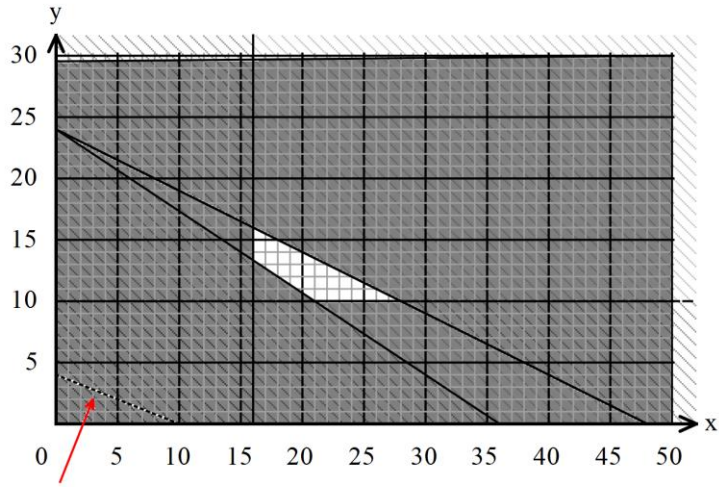


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NO.	WORKING	MARKS	REMARKS
1.	$\frac{110}{100} \times 902 = 820$ $\frac{900p + 700q}{p + q} = 820$ $900p + 700q = 820p + 820q$ $80p = 120q$ $p : q = 3 : 2$ NB: accept Pearson's square method	M1 M1 A1 03	Attempt to find buying price of the mixture Accurate ratio
2.	$\left(2 - \frac{1}{\sqrt{7}}\right)^4 = 16 - \frac{32}{\sqrt{7}} + \frac{24}{7} - \frac{8}{7\sqrt{7}} + \frac{1}{49}$ $\left(2 + \frac{1}{\sqrt{7}}\right)^4 = 16 + \frac{32}{\sqrt{7}} + \frac{24}{7} + \frac{8}{7\sqrt{7}} + \frac{1}{49}$ $= 32 + 6\frac{6}{7} + \frac{2}{49}$ $= 38\frac{44}{49}$	B1 B1 M1 A1 03	Expansion of first function Expansion of 2 nd function Addition of the two functions C.A.O
3.	$A = P \left(1 + \frac{r}{100}\right)^n$ $30\,000 = P \left(1 + \frac{1}{100}\right)^{24}$ $P = \frac{30000}{(1.01)^{24}}$ $= 23\,627$ Cash price = (23 627 + 5000) $= 28\,627$ Carrying charge = 35 000 - 28 627 $= 6373$ $= 6400$	B1 M1 A1 B1 04	Attempt to find 30 000 Substitution Accurate value of P The carrying charge to the nearest hundreds.



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4.	$\bar{x} = \frac{3+5+7+9+11}{5} = 7$<table border="1"><tr><td>X</td><td>3</td><td>5</td><td>7</td><td>9</td><td>11</td><td></td></tr><tr><td>$d = (x - \bar{x})$</td><td>-4</td><td>-2</td><td>0</td><td>2</td><td>4</td><td></td></tr><tr><td>d</td><td>4</td><td>2</td><td>0</td><td>2</td><td>4</td><td>$\sum d = 12$</td></tr></table> Mean absolute deviation = $\frac{12}{5}$ = 2.40	X	3	5	7	9	11		$d = (x - \bar{x})$	-4	-2	0	2	4		$ d $	4	2	0	2	4	$\sum d = 12$	M1	Attempt to calculate mean
X	3	5	7	9	11																			
$d = (x - \bar{x})$	-4	-2	0	2	4																			
$ d $	4	2	0	2	4	$\sum d = 12$																		
		M1	Attempt to work out M.A.D																					
		A1	C.A.O																					
		03																						
5.	 Search line $40x + 100y = P$ $4x + 10y = P$ Point of intersection are (16, 16) $40(16) + 100(16) = 2240$ Maximum profit = Ksh. 2240	B1	Objective function correctly written																					
		B1	Reading of the values from the graph																					
		B1	Accurate maximum																					
		03																						
6.	$(A - x)^2 = Bx + x^2$$A^2 - 2Ax + x^2 = Bx + x^2$$A^2 = Bx + 2Ax$$x = \frac{A^2}{B + 2A}$	M1	Square both sides to get rid of $\sqrt{\quad}$																					
		M1	Attempt to perform simplification																					
		A1	Accuracy																					
		03																						

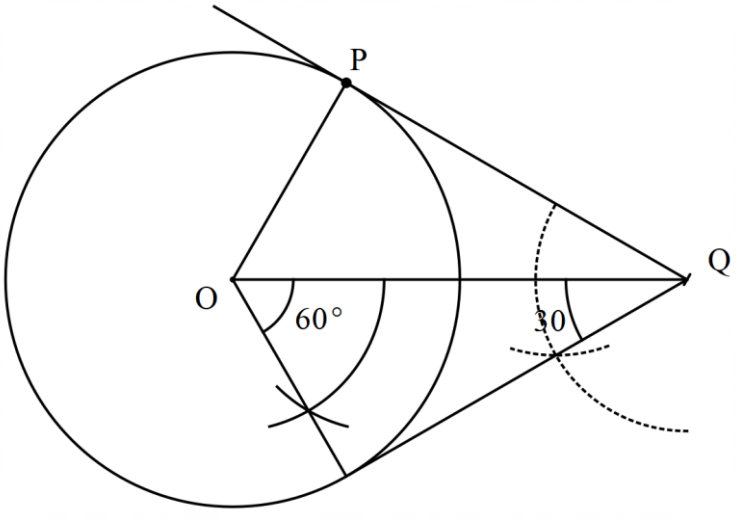


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7.	a) $\frac{dh}{dt} = 65 - 2t$ $= 65 - 2(2)$ $= 61 \text{ m/s}$	M1	Differentiation n Accurate velocity. Assume if sign not indicated otherwise wrong unit penalize fully
		A1	
	b) $65 - 2t = 0$ $t = 32\frac{1}{2}$ seconds or 32.5 seconds	B1	Accurate time
		03	
8.	$AX, XC = DX.XB$ $\frac{6 \times XC}{6} = \frac{4.8 \times 5}{6}$ $XC = 4 \text{ cm}$ $BT = \sqrt{18 \times 8}$ $= 12 \text{ cm}$	B1	XC correctly found
		M1	Relationship of external intersection of lines
		A1	Accuracy
		03	
9.	$ASF = \frac{110}{10} = 11$ $5x^2 + 6 = 11$ $\frac{5x^2}{5} = \frac{5}{5}$ $x^2 = 1$ $x = \pm 1$ $x = 1 \text{ or } -1$	M1	Attempt to get A.S.F
		M1	Attempt to solve quadratic function
		A1	The two roots given
		03	



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10.	$\log_2 9 + \log_2 \left(y^2 - \frac{y}{3} \right) = \log_2 2$ $\log_2 (9y^2 - 3y) = \log_2 2$ $9y^2 - 3y - 2 = 0$ $3y(3y - 2) + 1(3y - 2) = 0$ $(3y + 1)(3y - 2) = 0$ $y = -\frac{1}{3} \text{ or } \frac{2}{3}$	M1 M1 A1 03	Dropping of logs. Attempt to solve quadratic function. The other techniques correctly applied.
11.		B1 B1 02	Construction of angle 60 at Q and O. Required tangent.
12.	P(BBG) or P(BGB) or P(GBB) $\left(\frac{7}{12} \times \frac{6}{11} \times \frac{5}{10} \right) + \left(\frac{7}{12} \times \frac{5}{11} \times \frac{6}{10} \right) + \left(\frac{5}{12} \times \frac{7}{11} \times \frac{6}{10} \right)$ $= 3 \left(\frac{7}{44} \right)$ $= \frac{21}{44} \text{ reject } 0.4773$	M1 M1 A1 03	The denominator decreasing by 1 Substitution Accuracy
13.	$8\sin^2 \alpha + 2\sin \alpha - 3 = 0$ $8\sin^2 \alpha + 6\sin \alpha - 4\sin \alpha - 3 = 0$ $2\sin \alpha (4\sin \alpha + 3) - 1(4\sin \alpha + 3) = 0$ $(2\sin \alpha - 1)(4\sin \alpha + 3) = 0$ $\sin \alpha = \frac{1}{2} / -\frac{3}{4}$ $\alpha = 30^\circ \text{ or } 150^\circ$	M1 M1 A1 B1 04	Quadratic function. Attempt to solve The two $\sqrt{}$ All the angles given.



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14.	$C \left(\frac{6-2}{2}, \frac{6-2}{2} \right)$ $C(2,2)$ $r = \sqrt{(2-0)^2 + (2-6)^2}$ $= \sqrt{20} \text{ or } 2\sqrt{5}$ $(x-2)^2 + (y-2)^2 = 20$ $x^2 - 4x + 4 + y^2 - 4y + 4 = 20$ $x^2 + y^2 - 4x - 4y - 12 = 0$	B1 M1 A1 03	Centre and radius given. Expression of eqn of a circle Accuracy in the required format
15.	$ar = 16$ $ar^4 = 2$ $\frac{ar^4}{ar} = \frac{2}{16}$ $\sqrt[3]{r^3} = \sqrt[3]{\frac{1}{8}}$ $r = \frac{1}{2}$ $a \times \frac{1}{2} = 16$ $a = 32$	M1 A1 B1 03	Connecting the two terms Value of r Value of a correctly computed.

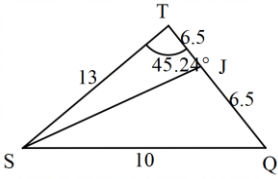
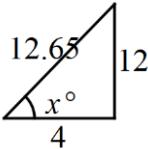
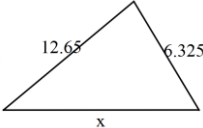


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16.	$= \frac{34-16}{25-16}$ $= 2.000 \pm 0.2$	B1 Drawing the tangent line. M1 Calculation A1 Accurate tangent must be to 4 s.f 03	
		50	



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17.	a) $PR = \sqrt{8^2 + 6^2}$ $= 10 \text{ cm}$ Height $= \sqrt{13^2 - 5^2}$ $= 12 \text{ cm}$	M1	Attempt to find PR
		A1	Accuracy (h)
		02	
	b) $\sin \theta = \frac{5}{13}$ $= 22.62$ $SJ^2 = 13^2 + 6.5^2 - 2(13)(6.5)\cos 45.24$ $= 9.605$ $\frac{6.5}{\sin \theta} = \frac{9.605}{\sin 45.24}$ $= 28.72^\circ$ 	M1	Cosine rule
		M1	Sine rule
		A1	Accuracy
		03	
	c)  $\tan x = \frac{12}{4}$ $x = 71.57^\circ$	M1	Use of SOHCAHTOA
		A1	Accuracy.
		02	
	d)  $x^2 = 12.65^2 + 6.325^2 - 2(12.65)(6.325)\cos 36.86$ $x = 8.4849$ $\frac{8.4849}{\sin 36.86} = \frac{6.325}{\sin \theta}$ $\theta = 26.56$	M1	Cosine rule applied.
		M1	Sine rule applied
		A1	Accuracy
		03	
		10	



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18.	$P \propto Q^2, \frac{1}{Q}$ a) $P = kQ^2 + \frac{m}{Q}$ $(10.5 = 6.25k + 0.4m)0.25$ $(30.75 = 16k + 0.25m)0.4$ $\left(\begin{array}{l} 2.625 = 1.5625k + 0.1m \\ 12.3 = 6.4k + 0.1m \end{array} \right) -$ $\frac{-9.675k}{-4.8375} = \frac{-4.8375}{-4.8375}$ $k = 2$ $12.3 = 12.8 + 0.1m$ $m = -5$ $P = 2Q^2 - \frac{5}{Q}$	M1	Attempt to come up with simultaneous eqn.
		M1	Attempt to solve simultaneous eqn.
		A1	Accurate value of k
		B1	Equation connecting the variables.
		04	
	b) $P = 2(1.5)^2 - \frac{5}{1.5}$ $= 1\frac{1}{6}$	M1	Substitution
		A1	Accuracy, accept decimal point to 4s.f
		02	
	$Q \propto \sqrt{R}$ $Q = k\sqrt{R}$ c) i) $3.04 = k\sqrt{3.61}$ $k = 1.6$ $Q = 1.6\sqrt{R}$	M1	Substitution
		A1	Accuracy.
		02	
	ii) $P = 2\left(1.6\sqrt{R}\right)^2 - \frac{5}{1.6\sqrt{R}}$ $= 5.12R - \frac{3.125}{\sqrt{R}}$	M1	Substitution
		A1	Accuracy.
		02	
		10	



	B1 line AB correctly measured B1 angle 75° correctly constructed. B1 triangle ABC completed. B1 Determination of height as 3 cm B1 location of locus P B1 30° at B and A constructed. B1 locus of Q drawn(major arc) B1 drawing an arc 5 cm with discontinuous curve. B1 angle bisector of ACB B1 – region R correctly shaded.
	10



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20.	Weight	F	X	d= x – A	Fd	Cf		B1	For fd
	1 -10	2	5.5	-36.5	-73	2			
	11 – 20	10	15.5	-26.5	-265	12			
	21 – 30	13	25.5	-16.5	-214.5	25			
	31 – 40	17	35.5	-6.5	-110.5	42			
	41 – 50	18	45.5	3.5	63	60			
	51 – 60	14	55.5	13.5	189	74			
	61 – 70	10	65.5	23.5	230	84			
	71 – 80	6	75.5	33.5	201	90			
	81 – 90	6	85.5	43.5	261	96			
	91 - 100	4	95.5	53.5	214	100			
					$\Sigma fd = 495$			M1	Attempt to find mean using assumed mean.
	a) $\bar{x} = 42 + \frac{495}{100}$ = 46.95							A1	Accuracy.
								03	
	b) Median = $40.5 + \frac{8}{18} \times 10$ = 44.94 $Q_3 = 60.5 + \frac{1}{10} \times 10$ = 61.5 Range = 44.94 – 61.5							M1	Attempt to substitute in the formulae of median.
								A1	Accurate median.
								M1	Attempt to compute upper quartile
								A1	Accuracy.
								B1	Range stated correctly.
								05	Substitution.
	c) 80 th percentile = $60.5 + \frac{6}{10} \times 10$ = 66.5 tonnes							M1	
								A1	Accuracy.
								02	
								10	



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21.	a) i) $6075.75+1162$ $= 7237.75$	M1	Finding gross tax
		A1	Accuracy
	$0.1\times10165 = 1016.50$		
	$0.15\times9575 = 1436.25$	M1	1 st two slabs
	$0.20\times9576 = 1915.20$		
	$0.25\times9576 = 2394.00$	M1	Next two bands
	ii) $0.3(P - 38892) = 7237.75 - 6761.95$	M1	Computation of last band
	$0.3P - 11667.6 = 475.8$	M1	Attempt to find p
	$\frac{0.3P}{0.3} = \frac{12143}{0.3}$	M1	Division
	$P = 40478$		
	b) $40\,478 - 5480$ $= 34\,998$	A1	Accuracy
		M1	Subtraction of allowance
		A1	Accuracy.
		10	
22.	a) $D_{nm} = \theta \times 60$ $= 60 \times 60$ $= 3\,600\text{ nm}$	M1	Application of getting great circle
		A1	Accuracy.
	b) Let Δ in longitude be θ $\frac{2700}{30} = \frac{\theta \times 60 \cos 60}{30}$	M1	Substitution
	$\theta = 90^\circ$	A1	Accurate θ
	X(60° N, 105° E)	B1	Location stated correctly.
	c) Time taken between		Total time.
	$PQ = \frac{1800}{300} = 6\text{hrs}$	B1	
	$QX = \frac{2700}{300} = 9\text{hrs}$		
	Total time = 15 hours	M1	Addition
	$1330+1500= 2830$		
$2830 - 2400 = 4.30\text{ am or }0430\text{hr}$	A1	Time unit must be written	
$2700 = \frac{90}{360} \times 2 \times \frac{22}{7} \times r$			
d) $r = \frac{2700 \times 360 \times 7}{90 \times 2 \times 22}$ $= 1718.18\text{ nm}$	M1	Attempt to find r	
	A1	Accuracy in nm	
	10		



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0	15	30	45	60	75	90	105	120	135	150	165	180	
0.00	0.50	0.87	1.00	0.87	0.50	0.00	-0.50	-0.87	-1.00	-0.87	-0.50	0.00	B2 all entries correct
0.87	0.97	1.00	0.97	0.87	0.71	0.50	0.26	0.00	-0.26	-0.50	-0.71	-0.87	B1 8 to 11 entries correct

d) $x=40^\circ, 60^\circ$ and $160^\circ \pm 1^\circ$

e) $160^\circ < x \leq 180^\circ \pm 1^\circ$

B0 otherwise

P1 first curve
C1 curve 1 smooth

P1 2nd curve

C1 2nd curve smooth

B2 all correct
B1 two correct
B0 otherwise

B1 for first inequality
B1 the other inequality

10



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24.	a) i) $\mathbf{XB} = \begin{pmatrix} 18 \\ 3 \end{pmatrix} - \begin{pmatrix} 0 \\ 6 \end{pmatrix} = \begin{pmatrix} 18 \\ -3 \end{pmatrix}$	B1	Correct vector
	ii) $\mathbf{ZA} = \begin{pmatrix} 6 \\ 10 \end{pmatrix} - \begin{pmatrix} 21 \\ 0 \end{pmatrix} = \begin{pmatrix} -15 \\ 10 \end{pmatrix}$	B1	Vector correct
	b) i) $\mathbf{OM} = \mathbf{OZ} + \mathbf{ZM}$ $= \begin{pmatrix} 21 \\ 0 \end{pmatrix} + k \begin{pmatrix} -15 \\ 10 \end{pmatrix}$ $= \begin{pmatrix} 21-15k \\ 10k \end{pmatrix}$	M1	Attempt to express in terms of k
	$\mathbf{OM} = \mathbf{OX} + \mathbf{XM}$ $= \begin{pmatrix} 0 \\ 6 \end{pmatrix} + m \begin{pmatrix} 18 \\ -3 \end{pmatrix}$ $= \begin{pmatrix} 18 \\ 6-3m \end{pmatrix}$	M1	Attempt to express in terms of m
	$\begin{pmatrix} 21-15k \\ 10k \end{pmatrix} = \begin{pmatrix} 18 \\ 6-3m \end{pmatrix}$	M1	Connecting the eqns.
	21 - 15k = 18m 10k = 6 - 3m 18m + 15k = 21 3m + 10k = 6 18m + 15k = 21 18m + 60k = 36 -45k = -15	M1	Attempt to solve simultaneous eqn
	$k = \frac{1}{3}$ $m = \frac{8}{9}$	A1	Values of k and m
	ii) $\mathbf{OM} = \begin{pmatrix} 21-15\left(\frac{1}{3}\right) \\ 10\left(\frac{1}{3}\right) \end{pmatrix}$	M1	Substitution
	$= \begin{pmatrix} 16, 3\frac{1}{3} \end{pmatrix}$	A1	Accuracy
	iii) 3 : -2	B1	Correct ratio.
		10	

