

FORM FOUR CLUSTER KCSE MODEL8

MATHEMATICS PAPER 2 ANSWER

SECTION I (50 Marks)

Answer all questions

1.

$$\begin{aligned}\text{Actual perimeter} &= 20.0 + 20.0 + 20.0 + 20.0 + 20.0 \\ &= 100.0\end{aligned}$$

$$\begin{aligned}\text{Maximum perimeter} &= 20.05 + 20.05 + 20.02 + 20.5 + 20.5 \\ &= 100.25\end{aligned}$$

$$\begin{aligned}\text{Percentage error in perimeter} \\ &= \frac{100.25 - 100.0}{100.0} \times 100\% \\ &= 0.25\%\end{aligned}$$

2.

Tap P alone $\frac{1}{30}$ of the tank in 1 minute.

Tap Q alone $\frac{1}{25}$ of the tank in 1 minute.

R alone $\frac{1}{60}$ of the tank in 1 minute

In 5 minutes P and Q running

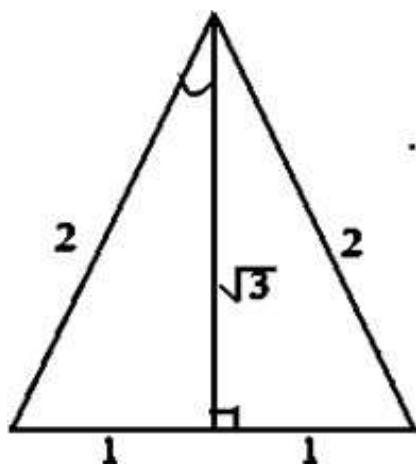
$$S = \left(\frac{1}{30} + \frac{1}{25}\right) = \frac{11}{30}$$

$$\text{Fraction remaining } 1 - \frac{11}{30} = \frac{19}{30}$$

$$\text{Three taps running (1 minute) } \frac{1}{30} + \frac{1}{25} - \frac{1}{60} = \frac{17}{300}$$

$$\text{Duration to fill the tank } \frac{19}{30} \div \frac{17}{300} = 11\frac{3}{17} \text{ minutes.}$$

3.



$$2^2 - 1^2 = h^2$$

$$\sqrt{3} = h$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\begin{aligned} \frac{\sqrt{2}}{1 - \cos 30^\circ} &= \frac{\sqrt{2}}{1 - \frac{\sqrt{3}}{2}} \\ &= \frac{\sqrt{2}}{\left(1 - \frac{\sqrt{3}}{2}\right)\left(1 + \frac{\sqrt{3}}{2}\right)} \\ &= \frac{\sqrt{2} + \frac{\sqrt{6}}{2}}{1 + \frac{3}{4}} \\ &= \frac{\sqrt{2} + \frac{\sqrt{6}}{2}}{\frac{1}{4}} \\ &= 4\sqrt{2} + 2\sqrt{6} \end{aligned}$$

4.

$$M \propto L R^2$$

$$M = K L R^2$$

$$6,000 = K \times 30 \times 4.9$$

$$6,000 = 147K$$

$$K = \frac{2,000}{49} L R^2$$

$$M = \frac{2,000}{49} \times 25 \times 7$$

$$= 7,142 \frac{6}{7}$$

$$= 7 \frac{1}{7} kg$$

5.

$$a b^2 = -bc - d$$

$$a b^2 + bc + d = 0$$

$$a b^2 + cb + d = 0$$

$$ab^2 + cb = -d$$

$$b^2 + \frac{c}{a}b = \frac{-d}{a}$$

$$b^2 + \frac{c}{a}b + \left(\frac{c}{2a}\right)^2 = \frac{-d}{a} + \left(\frac{c}{2a}\right)^2$$

$$\left(b + \frac{c}{2a}\right)^2 = \frac{-d}{a} + \frac{c^2}{4a^2}$$

$$\left(b + \frac{c}{2a}\right)^2 = \frac{c^2 - 4ad}{4a^2}$$

$$b + \frac{c}{2a} = \sqrt{\frac{c^2 - 4ad}{4a^2}}$$

$$b = \frac{-c \pm \sqrt{c^2 - 4ad}}{2a}$$

6.

$$AT^2 = BT \times CT$$

$$AT^2 = 16 \times 5$$

$$AT^2 = 80$$

$$AT = \sqrt{80}$$

$$= 8.944 \text{ cm}$$

7.

$$A=60,000$$

$$\text{Sum of terms in an A.P} = \frac{n}{2} \left[2a + (n-1)d \right]$$

$$32,400,000 = \frac{5}{2} \left[2(60,000) + (5-1)d \right]$$

$$32,400,000 = \frac{5}{2}(120,000 + 4d)$$

$$12,840,000 = 4d$$

$$3,210,000 = d$$

$$\text{Monthly increment of Ksh } 3,210,000$$

8. Arranging the numbers in ascending order
1,1,2,2,3,4,5,6,7,8,9,10 = 2

$$Q_1 = 2$$

$$Q_3 = 7$$

$$\frac{Q_1 - Q_2}{2} = \frac{7 - 2}{2}$$

$$2.5$$

- 9.

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

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

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

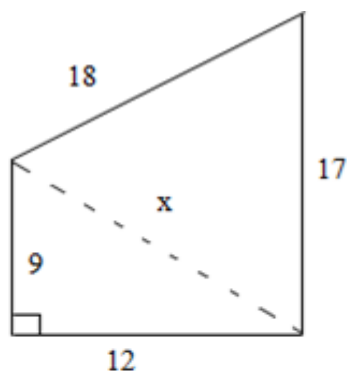
$$3y + 2 = 10(y - 4)$$

$$= 10y - 40$$

$$7y = 42$$

$$y = 6$$

- 10.



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

$$= 15$$

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

$$= 25$$

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

$$= 118.3216 + 54$$

$$= 172.3216 \text{ cm}^2$$

- 11.

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

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

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

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

$$\frac{35}{12} \text{ will take } \frac{35}{12} \text{ hrs}$$

12.

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

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

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

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

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

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

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

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

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

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

$$42n - 33.67n = 276$$

$$8.33n = 276$$

$$n = 33.13$$

$$n = 33$$

Subst in (i)

$$9m + 3n = 30$$

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

$$9m = 30 - 99$$

$$= -69$$

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

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

Equation

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

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

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

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

$$= -276 + 198$$

$$= -78$$

13.

Grades A and B in the ratio 4:3

Grade A shs 30 per kg

Grade B shs 27 per kg

$$\frac{4}{7} \times 30 + \frac{3}{7} \times 27 = \text{Shs } 28.71$$

Mixture costs shs 28.71

$$100\% - 28.71$$

$$130\% - ?$$

$$\frac{130 \times 28.71}{100} = \text{Shs } 37.33$$

14.

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

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

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

$$x^2 - \frac{3}{2}x + \left(-\frac{3}{4}\right)^2 + y^2 + y + \left(\frac{1}{2}\right)^2 = \frac{1}{4} + \left(\frac{3}{4}\right)^2 + \frac{1}{4}$$

$$\left(x - \frac{3}{4}\right)^2 + \left(y + \frac{1}{2}\right)^2 = \frac{17}{16}$$

$$(x-h)^2 + (y-k)^2 = r^2$$

$$r^2 = \frac{17}{16}$$

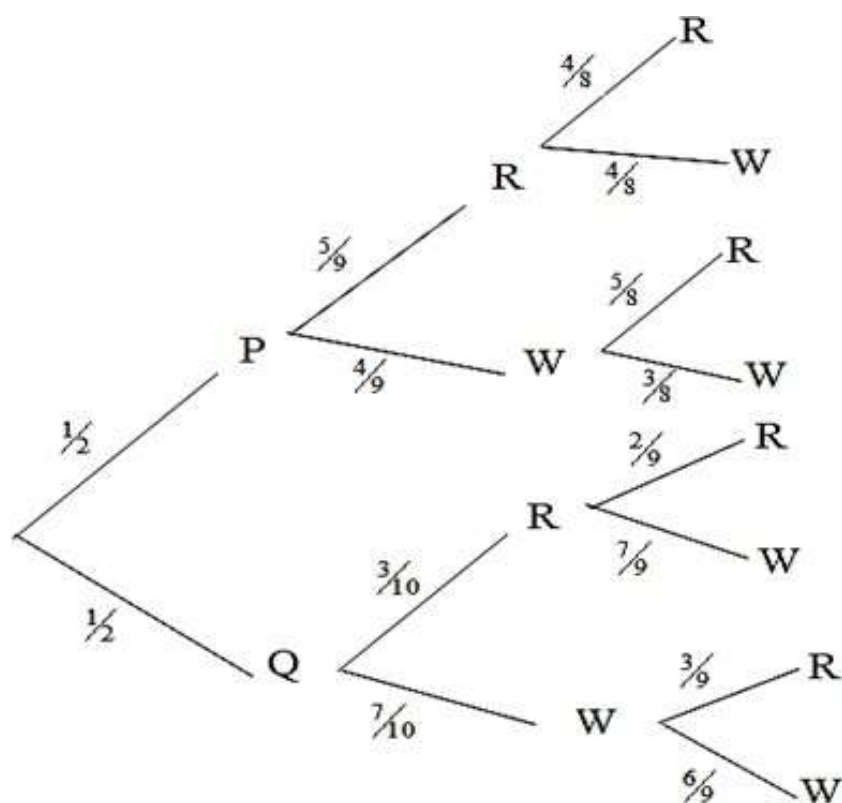
$$r = 1.031$$

$$\text{Centre } \left(\frac{3}{4}, -\frac{1}{2}\right)$$

15.

$$\begin{array}{l} y = 2x^2 \\ \frac{dy}{dx} = 4x \\ \text{gradient} = -4 \end{array} \left| \begin{array}{l} m_1 \times m_2 = -1 \\ m_2 = \frac{-1}{-4} = \frac{1}{4} \end{array} \right| \begin{array}{l} \frac{1}{4} = \frac{\Delta y}{\Delta x} \\ \frac{1}{4} = \frac{y-4}{x+1} \\ y-4 = \frac{1}{4}(x+1) \\ y = \frac{1}{4}x + \frac{1}{4} + 4 \\ y = \frac{1}{4}x + 4\frac{1}{4} \end{array}$$

16.



$$\begin{aligned}
 P(\text{Same colour}) &= P(\text{P R R}) \text{ or } P(\text{Q W W}) \\
 &= P(\text{P W W}) \text{ or } P(\text{Q R R}) \\
 &= \left(\frac{1}{2} \times \frac{5}{9} \times \frac{4}{8}\right) + \left(\frac{1}{2} \times \frac{4}{9} \times \frac{3}{8}\right) + \left(\frac{1}{2} \times \frac{3}{10} \times \frac{2}{9}\right) + \left(\frac{1}{2} \times \frac{7}{10} \times \frac{6}{9}\right) \\
 &= \frac{22}{45}
 \end{aligned}$$

SECTION II (50 Marks)

(Answer any FIVE questions in the spaces provided)

17.

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

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

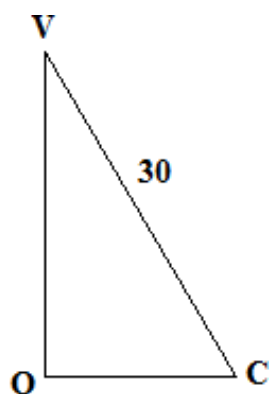
$$\begin{aligned} \text{ii) Amount paid} &= \text{Ksh.}60\,000 \times 25 \times 0.95 \\ &= \text{Ksh.}1425\,000 \end{aligned}$$

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

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

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

18.



$$a) 1.0 = \frac{1}{2} \left(\sqrt{20^2 + 14^2} \right)$$

$$= \frac{1}{2} \sqrt{400 + 196}$$

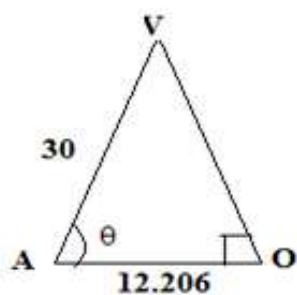
$$= 12.206$$

$$VO = \sqrt{30^2 - 12.06^2}$$

$$= \sqrt{900 - 149}$$

$$= \sqrt{751}$$

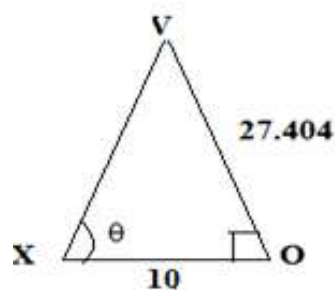
$$= 27.404 \text{ cm}$$



$$\cos \theta = \frac{12.206}{30}$$

$$= 0.4069$$

$$\theta = 65.98^\circ$$



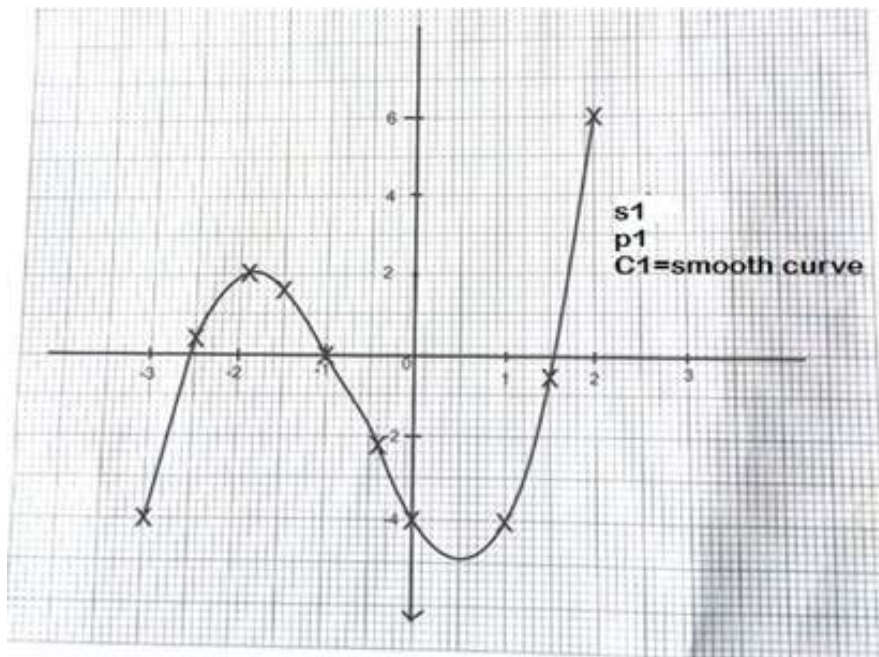
$$\tan \theta = \frac{27.404}{10}$$

$$= 2.7404$$

$$\theta = 69.95^\circ$$

19.

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



iii) a) $x = 2.6$

-1.....

1.55.....

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

$(0.5, -4.9)$

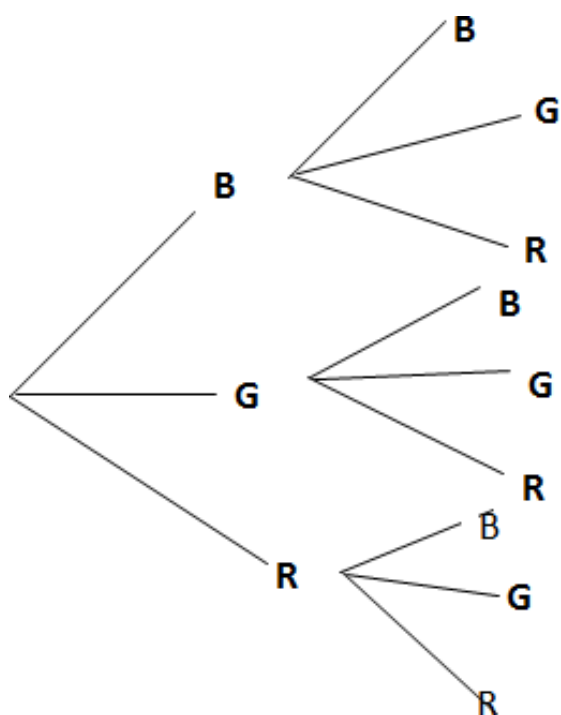
20.

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

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

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

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



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

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

21.

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

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

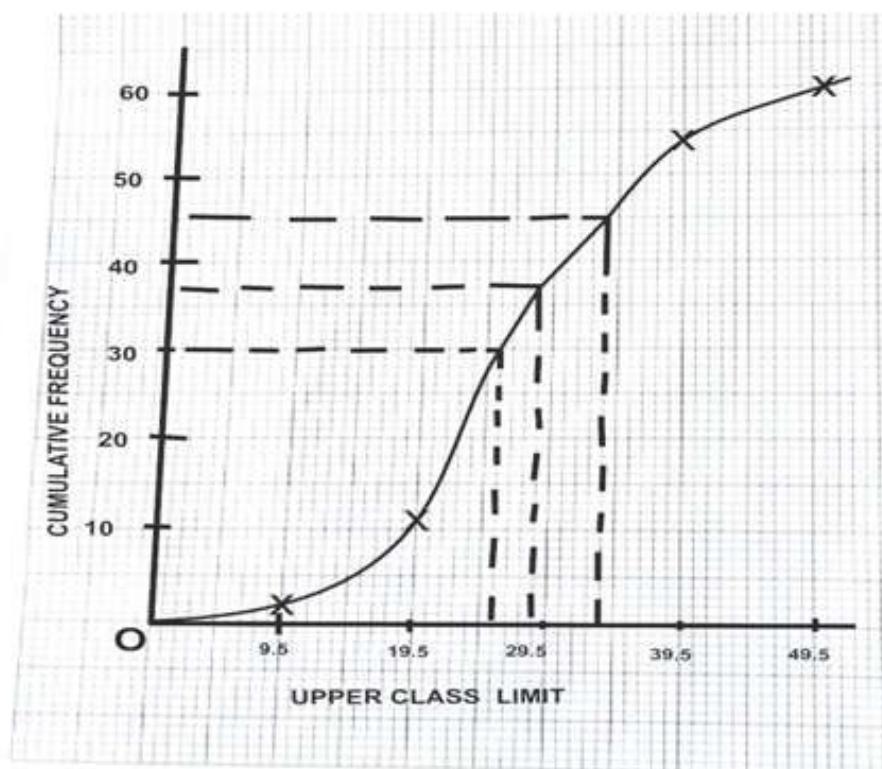
c) $\angle OQS = 18^\circ$

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

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

22.

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) $Q_1 = 18.5$

$Q_3 = 33.5$

$Q_3 - Q_1$

$33.5 - 18.5 = 15$

23.

a) (i) Younger child's age = $x - 5$ years

(ii) Parent's age = $[x + (x - 5)] \times 2$
 $= 4x - 10$

b)(i) $(x + 20), (x + 15), (4x + 10)$

$(x + 20)(x + 15) = 15(4x + 10)$

$x^2 - 25x + 150 = 0$

$(x - 10)(x - 15) = 0$

$x = 10$ or $x = 15$

(ii) $4 \times 10 - 10$ or $4 \times 15 - 15$
 $= 30$ $= 50$

(iii) $(10 - 5) + 20$ or $(15 - 5) + 20$
 $= 25$ $= 30$

24.

$$(a) \quad (i) \quad \vec{AB} = \vec{b} - \vec{a}$$

$$(ii) \quad \vec{BM} = \frac{1}{4} \vec{BA} \\ = \frac{1}{4} (\vec{a} - \vec{b})$$

$$(iii) \quad \vec{OM} = \vec{OB} + \vec{BM} \\ = \vec{b} + \frac{1}{4} (\vec{a} - \vec{b})$$

$$= \frac{1}{4} \vec{a} + \frac{3}{4} \vec{b}$$

$$(b) \quad \vec{AB} = \begin{pmatrix} 4 \\ -2 \end{pmatrix} - \begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$$

$$|\vec{AB}| = \sqrt{2^2 + (-5)^2}$$

$$= \sqrt{29}$$

$$= 5.385 \text{ units.}$$

$$(c) \quad \vec{OM} = \frac{3}{4} \vec{b} + \frac{1}{4} \vec{a} = \frac{1}{4} (3\vec{b} + \vec{a})$$

$$\vec{MC} = \vec{MB} + \vec{BC}$$

$$= \frac{1}{4} (\vec{b} + \vec{a}) + \frac{1}{3} \vec{a}$$

$$= \frac{1}{4} \vec{b} - \frac{1}{4} \vec{a} + \frac{1}{3} \vec{a}$$

$$= \frac{3\vec{b} + \vec{a}}{12}$$

$$= \frac{1}{12} (3\vec{b} + \vec{a})$$

$$\vec{OM} : \vec{MC} = \frac{1}{4} (3\vec{b} + \vec{a}) : \frac{1}{12} (3\vec{b} + \vec{a})$$

Common point M

$\therefore$ they are collinear.