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# MATHEMATICS FORM 3
# PAPER 2 MARKING SCHEME

1. Numerator

$\frac{1}{2}$ of $\frac{7}{2} + \frac{3}{2}\left(\frac{5}{2} - \frac{2}{3}\right)$

$\frac{1}{2}$ of $\frac{7}{2} + \frac{3}{2}\left[\frac{15-4}{6}\right]$

$\frac{1}{2} \times \frac{7}{2} + \frac{3}{2} \times \frac{11}{6}$

$\frac{7}{4} \times \frac{11}{4} = \frac{18}{4}$

Denominator

$\frac{3}{4} \times \frac{3}{2} \times \frac{2}{1} = \frac{15}{4}$

$= \frac{18}{4} \div \frac{15}{4}$

$= \frac{18}{4} \times \frac{4}{15} = \frac{18}{15}$

$= 1\frac{1}{5}$

2.

| NO | Log. |
|---|---|
| 0.7841 | $\bar{1}.8944$ |
| $0.1356^{\frac{1}{2}}$ | $\frac{\bar{1}.1323}{2} = \frac{\bar{1}.5662}{\bar{1}.4606}$ |
| Log 8492 = 1.929 | $\frac{0.2853}{\bar{1}.1753}$ |
| | $\frac{\bar{3}.2.1753}{3}$ |
| 0.5310 ← | $\bar{1}.7251$ |

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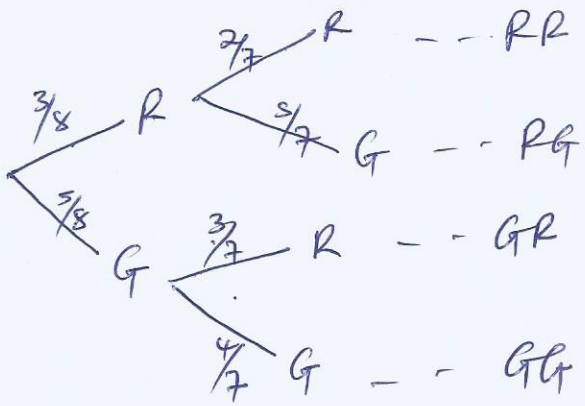
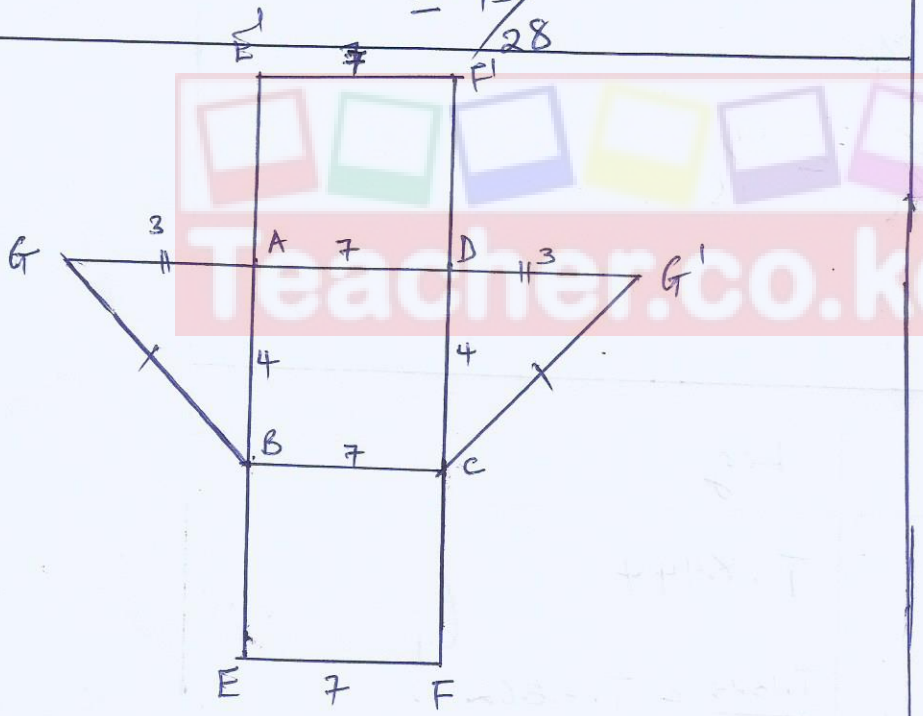
3.




$\left(\frac{3}{8} \times \frac{5}{7}\right) + \left(\frac{5}{8} \times \frac{3}{7}\right) = \frac{15}{56} + \frac{15}{56} = \frac{30}{56}$

$= \frac{15}{28}$

4.




✓ IF EF = BC = AD

✓ EF and other sides of a rectangle B1

✓ Triangular must fit as one folds. B1

✓ Labelling of vertices.

✓ Area of the shape = $96 cm^2$

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

$(1+x)\cdot A^2 = \frac{1-x}{(1+x)}(1+x)$

$A^2 + A^2x = 1-x$

$A^2x + x = 1 - A^2$

$\frac{x(A^2+1)}{A^2+1} = \frac{1-A^2}{A^2+1}$

$x = \frac{1-A^2}{A^2+1}$

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

$= \frac{6\sqrt{3}+3\sqrt{2}}{4\sqrt{9}+2\sqrt{6}-2\sqrt{6}-\sqrt{4}}$

$= \frac{6\sqrt{3}+3\sqrt{2}}{12-2}$

$= \frac{6\sqrt{3}+3\sqrt{2}}{10}$

or $\frac{3}{5}\sqrt{3} + \frac{3}{10}\sqrt{2}$

$=$

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7 (a) Hire Purchase Price.

$H.P = (D + MI)$

$= [200 + (250 \times 6)]$

$= 200 + 1500$

$= Sh.\ 1700$

b) The extra amount paid.

$= 1700 - 1560$

$= Ksh.\ 140$

8. $\log(x+24) - 2\log 3^2 = \log(9-2x)$

$\log \frac{x+24}{9} = \log(9-2x)$

$9\left(\frac{x+24}{9}\right) = (9-2x)\,9$

$x + 24 = 81 - 18x$

$5x + 18x = 81 - 24.$

$\frac{19x}{19} = \frac{57}{19}$

$x = 3$

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9 $(1+2x)^8 = 1 + (8+2x) + 28(2x)^2 + 56(2x)^3 + \cdots$

$1 + 16x + 112x + 448x$

$\Rightarrow (1+2x)^8 = (1.02)^8$

$\frac{2x}{2} = \frac{0.2}{2}$

$x = 0.01$

$= 1 + (16 \times 0.01) + 112(0.01)^2 + 448(0.01)^3$

$= 1 + 0.16 + 0.0112 + 0.000448$

$= 1.171648$

$= 1.172$

10. $x^2 + 4x + y^2 - 10y = 7$

$x^2 + 4x + (4/2)^2 + y^2 - 10y(-10/2)^2$

$= 7 + 2^2 + 5^2$

$(x+2)^2 + (y-5)^2 = 36$

$x = -2, \ y = 5, \ r = 6.$

Centre $(-2, 5)$

Radius $= 6$ units.

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11 $x = 2$ and $x_2 = -3$

$(x-2)$ and $(x+3)$

$(x-2)(x+3)$ M1

$x(x+3) - 2(x+3)$ M1

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

$x^2+x-6=0$ A1

12 let x kg of maize flour to cost sh 40 and y kg of millet flour to cost sh 52. Then the cost of the mixture will be.

$$(x+y)\frac{40x+52y}{x+y} = 46(x+y)$$

$$40x+52y = 46x+46y$$

$$52y-46y = 46x-40x$$

$$6y = 6x$$

$$1:1$$

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13 In 1 hour

$A = \frac{1}{3}$

$B = \frac{1}{6}$

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

$\left(\frac{1}{3} + \frac{1}{6} - \frac{1}{8}\right) = \frac{3}{8}$

$\frac{1}{2} \div \frac{3}{8}$

$= \frac{1}{2_1} \times \frac{8^4}{3}$

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

$= 2\frac{1}{3}$ hrs

14

$10^{th}$ term $= ar^9$

$8^{th}$ term $= ar^7$

$\frac{ar^9}{ar^7} = 9$

$r^{(9-7)} = 9$

$\sqrt{r^2} = \sqrt{9}$

$r = \pm 3$

$r = 3$ or $-3$

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$$\frac{p^2 - 2pq + q^2}{p^3 - pq^2}$$

$$\frac{p^2 - pq - pq + q^2}{p(p^2 - q^2)}$$ M1

$$\frac{p(p-q) - q(p-q)}{p(p+q)(p-q)}$$

$$\frac{(p-q)(p-q)}{p(p+q)(p-q)} = \frac{p-q}{p(p+q)}$$ A1

16

$$\begin{pmatrix} x & 1 \\ 4 & x- \end{pmatrix} \det = 0$$ M1

$x(x-3) - (1 \times 4) = 0$

$x^2 - 3x - 4 = 0$

$S = -3$

$P = -4$ No -4 and 1

~~$x(x-4)$~~ M1

$(x^2 - 4x) + (x - 4) = 0$

$x(x-4) + 1(x-4) = 0$

$(x+1)(x-x) = 0$ A1

$x_1 = -1 \quad x_2 = -4$



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SECTION II

17 (a) $x = 30 - (4+6+8+7+2)$ M1

$x = 3$ A1

(b) The modal class B1

(c) (i) the mean.

| Mass kg | mid-point | Frequency f | fx | c.f. |
|---|---|---|---|---|
| 60-64 | 62 | 4 | 248 | 4 |
| 65-69 | 67 | 6 | 402 | 10 |
| 70-74 | 72 | 8 | 576 | 18 |
| 75-79 | 77 | 7 | 539 | 25 |
| 80-84 | 82 | 3 | 246 | 28 |
| 85-89 | 87 | 2 | 174 | 50 |
| | | $\Sigma f = 30$ | $\Sigma fx = 2185$ | |

M1

$\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{2185}{30} = 72.83$ M1 A1

(ii) median.

$L + \frac{\left(\frac{N}{2} - c.f\right)i}{f}$ M1

$69.5 + \frac{\left(\frac{30}{2} - 10\right)5}{8}$ M1

$= 72.63 \text{ kg}$ A1

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18 a) Length AB $\Rightarrow \cos 26 = \frac{y}{10}$ M1

$y = 8.988$

$\cos 48.6 = \frac{x}{4}$ M1

$x = 2.643$

$AB = 8.988 + 2.643$

$= 11.633 \text{ cm}$. A1

b) Area of sector APQ M1

$\frac{52}{360} \times 3.142 \times 10^2$ A1

$= 45.38 \text{ cm}^2$

c) Area PAQ + PBQ M1

$A = PAQ = \frac{1}{2} \sin 52 \times 10^2$

$= 39.4 \text{ cm}^2$

$A = PBQ = \frac{1}{2} \sin 97.2 \times 4^2$ A1

$= 7.937$

Area $= 39.4 + 7.937$

$A = 47.34 \text{ cm}^2$

d) $\left(45.38 - 39.4\right) + \left(\frac{97.2}{360} \times 3.142 \times 4^2 - 7.937\right)$ M1

$= 5.98 + 5.636$ M1

$A = 11.616 \text{ cm}^2$ A1

10

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19) (i) $\angle SOQ = 2\angle SPQ = 106^\circ$ B1

$360 - 106 = 254^\circ$ B1

Angle at the centre subtended by QS.

(ii) $\angle OQS = \angle OSQ = \left(\frac{180^\circ - 106^\circ}{2}\right)$ B1

$= 37^\circ$ B1

Base angle in an isosceles $\Delta$ B1

$\angle PSO = 180^\circ - (53^\circ + 30^\circ + 37^\circ + 37^\circ)$

$= 23^\circ$

(iii) $\angle SRT = \angle SPQ = 53^\circ$ B1

Exterior angles of ~~a~~ cyclic quadrilateral B1

b) Area of OQPS

$\left(\frac{1}{2} \times 14^2 \sin 120\right) + \left(\frac{1}{2} \times 14^2 \sin 134\right)$ M1

$(98 \sin 120) + (98 \sin 134)$ m1

$84.8705 + 70.4953$ A1

$= 155.3658\ cm^2$

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20)

(i) $\underset{\sim}{PQ} = \underset{\sim}{Q} - \underset{\sim}{P}$. B1

(ii) $\underset{\sim}{ON} = \frac{1}{3}\underset{\sim}{P} + \frac{2}{3}\underset{\sim}{P}$ M1 A1

(iii) $\underset{\sim}{PT} = -\underset{\sim}{P} + \frac{3}{5}\left(\frac{2}{3}\underset{\sim}{Q} + \frac{1}{3}\underset{\sim}{P}\right)$ M1

$= \frac{2}{5}\underset{\sim}{Q} - \frac{4}{5}\underset{\sim}{P}$. A1

(iv) $\underset{\sim}{Pm} = -\underset{\sim}{P} + \frac{1}{2}\underset{\sim}{Q}$. M1 A1

b) $k\left(\frac{2}{5}\underset{\sim}{Q} - \frac{4}{5}\underset{\sim}{P}\right) = -\underset{\sim}{P} + \frac{1}{2}\underset{\sim}{Q}$. B1

$k = \frac{4}{5}$ B1

$PT = \frac{4}{5}PM$.

$\underset{\sim}{Pm} // \underset{\sim}{PT}$.

P is Common. B1

Hence P, T and m are Collinear.

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21 (a) $T = D/S = \frac{300\text{km}}{50\text{km/h}}$ M1

$= 3\text{hrs } 45\text{min}$

$+ \begin{array}{r} 7.00 \\ 3.45 \end{array}$

$10.45$ A.m. A1

(b) The distance covered by the bys before the car started the journey.

$D = S \times T$

$= 50\text{km/h} \times \frac{3}{4}\text{h}$ M1

$= 60\text{km}$.

$= 300\text{km} - 60\text{km}$

$= 240\text{km}$.

$S = D/T$

$T = D/S = \frac{240\text{km}}{200\text{km/h}}$ M1

$= 6/5\text{h}$.

$= 1\text{h } 12\text{minutes}$

$7.45$

$+ 1.12$

$8.57$ A1

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(c) $D = S \times T$.

$= 80\text{km/h} \times 6\frac{1}{5}\text{h}$. M,

$= 96\text{km} + 60\text{km}$

$= 156\text{km}$ A,

Or.

$80\text{km/h} \times \frac{117}{60} = 156\text{km}$.

(d) The time the caretaker from Eldoret to Nairobi

$T = \frac{D}{S}$. $= \frac{300\text{km}}{120\text{km/h}}$ M,

$T = \frac{5}{2}\text{h}$.

$= 2\text{hrs} - 30\text{minutes}$. M,

$D = S \times T$

$D = 80\text{km/h} \times \frac{5}{2}\text{h}$

$= 200\text{km}$.

The remaining distance A,

$300\text{km} - 200\text{km}$.

$= 100\text{km}$.

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22 (i) $P = \frac{kQ^2}{\sqrt{R}}$, $k \rightarrow$ Constant. M1

$k = \frac{P\sqrt{R}}{Q^2} = \frac{12 \times \sqrt{36}}{24^2} = \frac{1}{8}$ M1

Hence $P = \frac{1}{8}\frac{Q^2}{\sqrt{R}}$

when $Q = 27$, $R = 121$

$P = \frac{1}{8} \times \frac{27^2}{\sqrt{121}} = \frac{729}{88}$ A1

$P = 8.2841$

(ii) $Q_1 = 1.21Q^2$

$R_1 = 0.866025403\sqrt{R}$ M1

$P_1 = \frac{k \times 1.21Q^2}{\sqrt{0.75R}} = 1.3971876\frac{kQ^2}{\sqrt{R}}$ M1

New change $\frac{\left((1.3971876 - 1)\frac{kQ^2}{\sqrt{R}}\right)}{\frac{kQ^2}{\sqrt{R}}} 100\%$ M1

$= 39.71876\%$

Hence P increased by $39.72\%$ A1

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(iii) $Q = k\frac{1}{\sqrt{P}}$ M1

$k = Q\sqrt{P}$.

$= 3\sqrt{4}$

$= 6$.

$Q = 6\frac{1}{\sqrt{P}}$ M1

$P = \left(k\frac{1}{Q}\right)^2$

$= \left(6 \times \frac{1}{8}\right)^2 = \left(\frac{6}{8}\right)^2$

$\frac{9}{16}$ A1

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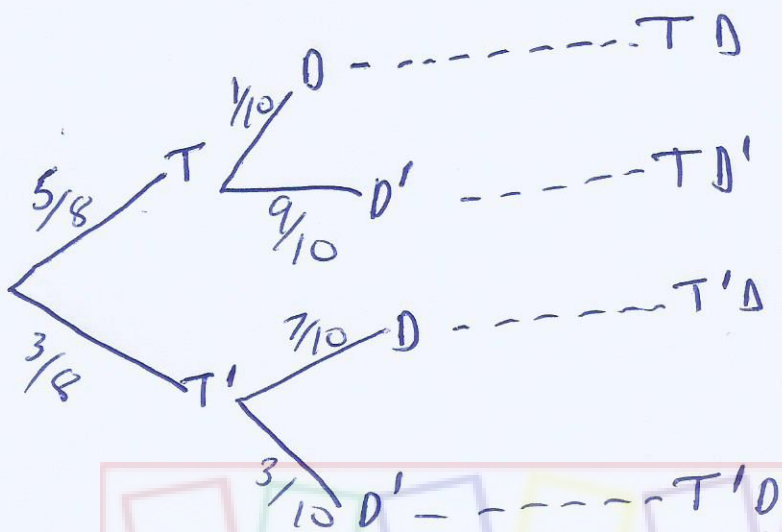
23 (a) (i) $P(T) = \frac{30}{48} = \frac{5}{8}$ B1

(ii) $P(T') = \frac{18}{48} = \frac{3}{8}$ B1

(b)




(i) $P(TD) = \frac{5}{8} \times \frac{1}{10}$ M1

$= \frac{1}{16}$ A1

(ii) $P(T'D) = \frac{5}{8} \times \frac{7}{10}$ M1

$= \frac{21}{80}$ A1

(iii) $P(TD') = \frac{5}{8} \times \frac{9}{10}$ M1

$= \frac{9}{16}$ A1

(iv) $P(T'D') = \frac{3}{8} \times \frac{3}{10}$ M1

$= \frac{9}{80}$ A1

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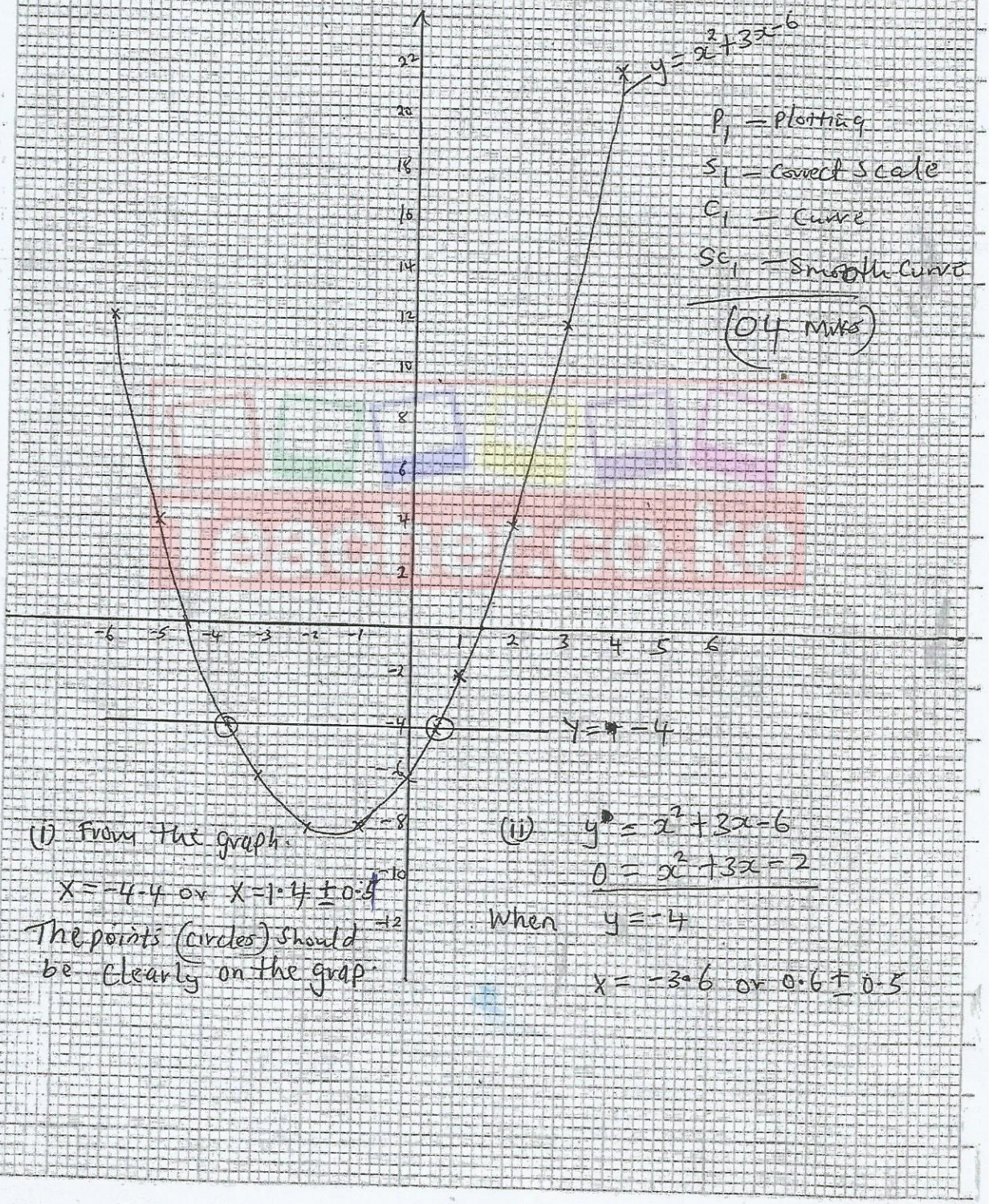
24) (a) (a)

| X | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Y | | 4 | -2 | | -8 | -8 | | -2 | 4 | 12 | |




$P_1$ = Plotting
$S_1$ = Correct Scale
$C_1$ — Curve
$Sc_1$ — Smooth Curve

(04 Mks)

(i) From the graph.
$X = -4.4$ or $X = 1.4 \pm 0.1$
The points (circles) should be clearly on the graph

(ii) $y = x^2 + 3x - 6$
$0 = x^2 + 3x - 2$
When $y = -4$
$x = -3.6$ or $0.6 \pm 0.5$

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