

KCSE 2012**8.2 Mathematics Alt. A Paper 2 (121/2)**

1.

No.	Log
83.46	1.9215
0.0054	$\overline{3.7324}$
	1.6539
1.56^2	$\overline{0.3862}$
	$\overline{1.2677} \div 3$
0.5700	1.7559

(4marks)

2. (a) cost of 1kg of mixture

$$= \frac{120 \times 3 + 90 \times 4 + 6 \times 5}{12}$$

$$= 85$$

b) Cost of 5kg of mixture

$$= \frac{108}{100} \times 85 \times 5$$

$$= 459$$

(4marks)

3.

$$w^3 = \frac{s+t}{s}$$

$$w^3 s = s + t$$

$$w^3 s - s = t$$

$$s = \frac{t}{w^3 - 1}$$

(3marks)

4. (a)

$$2x - 5 > -11 \Rightarrow 2x > -6 \Rightarrow x > -3$$

$$3 + 2x \leq 13 \Rightarrow 2x \leq 10 \Rightarrow x \leq 5$$

$$\therefore -3 < x \leq 5$$

(b) Integral values: -2, -1, 0, 1, 2, 3, 4, 5.

(4marks)

5. $\angle BAD = 30^0 + 40^0 = 70^0$
 $\angle BCD = 180^0 - 70^0 = 110^0$

(2marks)

6. (a)

+	7	8	9	10	11
4	11	12	13	14	15
5	12	13	14	15	16
6	13	14	15	16	17
7	14	15	16	17	18
8	15	16	17	18	19

(b) $P(\text{sum of at least 17}) = \frac{6}{25}$

(2marks)

7. (a) $T = \begin{pmatrix} 6 \\ -2 \end{pmatrix} - \begin{pmatrix} 4 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

(b)

$$OA' = \begin{pmatrix} 1 \\ 2 \end{pmatrix} + \begin{pmatrix} 2 \\ -3 \end{pmatrix} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$$

$$A' = (3, -1)$$

$$OB' = \begin{pmatrix} 3 \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ -3 \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$$

$$B'(5, 2)$$

(3marks)

8.

$$\sin 45^\circ = \frac{1}{\sqrt{2}}$$

$$\begin{aligned} \frac{\sqrt{8}}{1 + \sin 45} &= \frac{2\sqrt{2}\left(1 - \frac{1}{\sqrt{2}}\right)}{\left(1 + \frac{1}{\sqrt{2}}\right)\left(1 - \frac{1}{\sqrt{2}}\right)} \\ &= \frac{2\sqrt{2} - 2}{\frac{1}{2}} \\ &= 4(\sqrt{2} - 1) \end{aligned}$$

(3marks)

9. Maximum area = $4\pi \times 7.5^2$

Minimum area = $4\pi \times 6.5^2$

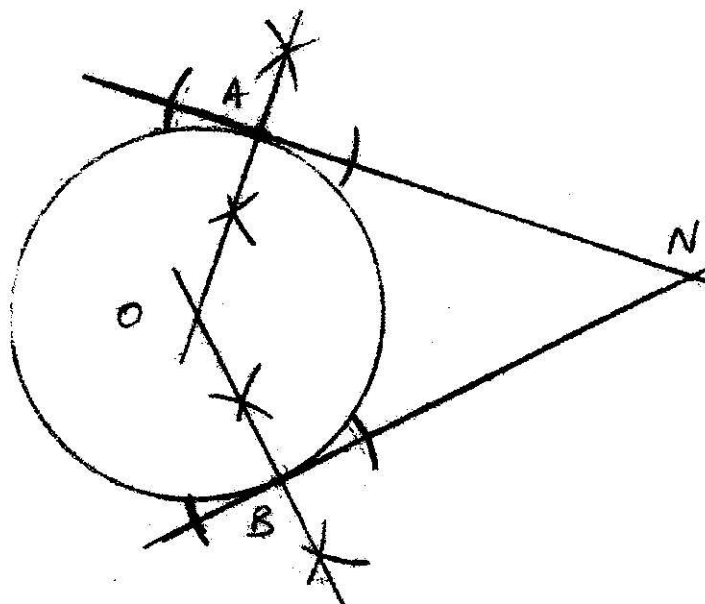
$$\begin{aligned} \text{Absolute error} &= \frac{4\pi(7.5^2 - 6.5^2)}{2} \\ &= 28\pi \end{aligned}$$

$$\% \text{ error} = \frac{28\pi}{4\pi \times 7 \times 7} \times 100\%$$

$$= 14.29\%$$

(4marks)

10.



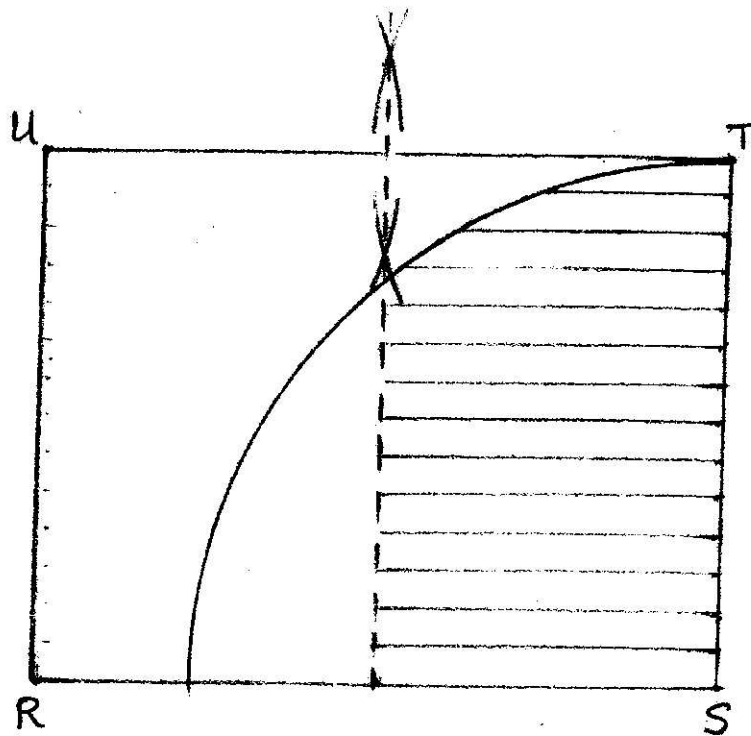
(3marks)

11.

$$\begin{aligned}
 \left(a + \frac{1}{2}\right)^4 + \left(a - \frac{1}{2}\right)^4 &= \left[a^4 + 4a^3\left(\frac{1}{2}\right) + 6a^2\left(\frac{1}{2}\right)^2 + 4a\left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^4 \right] - \\
 &\quad \left[a^4 + 4a^3\left(-\frac{1}{2}\right) + 6a^2\left(-\frac{1}{2}\right)^2 + 4a\left(-\frac{1}{2}\right)^3 + \left(-\frac{1}{2}\right)^4 \right] \\
 &= 2a^4 + 3a^2 + \frac{1}{8}
 \end{aligned}$$

(3marks)

12.



(3marks)

$$\begin{aligned}
 13. \quad \mathbf{PQ} &= -6\mathbf{i} - \mathbf{j} - 2\mathbf{i} + 5\mathbf{j} = -8\mathbf{i} + 4\mathbf{j} \\
 \mathbf{PN} &= \frac{3}{4}(-8\mathbf{i} + 4\mathbf{j}) = -6\mathbf{i} + 3\mathbf{j}
 \end{aligned}$$

(3marks)

$$\begin{aligned}
 14. \quad (a) \text{ let longitude difference be } \theta^\circ \\
 \theta \times 60 \cos 60^\circ &= 630 \\
 \theta &= \frac{630}{60 \cos 60^\circ} \\
 &= 21^\circ
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad 21^\circ \text{ due east of } 18^\circ \text{E is the longitude } (18^\circ + 21^\circ) \text{ E} \\
 \text{Location of N is } (60^\circ \text{N}, 39^\circ \text{E})
 \end{aligned}$$

(3marks)

15.

$$x^2 + y^2 - 6x - 10y + 30 = 0$$

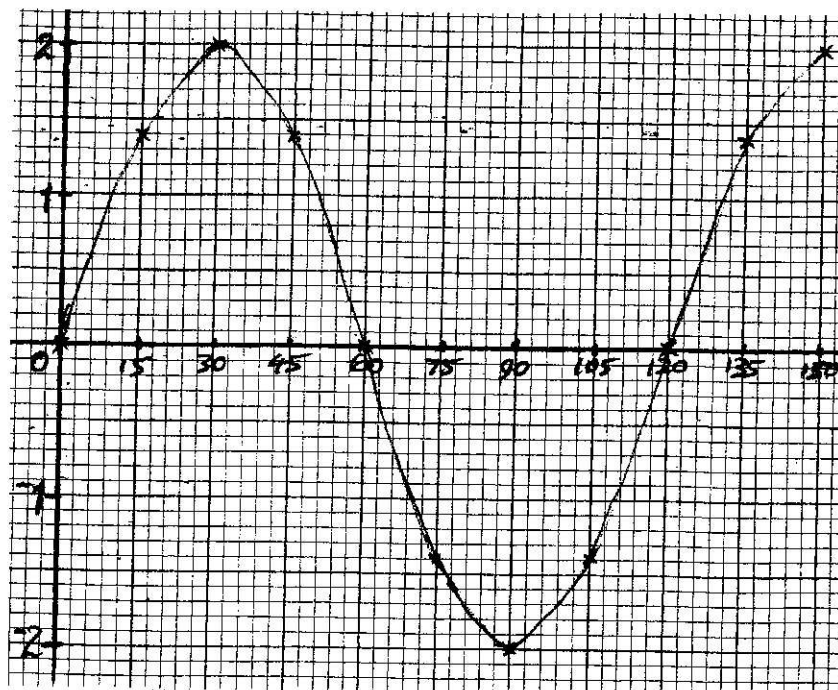
$$x^2 - 6x + 9 + y^2 - 10y + 25 = 4$$

$$(x-3)^2 + (y-5)^2 = 2^2$$

$$a=3, b=5$$

(3marks)

16.



Period = 120°

(3marks)

17. (a) (i) $7500 + 11 \times 6000 = 73500$

(ii) $\frac{73500 - 60000}{60000} \times 100 = 22.5\%$

(b) $60000 \times 25 \times 0.95 = 1425000$

(c) Institution X

$$73500 \times 25 = 1837500$$

Institution Y

$$60000 \times 25 \times (1.12)^2 = 1881600$$

$$\text{Difference} = 1881600 - 1837500 = 44100$$

(10marks)

18. (a) (i) $64 + 4d = 64r$
 $64 + 6d = 64r^2$

(ii) From (i)

$$d = 16r - 16$$

$$64r^2 = 64 + 6(16r - 16)$$

$$64r^2 = 64 + 96r - 96$$

$$2r^2 - 3r + 1 = 0$$

$$(2r - 1)(r - 1) = 0$$

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

For decreasing GP, $r = \frac{1}{2}$

Substituting $r = \frac{1}{2}$ in (i)

$$64 \times \frac{1}{2} = 64 + 4d$$

$$d = -8$$

(b) (i) A.P

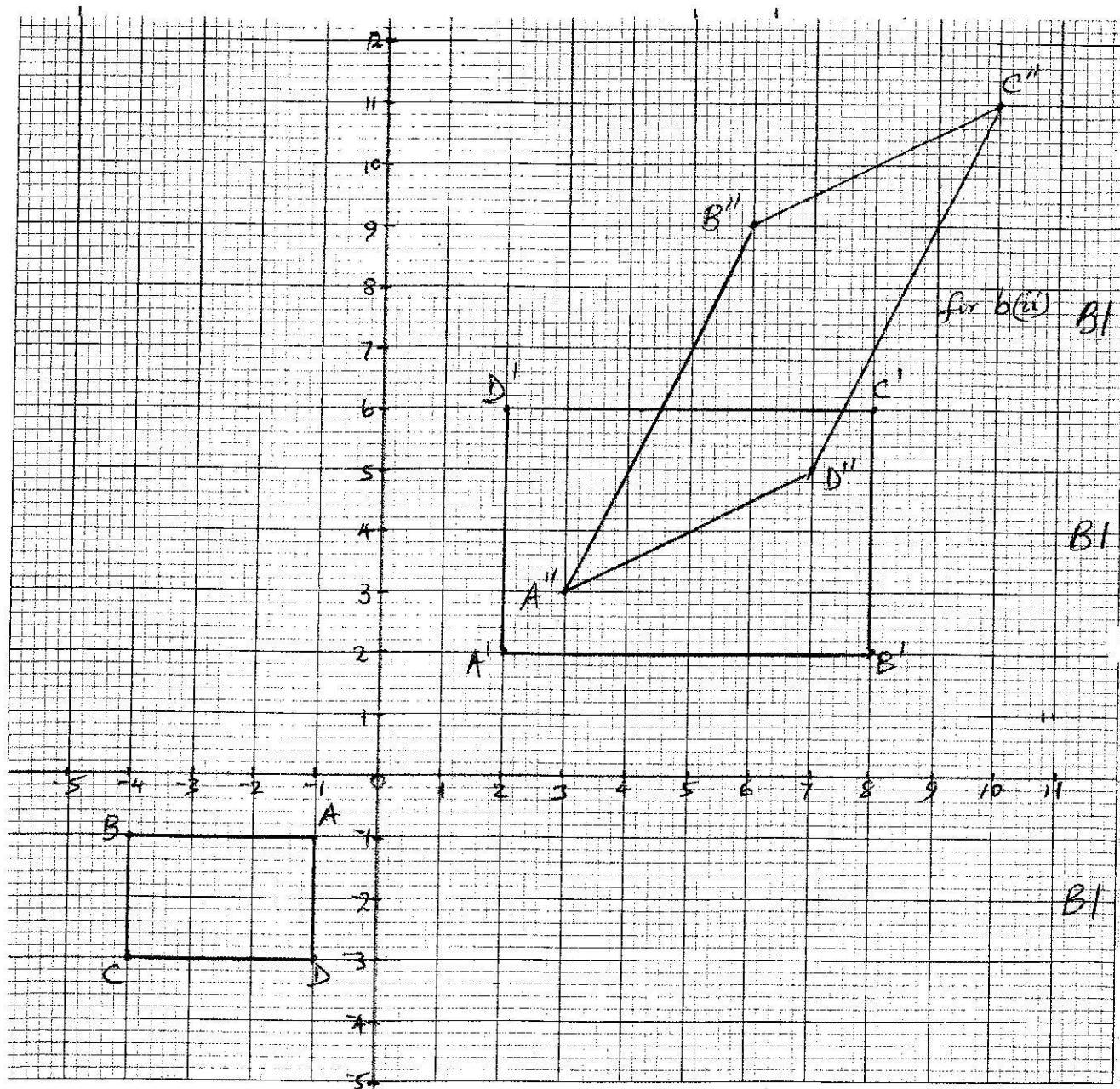
$$S_{10} = \frac{10}{2} \{ 2 \times 64 + 9 \times -8 \} = 280$$

(ii) G.P

$$S_{10} = \frac{64 \left(1 - \frac{1}{2^{10}} \right)}{1 - \frac{1}{2}} = \frac{64 \left(\frac{1023}{1024} \right)}{\frac{1}{2}} = 127.875$$

(10marks)

19. (a) $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix} \begin{pmatrix} -1 & -4 & -4 & -1 \\ -4 & -1 & -3 & -3 \end{pmatrix} = \begin{pmatrix} 2 & 8 & 8 & 2 \\ 2 & 2 & 6 & 6 \end{pmatrix}$



(b)

Coordinates; $A''(3,3), B''(6,9), C''(10,11), D''(7,5)$

(c) Determinant of matrix $P = \frac{1}{2} \times \frac{1}{2} - 1 \times 1$

$$= -\frac{3}{4}$$

Area of $A''B''C''D'' = \frac{3}{4} \times 6 \times 4 = 18$ sq units

(10 marks)

20. (a) (i) $x - 5$
(ii) $[x + (x - 5)] \times 2 = 4x - 10$

(b) (i)
 $(x + 20)(x + 15) = 15(4x + 10)$
 $x^2 - 25x + 150 = 0$
 $(x - 10)(x - 15) = 0$
 $x = 10 \text{ or } x = 15$

(ii) Parents' possible ages
 $4 \times 10 - 10 = 30$
or $4 \times 15 - 10 = 50$

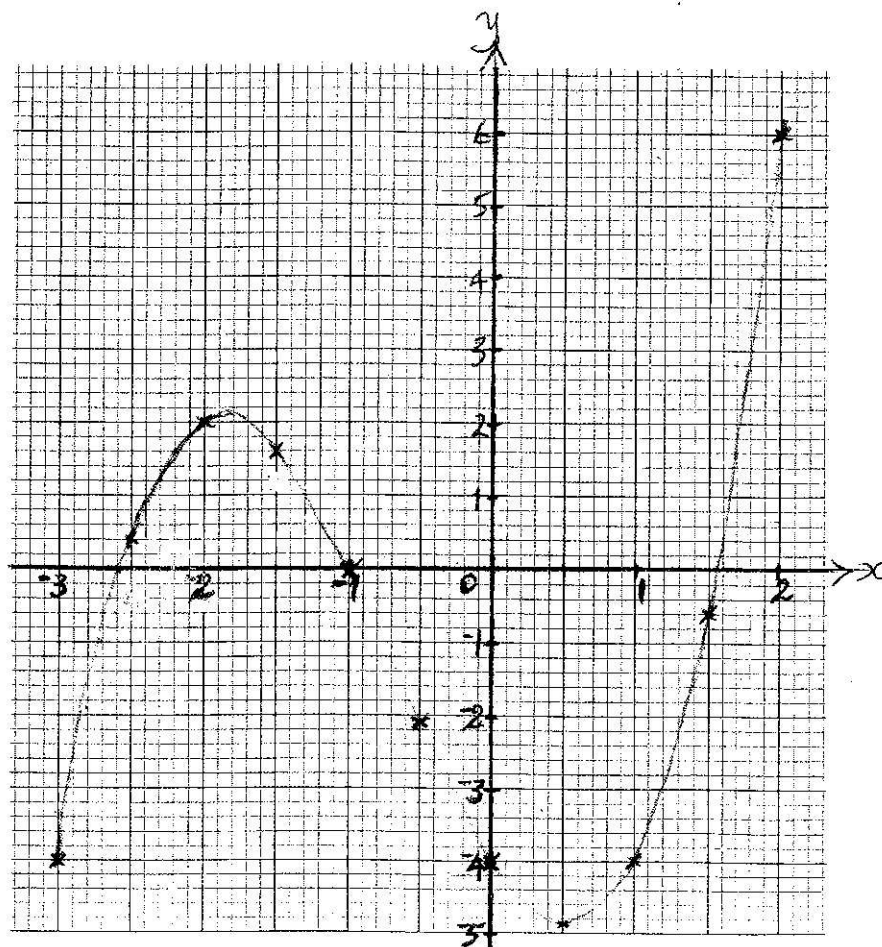
(iii) Possible ages of younger child in 20 years time
 $(10 - 5) + 20 = 25$
or $(15 - 5) + 20 = 30$

(10marks)

21. (a) (i)

x	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
$y = x^3 + 2x^2 - 3x - 4$			2			-2.1			-4	-0.6	

(ii)

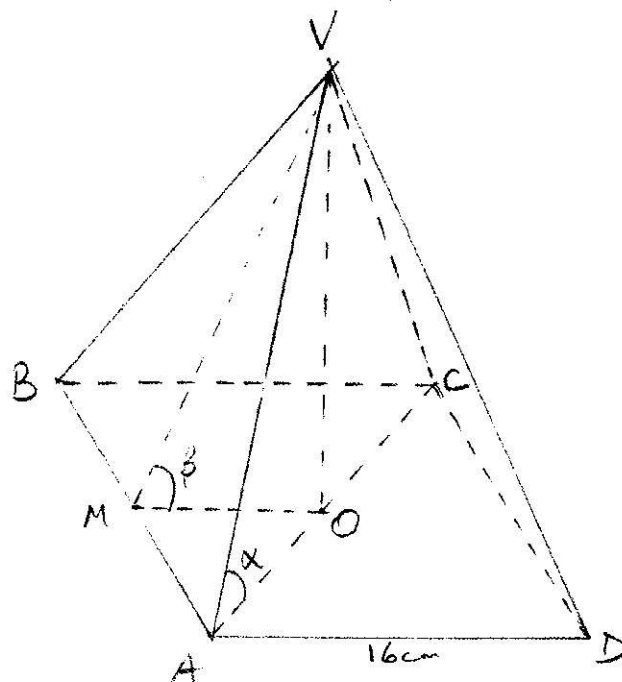


(b) (i) $x = -2.6, -1, 1.55$

(ii) Coordinates of turning points
 $(-1.85, 2.1)$ and $(0.5, 4.9)$

(10marks)

22.



(a) Height VO

$$AC^2 = 16^2 + 12^2 = 400$$

$$AC = 20$$

$$AO = 20 \div 2 = 10$$

$$VO = \sqrt{26^2 - 10^2} = 24$$

(b) Angle between edge VA and Plane ABCD = angle VAO = α

$$\frac{h}{10} = \tan \alpha$$

$$\alpha = \tan^{-1} 2.4$$

$$= 67.38^\circ$$

(c) Angle between planes VAB and ABCD = Angle VMO = β

$$\frac{h}{8} = \tan \beta$$

$$\beta = \tan^{-1} 3$$

$$= 71.57^\circ$$

(10marks)

$$23. (a) c = an + \frac{b}{n}$$

$$135 = 2a + \frac{b}{2}$$

$$140 = 2a + \frac{b}{3}$$

$$270 = 4a + b$$

$$\underline{420 = 9a + b}$$

$$150 = 5a \Rightarrow a = 30$$

$$270 = 120 + b \Rightarrow b = 150$$

$$c = 30n + \frac{150}{n}$$

(b)

$$\begin{aligned} c &= 30 \times 10 + \frac{150}{10} \\ &= 315 \end{aligned}$$

$$(c) 756 = 30n + \frac{150}{n}$$

$$756n = 30n^2 + 150$$

$$5n^2 - 126n + 25 = 0$$

$$(5n - 1)(n - 25) = 0$$

$$n = \frac{1}{5} \text{ or } n = 25$$

$$\text{number of items} = 25$$

(10marks)

24. (a)

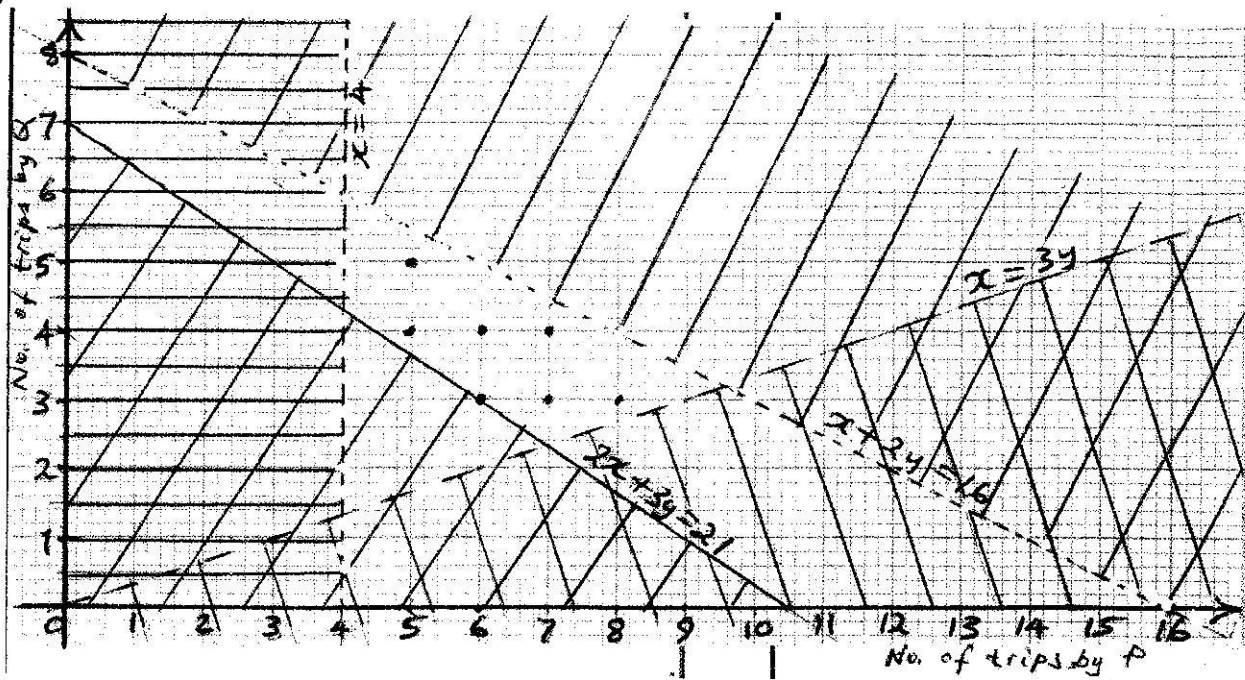
$$4x + 6y \geq 42 \Leftrightarrow 2x + 3y \geq 21$$

$$2x + 4y < 32 \Leftrightarrow x + y < 16$$

$$x < 3y$$

$$x > 4$$

(b)



- (c) $x = 5, y = 5 \Rightarrow 5 \times 4 + 5 \times 6 = 50$ tons
 $x = 6, y = 4 \Rightarrow 6 \times 4 + 4 \times 6 = 48$ tons
 $x = 7, y = 4 \Rightarrow 7 \times 4 + 4 \times 6 = 52$ tons

7 trips by P and 4 trips by Q

(10marks)