

S/N	Working	Marks
1.	Numerator $\frac{3}{4} + \frac{9}{7} \div \frac{3}{7} \times \frac{7}{3}$ $\frac{3}{4} + \frac{9}{7} \times 1$ $\frac{3}{4} + \frac{9}{7} = \frac{21 + 27}{28}$ $= \frac{48}{28}$ $= \frac{12}{7}$ Denominator $\frac{2}{3} \left(\frac{9}{7} - \frac{3}{8} \right) = \frac{2}{3} \left(\frac{72 - 21}{56} \right)$ $= \frac{2}{3} \times \frac{51}{56}$ $= \frac{17}{28}$ Now $\frac{\text{Num}}{\text{Den}} = \frac{12}{7} \div \frac{17}{28} = \frac{12}{7} \times \frac{28}{17}$ $= 2\frac{14}{17}$	M1 M1 A1
2	Numerator $3x^2 - xy - 2y^2$ $3x^2 - 3xy + 2xy - 2y^2$ $3x(x - y) + 2y(x - y)$ $(3x + 2y)(x - y) \checkmark$ Denominator $2(9x^2 - 4y^2) = 2(3x + 2y)(3x - 2y)$ Diff. of two squares. $\frac{(3x + 2y)(x - y)}{2(3x + 2y)(3x - 2y)} = \frac{x - y}{6x - 4y}$	M1 M1 A1

S/N	Working	MKS																								
3.	$St. 12000 \longrightarrow 100\%$ $SP \longrightarrow 90\%$ $SP = \frac{12000 \times 90}{100}$ $= St. 10,800$ ✓ $St. 10,800 \longrightarrow 108\%$ $BP \longrightarrow 100\%$ ✓ $BP = \frac{10,800 \times 100}{108} = St. 10,000$ ✓	M1 M1 A1																								
4.	L.C.M <table border="1"> <thead> <tr> <th>2</th> <th>30</th> <th>50</th> <th>60</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>15</td> <td>25</td> <td>30</td> </tr> <tr> <td>3</td> <td>15</td> <td>25</td> <td>15</td> </tr> <tr> <td>5</td> <td>5</td> <td>25</td> <td>5</td> </tr> <tr> <td>5</td> <td>1</td> <td>5</td> <td>1</td> </tr> <tr> <td></td> <td></td> <td>1</td> <td></td> </tr> </tbody> </table> $L.C.M = 2^1 \times 3 \times 5^1$ $= 300 \text{ min}$ $\text{Time in hrs} = \frac{300}{60}$ $= 5 \text{ hrs}$ $7:18 \text{ a.m}$ $5:00$ $12:18 \text{ p.m}$	2	30	50	60	2	15	25	30	3	15	25	15	5	5	25	5	5	1	5	1			1		
2	30	50	60																							
2	15	25	30																							
3	15	25	15																							
5	5	25	5																							
5	1	5	1																							
		1																								
5.	<table border="1"> <thead> <tr> <th>Class Limits</th> <th>f</th> <th>cf</th> </tr> </thead> <tbody> <tr> <td>20.5 - 30.5</td> <td>2</td> <td>2</td> </tr> <tr> <td>30.5 - 40.5</td> <td>4</td> <td>6</td> </tr> <tr> <td>40.5 - 50.5</td> <td>11</td> <td>17</td> </tr> <tr> <td>50.5 - 60.5</td> <td>5</td> <td>22</td> </tr> <tr> <td>60.5 - 70.5</td> <td>3</td> <td>25</td> </tr> <tr> <td></td> <td>$N = 25$</td> <td></td> </tr> </tbody> </table> $\text{Position of the median}$ $\frac{25}{2} = 12.5^{\text{th}}$ $\text{Median} = 40.5 + \left(\frac{12.5 - 6}{11} \right) \times 10$ $= 40.5 + \left(\frac{6.5}{11} \times 10 \right)$ $= 40.5 + 5.91$ $= 46.4$	Class Limits	f	cf	20.5 - 30.5	2	2	30.5 - 40.5	4	6	40.5 - 50.5	11	17	50.5 - 60.5	5	22	60.5 - 70.5	3	25		$N = 25$		M1 M1 A1			
Class Limits	f	cf																								
20.5 - 30.5	2	2																								
30.5 - 40.5	4	6																								
40.5 - 50.5	11	17																								
50.5 - 60.5	5	22																								
60.5 - 70.5	3	25																								
	$N = 25$																									

Q.	Working	MKS
6.	$r = h$ $2\pi r^2 + 2\pi rh = 154 \text{ cm}^2$ $2\pi r^2 + 2\pi r(r) = 154$ $4\pi r^2 = 154$ $4\left(\frac{22}{7}\right)r^2 = 154$ $r = \sqrt{\frac{154 \times 7}{88}} = 3.5 \text{ cm.}$ $\text{Diameter} = 2 \times 3.5$ $= 7 \text{ cm.}$	 M1 M1 A1
7.	$(x - 50) + (2x + 20) = 180^\circ$ $3x - 30 = 180^\circ$ $3x = 210^\circ$ $x = 70^\circ$ $\text{Exterior Angle} = 70 - 50^\circ$ $= 20^\circ$ $\text{Number of sides} = \frac{360^\circ}{20^\circ} = 18 \text{ sides.}$	 M1 M1 A1
8.	$6x + 2 < 3x + 11$ $3x < 9$ $x < 3 \checkmark$ $3x + 11 \leq 27x - 1$ $\frac{-24x \leq -12}{-24 \quad -24}$ $x \geq \frac{1}{2} \checkmark$ $\frac{1}{2} \leq x < 3 \quad \text{Integral values } 1, 2$	 M1 M1 A1

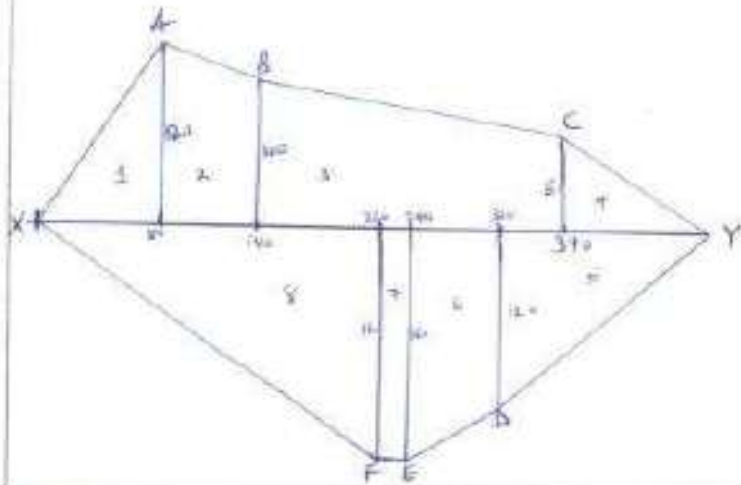
S/N	Working	Marks
9.	$\frac{1}{2}x + 2y = -3$ $2y = -\frac{1}{2}x - 3$ $y = -\frac{1}{4}x - \frac{3}{2} \quad \text{gradient}(M) = -\frac{1}{4}$ $M_1 \times M_2 = -1$ $-\frac{1}{4} \times M_2 = -1 \Rightarrow M_2 = 4$ Equation of perpendicular $\frac{y-1}{x-2} = 4$ $y-1 = 4x-8$ $y = 4x-7$	M1 M1 A1
10	$9^x + 2 \times 3^{2x} = 243$ $3^{2x} + 2 \times 3^{2x} = 243$ $\text{let } 3^{2x} = y$ $y + 2y = 243$ $3y = 243$ $\Rightarrow y = 81$ $3^{2x} = 3^4$ $\Rightarrow 2x = 4$ $x = 2$	M1 M1 A1
11	$\vec{OA} = \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix} \quad \vec{OB} = \begin{pmatrix} -2 \\ -1 \\ 2 \end{pmatrix} \quad \vec{AB} = \vec{OB} - \vec{OA}$ $= \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix} - \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix} = \begin{pmatrix} -4 \\ 2 \\ -2 \end{pmatrix}$ $\text{length of AB} = \sqrt{(-4)^2 + 2^2 + (-2)^2}$ $= \sqrt{24}$ $= 4.90 \text{ units}$	M1 M1 A1

s/n	Working	Mks
12.	Amount in Ksh. = 9600×125.3 $= \text{Ksh. } 1,202,880$ After the commission = $1,202,880 \times \frac{95}{100}$ $= \text{Sh. } 1,142,736$ Amount in US\$ = $\frac{1,142,736}{63.5} = \underline{17,996}$	M1 M1 A1
13.	$(2x - 10) + 60^\circ = 90^\circ$ Complementary angles. $2x + 50 = 90$ $2x = 40^\circ$ $\Rightarrow x = 20^\circ$	M1 M1 A1
14.	$3x-2$ $3x+1$ $(3x-2)(3x+1) = 28$ $9x^2 + 3x - 6x - 2 = 28$ $9x^2 - 3x - 30 = 0$ $3x^2 - x - 10 = 0$ $3x^2 - 6x + 5x - 10 = 0$ $3x(x-2) + 5(x-2) = 0$ $(3x+5)(x-2) = 0$ Either $3x+5=0 \Rightarrow x = -\frac{5}{3}$ ✓ N/A or $x-2=0 \Rightarrow x = 2$ Length = $3(x)+1 = 7\text{cm}$	M1 M1 A1

s/n	Working	Marks
15.	(a) V.S.f = Ratio of Mass $= \frac{324g}{768}$ $V.S.f = \frac{27}{64}$ $L.S.f = \sqrt[3]{\frac{27}{64}}$ $= \frac{3}{4}$ $\frac{h}{20} = \frac{3}{4} \Rightarrow h = 20 \times \frac{3}{4}$ $= 15cm$	M1 M1 A1
	(b) A.S.f = (L.S.f)² $= \left(\frac{3}{4}\right)^2$ $= \frac{9}{16}$ $\frac{A}{40} = \frac{9}{16} \Rightarrow h = 40 \times \frac{9}{16}$ $= 22.5cm^2$	M1 A1
16.	$3p + 5b = 130 \text{ --- (i)}$ $2p + 3b = 80 \text{ --- (ii)}$ $6p + 10b = 260$ $6p + 9b = 240$ $1b = 20$ $3p + 5(20) = 130$ $3p = 30$ $p = 10$ $1 \text{ Pen} = \\$1.10$ $1 \text{ Book} = \\$1.20$	M1 A1 A1

S/N	Working	Marks
17	(a) $\text{Time} = \frac{d}{s}$ $= \frac{300 \text{ km}}{80 \text{ km/h}}$ $= 3\frac{3}{4} \text{ hr}$ Time of arrival $\begin{array}{r} 7:00 \text{ a.m.} \\ 3:45 \\ \hline 10:45 \text{ a.m.} \end{array}$	M1 A1
	(b) Distance travelled by the bus for 40 min $D = s \times t$ $= 80 \text{ km/h} \times \frac{2}{3} \text{ hr}$ $= 60 \text{ km}$ Remaining distance = $300 - 60$ $= 240 \text{ km} \checkmark$ Relative speed = $80 \text{ km/h} + 120 \text{ km/h}$ $= 200 \text{ km/h}$ Time taken to meet = $\frac{240 \text{ km}}{200 \text{ km/h}} = 1 \text{ hr } 12 \text{ min}$ The time they met = $7:45 \text{ a.m.}$ $\begin{array}{r} 1:12 \\ \hline 9:57 \text{ a.m.} \end{array}$	M1 A1
	(c) Distance travelled by the car to meet $D = 120 \text{ km/h} \times \frac{1}{2} \text{ hr}$ $= 144 \text{ km} \checkmark$ Distance to NEB = $300 - 144 = 156 \text{ km} \checkmark$	M1 A1
	(d) Time taken by the car to arrive NEB $t = \frac{200 \text{ km}}{120 \text{ km/h}} = 2 \text{ hr } 30 \text{ min}$ $\begin{array}{r} 7:45 \\ 2:30 \\ \hline 10:15 \text{ a.m.} \end{array}$ Remaining distance = $80 \text{ km/h} \times \frac{1}{2}$ $= 40 \text{ km}$	

18 Jan	1 cm	rep.	40 ml.
--------	------	------	--------



(b)

$$\text{Area 1} = \frac{1}{2} \times 80 \times 120 = 4800 \text{ m}^2$$

$$\text{Area 2} = \frac{1}{2} \times 60 \times (120 + 100) = 6600 \text{ m}^2$$

$$\text{Area } 3 = \frac{1}{2} \times 200 \times (100 + 60) = 16000 \text{ m}^2$$

$$\text{Area 4} = \frac{1}{2} \times 60 \times 60 = 1800 \text{ m}^2$$

$$A_{\text{sec } 5} = \frac{1}{2} \times 100 \times 120 = 6000 \text{ m}^2$$

Area $G = \frac{1}{2} \times 60 \times (16 + 12) = 840 \text{ cm}^2$

Area 7 = $160 \times 20 = 3200 \text{ m}^2$

$$\text{Area } 8 = \frac{1}{2} \times 160 \times 220 = 17600 \text{ m}^2$$

$$\text{Total Area} = 64400 \text{ m}^2$$

$$\text{Area in ha} = \frac{64400}{10000} = 6.44 \text{ ha.}$$

(c) Total Cost = $6.44 \text{ kg} \times \$80.00/\text{kg}$
 $= \$515.20/\text{kg}$

$$19(a) \text{ Monthly taxable income} = 21\,750 + 15\,000 + 8\,000 \\ = \text{Ksh. } \underline{44\,750}$$

A1

$$\text{Annual taxable income} = 44\,750 \times 12 \\ = \text{Ksh. } \underline{537\,000}$$

A1

(b)

Income	Tax (Ksh)
$116\,600 \times \frac{10}{100}$	$= 11\,660$
$109\,000 \times \frac{15}{100}$	$= 16\,350$
$109\,440 \times \frac{26}{100}$	$= 21\,988$
$109\,440 \times \frac{27}{100}$	$= 27\,360$
$92\,520 \times \frac{30}{100}$	$= 27\,756$

$$\text{Total tax payable P.M} = \text{Ksh. } \underline{105\,014} \checkmark$$

$$\begin{aligned} \text{Tax due} &= \text{Tax payable} - \text{Personal Relief P.R.} \\ &= \text{Sh } 105\,014 - (10\,68 \times 12) \\ &= \text{Sh } 105\,014 - 12\,672 \\ &= \text{Sh. } \underline{92\,342} \end{aligned}$$

$$(c) \text{ Tax P.M} = \frac{92\,342}{12} = \text{Sh } \underline{7\,695.17}$$

$$\begin{aligned} \text{Net Income} &= \text{Gross Income} - \text{All deductions} \\ &= 44\,750 - (7\,695.17 + 2\,000 + 4\,500) \\ &= 44\,750 - 12\,395.17 \\ &= \underline{32\,354.83 /} \end{aligned}$$

20 (a)	$\frac{y-3}{x-(-1)} = -\frac{1}{2}$ $2y-6 = -x-1$ $2y = -x+5$ $y = -\frac{1}{2}x + \frac{5}{2} \quad (\text{Any form of Equation is acceptable})$	M1 A1
--------	---	----------

(b)	$\text{Gradient of } L_2 = \frac{5-(-1)}{4-1}$ $= \frac{6}{3}$	A1
-----	--	----

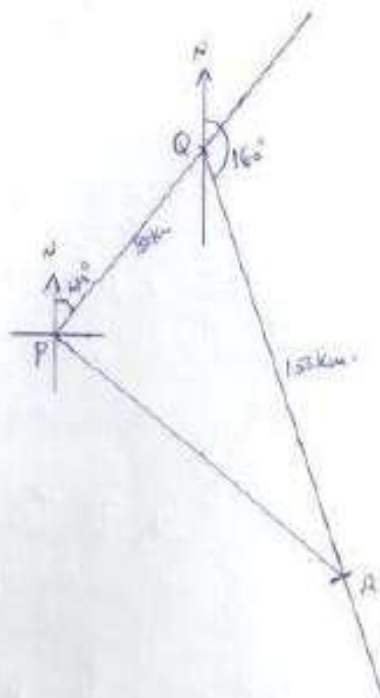
(c)	$\text{Equation of } L_2$ $\frac{y-(-3)}{x-1} = \frac{6}{3}$ $3y+9 = 6x-6$ $3y = 6x-15$ $y = \frac{2}{3}x - \frac{5}{2} \quad (\text{Accept Any other form of the equation})$	
-----	---	--

(d)	$M \times \frac{6}{3} = -1$ $M = -\frac{3}{2}$ $\frac{y-5}{x} = -\frac{3}{2}$ $2y-10 = -3x$ $2y = -3x+10$ $y = -\frac{3}{2}x + 5$	
-----	---	--

(d)	$\frac{y-5}{x-4} = -\frac{1}{2}$ $2y-10 = -x+4$	$2y = -x+14$ $y = -\frac{1}{2}x + 7$
-----	---	--------------------------------------

21.

1cm rep 20km.



31 mark
for each.
Correctly
plotted point.

a Distance $PR = 6.5 \times 20$
 $= 130 \pm 1 \text{ km.}$

(ii) $t = \frac{d}{s}$
 $= \frac{120 \text{ km}}{25 \text{ km/h.}}$
 $= \underline{5 \text{ hr } 12 \text{ min}}$

(d) S is the Centre of the circle.

$$\begin{aligned}
 22 \text{ (a)} \quad a^2 &= b^2 + c^2 - 2bc \cos A^\circ \\
 a^2 &= 6^2 + 8^2 - 2(6)(8) \cos 50^\circ \\
 a^2 &= 100 - 61.71 \\
 a &= \sqrt{38.29} \\
 &= \underline{6.19 \text{ cm}}
 \end{aligned}$$

M1

M1

A1

$$\begin{aligned}
 \text{(b)} \quad \frac{b}{\sin B^\circ} &= \frac{a}{\sin A^\circ} \\
 \frac{6}{\sin B} &= \frac{6.19}{\sin 50^\circ} \\
 \sin B^\circ &= \frac{6 \times \sin 50^\circ}{6.19} \\
 B^\circ &= \sin^{-1} 0.7265 \\
 &= \underline{47.95^\circ}
 \end{aligned}$$

M1

M1

A1

$$\begin{aligned}
 \text{(c)} \quad a^2 &= 7^2 + c^2 - 2(7)(c) \cos A^\circ \\
 2.82^2 &= 49 - 84 \cos A^\circ \\
 \cos A^\circ &= \frac{49 - 2.82^2}{84} \\
 A &= \cos^{-1} 0.9172 \\
 &= \underline{23.48^\circ}
 \end{aligned}$$

M1

M1

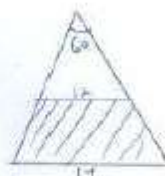
A1

$$\begin{aligned}
 \text{(d)} \quad \text{Area of } \triangle ABC &= \frac{1}{2} \times 6 \times 7 \times \sin 23.48^\circ \\
 &= \underline{8.37 \text{ cm}^2}
 \end{aligned}$$

M1

A1

24 (c)



$$\begin{aligned} \text{Area of shaded R} &= \left(\frac{1}{2} \times 14 \times 6 \right) - \left(\frac{1}{2} \times 12 \times 4 \right) \\ &= 84.87 - 62.35 \\ &= 22.52 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Total Area of shaded R} &= 22.52 \times 6 \\ &= 135.12 \text{ cm}^2 \end{aligned}$$

b)

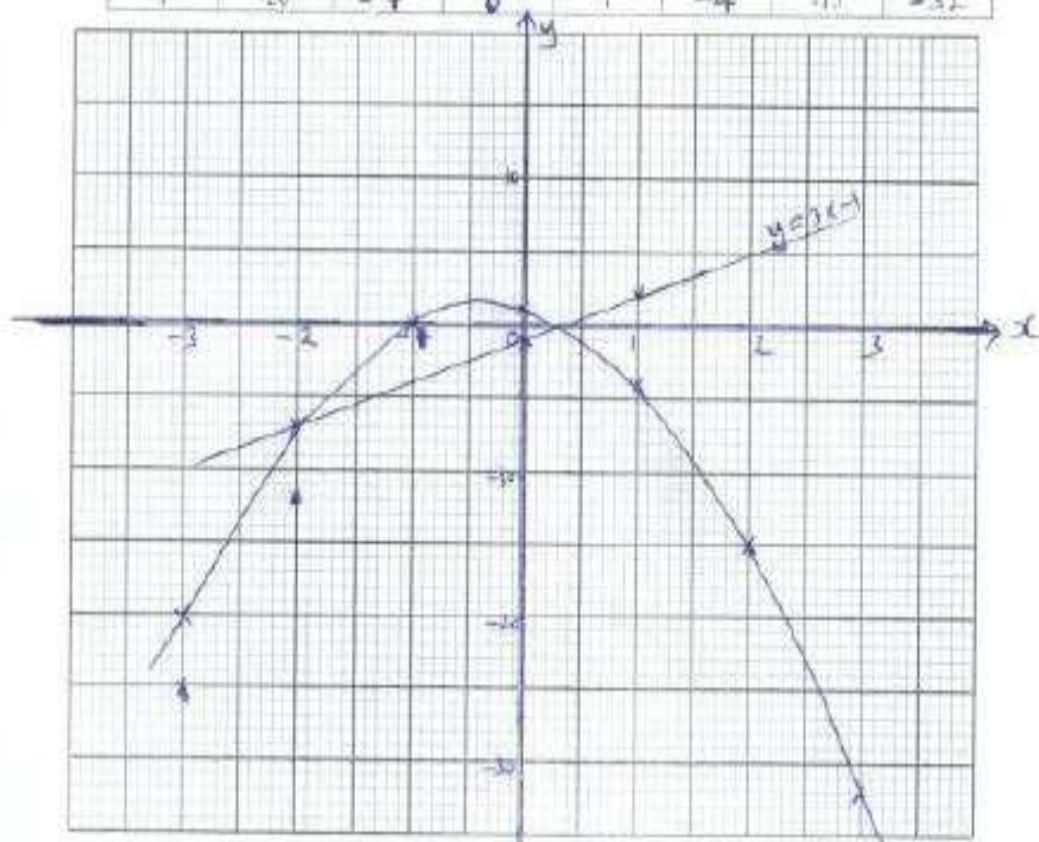
$$\begin{aligned} \text{Volume} &= \text{Area of Cross-section} \times \text{length} \\ &= 135.12 \text{ cm}^2 \times 20 \text{ cm} \\ &= 2702.4 \text{ cm}^3 \end{aligned}$$

(c) Mass = density $\times$ Volume

$$\begin{aligned} &= 3.5 \text{ g/cm}^3 \times 2702.4 \text{ cm}^3 \\ &= 9458.4 \text{ g} \\ &= \underline{9.458 \text{ kg}} \end{aligned}$$

2) Complete the table for the function $y = 1 - 2x - 3x^2$ in the range $-3 \leq x \leq 3$ (2 mks)

X	-3	-2	-1	0	1	2	3
$-3x^2$	-27	-12	-3	0	-3	-12	-27
$-2x$	6	4	2	0	-2	-4	-6
1	1	1	1	1	1	1	1
Y	-20	-7	0	1	-4	-15	-32



b) Using the table above and the graph paper provided, draw the graph of $y = 1 - 2x - 3x^2$ (4 mks)

c) Use the graph in (b) above to solve

i) $1 - 2x - 3x^2 = 0$ $x = ?$ (2 mks)

Roots $x = -1$ or $x = 0.2$

ii) $2 - 5x - 3x^2 = 0$ (2 mks)

$$y = 1 - 2x - 3x^2$$

$$0 = 2 - 5x - 3x^2$$

$$y = -1 + 3x$$

Roots $x = -2$ or $x = 0.3$