

**Mathematics Paper 2 (121/2)**

1.

No	Log
6.3730	0.8043
0.6944	1.8416 +
	0.6459
$\sqrt{0.004636}$	$\frac{3.6661}{2} \div 2$ -
	1.83331
	1.8128
	↓
	64.98

(3 marks)

2.

$$q - htq = 1 + rh$$

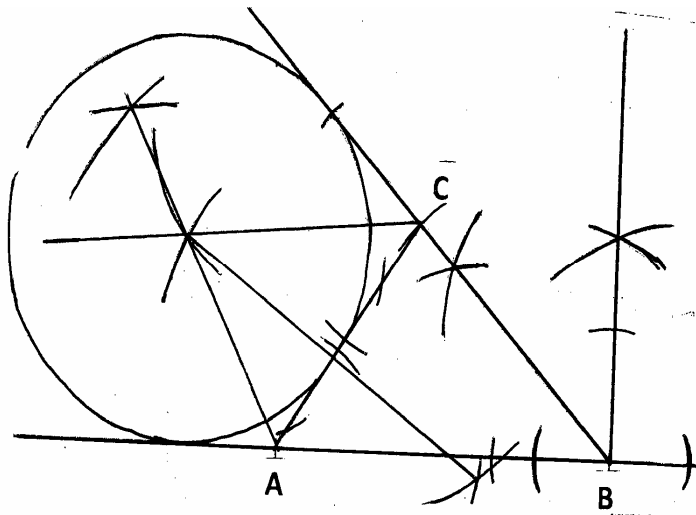
$$q - 1 = rh + htq$$

$$q - 1 = h(r + tq)$$

$$h = \frac{q - 1}{r + tq}$$

(2 marks)

3.



(3 marks)

4.

$$AB = \begin{pmatrix} 8 \\ -6 \\ 6 \end{pmatrix} - \begin{pmatrix} 3 \\ -1 \\ -4 \end{pmatrix} = \begin{pmatrix} 5 \\ -5 \\ 10 \end{pmatrix}$$

$$OP = OA + AP$$

$$= \begin{pmatrix} 3 \\ -1 \\ -4 \end{pmatrix} + \frac{2}{5} \begin{pmatrix} 5 \\ -5 \\ 10 \end{pmatrix} = \begin{pmatrix} 5 \\ -3 \\ 0 \end{pmatrix}$$

(3 marks)

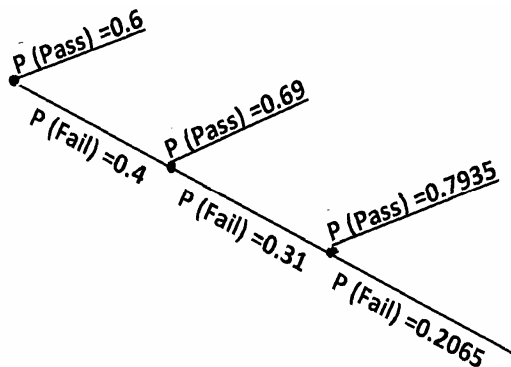
5.

$$0.05 \times 6 = 0.3$$

$$\begin{aligned} \% \text{ error} &= \frac{0.3}{50 \times 6} \times 100\% \\ &= 0.1\% \end{aligned}$$

(3 marks)

6.



p(passing in 2nd attempt)

$$= 0.4 \times 0.69$$

p(passing in 3rd attempt)

$$= 0.4 \times 0.31 \times 0.7935$$

p(passing in 2nd or 3rd attempt)

$$= 0.4 \times 0.69 + 0.4 \times 0.31 \times 0.7935$$

$$= 0.276 + 0.098394$$

$$= 0.374394$$

(3 marks)

7.

(i) Distance =  $500 \times \frac{9}{4} = 1125 \text{ nm}$

(ii)

$$\begin{aligned}\theta \times 60 \times \cos 53.4^\circ &= 1125 \\ \theta &= \frac{1125}{60 \cos 53.4^\circ} \\ &= 31.45^\circ\end{aligned}$$

$\therefore$  Longitude of Q =  $71.45^\circ$  E

(3 marks)

8.

(a)

$$\begin{aligned}\left(10 + \frac{2}{x}\right)^5 &= 10^5 + 5 \cdot 10^4 \left(\frac{2}{x}\right) + 10 \cdot 10^3 \left(\frac{2}{x}\right)^2 + 10 \cdot 10^2 \left(\frac{2}{x}\right)^3 + 5 \cdot 10 \left(\frac{2}{x}\right)^4 + \left(\frac{2}{x}\right)^5 \\ &= 100000 + \frac{100000}{x} + \frac{40000}{x^2} + \frac{8000}{x^3} + \frac{800}{x^4} + \frac{32}{x^5}\end{aligned}$$

(b)

$$\begin{aligned}14^5 &= \left(10 + \frac{2}{\frac{1}{2}}\right)^5 \\ &= 100000 + \frac{100000}{\frac{1}{2}} + \frac{40000}{\left(\frac{1}{2}\right)^2} + \frac{8000}{\left(\frac{1}{2}\right)^3} + \frac{800}{\left(\frac{1}{2}\right)^4} + \frac{32}{\left(\frac{1}{2}\right)^5} \\ &= 100000 + 200000 + 160000 + 64000 + 128000 + 1024 = 537824\end{aligned}$$

(4 marks)

9.

$\Delta$  ADC and  $\Delta$  BAC are similar

$$\frac{AC}{BC} = \frac{4}{3}$$

$$\text{Area scale factor} = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$$

$$\text{Area of } \Delta \text{ ADC} = \frac{16}{9} \times 24 = 42\frac{2}{3} \text{ cm}^2$$

(3 marks)

10.

$$\text{Let } T = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 2 & 4 \\ 2 & 3 \end{pmatrix} = \begin{pmatrix} 2 & 4 \\ 8 & 15 \end{pmatrix}$$

$$2a + 2b = 2 \quad 2c + 2d = 8$$

$$4a + 3b = 4 \quad 4c + 3d = 15$$

$$4a + 4b = 4 \quad 4c + 4d = 16$$

$$4a + 3b = 4 \quad \text{or} \quad 4c + 3d = 15$$

$$b = 0, a = 1 \quad d = 1, c = 3$$

$$\therefore T = \begin{pmatrix} 1 & 0 \\ 3 & 1 \end{pmatrix}$$

(4 marks)

11.

$$x^2 + y^2 - 2x + 5y = \frac{7}{4}$$

$$x^2 - 2x + 1 + y^2 + 5y + \frac{25}{4} = \frac{7}{4} + 1 + \frac{25}{4}$$

$$(x-1)^2 + \left(y + \frac{5}{2}\right)^2 = 9$$

$$\text{centre } (1, -2\frac{1}{2})$$

(3 marks)

12.

$$\text{Log} \left( \frac{3y+2}{10} \right) = \text{Log}(y-4)$$

$$\frac{3y+2}{10} = y-4$$

$$3y+2 = 10y-40$$

$$y = 6$$

(3 marks)

13.

$$\frac{\sqrt{3}}{1 - \cos 30^\circ} = \frac{\sqrt{3}}{1 - \frac{\sqrt{3}}{2}}$$

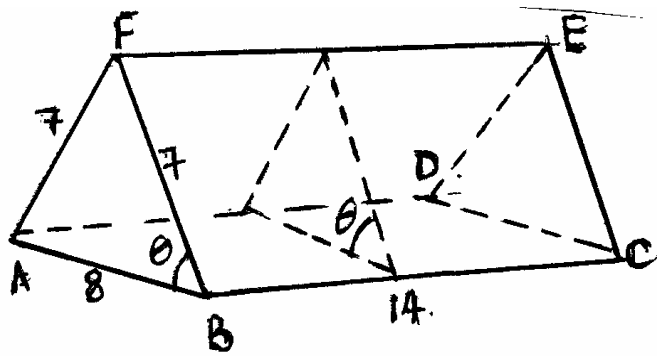
$$= \frac{2\sqrt{3}(2 + \sqrt{3})}{(2 - \sqrt{3})(2 + \sqrt{3})}$$

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

$$= 4\sqrt{3} + 6$$

(3 marks)

14.



$$\cos\theta = \frac{4}{7}$$

$$\theta = 55.1500954^\circ$$

$$\approx 55.15^\circ$$

(3 marks)

15.

$$\begin{aligned} \text{Distance travelled} &= \left( \frac{9}{3}t^3 - \frac{4}{2}t^2 + t \right)_2^3 \\ &= (3 \times 3^3 - 2 \times 3^2 + 3) - (3 \times 2^3 - 2 \times 2^2 + 2) \\ &= 66 - 18 \\ &= 48\text{m} \end{aligned}$$

(3 marks)

16.

$$\begin{aligned} 2(1 - \sin^2 x) - \sin x &= 1 \\ 2\sin^2 x + \sin x - 1 &= 0 \\ 2\sin^2 x + 2\sin x - \sin x - 1 &= 0 \\ (2\sin x - 1)(\sin x + 1) &= 0 \\ \sin x = \frac{1}{2} \text{ or } \sin x = -1 \\ x = \frac{1}{6}\pi^c, \frac{5}{6}\pi^c, \frac{3}{2}\pi^c \end{aligned}$$

(4 marks)

17.

$$\begin{aligned} \text{(a)} \\ \text{CP} &= 400 \times 30 + 350 \times 50 = 29500 \\ \text{SP} &= \frac{120}{100} \times 29500 = 35400 \\ 1\text{bag} &= 35400 \div 80 = \text{sh.}442.50 \end{aligned}$$

(b)

$$CP = \frac{400x + 350y}{x + y}$$

$$\frac{400x + 350y}{x + y} = 383.50$$

$$400x + 350y = 383.5x + 383.5y$$

$$\Leftrightarrow 16.5x = 33.5y$$

$$x : y = 33.5 : 16.5$$

$$= 67 : 33$$

(c)

$$\left(\frac{3}{8} + \frac{67}{100}\right) : \left(\frac{5}{8} + \frac{33}{100}\right)$$

$$= 209 : 191$$

(10 marks)

18.

(a)

$$p = \frac{kq}{r^2}$$

$$9 = \frac{k(12)}{2^2} \quad k = 3$$

$$p = \frac{3(15)}{5^2} = 1.8$$

(b)

$$q = \frac{pr^2}{3}$$

(c)

(i)

$$q_1 = \frac{1.2p(0.9r)^2}{3} = 0.972 \frac{pr^2}{3}$$

$$\Delta q = 0.972 \frac{pr^2}{3} - \frac{pr^2}{3} = -0.028 \frac{pr^2}{3}$$

(ii)

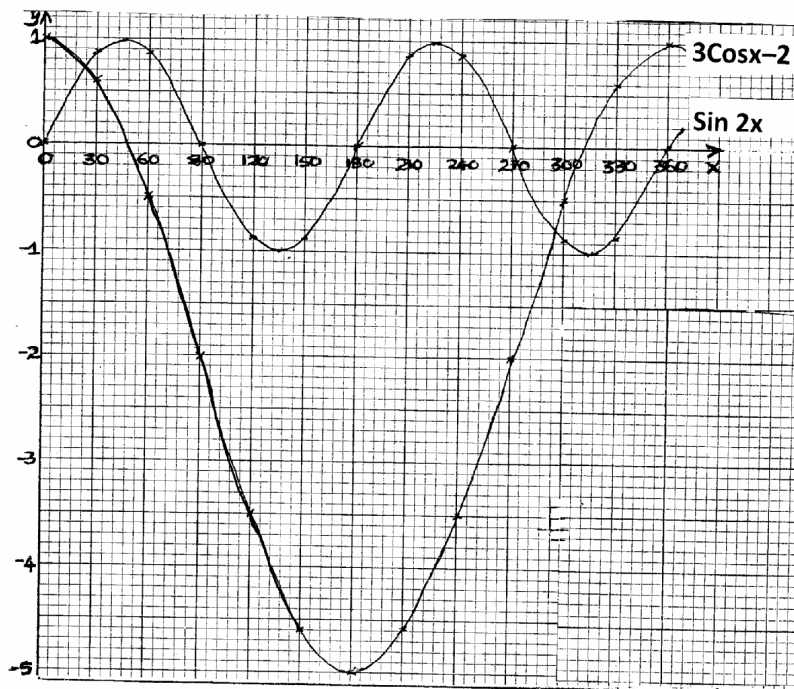
$$\% \text{ change} = \frac{0.028 \frac{pr^2}{3}}{\frac{pr^2}{3}} \times 100\%$$

$$= -2.8\%$$

(10 marks)

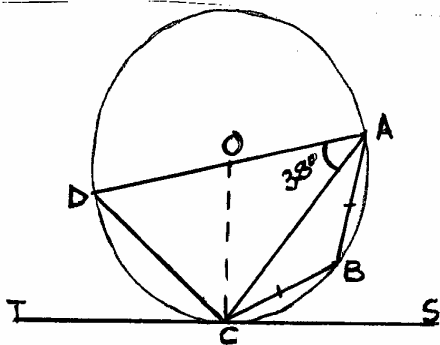
19.

$x^\circ$	$30^\circ$	$60^\circ$	$90^\circ$	$150^\circ$	$180^\circ$	$240^\circ$	$270^\circ$	$300^\circ$	$330^\circ$
$\sin 2x$	0.87		0	-0.87		0		-0.87	-0.87
$3 \cos x - 2$		0.5		-4.60	-5	-3.5	-2		0.60



(10 marks)

20.



(a)

(i)

$$\angle ADC = 52^\circ \text{ or } \angle OCA = 38^\circ \text{ or } \angle DCT = 38^\circ$$

$$= 52^\circ$$

(ii)

$$\angle CBA = 128^\circ$$

$$\angle BCA = 26^\circ$$

(b)

(i)

$$\begin{aligned} AC &= 20 \cos 38 \\ &= 15.76 \text{ cm} \end{aligned}$$

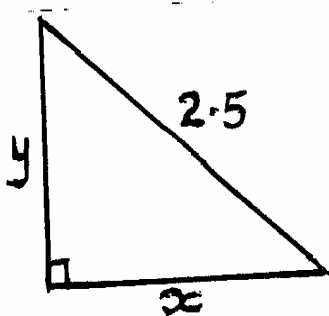
(ii)

$$\begin{aligned} \frac{AB}{\sin 26^\circ} &= \frac{15.76}{\sin 128^\circ} \\ AB &= \frac{15.76 \sin 26^\circ}{\sin 128^\circ} \\ &= \frac{15.76 \times 0.4384}{0.7880} \\ &= 8.768 \text{ cm} \end{aligned}$$

(10 marks)

21.

(a)



(b)

(i)

$$x^2 + y^2 = 2.5^2$$

$$\frac{y}{2.4} = \frac{x}{3.2}$$

(ii)



$$y = \frac{3}{4}x$$

$$x^2 + \left(\frac{3}{4}x\right)^2 = 2.5^2$$

$$16x^2 + 9x^2 = 6.25 \times 16$$

$$x^2 = \frac{6.25 \times 16}{25}$$

$$x = 2\text{km}$$

$$y = \frac{3}{4} \times 2 = 1.5\text{km}$$

(iii)

$$\text{Time taken} = \frac{2}{3.2} \text{ or } \frac{1.5}{2.4}$$

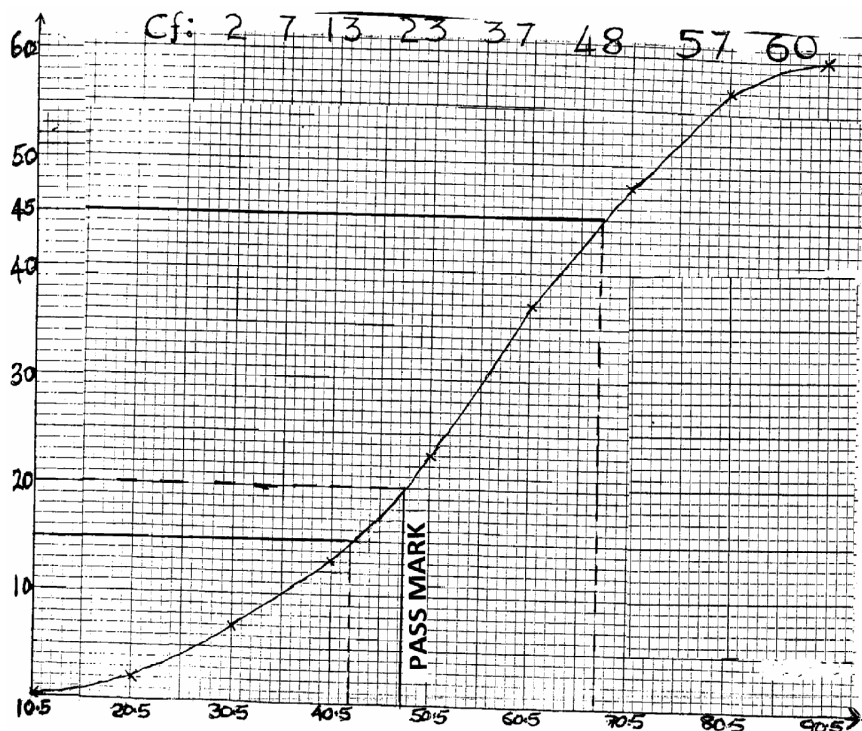
$$= 0.625\text{hrs}$$

$$\text{or } 37\frac{1}{2}\text{minutes}$$

$$\text{or } \frac{5}{8}\text{hrs}$$

(10 marks)

22.



(10 marks)

23.

(a)

$$\text{Interest} = 109375 \times \frac{8}{100} \times 2 = 17500$$

$$\text{Amount} = 109375 + 17500 = \text{sh } 126875$$

(b)

(i)

$$1^{\text{st}} \text{ year value} = \frac{96}{100} \times 126875 = \text{sh } 121800$$

(ii)

$$4^{\text{th}} \text{ year value} = 121800 \left( 1 + \frac{6}{100} \right)^9 = \text{sh } 205779$$

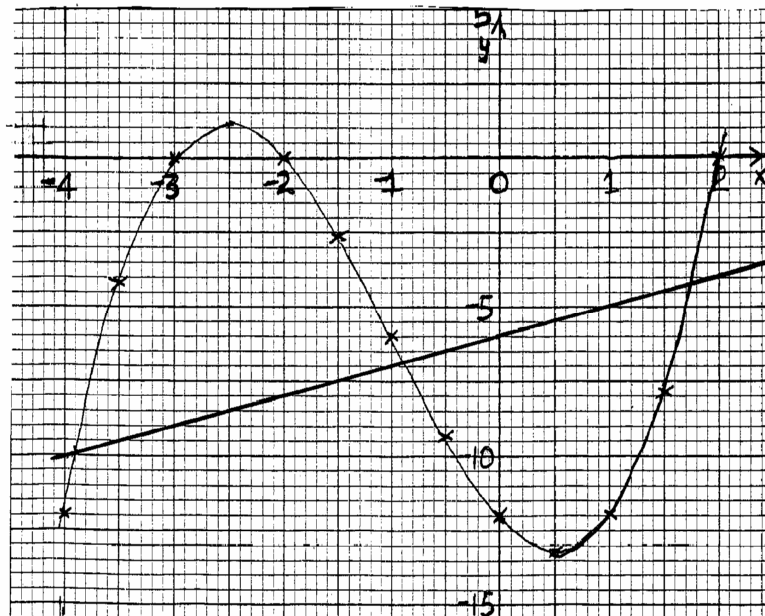
(c)

$$\% \text{ gain} = \frac{205779 - 126875}{126875} \times 100\% = 62.19\%$$

(10 marks)

24.

x	-4	-3	-2	-1	0	1	2
y	-12	0	0	-6	-12	-12	0



$$y = x^3 + 3x^2 - 4x - 12$$

$$0 = x^3 + 3x^2 - 5x - 6$$

$$y = \frac{\quad}{x - 6}$$

$$x = (-3.9, -0.9, 1.76) \pm 0.05$$

**(10 marks)**