

FORM FOUR CLUSTER KCSE MODEL 2

MATHEMATICS PAPER 1 ANSWER

SECTION 1 (50 Marks)

Answer all the questions from this section

1.

$$3,375 = 3^3 \times 5^3$$

$$315 = 3^2 \times 5 \times 7$$

$$\frac{3^4 \times 5^2 \times 7^2}{\sqrt[3]{3^3 \times 5^3}} = \frac{3^4 \times 5^2 \times 7^2}{3 \times 5}$$
$$= 3^3 \times 5 \times 7^2$$

2.

$$= \frac{-5 \times -21}{-35}$$

$$= \frac{105}{-35}$$

$$= -3$$

3.

$$\frac{1}{2}(5x - 4) \leq x + 5 \frac{1}{2}$$

$$5x - 4 \leq 2x + 11$$

$$3x \leq 15$$

$$x \leq 5$$

$$x + \frac{11}{2} < 3x + \frac{3}{2}$$

$$2x + 11 < 6x + 3$$

$$-4x < -8$$

$$2 < x$$

$$2 < x \leq 5$$

$$3, 4, 5$$

4.

$$\frac{2x(3x^2 - 5xy - 12y^2)}{4x(9x^2 - 16y^2)}$$

$$\frac{(x - 3y)(3x + 4y)}{2(3x - 4y)(3x + 4y)}$$

$$\frac{(x - 3y)}{2(3x - 4y)}$$

5.

$$3x + 4y = 9$$

$$2x + y = 1$$

$$3x + 4y = 9$$

$$\underline{8x + 4y = 2}$$

$$-5x = 1$$

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

$$y = 2 - \left(2 \times -\frac{1}{5} \right)$$

$$y = 2\frac{2}{5}$$

6.

$$\frac{\frac{1}{2} \times \frac{7}{2} + \frac{3}{2} \left(\frac{5}{2} - \frac{2}{3} \right)}{\frac{3}{4} \times \frac{5}{2} \times \frac{2}{1}}$$

$$\frac{\frac{7}{4} + \frac{3}{2} \times \frac{11}{6}}{\frac{15}{4}} = \frac{18}{4} \times \frac{4}{15}$$

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

7.

$$2,000 \times 75 = 150,000$$

$$\text{Amount remaining} = 150,000 - 60,000 = 90,000$$

$$\frac{90,000}{4.50} \times 100$$

$$= 2,000,000$$

8.

$$m_1 = \frac{-2 - 0}{6 - 0} = -\frac{1}{3}$$

$$m_2 = 3$$

$$\text{Midpoint of AB} = (3, -1)$$

$$\frac{y+1}{x-3} = 3$$

$$y = 3x - 10$$

$$3x - y - 10 = 0$$

9.

$$12 = 2^2 \times 3$$

$$18 = 2 \times 3^2$$

$$60 = 2^2 \times 3 \times 5$$

$$LCM = 2^2 \times 3^2 \times 5$$

$$= 180 \text{ Seconds}$$

Will ring together at 6.33pm, 6.36 pm and 6.39 pm

10.

$$\tan 48^\circ = \frac{h}{4}, \quad h = 4 \tan 48$$

$$\tan 38 = \frac{h}{4+x}, \quad h = (4+x) \tan 38$$

$$4 \tan 48 = (4+x) \tan 38$$

$$4.442 = 3.125 + 0.7813x$$

$$x = \frac{1.317}{0.7813}$$

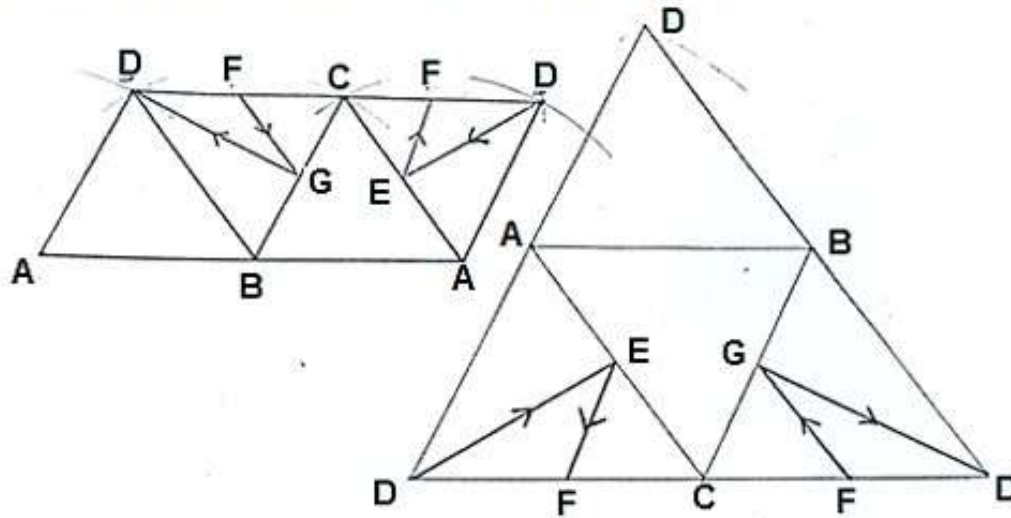
$$x = 1.686m$$

$$\text{Shadow is} = (4 + 1.686) = 5.686m$$

11.

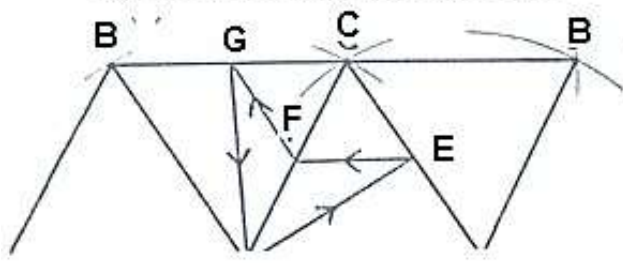
a)

(a) Draw and label a net of this tetrahedron



b)

(b) On the net show the path



12.

$$\begin{aligned}
 6A + 7B &= 84 \\
 3A + 2B &= 33 \\
 6A + 7B &= 84 \\
 6A + 4B &= 66 \\
 \hline
 3B &= 18 \\
 B &= 6 \\
 3A &= 21 \\
 A &= 7
 \end{aligned}$$

13.

$$\begin{aligned}
 \text{Area of } A &= 20 \times 10 = 200 \\
 B &= 25 \times 15 = 375 \\
 \text{Frequency of } A &= \frac{200 \times 15}{375} \\
 &= 8
 \end{aligned}$$

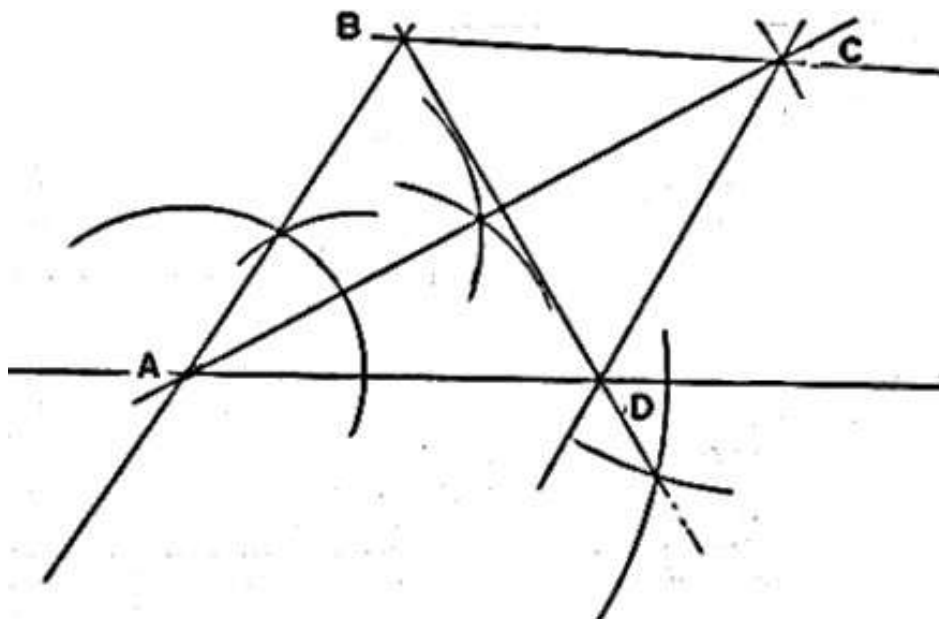
14.

$$\begin{aligned}(2n-4)90^\circ &= 90 + 126(n-1) \\ 180n - 360 &= 90 + 126n - 126 \\ 54n &= 324 \\ n &= 6\end{aligned}$$

15.

$$\begin{aligned}\text{Mass of the mixture} &= (3.5 \times x) + (2.4 \times 50) \\ &= 3.5x + 120 \\ \frac{3.5x + 120}{x + 50} &= 2.7 \\ 0.8x &= 15 \\ x &= 18.75 \text{ cm}^3\end{aligned}$$

16.



SECTION II (50 Marks)

Answer only five questions from this section

17.

$$(i) \quad \frac{360}{x}$$

$$(ii) \quad \frac{360}{x+4}$$

$$\frac{3600}{x+4} + 30 = \frac{3600}{x}$$

$$3600x + 30x^2 + 120x = 3600x + 14400$$

$$30x^2 + 120x - 14400 = 0$$

$$x^2 + 4x - 480 = 0$$

$$(x+2)^2 = 484$$

$$x = \pm 22 - 2$$

$$x = 20 \text{ or } x = -24$$

$$x = 20$$

$$\frac{3600}{20+4}$$

$$= \frac{3600}{24}$$

$$= sh.150$$

18.

$$2P + J = 1080$$

$$4J - 5P = 420$$

$$J + 2P = 1080$$

$$4J - 5P = 420$$

$$\begin{pmatrix} 1 & 2 \\ 4 & -5 \end{pmatrix} \begin{pmatrix} J \\ P \end{pmatrix} = \begin{pmatrix} 1080 \\ 420 \end{pmatrix}$$

$$-\frac{1}{13} \begin{pmatrix} -5 & -2 \\ -4 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 4 & -5 \end{pmatrix} \begin{pmatrix} J \\ P \end{pmatrix} = -\frac{1}{13} \begin{pmatrix} -5 & -2 \\ -4 & 1 \end{pmatrix} \begin{pmatrix} 1080 \\ 420 \end{pmatrix}$$

$$\begin{pmatrix} J \\ P \end{pmatrix} = \begin{pmatrix} 480 \\ 300 \end{pmatrix}$$

$$1 \text{ Jembe} = \text{sh. } 480$$

$$1 \text{ Panga} = \text{sh. } 300$$

Let the number of jembes be x and pangas be $x+2$,

$$360x + 360(x+2) = 2880$$

$$720x + 720 = 2880$$

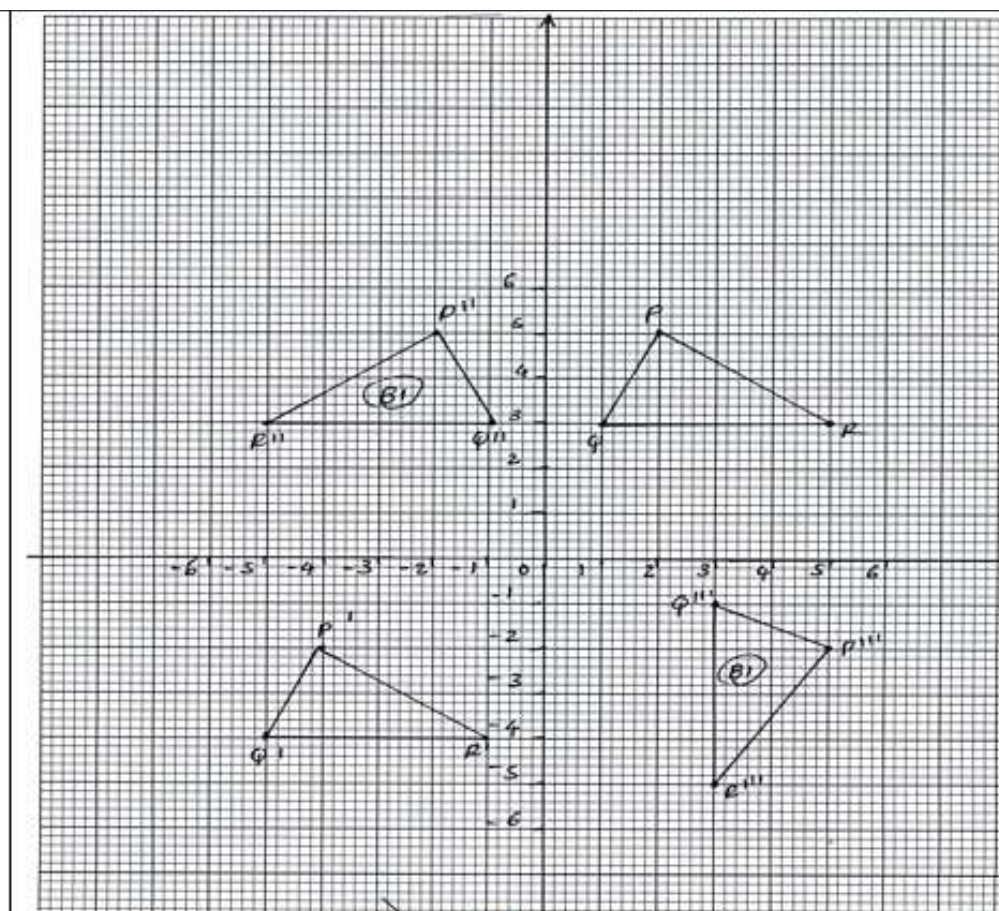
$$x = 3$$

$$\text{Pangas} = 3 + 2 = 5$$

$$(5 \times 300) + (3 \times 480) = 2940$$

$$\begin{aligned} \text{Price difference} &= 2940 - 2880 \\ &= \text{Sh. } 60 \end{aligned}$$

19.



(a) Translation ; Vector $\vec{T} = \begin{pmatrix} -6 \\ -7 \end{pmatrix}$

(b) $P^{11}(-2, 5), Q^{11}(-1, 3), R^{11}(-5, 3)$

(c) $P^{111}(2, -5), Q^{111}(1, -3), R^{111}(-5, -3)$

$P^{111}(5, -2), Q^{111}(3, -1), R^{111}(3, -5)$

(d) Reflection mirror line $y = x$

(e) (i) $\Delta P^{11}Q^{11}R^{11}$ and $P^{111}Q^{111}R^{111}$

PQR and $P^{11}Q^{11}R^{11}$

(ii) ΔPQR and $P^1Q^1R^1$

$P^1Q^1R^1$ and $P^{111}Q^{111}R^{111}$

20.

$$(a) (i) a - b$$

$$(ii) 3a - 2b$$

$$(b)(i) b + h(a - b)$$

$$= ha + (1 - h)b$$

$$(ii) ha + (1 - h)b = k(3a + 2b)$$

$$= 3ka + 2kb$$

$$3k = h$$

$$2k = 1 - h$$

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

$$(c) \quad h = \frac{3}{5}$$

$$\frac{1}{5} : \frac{4}{5}$$

$$= 1 : 4$$

21.

$$\frac{400}{80} = 5$$

$$(a) 7.00 + 5.00$$

$$12.00 \text{ noon}$$

$$400 - 80 = 320 \text{ km}$$

$$(b) \text{ Relative speed } 12 + 80 = 200 \text{ km/hr}$$

$$\frac{320}{200} = 1 \frac{3}{5}$$

$$= 8.00 + 1.36$$

$$= 9.36 \text{ am}$$

$$(c) \frac{8}{5} \times 80 = 128$$

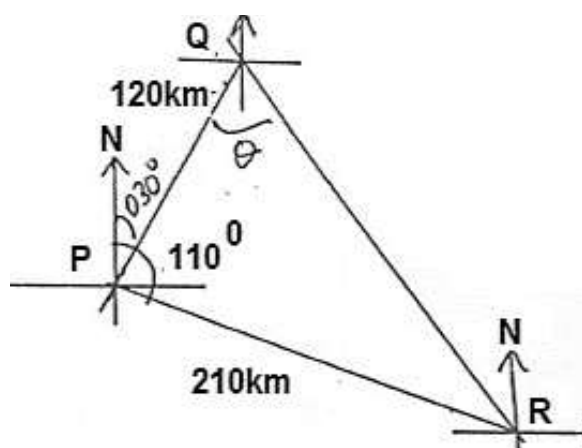
$$128 + 80 = 208$$

$$\frac{400}{120} \times 80 = 226 \frac{2}{3}$$

$$(d) 400 - \left(226 \frac{2}{3} + 80 \right)$$

$$= 53 \frac{1}{3}$$

22.



$$QR^2 = 120^2 + 210^2 - 2(120)(210) \cos 80^\circ$$

$$QR = \sqrt{49748.13}$$

$$QR = 223$$

$$\frac{\sin 80^\circ}{223} = \frac{\sin \theta}{210}$$

$$\sin \theta = \frac{\sin 80^\circ}{223} \times 210$$

$$\theta = 68^\circ$$

$$68 - 30 = 38$$

$$\begin{aligned} \text{Bearing of R from Q} &= 180 - 38 \\ &= 142 \end{aligned}$$

23.

(a) (i) Area of cross-section = $\frac{1}{2} \times 2^2 \times 6 \times \sin 60^\circ$

$$\begin{aligned} \text{Volume} &= \frac{1}{2} \times 2^2 \times 5 \times 6 \sin 60^\circ \\ &= 51.96 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad \frac{1}{2} \times 4^2 \times \sin 60^\circ \times 6 \times 2 \\ &= 83.14 \text{ cm}^2 \end{aligned}$$

(b) (i) Volume of cylindrical part = $\frac{22}{7} \times 2.1 \times 2.1 \times 5$
 $= 69.3$

$$\begin{aligned} \text{Volume of lock nut} &= 83.14 - (69.3 - 51.96) \\ &= 100.5 \text{ cm}^3 \end{aligned}$$

24.

$$v = \int \frac{dv}{dt} = \int (10t + 1) dt$$

(a) $v = 5t^2 + t + c$ when $t = 0$, $v = -4$

Therefore, $v = 5t^2 + t - 4$

(b) $v = 5(3)^2 + 3 - 4 = 44 \text{ m/s}$

(c) The particles is at rest when $v = 0$,

$$5t^2 + t - 4 = 0$$

$$5t^2 + 5t - 4t - 4 = 0$$

$$(5t - 4)(t + 1) = 0$$

$$t = -1 \text{ or } t = 0.8 \text{ s}$$

Therefore $t = 0.8 \text{ s}$

(d) $s = \int_2^4 (5t^2 + t - 4) dt$

$$\left[\frac{5t^3}{3} + \frac{t^2}{2} - 4t \right]_2^4$$

$$\left(\frac{5}{3}(4)^3 + \frac{4^2}{2} - 4(4) \right) - \left(\frac{5}{3}(2)^3 + \frac{2^2}{2} - 8 \right)$$

$$98.67 - 0.67 = 98 \text{ m}$$