

FORM FOUR CLUSTER KCSE MODEL5

MATHEMATICS PAPER 2 ANSWERS

SECTION I (50 Marks)

Answer ALL questions

1.
$$\begin{aligned} & \frac{1}{3} \times \left(\frac{11}{4} - \frac{11}{2} \right) \times \frac{27}{7} \times \frac{4}{9} \\ &= \frac{1}{3} \times \frac{11-22}{4} \times \frac{27}{7} \times \frac{4}{9} \\ &= \frac{1}{3} \times -\frac{11}{4} \times \frac{27}{7} \times \frac{4}{9} \\ &= -\frac{11}{7} \\ &= -1\frac{4}{7} \end{aligned}$$
2. Total ratio = 3+4+35=12
 - a) Cost/kg =
$$\frac{120 \times 3 + 90 \times 4 + 60 \times 5}{12}$$
$$= \text{sh.}85$$
 - b) 5kg mixture =
$$\frac{108}{100} \times 85 \times 5$$
$$= \text{sh.}459$$
3. Actual surface area = $4\pi r^4$
$$= 4 \times 3.142 \times 7^2$$
$$= 615.832 \text{ cm}^2$$

Max surface area = $4 \times 3.142 \times 7.5^2$
$$= 706.95 \text{ cm}^2$$

Min surface area = $4 \times 3.142 \times 6.5^2$
$$= 530.998 \text{ cm}^2$$

Absolute error =
$$\frac{\text{max area} - \text{min area}}{2}$$
$$= \frac{706.95 - 530.998}{2}$$
$$= \frac{175.952}{2}$$
$$= 87.976$$
$$\% \text{ error} = \frac{87.976}{615.832} \times 100\%$$
$$= 14.285714286\%$$

$$=14.29\% \text{ (2 d.p.)}$$

$$\begin{aligned} 4. \quad (a + \frac{1}{2})^4 &= a^4 + 4a^3(\frac{1}{2}) + 6a^2(\frac{1}{2})^2 \\ &\quad + 4a(\frac{1}{2})^3 + (\frac{1}{2})^4 \\ &= a^4 + 2a^3 + \frac{3}{2}a^2 + \frac{1}{2}a + \frac{1}{16} \end{aligned}$$

$$\begin{aligned} (a - \frac{1}{2})^4 &= a^4 + 4a^3(-\frac{1}{2}) + 6a^2(-\frac{1}{2})^2 \\ &\quad + 4a(-\frac{1}{2})^3 + (-\frac{1}{2})^4 \\ &= a^4 - 2a^3 + \frac{3}{2}a^2 - \frac{1}{2}a + \frac{1}{16} \end{aligned}$$

$$(a + \frac{1}{2})^4 + (a - \frac{1}{2})^4 = 2a^4 + 3a^2 + \frac{1}{8}$$

$$\begin{aligned} 5. \quad i) \quad x^2 - 6x + 9 + y^2 - 10y + 25 &= -30 + 9 + 25 \\ \pm 2a &= \pm 6 \text{ or } (x-3)^2 = (x-a)^2 \\ \pm 2b &= \pm 10 \text{ or } (y-5)^2 = (y-b)^2 \\ a &= 3 \text{ and } b = 5 \end{aligned}$$

$$ii) \quad r = \sqrt{(6-3)^2 + 9 - 5} = \sqrt{25} = 5 \text{ units}$$

$$\begin{aligned} 6. \quad -2 + y - z &= -1 \\ y - z &= 1 \dots\dots\dots(i) \\ -2 - 2y + z &= -7 \\ -2y + z &= -5 \\ \therefore y - z &= 1 \dots\dots\dots(i) \\ -2y + z &= -5 \dots\dots(ii) \\ (i) + (ii) - y &= -4 \\ y &= 4 \end{aligned}$$

$$\begin{aligned} \text{Subst in (i)} \\ 4 - z &= 1 \\ z &= 3 \\ y &= 4 \\ z &= 3 \end{aligned}$$

7.

Ratio = 7:9:10:14

Total ratio = 40

$$\text{Profit shared equally} = \frac{12}{100} \times 46800 \\ = \text{sh. } 5\,616$$

$$\text{Each received sh. } \left(\frac{5\,616}{4} \right)$$

$$= \text{sh. } 1\,404$$

$$\text{Balance} = \text{sh. } (46\,800 - 5\,616) \\ = \text{sh. } 41\,184$$

$$\text{Diva received } \frac{14}{40} \times 41\,184 \\ \text{Sh. } 14\,414.4$$

$$\text{Total} = \text{sh. } (14\,414.4 + 1\,404) \\ = \text{Sh. } 15\,818.40$$

8. $\text{Sh. } 120\,000 - \text{sh. } 15\,000 \\ = \text{sh. } 105\,000$

$$\text{Less discount} = \text{sh. } (105\,000 - \frac{5}{2}(105\,000)) \\ = \text{sh. } (105\,000 - 3\,000) \\ = \text{sh. } 102\,000$$

$$\therefore \text{Commission} = \frac{5}{100} \times 102\,000 \\ = \text{sh. } 5\,100$$

$$\text{Total earning} = \text{sh. } 9\,000 \\ + \underline{5\,100} \\ \text{Sh. } 14\,100$$

9. $\text{Period} = \frac{360}{3} = 120^\circ$
Amplitude 2

10. $xy = 24 \dots\dots\dots (i)$
 $(10y + x) - (10x + y) = 18$
 $9y - 9x = 18 \qquad \qquad \qquad 6 \text{ or } 4$

$$\therefore y - x = 2 \dots\dots\dots (ii)$$
$$\therefore y = 2 + x$$

11. $x(2 + x) = 24$
 $x^2 + 2x - 24 = 0$

$$r\sqrt{n-1} = mp$$

$$\sqrt{n-1} = \frac{mp}{r}$$

$$n-1 = \left(\frac{mp}{r}\right)^2$$

$$12. \quad n = \frac{m^2 p^2}{r^2} + 1$$

$$\frac{\sqrt{5}(\sqrt{5}+2)}{(\sqrt{5}-2)(\sqrt{5}+2)}$$

$$13. \quad = \frac{5+2\sqrt{5}}{5-4}$$

$$= \frac{5+2\sqrt{5}}{1}$$

$$= 5+2\sqrt{5}$$

$$\log_{10}(3y+2) - \log_{10} 10 = \log_{10}(y-4)$$

$$14. \quad \log_{10}\left(\frac{3y+2}{10}\right) = \log_{10}(y-4)$$

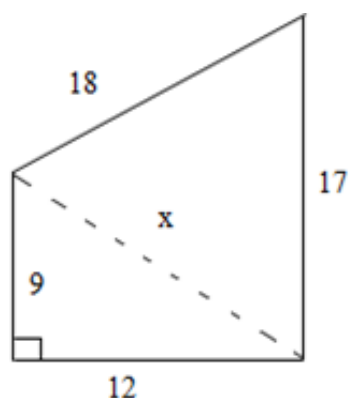
$$\frac{3y+2}{10} = y-4$$

$$3y+2 = 10(y-4)$$

$$= 10y - 40$$

$$7y = 42$$

$$y=6$$



$$x = \sqrt{9^2 + 12^2}$$

$$= 15$$

$$S = \frac{1}{2}(15 + 18 + 17)$$

$$= 25$$

$$= \sqrt{25(10 \times 7 \times 8 + \frac{1}{2} \times 12 \times 9)}$$

$$= 118.3216 + 54$$

$$= 172.3 \text{ cm}^2$$

15. In 1 hr Wamalwa cultivates $\frac{1}{7}$

In 1 hr Nanjeko cultivates $\frac{1}{5}$

$$\therefore \text{When working together they cultivate } \frac{1}{7} + \frac{1}{5} = \frac{5+7}{35}$$

$$= \frac{12}{35}$$

16. $A = mB + n\sqrt{B}$

$$30 = 9m + n\sqrt{9}$$

$$\therefore 9m + 3n = 30 \dots\dots\dots (i)$$

$$16 = 14m + n\sqrt{14}$$

$$\therefore 14m + n\sqrt{14} = 16 \dots\dots\dots (ii)$$

$$9m + 3n = 30 \dots\dots\dots (i) \times 14$$

$$14m + n\sqrt{14} = 16 \dots\dots\dots (ii) \times 9$$

$$126m + 42n = 420 \dots\dots\dots (iii)$$

$$126m + 9n\sqrt{14} = 144 \dots\dots\dots (iv)$$

$$(iii)-(iv) \quad 42n - 9n\sqrt{14} = 276$$

$$42n - 33.67n = 276$$

$$8.33n = 276$$

$$n = 33.13$$

$$n = 33$$

Subst in (i)

$$9m + 3n = 30$$

$$9m + 3(33) = 30$$

$$9m = 30 - 99$$

$$= -69$$

$$m = -\frac{69}{9}$$

$$= -7\frac{2}{3}$$

Equation

$$A = -7\frac{2}{3}B + 33\sqrt{B}$$

$$\text{When } B = 36$$

$$A = -7\frac{2}{3}(36) + 33\sqrt{36}$$

$$= -\frac{23}{3}(36) + 33(6)$$

$$= -276 + 198$$

$$= -78$$

SECTION II (50 Marks)

Answer any FIVE questions

17.

$$\begin{aligned}\text{i)a) Cost} &= \text{Ksh.}(7\,500 + 11 \times 6000) \\ &= \text{Ksh.}73\,500\end{aligned}$$

$$\begin{aligned}\text{b) \% increase} &= \frac{73\,500 - 60\,000}{60\,000} \times 100 \\ &= 22.5\%\end{aligned}$$

$$\begin{aligned}\text{ii) Amount paid} &= \text{Ksh.}60\,000 \times 25 \times 0.95 \\ &= \text{Ksh.}1425\,000\end{aligned}$$

$$\begin{aligned}\text{iii) Illustration X;} & \text{Ksh.}73\,500 \times 25 \\ &= \text{Ksh.}1\,837\,500\end{aligned}$$

$$\begin{aligned}\text{Illustration Y;} &= \text{Ksh.}60\,000 \times 25 \times \left(1 + \frac{12}{100}\right)^2 \\ &= \text{Ksh.}1881600\end{aligned}$$

$$\begin{aligned}\text{Difference} &= \text{Ksh.}(1881600 - 1837500) \\ &= \text{Ksh.}44100\end{aligned}$$

$$\begin{aligned}18. \text{ a) i) Younger child's age} &= x - 5 \text{ years} \\ \text{ii) Parent's age} &= [x + (x - 5)] \times 2 \\ &= 4x - 10\end{aligned}$$

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

$$\begin{aligned}\text{ii) } &4 \times 10 - 10 \text{ or } 4 \times 15 - 15 \\ &= 30 \qquad \qquad = 50\end{aligned}$$

$$\begin{aligned}\text{iii) } &(10 - 5) + 20 \text{ or } (15 - 5) + 20 \\ &= 25 \qquad \qquad = 30\end{aligned}$$

19.

$$\begin{aligned} \text{a) Area} &= \left(\frac{72}{360} \times 3.142 \times 8^2 - \frac{1}{2} \times 8 \times 8 \sin 72 \right) + \\ &\quad \left(\frac{90}{360} \times 3.142 \times 7^2 - \frac{1}{2} \times 7 \times 7 \sin 90 \right) \\ &= 23.7733 \end{aligned}$$

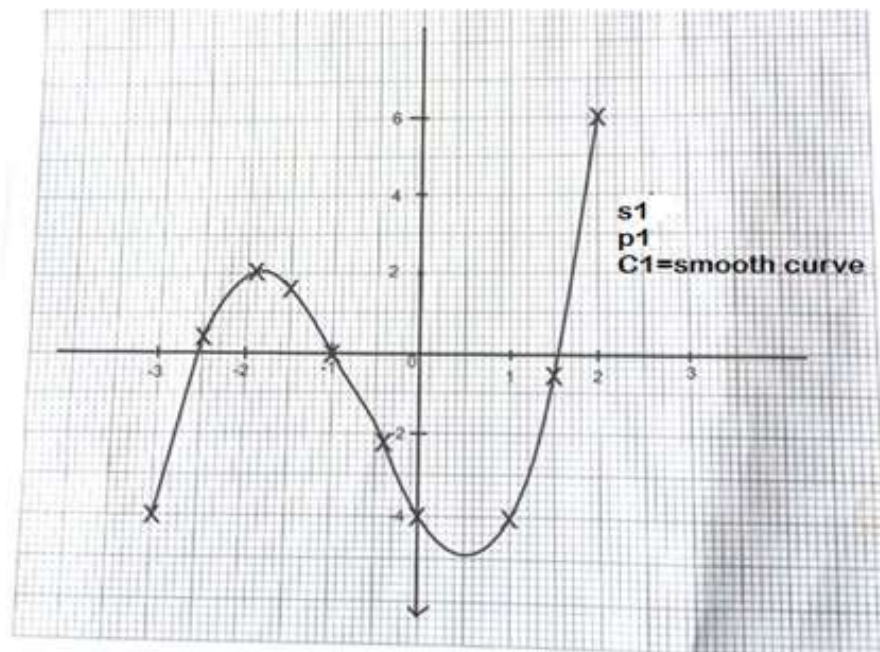
$$\begin{aligned} \text{b) Area} &= \frac{1}{2} \times 8 \times 8 \sin 70 + \frac{1}{2} \times 7 \times 7 \sin 90 \\ &= 54.5702 \end{aligned}$$

$$\begin{aligned} \text{c) Area shaded} &= 54.5702 - \frac{72}{360} \times 3.142 \times 8^2 \sin 72 \\ &= 16.321 \text{ cm}^2 \end{aligned}$$

20.

x	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
y	-0.40	0.4	2	1.6	0	-2.1	-4.0	-4.9	-4.9	-0.6	6

ii)



iii) a) $x = 2.6$
 -1.....
 1.55.....

b) Turning point $(-1.85, 2.1)$
 $(0.5, -4.9)$

21.

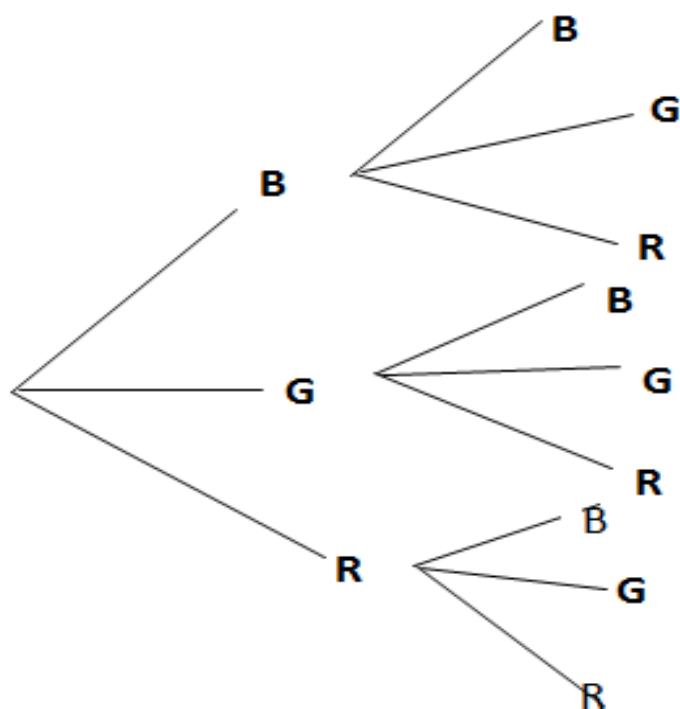
a) i) $P(\text{Blue}) = \frac{8}{15}$

ii) $P(\text{Either green or red}) = P(G) + P(R)$

$$= \frac{2}{15} + \frac{5}{15}$$

$$= \frac{7}{15}$$

b)



$$\begin{aligned}
 \text{ii) } P(\text{1st two are green}) &= P(G \text{ and } G) \\
 &= P(G) \times P(G) \\
 &= \frac{2}{15} \times \frac{1}{14} \\
 &= \frac{1}{105}
 \end{aligned}$$

$$\begin{aligned}
 \text{iii) } P(\text{only 1 of the first two picked is R}) \\
 &= P(BR \text{ or } GR \text{ or } RB \text{ or } RG) \\
 &= \frac{8}{15} \times \frac{5}{14} + \frac{2}{15} \times \frac{5}{14} + \frac{5}{15} \times \frac{8}{14} + \frac{5}{15} \times \frac{2}{14} \\
 &= \frac{4}{21} + \frac{1}{21} + \frac{4}{21} + \frac{1}{21} \\
 &= \frac{10}{21}
 \end{aligned}$$

$$22. \text{ a) } \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} K & L & M & N \\ 1 & 4 & 2 & 1 \\ 1 & 1 & 3 & 3 \end{pmatrix} = \begin{pmatrix} K' & L' & M' & N' \\ 4 & 7 & 11 & 10 \\ 1 & 1 & 3 & 3 \end{pmatrix}$$

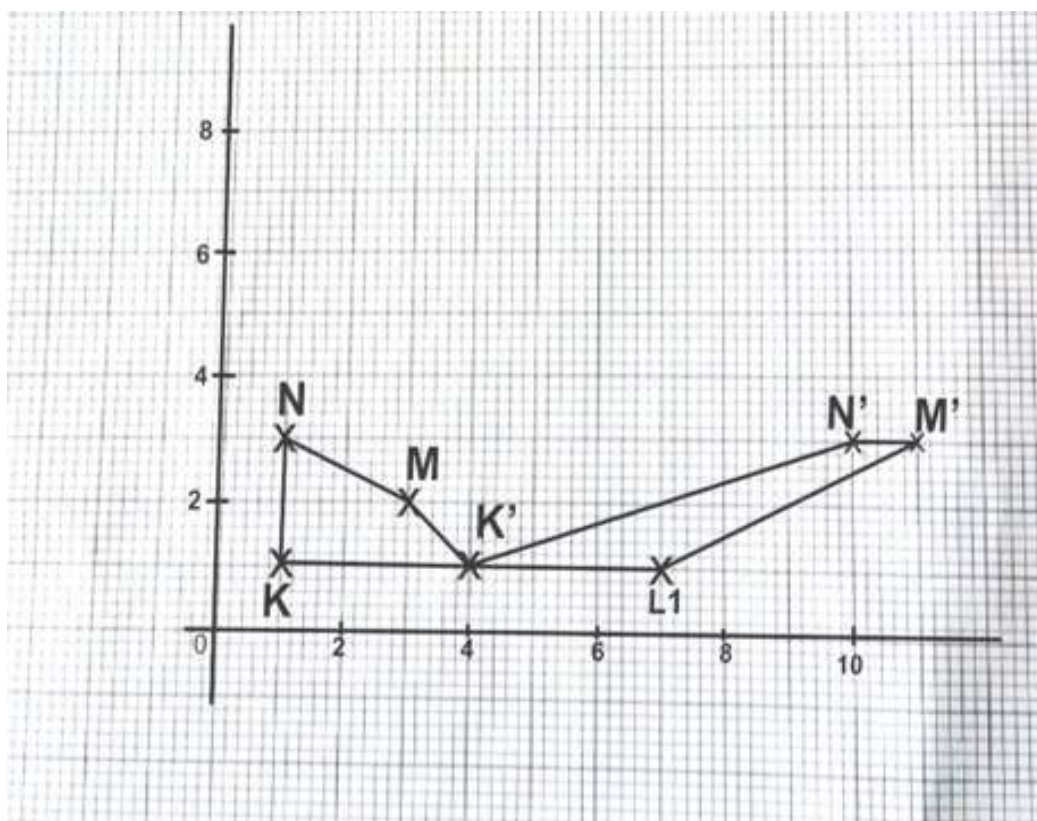
Co-ordinates

K(4,1), L(7,1), M(11,3) N,(10,3)

b)

Object

Image



c)i) It is a shear parallel to x-axis with shear factor
3(x-axis invariant)

ii) Area = 4 square units

d) $\begin{pmatrix} 1 & -3 \\ 0 & 1 \end{pmatrix}$

23.

a) $\angle QPR = 18^\circ$

b) $\angle PQS = 36^\circ$

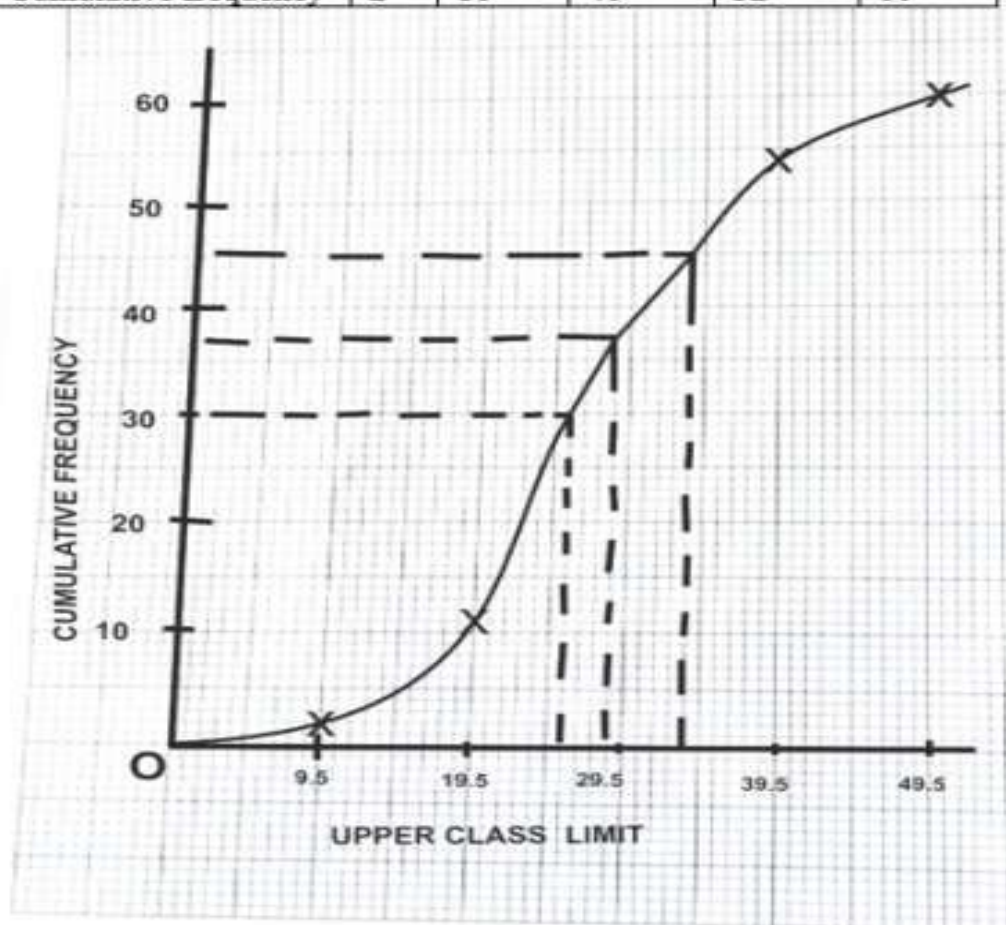
c) $\angle OQS = 18^\circ$

d) $\angle RTS = 126^\circ$

e) $\angle RSV = 54^\circ$

24.

No of goals	0-9	10-19	20-29	30-39	40-49
No of matches	2	14	24	12	8
Cumulative frequency	2	16	40	52	60



b)i) Medium = 25.5 ± 1

ii) Goals not more than 37 = 28

iii) $Q_1 = 18.5$

$Q_3 = 33.5$

$Q_3 - Q_1$

$33.5 - 18.5 = 15$