

MATHEMATICS

Form 4 term 3

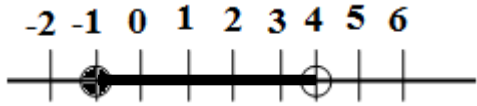
Paper 1

MARKING SCHEME

SECTION I

	WORKING	MARKS	GUIDELINES
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1.	Numerator: $-2(-5 + 8) - 9 \div 3 - 5$ $-6 - 9 \div 3 + 5$ $-6 - 3 - 5 = -14$ Denominator: $-3 \times -5 + -2 \times 4$ $15 - 8 = 7$ Quotient $\frac{-14}{7} = -2$	M1 M1 A1	
		4	
2.	(a) (i) $86.46^2 = 7475$ (ii) $\frac{1}{27.56} = \frac{1}{2.756 \times 10^2} = 0.03628$ (b) $\frac{86.46^2}{27.56} = 7475 \times 0.03628$ $= 271.2$	B1 B1 M1 A1	
		3	
3.	$\frac{90}{90}(2n - 4) = \frac{1440}{90}$ $(2n - 4) = 16$ $2n = 20$ $n = 10$ Decagon	M1 A1 B1	
		3	
4.	$A.S.F = \frac{750}{120} = \frac{25}{4}$ $L.S.F = \sqrt{\frac{25}{4}} = \frac{5}{2}$ $V.S.F = \left(\frac{5}{2}\right)^3 = \frac{125}{8}$ Volume of larger = $\frac{125}{8} \times \frac{400}{1000} = 6.25$ litres	M1 M1 A1	
		3	

5.	$P = 2 \begin{pmatrix} -1 \\ 4 \end{pmatrix} - 4 \begin{pmatrix} -3 \\ -2 \end{pmatrix} + 3 \begin{pmatrix} -2 \\ -1 \end{pmatrix}$ $= \begin{pmatrix} -2 \\ 8 \end{pmatrix} - \begin{pmatrix} -12 \\ -8 \end{pmatrix} + \begin{pmatrix} -6 \\ -3 \end{pmatrix}$ $= \begin{pmatrix} 4 \\ 13 \end{pmatrix}$	M1 M1 A1	
		3	
6.	$\begin{aligned} -3x &> -7 - 5 \\ -3x &> -12 \\ \frac{-3x}{-3} &< \frac{-12}{-3} \\ x &< 4 \end{aligned}$ $\begin{aligned} x - 3x &> -4 + 6 \\ -2x &\leq 2 \\ \frac{-2x}{-2} &\geq \frac{2}{-2} \\ x &\geq -1 \end{aligned}$ 	M1 M1 A1	
		3	
7.	<i>Cost of the car in Kshs</i> = 4800×72.34 = Kshs 347 232 <i>Commision in Kshs</i> = $\frac{15}{100} \times \text{Kshs } 347\,232$ = Kshs 52 084.80 <i>Cost of shipment in Kshs</i> = $\frac{72\,220}{117.2}$ = US \$ 616.216 $\times$ 72.34 = Kshs 44 576.70 <i>Total cost</i> = 347 232.00 + 52 084.80 + 44 576.70 = Kshs 443 893.50	M1 M1 A1	
		3	

8.	$\begin{array}{r l} 3 & 189 \\ \hline 3 & 63 \\ \hline 3 & 21 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$ $p^3 \times q = 3^3 \times 7$ $p = 3 \text{ and } q = 7$	M1 M1 A1	Table
		3	
9.	$1000 \left(\sqrt{\frac{0.0128}{200}} \right) = 1000 \left(\sqrt{\frac{0.0064}{100}} \right)$ $= 1000 \times \frac{0.08}{10}$ $= 8$	M1 M1 A1	
		3	
10.	$\frac{2x-3}{3} - \frac{x-2}{2} - \frac{1-x}{4} = \frac{4(2x-3) - 6(x-2) - 3(1-x)}{12}$ $= \frac{8x - 12 - 6x + 12 - 3 + 3x}{12}$ $= \frac{5x - 3}{12}$	M1 M1 A1	
		3	
11.	$14 \times \frac{30}{40} \times \frac{10}{7}$ $= 15 \text{ days}$	M1M1 A1	
		3	
12.	$\text{Area of the sector } OAB = \frac{100}{360} \times 3.142 \times 6^2$ $= 31.42 \text{ cm}^2$ $\text{Area of the triangle} = \frac{1}{2} \times 6 \times 6$ $= 17.73 \text{ cm}^2$ $\text{Area of the shaded region} = 31.42 - 17.73$ $= 13.69 \text{ cm}^2$	M1 M1 A1	for conversi on
		3	

13.	<table><tr><td>2</td><td>1764</td></tr><tr><td>2</td><td>882</td></tr><tr><td>3</td><td>441</td></tr><tr><td>3</td><td>147</td></tr><tr><td>7</td><td>49</td></tr><tr><td>7</td><td>7</td></tr><tr><td></td><td>1</td></tr></table> $1764 = 2^2 \times 3^2 \times 7^2$ $2744 = 2^3 \times 7^3$ $\frac{\sqrt{1764}}{\sqrt[3]{2744}} = \frac{2 \times 3 \times 7}{2 \times 7}$ $= 3$	2	1764	2	882	3	441	3	147	7	49	7	7		1	M1 M1 A1	
2	1764																
2	882																
3	441																
3	147																
7	49																
7	7																
	1																
		3															
14.	$Density = \frac{mass}{volume}$ $2.4 = \frac{18\,000}{15 \times 50 \times h}$ $h = \frac{18\,000}{15 \times 50 \times 2.4}$ $h = 10\,cm$	M1 M1 A1															
		3															
15.	$Area = \frac{1}{2}ab \sin \phi$ $51 = \frac{1}{2} \times 12 \times 17 \sin \phi$ $\frac{51}{6 \times 1} = \frac{6 \times 17 \sin \phi}{6 \times 1}$ $\sin \phi = 0.5$ $\phi = 30^0$	M1 M1 A1															
		3															
16.	(a) GCD is xy^2 (b) $xy^2(9x^2 - 4y^2)$ $xy^2(3x - 2y)(3x + 2y)$	A1 M1 A1															
		3															

SECTION II

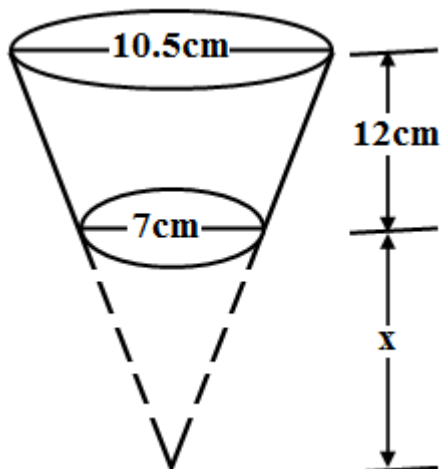
17.	(a) At the x - axis, $y = 0$ $0 = \frac{2}{3}x - \frac{2}{3}$ $\frac{2}{3}x = \frac{2}{3}$ $x = 1$ $T(1, 0)$ (b) $y = \frac{2}{3}x - \frac{2}{3}$ $m_1 = \frac{2}{3} \qquad m_2 = \frac{-3}{2}$ $\frac{y - 0}{x - 1} = \frac{-3}{2}$ $2y = -3x + 3$ $2y + 3x = +3$ (c)(i) $m_1 = m_3 = \frac{2}{3}$ point $(-4, 1)$ $\frac{y - 1}{x + 4} = \frac{2}{3}$ $y - 1 = \frac{2}{3}x + \frac{8}{3}$ $y = \frac{2}{3}x + \frac{11}{3}$ (ii) $y = \frac{2}{3}x + \frac{11}{3}$ $(2y + 3x = 3)3$ $(3y - 2x = 11)2$ $6y + 9x = 9$ $6y - 4x = 22$ $13x = -13$ $x = -1$ $y = 3$ $S(-1, 3)$	M1 A1 M1 M1 A1 M1 M1 A1	
		10	

18.	(a) $v = \frac{1}{2}t^2 - 3t + 7$ $= \frac{1}{2}(8)^2 - 3(8) + 7$ $= 15 \text{ m/s}$ (b) $a = t - 3$ <i>when $t = 0, a = -3$</i> <i>Retardation of 3m/s^2</i> (c) $\frac{dv}{dt} = 0$ <i>at minimum velocity</i> $t - 3 = 0$ $t = 3$ <i>Minimum velocity</i> $v = \frac{1}{2}(3)^2 - 3(3) + 7$ $= 2\frac{1}{2} \text{ m/s}$ (d) $s = \int \left(\frac{t^2}{2} - 3t + 7\right) dt$ $s = \frac{t^3}{6} - \frac{3}{2}t^2 + 7t + c$ <i>for $t = 2,$</i> $s = \frac{8}{6} - 6 + 14$ $s = 9\frac{1}{3} \text{ m}$	M1 A1 M1 A1 M1 A1 M1 A1 M1 A1	
		10	

19.	(a) $\begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix} \begin{pmatrix} 4 & 0 & -2 \\ 1 & 2 & 4 \end{pmatrix} = \begin{pmatrix} 5 & 2 & 2 \\ 11 & 6 & 8 \end{pmatrix}$ $A^I(5, 11), B^I(2, 6)C^I(2, 8)$ (b) $\begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} 5 & 2 & 2 \\ 11 & 6 & 8 \end{pmatrix} = \begin{pmatrix} -1 & -2 & -4 \\ 27 & 14 & 18 \end{pmatrix}$ $A^I(5, 11), B^I(2, 6)C^I(2, 8)$ (c) $\begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix}$ $= \begin{pmatrix} 0 & -1 \\ 5 & 7 \end{pmatrix}$ (d) $\frac{1}{5} \begin{pmatrix} 7 & -1 \\ 5 & 0 \end{pmatrix}$ $= \begin{pmatrix} \frac{7}{5} & \frac{1}{5} \\ -1 & 0 \end{pmatrix}$	M1M1 A1 M1M1 A1 M1 A1 M1 A1	
		10	

20.	(a) <i>Distance of A before B started</i> $= 65 \times 2\frac{1}{6}$ $= 140.83km$ <i>Distance shared</i> $= 460 - 140.83$ $= 319.17km$ <i>Time to meet</i> $= \frac{319.17km}{145}$ $= 2.2012hrs$ <i>Distance from B</i> $= 80 \times 2.2012$ $= 176.09km$ (b) <i>Time</i> $\approx 2hrs\ 12\ minutes$ <i>Meeting time</i> $= 1055hrs + 2hrs\ 12\ min$ $= 1307hrs$ $= 1.07pm$ (c) <i>Time taken by minibus</i> $= \frac{460}{65}$ $\approx 7\ hrs\ 05minutes$ <i>Time to reach B</i> $= 0845hrs + 7\ hrs\ 5\ mins$ $= 1550hrs$ $= 3.50pm$ <i>Time of the motorist</i> $= 1550hrs - 0915hrs$ $= 6hrs\ 35minutes$ <i>Distance</i> $= 120 \times 6\frac{35}{60}$ $= 790km$	M1 M1 M1 A1 M1 A1 M1 M1 M1 A1	
		10	

21.



$$\begin{aligned} \text{(a)} \quad \frac{x}{x+12} &= \frac{7}{10.5} \\ 10.5x &= 7x + 84 \\ 3.5x &= 84 \\ x &= 24 \end{aligned}$$

$$L = \sqrt{36^2 + 5.25^2} = 36.38 \text{ cm}$$

$$l = \sqrt{24^2 + 3.5^2} = 24.25 \text{ cm}$$

Curved surface area

$$\begin{aligned} &= \left(\frac{22}{7} \times 5.25 \times 36.38 \right) - \left(\frac{22}{7} \times 3.5 \times 24.25 \right) \\ &= 333.6 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Total surface area} &= 333.6 + \left(\frac{22}{7} \times 7 \times 7 \right) \\ &= 487.6 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{(b) Volume} &= \frac{22}{7} \times 5.25^2 \times 36 - \frac{22}{7} \times 3.5^2 \times 24 \\ &= 2194.5 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Capacity} &= \frac{2194.5 \text{ cm}^3}{1000} \\ &= 2.1945 \text{ litres} \\ &= 22 \text{ decilitres} \end{aligned}$$

M1

M1

M1

M1

M1

A1

M1M1

M1

A1

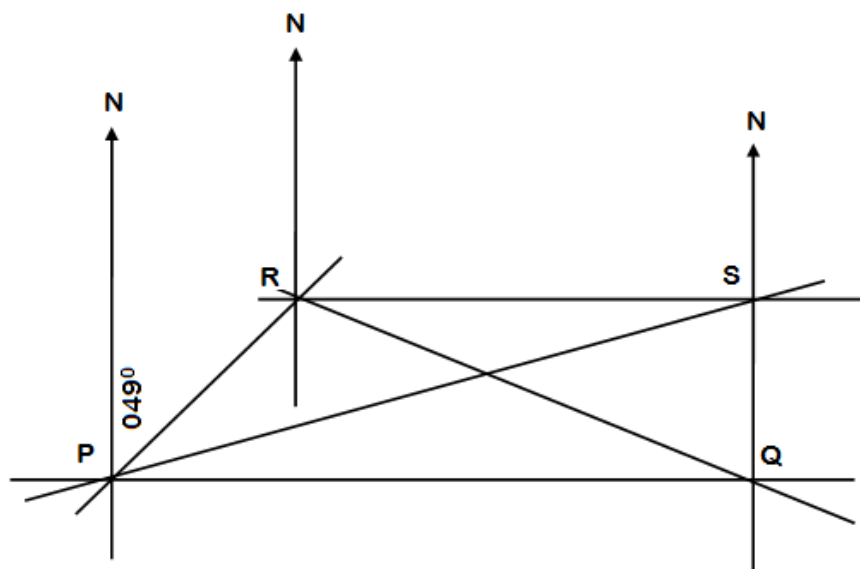
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22.	(a) 55 – 59	B1	For the values of x																																																						
	(b) Assumed mean = 57																																																								
	<table><tr><th>Class</th><th>f</th><th>Mid point(x)</th><th>x – A = d</th><th>fd</th><th>fd²</th></tr><tr><td>40 – 44</td><td>3</td><td>42</td><td>–15</td><td>–45</td><td>675</td></tr><tr><td>45 – 49</td><td>30</td><td>47</td><td>–10</td><td>–300</td><td>3000</td></tr><tr><td>50 – 54</td><td>29</td><td>52</td><td>–5</td><td>–45</td><td>725</td></tr><tr><td>55 – 59</td><td>33</td><td>57</td><td>0</td><td>0</td><td>0</td></tr><tr><td>60 – 64</td><td>13</td><td>62</td><td>5</td><td>65</td><td>325</td></tr><tr><td>65 – 69</td><td>1</td><td>67</td><td>10</td><td>10</td><td>100</td></tr><tr><td>70 – 74</td><td>1</td><td>72</td><td>15</td><td>15</td><td>225</td></tr><tr><td></td><td>110</td><td></td><td></td><td>–400</td><td>5050</td></tr></table>	Class		f	Mid point(x)	x – A = d	fd	fd ²	40 – 44	3	42	–15	–45	675	45 – 49	30	47	–10	–300	3000	50 – 54	29	52	–5	–45	725	55 – 59	33	57	0	0	0	60 – 64	13	62	5	65	325	65 – 69	1	67	10	10	100	70 – 74	1	72	15	15	225		110			–400	5050	B1
	Class	f		Mid point(x)	x – A = d	fd	fd ²																																																		
	40 – 44	3		42	–15	–45	675																																																		
	45 – 49	30		47	–10	–300	3000																																																		
	50 – 54	29		52	–5	–45	725																																																		
	55 – 59	33		57	0	0	0																																																		
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	65 – 69	1		67	10	10	100																																																		
70 – 74	1	72	15	15	225																																																				
	110			–400	5050																																																				
$Mean = \frac{-400}{110} + 57$	M1																																																								
$= 53.364$	A1																																																								
(c) $s = \sqrt{\frac{5050}{110} - \left(\frac{-400}{110}\right)^2}$	M1																																																								
$= \sqrt{32.69}$	M1																																																								
$= 5.718$	A1																																																								
(d) 50 th student																																																									
$= 49.5 + \frac{17}{29} \times 5$	M1																																																								
$= 49.5 + 2.9310$	M1																																																								
$= 52.43$	A1																																																								
	10																																																								

23.	(a)	$y^2 = 13.4^2 + 5^2 - 2 \times 13.4 \times 5 \cos 57.7^\circ$	M1	
		$= 179.6 + 25 - 134 \times 0.5344$	M1	
		$= 204.6 - 71.61$		
		$= 132.99$	M1	
		$y = \sqrt{132.99} = 11.53 \text{ cm}$	A1	
	(b)	$\frac{5}{\sin Z} = \frac{11.53}{\sin 57.7^\circ}$	M1	
		$\sin Z = \frac{5 \sin 57.7^\circ}{11.53}$	M1	
		$\sin Z = 0.3666$		
		$Z = 21.51^\circ$	A1	
	(c)	$\text{Angle } YXZ = 180 - (21.51^\circ + 57.7^\circ)$	M1	
		$= 100.79$	M1	
		$= 100.8$	A1	
	0		10	

24.

(a)



B1

B1

B1

B1

(b)

B1

(i) Bearing of S from P = $075^{\circ} \pm 1^{\circ}$

M1

A1

(ii) Distance of Q from S = 2.6×20
 $= 52 \pm 2km$

B1

(iii) Bearing of Q from R = $111^{\circ} \pm 1^{\circ}$

M1

A1

(iv) Distance of R from S = 7.0×20
 $= 140 \pm 2km$

10