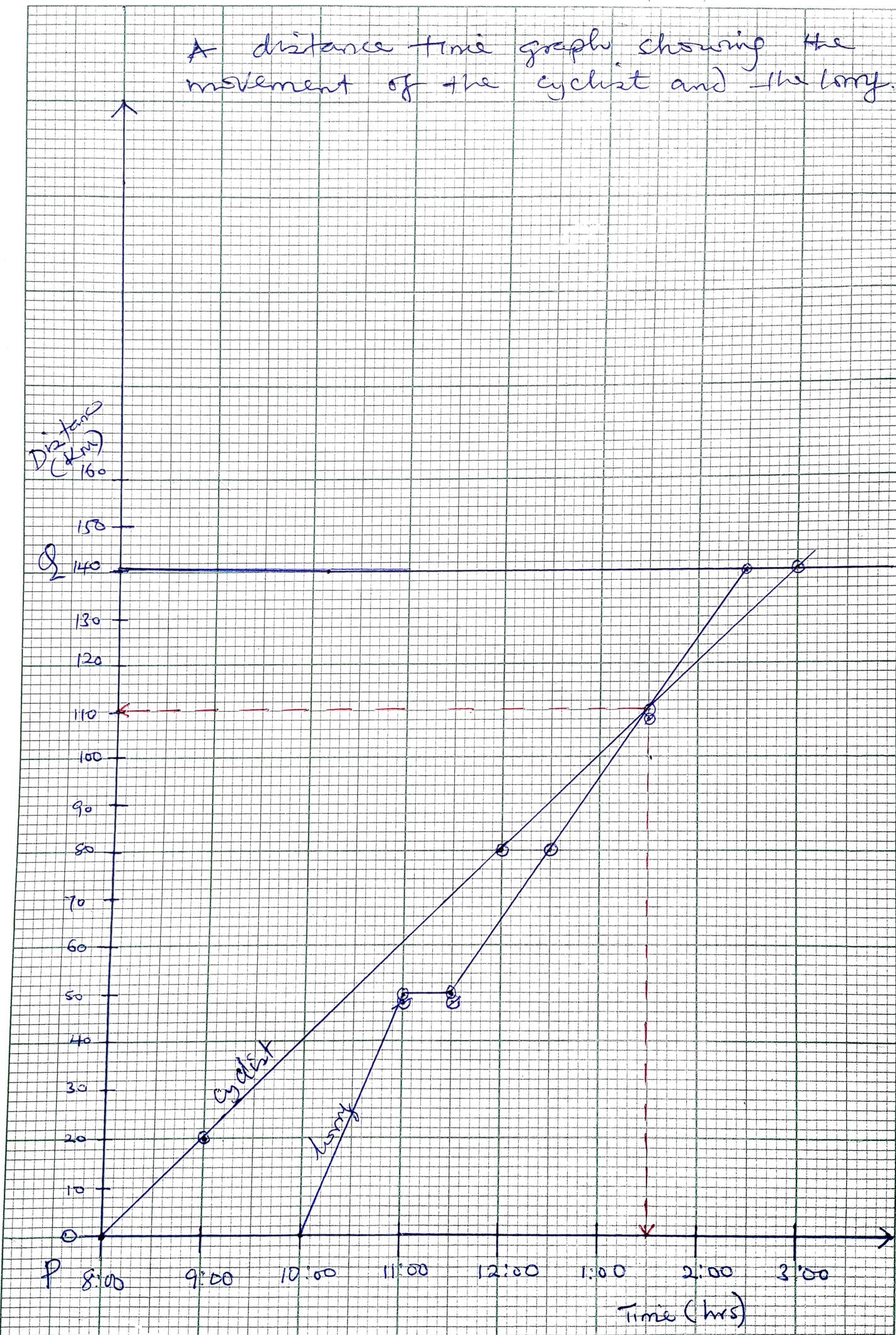
iii) At 2:30 pm,

iv) At 3:00 pm

v) 30 minutes or half an hour.

12

A distance time graph showing the movement of the cyclist and the lorry.



16.	Allowances	calculation	Amount (shs)
a)	- Marriage	$\frac{1}{20} \times 720,000$	36,000
	- Housing		30,000
	- Medical &	<u>180,000</u>	15,000
	Insurance	12	
	- Lunch & break	1500×30	45,000
	- Children	8yrs 20,000 14yrs 15,000	35,000
			161,000

$$\text{Taxable income} = 720,000 - 161,000 \\ = \text{shs. } 559,000$$

Taxable income	Rate	Calculation	Amount
(120,000 - 0)	0	0	0
(250,000 - 120,000)	13.0	$\frac{13}{100} \times 130,000$	16,900
(430,000 - 250,000)	24.0	$\frac{24}{100} \times 180,000$	43,200
(559,000 - 430,000)	30.0	$\frac{30}{100} \times 129,000$	38,700
			98,800

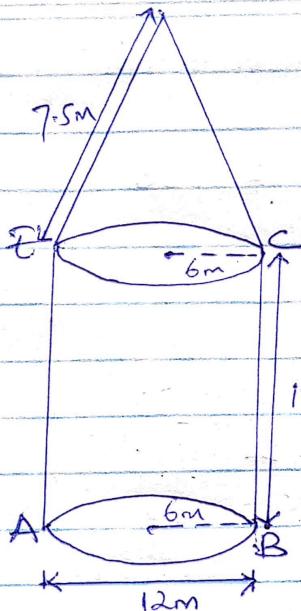
$$\text{Income tax} = \text{shs. } 98,800$$

b)

$$\frac{98,800}{720,000} \times 100\% \\ = 13.72\%$$

TOTAL	12

17. a)



$$S = 7.5\text{m}$$

$$h = 10\text{m}$$

$$\pi = 3.142$$

$$r = 6\text{m}$$

T.S.A = S.A of the cone + S.A of cylinder

$$= \pi r s + \pi r^2 + 2\pi r h$$

$$= (3.142 \times 6 \times 7.5) + (3.142 \times 6^2 + 2 \times 3.142 \times 6 \times 10)$$

$$= 141.39 + 113.12 + 377.04$$

$$\text{Total surface area} = 631.542 \text{ m}^2$$

b)

Total volume = Volume of cylinder + Volume of cone

$$= \pi r^2 h_1 + \frac{1}{3} \pi r^2 h_2$$

$$h_1 = 10\text{m} \quad h_2 = 4.5\text{m}$$

~~$$= \frac{4}{3} \pi r^2 h$$~~

~~$$= 4 \times 3.142 \times 6^2 \times$$~~

$$3.142 \times 6^2 \times 10 + \frac{1}{3} \times 3.142 \times 6^2 \times 4.5$$

$$1131.12 + 169.668$$

$$1300.788 \text{ m}^3$$

TOTAL

12