

FORM FOUR CLUSTER KCSE MODEL 3

MATHEMATICS PAPER 1 ANSWERS

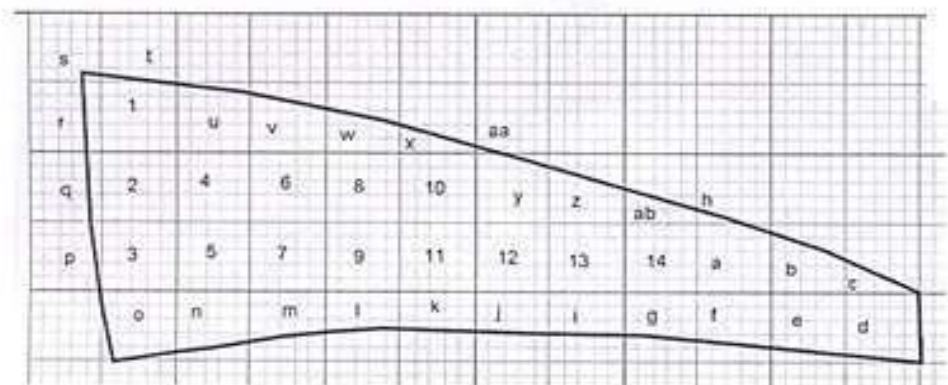
SECTION 1 (50 Marks)

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

$$\begin{aligned}
 1. \quad & \frac{\sqrt{729 \times 10^{-4}} \times \sqrt{2916 \times 10^{-2}}}{3.6 \times 4.5} \\
 & \frac{\sqrt{3^6 \times 10^{-4}} \times \sqrt{2^2 \times 3^6 \times 10^{-2}}}{3.6 \times 4.5} \\
 & \frac{3^3 \times 10^{-2} \times 2 \times 3^3 \times 10^{-1}}{36 \times 45 \times 10^{-2}} \\
 & = \frac{9 \times 10^{-1}}{10} \\
 & = 0.09
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & \frac{4-x}{x} = 3 \quad 4-x = 3x \\
 & 4x = 4 \quad x = 1 \\
 & \frac{6-y}{2-y} = 3 \quad 6-y = 6-3y \\
 & y = 0 \\
 & \text{centre} = (1, 0)
 \end{aligned}$$

3.



$$\text{Area} = 28 \text{ cm}^2$$

$$\begin{aligned}
 \text{Area} &= \frac{28 \times 2,500 \times 2,500}{100 \times 100 \times 100 \times 100} \text{ hectares} \\
 &= 1.75 \text{ Ha}
 \end{aligned}$$

4.

$$\text{Gradient} = \frac{-2-6}{4--2} = \frac{-4}{3}$$

$$\therefore \text{Gradient of } h = \frac{3}{4}$$

$$\text{Mid-point} = \left(\frac{-2+4}{2}, \frac{6-2}{2} \right) = (1, 2)$$

$$\frac{y-2}{x-1} = \frac{3}{4}$$

$$y = \frac{3}{4}x + \frac{5}{4}$$

5.

$$\text{Recip } (3.75) = 0.2667$$

$$0.2667 + 5 \times 0.2267 \times 10^{-2}$$

$$0.2667 + 133.35$$

$$= 133.6167$$

6.

$$144x^3y^2 = y^2 \times x^3 \times 2^4 \times 3^2$$

$$81xy^4 = x \times y^4 \times 3^4$$

$$GCD = x \times y^2 \times 3^2$$

$$= 9xy^2$$

$$9xy^2(16x^2 - 9y^2)$$

$$9xy^2(4x+3y)(4x-3y)$$

7.

$$\text{angle } SPT = 110$$

$$\text{Angle } TSP = 90 - 55 = 35$$

$$\text{Angle } STP = 180 - 110 = 35^\circ$$

8.

$$\text{US \$} = \text{Ksh} = 5,000 \times 101.109 = \text{Kshs } 505,545$$

$$\text{Balance} = 505,545 - 214,500 = \text{Kshs } 291,045$$

$$\begin{aligned} \text{Sterling Pound} &= \frac{291,045}{147.426} = 1,974.18 \\ &= 1,974. \end{aligned}$$

9.

$$\frac{-3x+2(x-2)}{5} = \frac{2(x+2)}{5}$$

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

$$-x-4 = 2x+4$$

$$-3x = 8$$

$$x = \frac{-8}{3} \quad \text{OR} = -2\frac{2}{3}$$

10.

$$Lsf = \sqrt{\frac{9}{25}} = \frac{3}{5}$$

$$VSF = \left(\frac{3}{5}\right)^3 = \frac{27}{125}$$

$$Volume = \frac{125}{27} \times 8.1 = 37.5 \text{ cm}^3$$

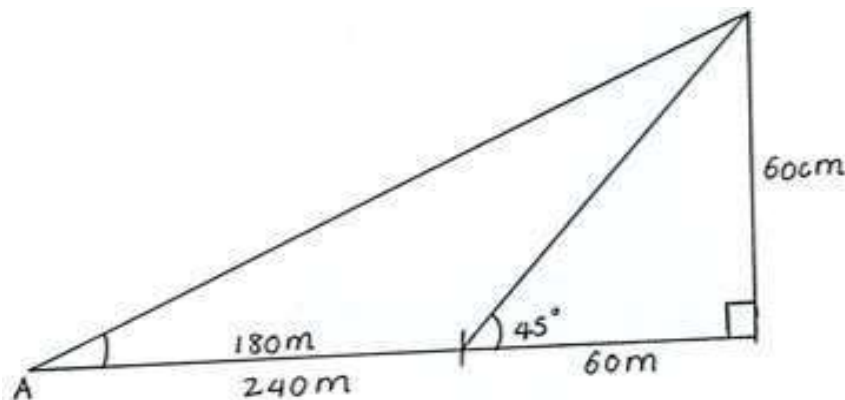
11.

Distance = Area

$$\frac{1}{2} (16+24) \times 8$$

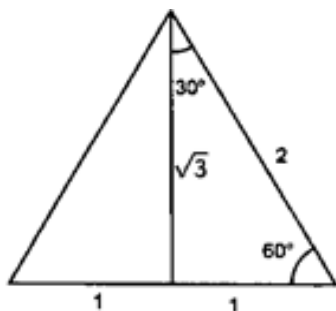
$$= 160$$

13.



$$\frac{h}{60} = \tan 45, h = 60 \tan 45$$

$$\tan \theta = \frac{60 \tan 45}{240}$$



$$3x - 30^\circ = 60^\circ, 420^\circ, 780^\circ, \dots$$

$$3x - 30 = 120^\circ, 480^\circ, 840^\circ, \dots$$

$$\Rightarrow 3x = 90^\circ, 150^\circ, 450^\circ, 510^\circ, 810^\circ, 870^\circ, \dots$$

$$\therefore x = 30^\circ, 50^\circ$$

15.

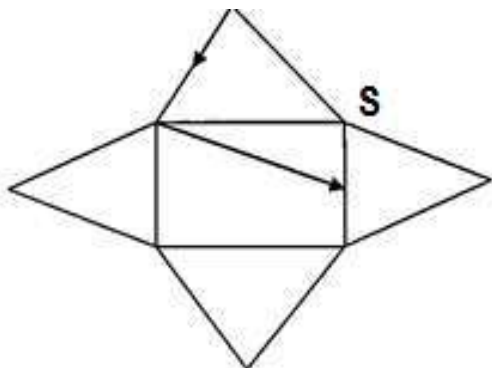
$$\text{Price of the house} = \frac{100}{94} \times 1,269,000$$

$$\text{Sh. } 1,350,000$$

$$\text{Commission} = 1,350,000 - 1,269,000 =$$

$$= \text{Sh. } 81,000$$

16.



$$\text{Distance} = 15 + \sqrt{(144 + 16)}$$

$$= 37.649 \text{ cm}$$

SECTION II (50 Marks)

Answer ONLY FIVE questions in this section in the spaces below each question.

17.

$$\begin{aligned}
 \text{(a) Godana's Deposit} &= \frac{3}{9} \times \frac{40}{100} \times 7,200,000 \\
 &= \text{Shs. } 960,000 \\
 \text{(b) Balance} &= 7,200,000 - \left(\frac{40}{100} \times 7,200,000 \right) \\
 &= 4,320,000 \\
 \text{Total Balance} &= 1.1 \times 4,320,000 \\
 \text{Total Balance} &= 4,752,000 \\
 \frac{4}{9} \times 4,752,000 &= 2,112,000 \\
 \text{(c) Mwanzia's contribution of remaining balance} &= \frac{2}{9} \times 4,752,000 \\
 &= 1,056,000 \\
 \text{Mwanzia's Gross Share} &= \frac{2}{9} \times 8,044,000 \times 0.85 \\
 &= 1,519,422.22 \\
 \text{Macharia's Net Share} &= 1,519,422.22 - 1,056,000 \\
 &= 463,422.22
 \end{aligned}$$

18.

$$\begin{aligned}
 \text{(a) } Lsf &= \frac{14}{20} = 0.7 \\
 \frac{h}{45+h} &= 0.7, \quad h = 31.5 + 0.7h \\
 0.3h &= 31.5, \quad h = 105 \\
 vsf &= 0.7^3 = 0.343 \\
 V_{\text{Frustrum}} &= (1 - 0.343) \times \frac{1}{3} \times \frac{22}{7} \times 20 \times 20 \times 150 \\
 &= 41,297.14 \text{ cm}^3 \\
 \text{(b) Half vol} &= \frac{41,297.14}{2} = 20,648.57 \text{ cm}^3 \\
 \text{Vol of cone} &= \frac{1}{3} \times \frac{22}{7} \times 20 \times 20 \times 150 = 62,857.14 \text{ cm}^3 \\
 1 - vsf &= \frac{20,648.57}{62,857.14} = 0.3285 \\
 vsf &= 1 - 0.3285 = 0.6715 \\
 lsf &= \sqrt[3]{0.6715} = 0.8757 \\
 \frac{r}{20} &= 0.8757 \\
 r &= 20 \times 0.8757 \\
 &= 17.51 \text{ cm}
 \end{aligned}$$

$$(a) Lsf = \frac{14}{20} = 0.7$$

$$\frac{h}{45+h} = 0.7, \quad h = 31.5 + 0.7h$$

$$0.3h = 31.5, \quad h = 105$$

$$vsf = 0.7^3 = 0.343$$

$$V_{Frustrum} = (1 - 0.343) \times \frac{1}{3} \times \frac{22}{7} \times 20 \times 20 \times 150$$

$$= 41,297.14 \text{ cm}^3$$

$$(b) \text{Half vol} = \frac{41,297.14}{2} = 20,648.57 \text{ cm}^3$$

$$\text{Vol of cone} = \frac{1}{3} \times \frac{22}{7} \times 20 \times 20 \times 150 = 62,857.14 \text{ cm}^3$$

$$1 - vsf = \frac{20,648.57}{62,857.14} = 0.3285$$

$$vsf = 1 - 0.3285 = 0.6715$$

$$lsf = \sqrt[3]{0.6715} = 0.8757$$

$$\frac{r}{20} = 0.8757$$

$$r = 20 \times 0.8757$$

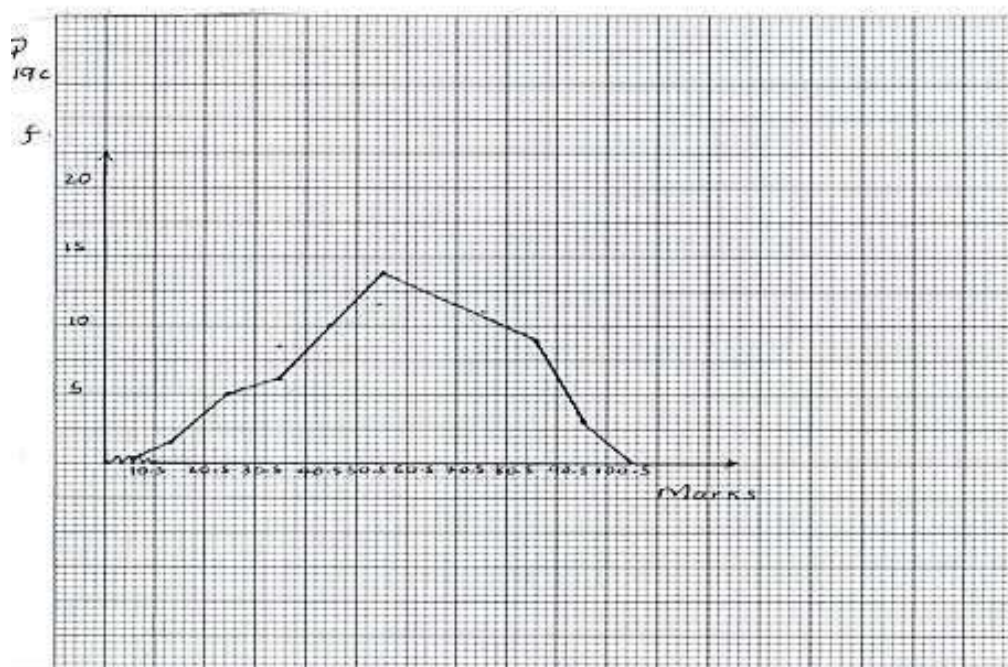
$$= 17.51 \text{ cm}$$

19.

Marks	x	f	fx	CF
11-20	15.5	2	31.0	2
21-30	25.5	5	127.5	7
31-40	35.5	6	213.0	13
41-50	45.5	10	456.0	23
51-60	55.5	14	777.0	37
61-70	65.5	11	720.5	48
71-80	75.5	9	679.5	57
81-90	85.5	3	256.5	60
Total		60	3,261	

$$\text{Mean} = \frac{3,261}{60} = 54.35$$

$$\begin{aligned}\text{Median} &= 50.5 + (30 - 27) \times \frac{10}{14} \\ &= 50.5 + \frac{30}{14} \\ &= 52.64\end{aligned}$$



20.

(a) Cow cost Ksh x , goat cost Ksh y .

$$8x + 12y = 294,000$$

$$9x + 15y = 337,500$$

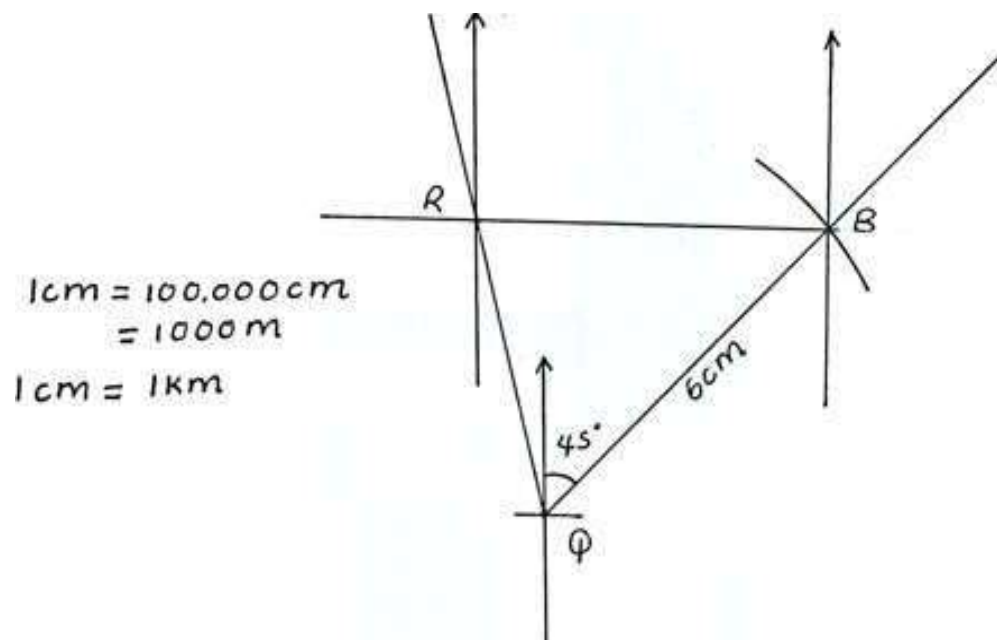
$$(b) \begin{pmatrix} 8 & 12 \\ 9 & 15 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 294,000 \\ 337,500 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{12} \begin{pmatrix} 15 & -12 \\ -9 & 8 \end{pmatrix} \begin{pmatrix} 294,000 \\ 337,500 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 30,000 \\ 4,500 \end{pmatrix}$$

Cow cost 30,000, goat Kshs 4,500.

21.



22.

$$\frac{h}{160} = \tan 67$$

$$h = 160 \tan 67$$

$$= 376.9\text{m}$$

$$HQ = \sqrt{160^2 + 420^2}$$

$$HQ = \sqrt{202,000}$$

$$HQ = 449.4\text{m}$$

$$\tan \theta = \frac{376.9}{449.4} = 0.8387$$

$$\theta = 40^\circ$$

$$HR = \frac{376.9}{\tan 35}$$

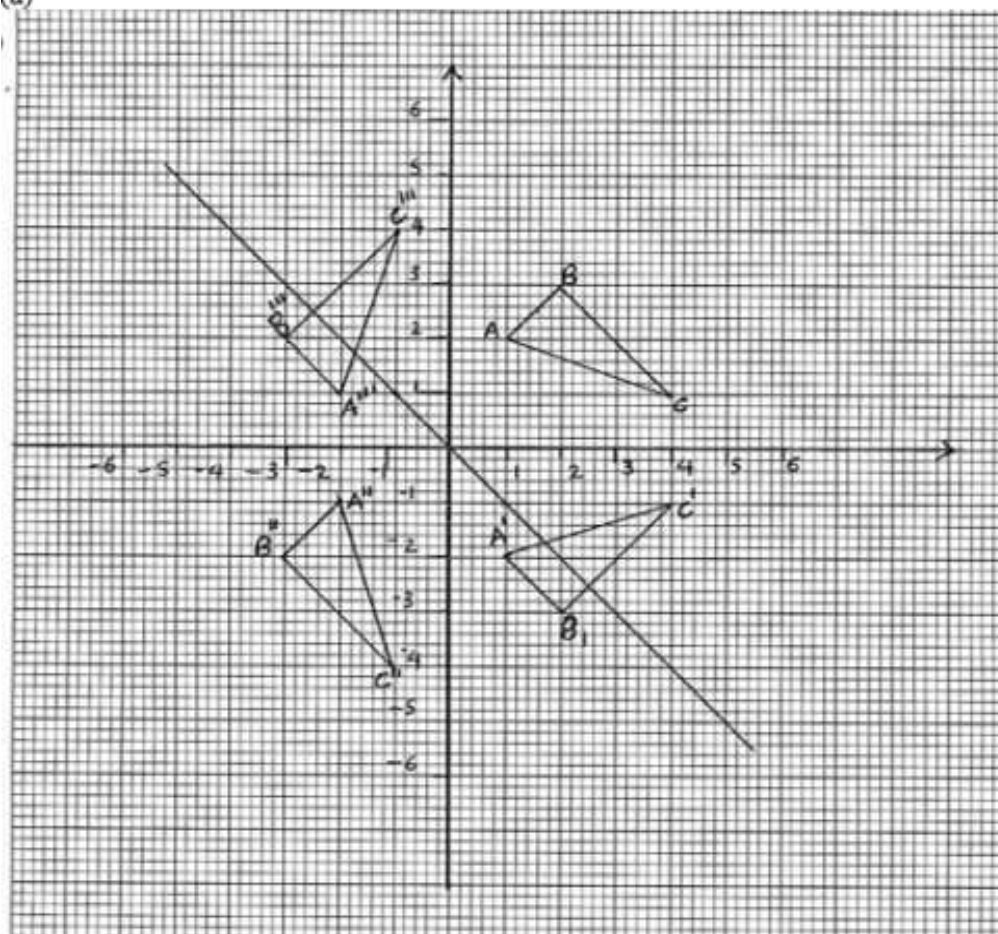
$$HR = 538.3\text{m}$$

$$PR = \sqrt{538.3^2 - 160^2}$$

$$= 513.94\text{m}$$

23.

(a)



- | | |
|------|----------------------------------|
| (a)B | ΔABC |
| 1 | $\checkmark$ drawn |
| B1 | $\Delta A^1 B^1 C^1$ |
| B1 | drawn |
| B2 | Bisection in |
| | $y=0$ |
| (b)B | Reflection, |
| 2 | line $y=0$ or x |
| | $-axis$ |
| (c) | Line $y=-x$ |
| | drawn |
| B3 | $\Delta A^{11} B^{11} C^{11}$ |
| | $\checkmark$ drawn |
| | Correct angle |
| | and |
| | direction. |
| | Construction |
| | of sides |
| | $\Delta A^{11} B^{11} C^{11}$ |
| | drawn |
| | $\Delta A^{111} B^{111} C^{111}$ |
| | $\checkmark$ drawn |

24.

$$(a) \ v = \frac{ds}{dt} = 3t^2 - 8t + 4$$

$$v = 3(3^2) - 8(3) + 4$$

$$v = 7 \text{ m/s}$$

$$(b) \ 3t^2 - 8t + 4 = 0$$

$$3t^2 - 6t - 2t + 4 = 0$$

$$3t(t-2) - 2(t-2) = 0$$

$$(3t-2)(t-2) = 0$$

$$\text{Either } 3t=2 \Rightarrow t = \frac{2}{3} \quad \text{OR} \quad \frac{8 \pm 4}{6} = 0.6667 \quad \text{OR} \quad 0.6$$

$$\text{Or } t = 2$$

$$(c) \ S = \left(\frac{2}{3}\right)^3 - 4\left(\frac{2}{3}\right)^2 + 4\left(\frac{2}{3}\right) + 3 = 4\frac{4}{27} \text{ or } \underline{4.185}$$

$$S = 2^3 - 4(2)^2 + 4(2) + 3 = 3$$

$$(d) \ a = \frac{dv}{dt} = 6t - 8$$

$$6(2) - 8 = 4$$