

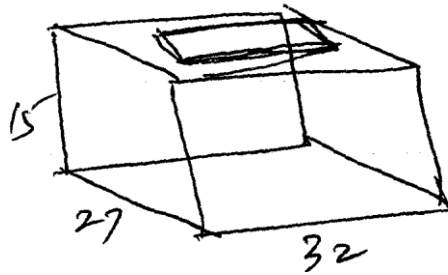
FORM THREE
END TERM 2 EXAM 2024
MATHEMATICS 121/1
MARKING SCHEME

No.	SECTION 1																														
1.	$\frac{3}{4} + 1\frac{7}{7} \div \frac{4}{7} \times \frac{7}{3}$ $= \frac{3}{4} + \frac{9}{7} = \frac{21+36}{28} = \frac{57}{28}$ $\left(\frac{80-35}{56}\right) \times \frac{2}{3}$ $= \frac{45}{56} \times \frac{2}{7}$ $= \frac{15}{28}$ $= \frac{57}{28} \times \frac{28}{15} = \frac{19}{5}$ $= 3\frac{4}{5}$	M1 M1 A1																													
2.	$\frac{7}{12} \times \frac{13}{18} = \frac{91}{216}$ $= \frac{91}{216} \times \frac{5}{18} = \frac{91+60}{216} = \frac{151}{216}$ $\left(\frac{5}{18} \div \frac{65}{216}\right) 100$ $= \frac{5}{18} \times \frac{216}{65} \times 100 = \frac{1200}{13}$ $= 92\frac{4}{13}\%$	M1 M1 M1 A1																													
3	<p>L.C.M $2^3 \times 5^2 \times 11$</p> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr><td></td><td style="text-align: center;">1400</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">700</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">350</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">175</td></tr> <tr><td style="text-align: center;">5</td><td style="text-align: center;">35</td></tr> <tr><td style="text-align: center;">5</td><td style="text-align: center;">7</td></tr> <tr><td style="text-align: center;">7</td><td style="text-align: center;">1</td></tr> </table> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr><td></td><td style="text-align: center;">1960</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">980</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">490</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">245</td></tr> <tr><td style="text-align: center;">5</td><td style="text-align: center;">47</td></tr> <tr><td style="text-align: center;">7</td><td style="text-align: center;">7</td></tr> <tr><td style="text-align: center;">7</td><td style="text-align: center;">1</td></tr> </table> <p style="text-align: center;">$N = 2^3 \times 5 \times 7^2$</p>		1400	2	700	2	350	2	175	5	35	5	7	7	1		1960	2	980	2	490	2	245	5	47	7	7	7	1	M1	
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	<table border="1"> <tr> <td></td> <td>70</td> </tr> <tr> <td>2</td> <td>35</td> </tr> <tr> <td>5</td> <td>7</td> </tr> </table> <p style="text-align: center;">L.C.M</p> $2^3 \times 5^2 \times 7^2 \times 11$ $n = 2 \times 5 \times 11 \times 7$ $= 770$		70	2	35	5	7	M1	
	70								
2	35								
5	7								
4	<p style="text-align: center;">At 9.50am , the bus has travelled</p> $\left(\frac{20}{60} \times 60\right) = 20km$ <p style="text-align: center;">The distance between the two vehicles at 9.50am</p> $(65 - 45)$ $= 20km$ <p style="text-align: center;">Rel . speed = 140 km/ h.</p> <p style="text-align: center;">It will take them $\frac{45}{140}$ hrs since</p> <p style="text-align: center;">Leaving Kitale.</p> <p style="text-align: center;">Distance covered at the time Matatu</p> <p style="text-align: center;">Met the bus</p> $= \frac{45}{140} \times 80 = 25.71km$	B1							
5	$M\left(\frac{6+2}{2}, \frac{3+1}{2}\right) = (4,2)$ $\text{Gradient} = \frac{1-3}{6-2} = \frac{-1}{2}$ $g \times \frac{-1}{2} = -1$ $g = 2$ $\frac{y-2}{x-4} = 2$ $y - 2 = 2x - 8$ $y = 2x - 6$	M1							
6.	$\frac{4x(3x-4)}{20-15x+4x-3x^2} = \frac{4x(3x-4)}{5(4-3x)+x(4-3x)}$ $= \frac{4x(3x-4)}{(5+x)(4-3x)}$ $= \frac{-4x(4-3x)}{(5+x)(4-3x)}$ $= \frac{-4x}{5+x}$	M1							
7.		B1							

	$y = \sqrt{9-4}$ $= \sqrt{5}$ $\tan^2 \theta + \cos^2 \theta$ $\left(\frac{\sqrt{5}}{3}\right)^2 + \left(\frac{\sqrt{5}}{3}\right)^2$ $= \frac{4}{5} + \frac{5}{9} = \frac{61}{45} = 1 \frac{16}{45}$	M1	
		A1	
8.	$8x(2^2)^y = 6(2^y) - 1$ $= 8x(2^y)^2 = 6x(2^y) - 1$ <p>Let $2^y = x$</p> $\therefore 8x^2 = 6x - 1$ $\Rightarrow 8x^2 - 6x + 1 = 0$ $\Rightarrow 8x^2 - 4x - 2x + 1 = 0$ $4x(2x - 1) - 1(2x - 1) = 0$ $\Rightarrow (4x - 1)(2x - 1) = 0$ $\Rightarrow \therefore x = \frac{1}{2} \text{ or } \frac{1}{4}$ $2^y = \frac{1}{2} = 2^{-1} \text{ or } 2^y = \frac{1}{4} = 2^{-2}$ $\therefore y = -1$ <p>or</p> $y = -2$	M1	
		M1	
		M1	
		A1	
9.		B1	$\sqrt{\text{angle } 37.5^\circ}$
		B1	$\sqrt{\text{Division of BD}}$
		B1	$\sqrt{\text{Division of BC}}$

10.		B1 B1 2
11.	$x + \frac{x - 36}{3} = 180^\circ$ $\Rightarrow 3x + x - 36 = 540$ $4x = 576$ $\Rightarrow x = 144^\circ$ $\text{Exterior angle} = \frac{144 - 36}{3} = \frac{108}{3} = 36^\circ$ <p>\therefore No of sides of the polygon</p> $n = \frac{360}{36} = 10 \text{ sides}$	M1 B1 B1 3
12.	$AC^2 = 85^2 - 75^2$ $AC = \sqrt{85^2 - 75^2} = 40m$ <p>Area of quadrilateral ABCD</p> $\frac{1}{2} \times 40 \times 75 + \sqrt{75(75 - 60)(75 - 50)(75 - 40)}$ $= 1500 + \sqrt{984375}$ $= 2492m^2$ <p>In hectares = $\frac{2492}{10000} = 0.2492 \text{ hectares}$</p> $\approx 0.25 \text{ hectares.}$	M1 M1 A1 4
13.		M1 M1



$$\text{External volume} = (32 \times 27 \times 15) = 12960 \text{ cm}^3$$

$$\text{Internal volume} = (30 \times 25 \times 14) = 10500 \text{ cm}^3$$

$$\text{Volume of material} = (12960 - 10500)$$

$$\text{Metre used} = 2460 \text{ cm}^3$$

$$\text{Density} = \frac{\text{mass}}{\text{volume}} = \frac{1500}{2460}$$

$$0.6098 \text{ g / cm}^3$$

A1
3

14.

$$2x > 5x - 3 > -8$$

$$2x + 3 > 5x - 3$$

$$-3x > -6$$

$$x < 2$$

$$5x - 3 > -8$$

$$5x > -5$$

$$x > -1$$

$$-1 < x < 2$$

M1

M1

A1

The integral values are 0 and 1)

3

15.

$$\text{Remaining amount} = \frac{9600}{1\text{E}} \times \frac{95}{100} \times 125$$

$$= \text{ksh}1,140,000$$

$$\text{Amount speed} = \text{ksh} \frac{1,140,000 \times 3}{4}$$

$$= \text{ksh}855,000$$

$$\text{The Balance} = \text{ksh} 1,140,000 - 855,000$$

$$= \text{ksh}285,000$$

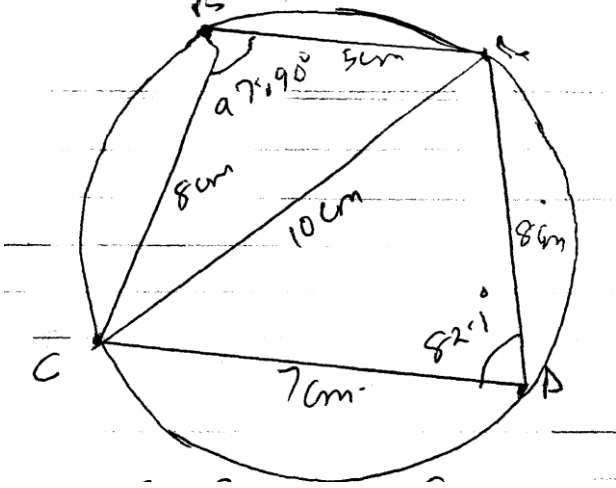
$$\text{Amount in dollars} = \frac{285,000}{63.20}$$

$$= 4509.49 \text{ USdollars}$$

M1

M1

A1

16	$1.2 \times 10 \times x = 6$ $x = \frac{6}{12}$ $= 0.5$ $3.2 \times 15 \times 0.5 = 24$	M1 A1 A1	
17	 <p style="text-align: center;"> $10^2 = 8^2 + 7^2 - 2 \times 8 \times 7 \cos B$ $\cos B = \frac{89 - 100}{80} = \frac{-11}{80}$ $B = \cos^{-1}\left(\frac{-11}{80}\right) = 97.90^\circ$ </p> <p>(b)</p> $2R = \frac{10}{\sin 97.90}$ $R = \frac{5}{\sin 97.90} = 5.0479 \text{ cm}$ <p>(c)</p> $\frac{10}{\sin 82.1^\circ} = \frac{7}{\sin A}$ $\sin A = \frac{7}{10} \sin 82.1 = 0.6984$ $A = \sin^{-1}(0.6934) = 43.90^\circ$ $\angle COD = 2 \times 43.90^\circ = 87.80^\circ$ $\text{Area} = \frac{87.80}{360} \times \frac{22}{7} \times 5.0479 - \frac{1}{2} \times 5.04329 \sin 87.80$ $= 19.5316 - 12.7313$ $= 6.800 \text{ cm}^2$	M1 M1 A1 M1 A1 M1 1 M1 A1	
18	<p style="text-align: center;">→</p> <p>(a) (i) $AB = b - a$</p> <p style="text-align: center;">→ ~ ~</p> <p>(ii) $CD = -3b + -\frac{1}{3}a$</p> <p style="text-align: center;">→ ~</p>	B1 B1	

$$(b) \vec{CM} = \frac{1}{3} \vec{Ka} - 3\vec{kb}$$

~

$$\Rightarrow \vec{AM} = -h \vec{a} + h \vec{b}$$

$$\vec{CM} = \vec{CA} + \vec{AM}$$

$$= \frac{1}{3} \vec{Ka} - 3\vec{kb}$$

$$= \vec{a}(1-h) + \vec{b}(h-3)$$

$$K = 3 - 3h \text{ and } \frac{1}{3}K = 1 - h$$

}

$$h = \frac{3}{4}$$

$$k = \frac{3}{4}$$

→

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

~

→

$$\vec{ON} = \frac{1}{2} \vec{a} + \frac{3}{4} \vec{b}$$

~

→

$$\vec{OM} = \frac{1}{2} \vec{ON}$$

Hence parallel, and point O is common
 \Rightarrow O, M and N are collinear

M1

M1

M1

B1

B1

B1

B1

B1

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<p>19</p>	<p>a)</p> $p \propto \frac{q}{r^2}$ $p = \frac{kq}{r^2}$ $18 = \frac{24 \times k}{4^2}$ $K = \frac{18 \times 16}{2}$ $K = 12$ <p>Equation: $p = \frac{12q}{r^2}$</p> <p>when $q = 30, r = 10$</p> $P = \frac{(12 \times 30)}{100}$ $= \frac{18}{5} \text{ or } 3.6$ <p>(b) $P = \frac{12q}{r^2}$</p> $12q = pr^2$ $q = \frac{pr^2}{12}$ <p>(c) New value of $P = 1.2P$</p> <p>New $r = 0.9r$</p> $q = \frac{pr^2}{12}$ $= \frac{1.2p \times (0.9r)^2}{12}$ $\Delta \text{in } q = \frac{1.2 \times 0.81}{12} \frac{pr^2 - pr^2}{12}$ $= \frac{pr^2}{12} (1.2 \times 0.81 - 1)$ $= \frac{-0.028}{12} pr^2$ <p>(ii) $\frac{0.028}{12} pr^2 \times \frac{12}{pr} \times 100$</p> $= 2.8\%$	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>For d</p> <p>For df</p> <p>For df²</p> <p>For cf</p>
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20

(a)

$$R = r + 7$$

$$\pi R^2 - \pi r^2 = \frac{21}{100} \pi r^2$$

$$\pi R^2 = 0.21 \pi r^2 + \pi r^2$$

$$\pi R^2 = 1.21 \pi r^2$$

$$R^2 = 1.21 r^2$$

$$R = 1.2r$$

$$R + 7 = 1.1r$$

$$7 = 1.1r - r$$

$$7 = 0.1r$$

$$R = 70\text{m}$$

B1

B1

M1

A1

B1

(b) Inner radius = 70m

B1

$$2\pi r = 2 \times \frac{22}{7} \times 70 = 400\text{m}$$

B1

$$\frac{400\text{m}}{10} = 44 \text{ posts}$$

Outer radius $r = 77\text{m}$

$$2\pi r = 2 \times \frac{22}{7} \times 77 = 484\text{m}$$

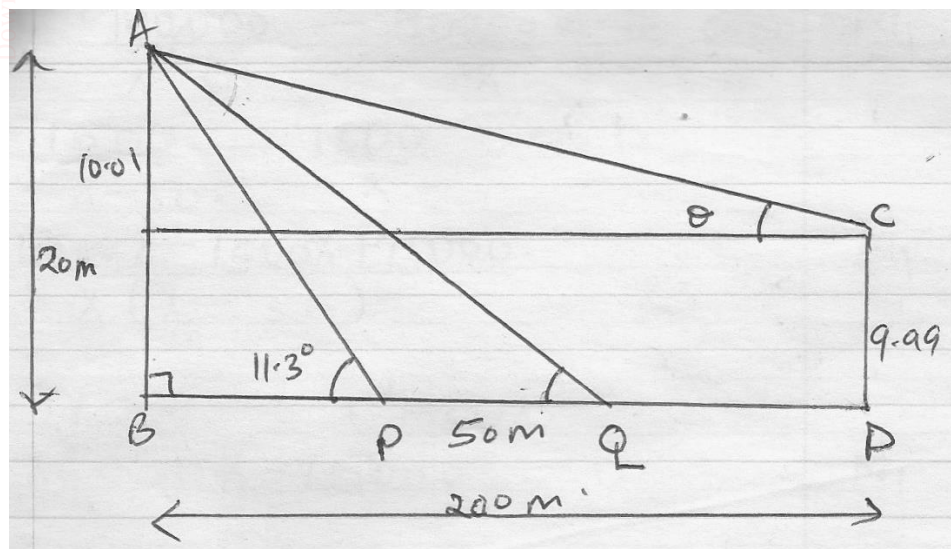
$$\frac{484}{11} = 44 \text{ posts}$$

Total number of posts = 88

(c) total cost

$$88 \times 105 = \text{sh } 9240$$

21



B1

B1

B1

B1

B1

B1

B1

B1

Diagram

positions

M1

$$(a) \tan 11.3^\circ = \frac{20}{BP}$$

A1

$$\therefore BP = \frac{20}{\tan 11.3^\circ} = 100.09m$$

M1

$$(b) \text{ Time Taken in hrs} = \frac{5}{3600}$$

M1

A1

Distance between P and Q

$$= \left(\frac{36}{1} \times \frac{5}{3600} \right)$$

M1

$$= 0.05km$$

$$50km$$

$$\Rightarrow \tan \alpha = \frac{20}{150.09}$$

A1

M1

$$\alpha = \tan^{-1} \left(\frac{20}{150.09} \right) = 7.59^\circ$$

M1

$$(c) (i) CD^2 = 50.9^2 - 49.91^2 = 99.8019$$

$$CD = \sqrt{99.8019} = 99.9901$$

A1

$$= 9.99m$$

B1

$$(ii) \tan \alpha = \frac{10.01}{200} = 0.05005$$

$$\alpha = \tan^{-1} (0.05005)$$

$$= 2.865$$

$$= 3.00$$

$$\frac{900,000}{x-50} - \frac{900,000}{x} = 600$$

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$$\frac{1500}{x-50} - \frac{1500}{x} = 1$$

$$\frac{1500x - 1500x + 75000}{x(x-50)}$$

$$75000 = x^2 - 50x$$

$$x^2 - 50x - 75000 = 0$$

$$x^2 - 300x + 250x - 75000 = 0$$

$$x(x-300) + 250(x-300) = 0$$

$$(x-300)(x+250) = 0$$

$$x = 300 \text{ or } -250$$

$$\Rightarrow x = 300$$

(a)

$$(b) \frac{900,000}{250} - \frac{900,000}{300} \times 100\%$$

$$\frac{900,000}{300} = \left(\frac{3600 - 3000}{300} \right) \times 100\%$$

$$= 20\%$$

(c) B:G
11:7

$$\frac{11}{18} \times 900,000$$

Kshs.550,000

M1

M1

A1

M1

A1

10

23. (a) Let the constant amount be x

Jane - $(\frac{3}{8}x) / =$

Jepchoge's - $\frac{2}{5} (\frac{5}{8}x) / =$
 $= \frac{1}{4} x / =$

Remaining $\frac{3}{5}x - 18,000$

$$x = 48,000 / =$$

Therefore the original amount is 48,000.

(b) Jepchoge received

$(\frac{1}{4} \times 48,000)$

$$= 12,000 / =$$

(c) Business maintenance

$= (\frac{1}{3} \times 12,000)$

$$= 4,000 / =$$

Balance = 8,000 / =

Ratios: Jane = $(\frac{3}{8} \times 48,000)$
 = Kshs. 18,000/=

Jepchoge – $(\frac{1}{4} \times 48,000)$ = Kshs. 12,000/=

Chepkemboi – $(\frac{1}{3} \times 18,000)$ = Kshs. 6,000/=

Ratio: 18,000 : 12,000 : 6,000
 3 : 2 : 1

Jane got $\frac{3}{6} \times 8,000 + 18,000$
 = Kshs. 22,000/=

Jepchoge got $\frac{2}{6} \times 8,000$
 = Kshs. 2,677/=

Chepkemboi got $\frac{1}{6} \times 8,000 + 18,000$
 = Kshs. 1,337/=

24

(i)

R.S = 30km/hr + 40km/hr
 = 70km/hr $\sqrt{m1}$

$$T = \frac{D}{R.S}$$

$$= \frac{185\text{km}}{70\text{km/hr}}$$

$$= 2 \frac{1}{2} \text{ hours } \sqrt{m1}$$

Time they met = 7.30am $\sqrt{m1}$

$$\frac{2.30}{10.00\text{am}} \sqrt{m1}$$

(ii) Distance from Onyango's house where the two met:
 Distance = 30km/hr $\times \frac{5}{2}$ hours
 = 75km
 = 75 + 15
 = 90km $\sqrt{m1}$

(iii) Distance from Onyango to Juma's house when they met:
 200km – 90km $\sqrt{m1}$
 = 110km $\sqrt{A1}$

(b) Meeting time = 10.00a.m
 $\frac{+15}{10.15\text{am}}$

$$T = \frac{110\text{km}}{20\text{km/hr}} = 5 \frac{1}{2} \text{ hours } \sqrt{m1}$$

Time of arrival to Jumas house
 = 10.15am
 $\frac{+5.30}{15.45\text{pm}}$ $\sqrt{m1}$
 = 15.45pm or 3.45pm