FORM FOUR CLUSTER KCSE MODEL 3

MATHEMATICS PAPER 2 ANSWERS

SECTION 1 (50 Marks)

Answer all the questions in this section in the spaces provided below each question.

No	*Log*
$Cos\,81.53^0$	$\bar{1}.681 \rightarrow \bar{1}.1681$
4.497	$0.6529 \rightarrow 0.6529$ +
$\sqrt{0.3673}$	$\bar{1}.5650 \div 2 \rightarrow \underline{\bar{1}.7825}$ −
	0.4354
	$\bar{2}.7327$
5.404×10^2	
	$= 0.05404$

2.

Max thickness $2.5 - 1.75$

$=0.75$ cm

3.

$$T^2 = \frac{P^2Q}{Q-1}$$

$$T^2Q - T^2 = P^2Q$$

$$T^2Q - P^2Q = T^2$$

$$Q\left(T^2 - P^2\right) = T^2$$

$$Q = \frac{T^2}{T^2 - P^2}$$

4.

$$\frac{\frac{\sqrt{3}}{2}}{1+\sqrt{3}} = \frac{\sqrt{3}}{2+2\sqrt{3}}$$

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

$$= \frac{2\sqrt{3}-6}{4-12}$$

$$= \frac{3}{4} - \frac{1}{4}\sqrt{3}$$

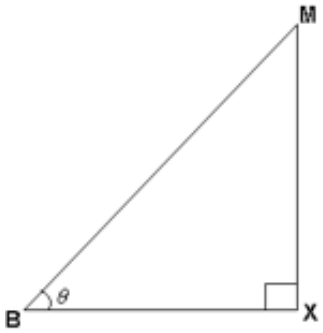
5.

$$Period = \frac{360}{\frac{2}{3}}$$

$$= 540^0$$

$$Amplitude = 2$$

6.



$$MX = CF = 6.8cm$$

$$BX = BC^2 + CX^2$$

$$= 8^2 + 3^2$$

$$= 64 + 9$$

$$= 73$$

$$BX = \sqrt{73}$$

$$\tan\theta = \frac{6.8}{\sqrt{78}} = 0.7959$$

$$\theta = 38.52^0$$

7.

Cost of price of the mixture

$$\frac{3\times 200 + 5\times 250}{8}$$

$$Ksh.231.25 \ per \ kg$$

$$\text{Profit} = 240 - 231.25$$

$$Ksh8.75$$

$$\%\ \text{profit} = \frac{8.75\times 100}{231.25}$$

$$= 3.78\%$$

8.

$$4x - 10 + x + 60 = 90^0$$

$$5x + 50 = 90^0$$

$$5x = 40$$

$$x = 8^0$$

$$Inverse = \frac{1}{-3-2}\begin{bmatrix} -1 & -1 \\ -2 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{1}{5} & \frac{1}{5} \\ \frac{2}{5} & \frac{-3}{5} \end{bmatrix}$$

$$\begin{bmatrix} 3 & 1 \\ 2 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$= (1, 1)$$

10.

(a)

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

$$= 32 - 20x + 5x^2 - 0.625x^3 + \ldots$$

(b) $(1.75)^5 \approx 32 - 20(1) + 5(1)^2 - 0.625(1)^3$

$= 16.38.$

11.

$$\frac{4+x}{-3} > 3x + 2$$

$$4 + x < -9x - 6$$

$$10x < -1$$

$$x < -1$$

$$3x + 2 > -13$$

$$3x > -15$$

$$x > -5$$

$$-5 < x < -1$$

Hence the integral values are -4, -3 and -2.

12.

$a+4d+a+5d$

$2a+9d=30.....(i)$

$a+2d=5.....(ii)$

$2a+9d=30$

$2a+4d=10$

$5d=20$

$d=4$

$a=5-2d$

$=5-2(4)$

$=-3$

$3x^2+3y^2+18y-12x-9=0$

$x^2+y^2-4x+6y=3$

$x^2-4x+4+y^2+6y+9=3+4+9$

$(x-2)^2+(y+3)^2=16$

Centre $(2,-3)$, *radius* 4 *units.*

14.

$\log(3x+9)=\log 100+\log 27$

$\log(3x+9)=\log 2{,}700$

$3x+9=2{,}700$

$3x=2{,}691$

$x=897$

15.

15, (17) 18,19,21, (21) 22

Quartile deviation $=\frac{21-17}{2}$

$=2$

16.

(a)

	2	3	5	7
2	22	32	52	72
3	23	33	53	73
5	25	35	55	75
7	27	37	57	77

(b) $\frac{4}{16} + \frac{2}{16}$

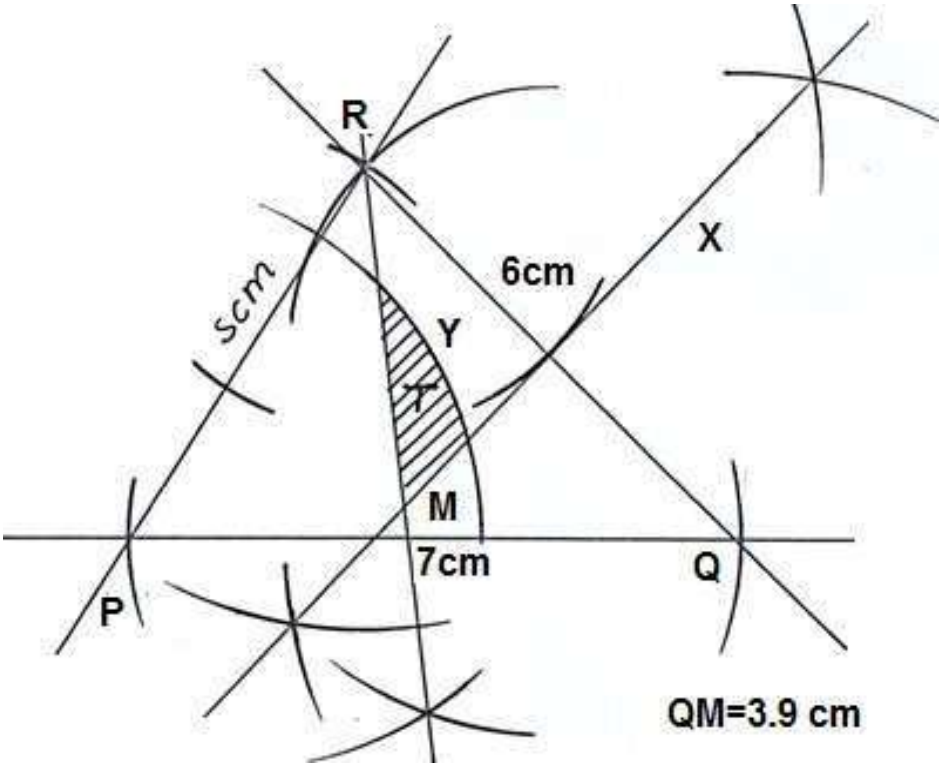
$= \frac{6}{16}$

$= \frac{3}{8}$

SECTION 2 (50 Marks)

Answer all the questions in this section in the spaces provided below each question.

17.



$$\begin{matrix} & & & & A & B & C & & A^1 & B^1 & C^1 \end{matrix}$$

(a) $\begin{bmatrix} -1 & 1 \\ 2 & -3 \end{bmatrix}\begin{bmatrix} 4 & 0 & -2 \\ 1 & -2 & 4 \end{bmatrix} = \begin{bmatrix} -3 & -2 & 6 \\ 5 & 6 & -16 \end{bmatrix}$

$A^1(-3,5), B^1(-2,6)\ and C^1(6,-16)$

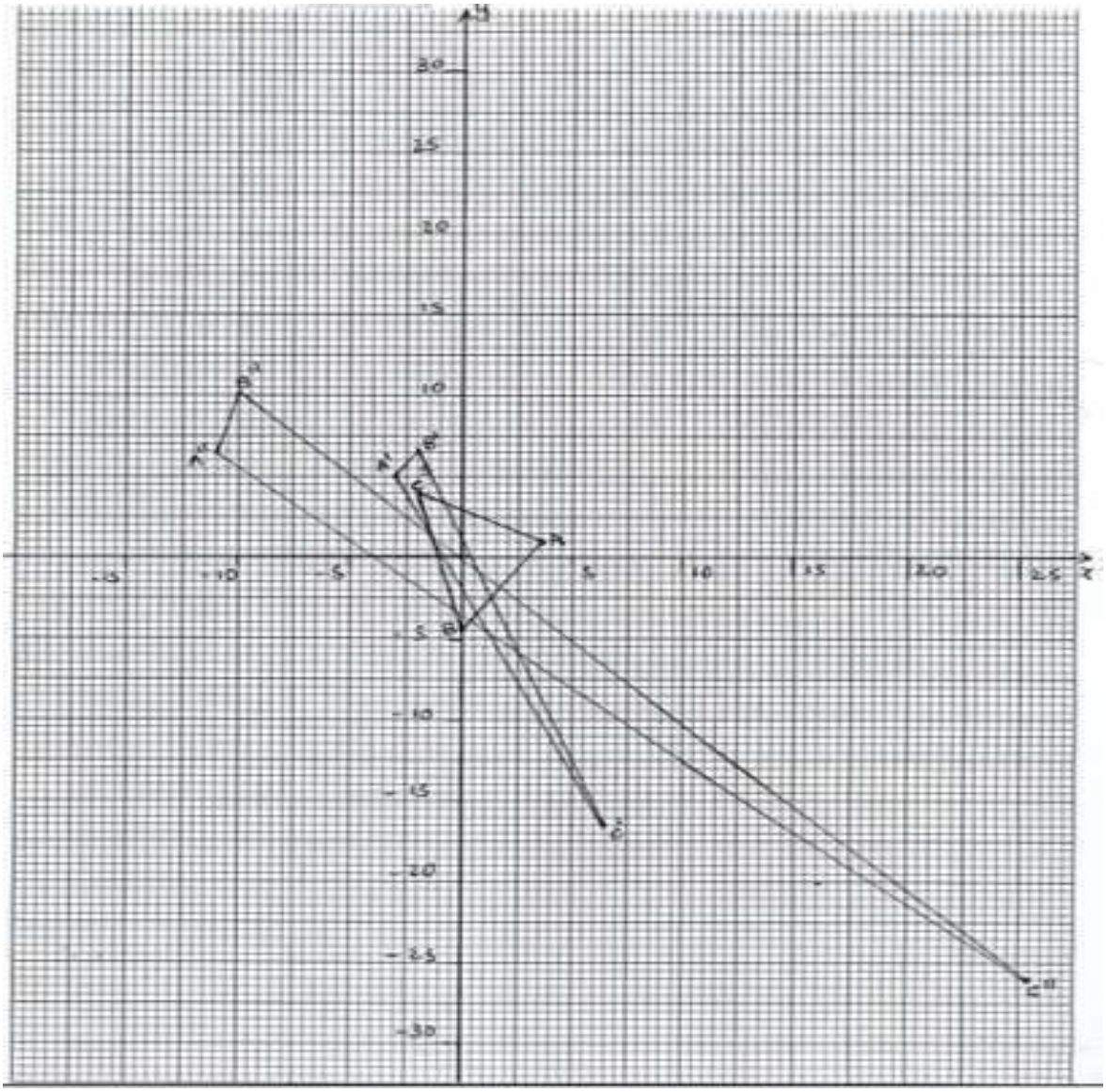
$$\begin{matrix} & & & & A^1 & B^1 & C^1 & & A^{11} & B^{11} & C^{11} \end{matrix}$$

(b) $\begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} -3 & -2 & 6 \\ 5 & 6 & -16 \end{bmatrix} = \begin{bmatrix} -11 & -10 & 28 \\ 7 & 10 & -26 \end{bmatrix}$

$A^{11}(-11,7)\ B^{11}(-10,10)\ and C^{11}(28,-26)$

(c) $NM = \begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} -1 & 1 \\ 2 & -3 \end{bmatrix}$

$= \begin{bmatrix} -4 & 5 \\ 3 & -5 \end{bmatrix}$



19.

Wage	x	$d = x - 1049.5$	f	d^2	fd	fd^2
800-889	849.5	-200	3	40000	-600	120000
900-999	949.5	-100	10	10000	-1000	100000
1000-1099	1049.5	0	23	0	0	0
1100-1199	1149.5	100	9	10000	900	90000
1200-1399	1299.5	250	3	62500	750	187500

1400-1599	1499.5	450	2	202500	900	405000
			$\sum f = 50$		$\sum fd = 950$	$\sum fd^2 = 902500$

(a) 1000-1099

(b)(i) $Mean = \frac{\sum fd}{\sum f} + A$

$= \frac{950}{50} + 1049\ .5$

$= 1068\ .5$

(ii) Standard deviation $= \sqrt{\frac{\sum fd^2}{\sum f} - \left(\frac{\sum fd}{\sum f}\right)^2}$

$= \sqrt{\frac{902500}{50} - \left(\frac{950}{50}\right)^2}$

$= \sqrt{18050 - 361}$

$= \sqrt{} = 133$

20.

(a) Let the constants of proportionality be:

k *and* h.

$$\Rightarrow C = kn + \frac{h}{n}$$

$$50 = 2k + \frac{1}{2}h$$

$$70 = 6k + \frac{1}{6}h$$

$$\Rightarrow \quad 4k + h = 100$$

$$\underline{36k + h = 420}$$

$$32k \quad = 320$$

$$k = 10 \quad and \; h = 60$$

$$\therefore C = 10n + \frac{60}{n}$$

(b) $C = 10 \times 12 + \frac{60}{12}$

$= 120 \; + 5$

$= 125$

(c) $106 = 10n + \frac{60}{n}$

(a) $AB = 60 \times 71 \times \cos 60^0$

$= 2130 nm$

(b) Time difference= 4 x 71 mins

$= 284$ mins.

$= 4$ hrs 44 mins.

Time at A 1300

$\underline{-444}$

0816

8. 16a.m

(c) $AB = \frac{\theta}{360} \times 2\pi R \cos \alpha$

$AB = \frac{71}{360} \times 2 \times \frac{22}{7} \times 6370 \times \cos 60^0$

$= 3948.39 km$

(d) $\frac{\theta}{360} \times 2 \times \frac{22}{7} \times 6370 = 10,010$

$\theta = \frac{10,010 \times 7 \times 360}{2 \times 22 \times 6370}$

$= 90^0$

$C = (30^0 S, 42^0 W)$

22.

(a)(i) $< SOQ = 53 \times 2$

$= 106^0$

(ii) $< QOS reflex = 360^0 - 106^{02}$

$= 254^0$

$$< POS = 360^0 - (53^0 + 30^0 + 254^0)$$
$$= 360^0 - 337^0$$
$$= 23^0$$

(iii) $< SRT = 180 - (180 - 53)$

$$= = 53^0$$

(b) *Area of OQS*

$$= \frac{1}{2} \times 14 \times 14 \times \sin 106^0$$
$$= 94.20714\, cm^2$$

(a)(i) $\underset{\sim}{XR} = \underset{XQ}{\longrightarrow} + \underset{QR}{\longrightarrow}$

$$= \underset{\sim}{XO} + \underset{OR}{\longrightarrow}$$
$$= -\frac{1}{3}\underset{\sim}{q} + \underset{\sim}{r}$$
$$= \underset{\sim}{r} - \frac{1}{3}\underset{\sim}{q}$$

(ii) $\underset{\sim}{YQ} = \underset{\sim}{YO} + \underset{\sim}{OQ}$

$$= -\frac{3}{7}\underset{\sim}{r} + \underset{\sim}{q}$$
$$= \underset{\sim}{q} - \frac{3}{7}\underset{\sim}{r}$$

(b) (i) $\underset{\sim}{OE} = \underset{\sim}{OX} + \underset{\sim}{XE}$

$$= \frac{1}{3}\underset{\sim}{q} + m\,\underset{\sim}{XR}$$
$$= \frac{1}{3}\underset{\sim}{q} + m\left(\underset{\sim}{r} - \frac{1}{3}\underset{\sim}{q}\right)$$
$$= \frac{1}{3}\underset{\sim}{q} + m\underset{\sim}{r} - \frac{1}{3}m\underset{\sim}{q}$$
$$= \left(\frac{1}{3} - \frac{1}{3}m\right)\underset{\sim}{q} + m\underset{\sim}{r}$$

(ii) $\underset{\sim}{OE} = \underset{\sim}{OY} + \underset{\sim}{YE}$

23.

$$= \frac{3}{7}\underset{\sim}{r} + n\underset{\sim}{YQ}$$

$$= \frac{3}{7}\underset{\sim}{r} + n\left(\underset{\sim}{q} - \frac{3}{4}\underset{\sim}{r}\right)$$

$$= n\underset{\sim}{q} + \left(\frac{3}{7} - \frac{3}{7}n\right)\underset{\sim}{r}$$

(c) $\left(\frac{1}{3} - \frac{1}{3}m\right)\underset{\sim}{q} + m\underset{\sim}{r} = \left(\frac{3}{7} - \frac{3}{7}n\right)\underset{\sim}{r} + n\underset{\sim}{q}$

$\Rightarrow n = \frac{1}{3} - \frac{1}{3}m$

$m = \frac{3}{7} - \frac{3}{7}n$

$n = \frac{1}{3} - \frac{1}{3}\left(\frac{3}{7} - \frac{3}{7}n\right)$

$n = \frac{1}{3} - \frac{1}{7} + \frac{1}{7}n$

$\frac{6}{7}n = \frac{4}{21}$

$n = \frac{4}{21} \times \frac{7}{6}$

$n = \frac{2}{9}$ *and* $m = \frac{1}{3}$

24.

a) At C and D

$x^2+5=8-2x$

$\Rightarrow x^2+2x-3=0$

$x=\dfrac{-2\pm\sqrt{2^2+12}}{2}$

$x=\dfrac{-2\pm4}{2}$

$x=x=-3 \text{ or } x=1$

when $x=-3$, $y=(-3)^2+5=14$

when $x=1$, $y=1^2+5=6$

Hence $C(-3,4)$ *and* $D(1,6)$

b) $A=\int_{-3}^{1}(x^2+5)dx$

$\left[\dfrac{x^3}{3}+5x+c\right]_{-3}^{1}$

$=\left(\dfrac{1}{3}+5\right)-\left(-\dfrac{27}{3}-15\right)$

$=\dfrac{16}{3}+24$

$=29\dfrac{1}{3}\ sq.units.$

c) $A=\dfrac{1}{2}\times4\times(6+14)$

$=\dfrac{1}{2}\times4\times20$

$=40\ sq\ units$

d) Shaded area$=\left(40-29\dfrac{1}{3}\right)squnits$

$=10\dfrac{2}{3}\ sq\ units$