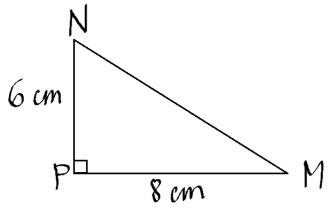
SEMESTER 2 EXAM - YEAR 10

Q.no	Scheme	Mark
PART 1 - KNOWLEDGE CHECK		
1	a. 	2 marks
	$MN^2 = 6^2 + 8^2$	0.5 mark
	$MN^2 = 100$	0.5 mark
	$MN = \sqrt{100}$	0.5 mark
	$MN = 10\ cm$	0.5 mark
	b. $\cos \angle PMN = \dfrac{PM}{MN}$	4 marks
	c. $\sin \angle PMN = \dfrac{PN}{MN}$	4 marks
	d. i. We have the adjacent and hypotenuse sides, so we need to use cos.	2 marks
	ii. We have the opposite and adjacent sides, so we need to use tan.	2 marks
	e. $\sin^{-1}$.	2 marks
	f. an angle measure.	2 marks
2	a. $\dfrac{1}{2}.PQ.QR.\sin Q$ or $\dfrac{1}{2}.PQ.PR.\sin P$ or $\dfrac{1}{2}.QR.PR.\sin R$	2 marks
	b. $\dfrac{QR}{\sin P} = \dfrac{QP}{\sin R} = \dfrac{PR}{\sin Q}$	2 marks
	c. $QR^2 = QP^2 + PR^2 - 2.QP.PR.\cos P$	2 marks
3	a. i. numerical	2 marks
	ii. categorical	2 marks
	iii. categorical	2 marks

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3	b. Arrange in order:	
	$3, 4, 5, 5, 6, 6, 6, 6, 7, 7, 7, 7, 8, 8, 10.$	1 mark
	Mode = 6 and 7.	1 mark each
	Median = 6.	1 mark
	Mean = $\frac{19}{3} \approx 6.33$.	2 marks
	c. Min = 1, $Q_1 = 2, Q_3 = 4.5$, Max = 8.	0.25 mark each
	Median = 0.25, IQR = 4.5 - 2 = 2.5.	0.5 mark each
PART 2 - FLUENCY CHECK		
4	a. i. Function	0.25 mark
	ii. Function	0.25 mark
	iii. Not a function	0.25 mark
	iv. Not a function	0.25 mark
	b. i. Function	0.5 mark
	ii. Function	0.5 mark
	iii. Not a function	0.5 mark
	iv. Function	0.5 mark
5	a. i. Reflecting the graph in the y-axis.	1 mark
	Translating the graph vertically upwards 5 units.	1 mark
	ii. Translating the graph horizontally to the right 5 units.	0.5 mark
	Reflecting the graph in the x-axis.	0.5 mark
	Vertically stretching with scale factor 2.	1 mark

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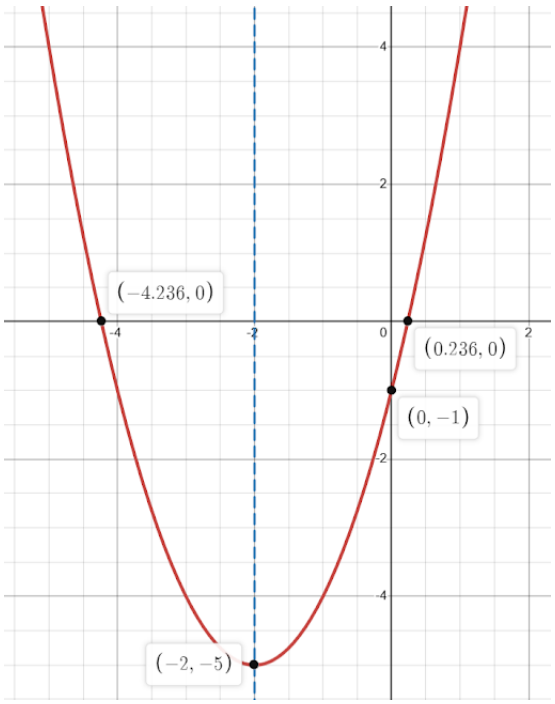
	PART 2 - FLUENCY CHECK	
5	b. $x^2 - 6x + 8 = 15$	0.25 mark
	$x^2 - 6x - 7 = 0$	0.25 mark
	$(x + 1)(x - 7) = 0$	0.25 mark
	$x = -1$ or $x = 7$	0.25 mark
	c. i. y-intercept: (0;-1)	1 mark
	x-intercept: $(x + 2)^2 - 5 = 0$	0.25 mark
	$(x + 2)^2 = 5$	0.25 mark
	$x = \pm\sqrt{5} - 2$	0.25 mark
	So x-intercepts are $(\sqrt{5} - 2; 0)$ and $(-\sqrt{5} - 2; 0)$	0.25 mark
	ii. 	0.25 mark for each point

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PART 2 - FLUENCY CHECK		
6	a. i. $AB^2 + AC^2 = 2^2 + 1^2 = 5$	0.25 mark
	$BC^2 = (\sqrt{5})^2 = 5$	0.25 mark
	$AB^2 + AC^2 = BC^2$	0.25 mark
	ABC is a right triangle at A.	0.25 mark
	ii. $AB^2 + BC^2 = 8^2 + 12^2 = 208$	0.25 mark
	$AC^2 = (\sqrt{218})^2 = 218$	0.25 mark
	$AB^2 + BC^2 \neq AC^2$	0.25 mark
	ABC is not a right triangle.	0.25 mark
	b. i. $\theta = 180^0 - 90^0 - 68^0 = 22^0$.	0.5 mark
	$\sin 68^0 = \dfrac{7.5}{a}$	0.25 mark
	$a = \dfrac{7.5}{\sin 68^0} \approx 8.09\ m$	0.5 mark
	$\tan 68^0 = \dfrac{7.5}{b}$	0.25 mark
	$b = \dfrac{7.5}{\tan 68^0} \approx 3.03\ m$	0.5 mark
	ii. $\theta = 180^0 - 90^0 - 31^0 = 59^0$.	0.5 mark
	$\sin 31^0 = \dfrac{b}{15.2}$	0.25 mark
	$b = 15.2.\sin 31^0 \approx 7.83\ cm$	0.5 mark
	$\cos 31^0 = \dfrac{a}{15.2}$	0.25 mark
	$a = 15.2.\cos 31^0 \approx 13.03\ cm$	0.5 mark
7	a. i. 40^0	0.5 mark
	ii. $180^0 + 55^0 = 235^0$	0.5 mark
	b. $P(\cos 74^0, \sin 74^0)$	0.5 mark
	$Q(\cos 155^0, \sin 155^0)$	0.5 mark

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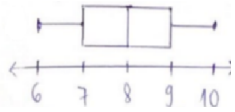
PART 2 - FLUENCY CHECK		
7	c. $180^0 - 40^0 - 116^0 = 24^0$.	0.5 mark
	$\dfrac{x}{\sin 24^0} = \dfrac{6}{\sin 40^0}$	0.5 mark
	$x = \dfrac{6 \sin 24^0}{\sin 40^0} \approx 3.80\ cm.$	0.5 mark
	$A = \dfrac{1}{2} \times 3.80 \times 6 \times \sin 116^0 \approx 10.25\ cm^2.$	0.5 mark
	d. $AB = \sqrt{124^2 + 105^2 - 2.124.105.\cos 130^0} \approx 207.70\ m.$	0.5 mark
	The distance between A and B is 207.70 m.	0.5 mark
8	a. 10 - 6 = 4	1 mark
	b. Min =6, Max = 10, Median = 8, $Q_1 = 7, Q_3 = 9$	2 marks
	c. 	1 mark
	d. This set of data has a symmetric distribution	1 mark
	e. $s \approx 1.13$	1 mark
PART 3 - PROBLEM SOLVING		
9	a. When $t = 0, s = -6 \times 0^2 + 12 \times 0 + 60 = 60$ km/h.	0.5 mark
	The car was travelling 60 km/h when the driver applied the brakes.	0.5 mark
	b. $t = \dfrac{-b}{2a}$	0.5 mark
	$= \dfrac{-12}{2 \times (-6)}$	0.5 mark
	$= 1$ second.	0.5 mark
	After 1 second, the car reaches its maximum speed.	0.5 mark
	c. When $t = 1, s = -6 \times 0^2 + 12 \times 1 + 60 = 66$ km/h.	0.5 mark
	The maximum speed reached is 66 km/h.	0.5 mark

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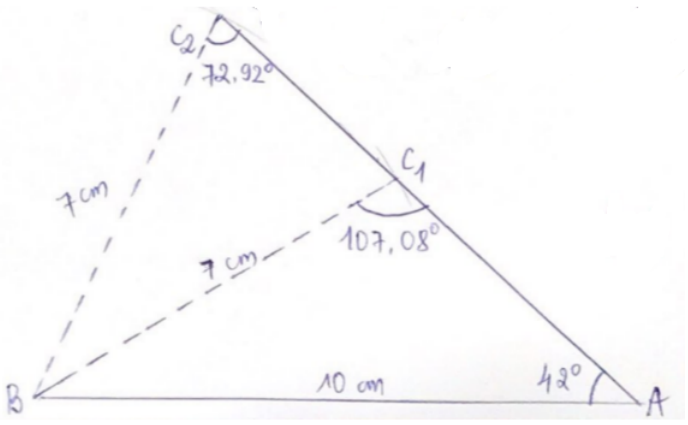
PART 3 - PROBLEM SOLVING		
9	d. $-6t^2 + 12t + 60 = 0 \longrightarrow t^2 - 2t - 10 = 0.$	0.25 mark
	$\delta = b^2 - 4ac = (-2)^2 - 4 \times 1 \times (-10) = 44 > 0.$	0.25 mark
	$t_1 = \dfrac{2 + \sqrt{44}}{2} = \dfrac{1 + \sqrt{11}}{2} \approx 4.32s.$	
	$t_2 = \dfrac{2 - \sqrt{44}}{2} = \dfrac{1 - \sqrt{11}}{2} \approx -2.32s$ (reject).	0.25 mark
	It takes 4.32 seconds for the vehicle to stop.	0.25 mark
10	$\tan 56^0 = \dfrac{CB}{30}$	1 mark
	$CB = 30 \tan 56^0 \approx 44.48\ m.$	1 mark
	$\tan 60^0 = \dfrac{DB}{30}$	1 mark
	$DB = 30 \tan 60^0 \approx 51.96\ m.$	1 mark
	$CD = DB - CB = 51.96 - 44.48 = 7.48\ m.$	0.5 mark
	The height of the flagpole is 7.48 m.	0.5 mark
11	a. $\dfrac{10}{\sin \angle ACB} = \dfrac{7}{\sin 42^0}$	1 mark
	$\sin \angle ACB = \dfrac{10 \sin 42^0}{7}$	1 mark
	$\angle ACB = \arcsin \dfrac{10 \sin 42^0}{7} \approx 72.92^0$	1 mark
	or $\angle ACB = 180^0 - 72.92^0 = 107.08^0$	1 mark
	b. 	1 mark

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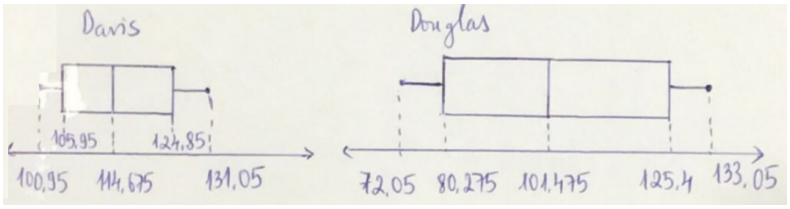
	PART 3 - PROBLEM SOLVING	
12	For this question, all units are in dollars.	
	a. Davis:$Min = 100.95, Max = 131.05, Median = 114.675$	0.5 mark
	$Q_1 = 105.05, Q_3 = 124.85$	0.5 mark
	Douglas: $Min = 72.05, Max = 133.05, Median = 101.475$	0.5 mark
	$Q_1 = 80.275, Q_3 = 125.4$	0.5 mark
	b. 	1 mark each
	c. Davis: Range = 131.05 - 100.95 = 30.1	0.5 mark
	IQR = 124.85 - 105.05 = 19.8	0.5 mark
	Douglas: Range = 133.05 - 72.05 = 61	0.5 mark
	IQR = 125.4 - 80.275 = 45.125	0.5 mark
	d. Davis: Mean = 115.28	0.5 mark
	Standard deviation = 9.60	0.5 mark
	Douglas: Mean = 102.37	0.5 mark
	Standard deviation = 20.42	0.5 mark
	e. i. Davis's family spent more at the supermarket each week generally.	1 mark
	ii. Douglas's family had the greater variation in the amount they spent each week.	1 mark

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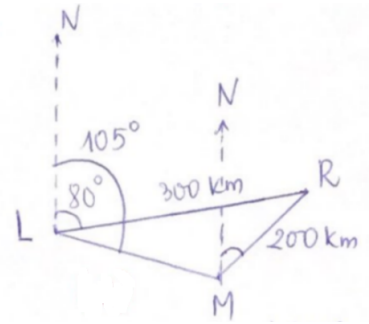
PART 4 - ADVANCED PROBLEM SOLVING		
13		2 marks
	$\angle RLM = 105^0 - 80^0 = 25^0$	1 mark
	$\frac{300}{\sin \angle LMR} = \frac{200}{\sin 25^0}$	1 mark
	$\sin \angle LMR = \frac{300 \sin 25^0}{200}$	1 mark
	$\angle LMR = 180^0 - \arcsin \frac{300 \sin 25^0}{200}$	1 mark
	$\approx 140.66^0$	1 mark
	$\angle NML = 180^0 - 105^0 = 75^0$	1 mark
	$\angle NMR = 140.66^0 - 75^0 = 65.66^0$	1 mark
	The bearing of Rotterdam from Margate is 65.66^0	1 mark
14	a. i. (0,6)	1 mark
	ii. $x = 9$	1 mark
	b.One x-intercept is (27,0)	1 mark
	The difference between 27 and 9 is 27 - 9 = 18 m	0.5 mark
	So 9 - 18 = -9	0.5 mark
	The other x-intercept is (-9,0)	1 mark

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PART 4 - ADVANCED PROBLEM SOLVING		
14	c. $y = a(x+9)(x-27)$ since the x-intercepts are (-9,0) and (27,0)	1 mark
	The y-intercept is (0,6) so $a(0+9)(0-27) = 6$	0.5 mark
	$-243.a = 6$	0.5 mark
	$a = \dfrac{-2}{81}$	0.5 mark
	So $y = \dfrac{-2}{81}(x+9)(x-27)$	0.5 mark
	d. When $x = 9, y = \dfrac{-2}{81}(9+9)(9-27) = 8$ m.	1 mark
	The maximum height reached by the stone is 8 m.	1 mark