Name: _____

Higher Unit 13 topic test

Date:

Time: 55 minutes

Total marks available: 46

Total marks achieved: _____

Questions

Q1.
ABC is an isosceles triangle.

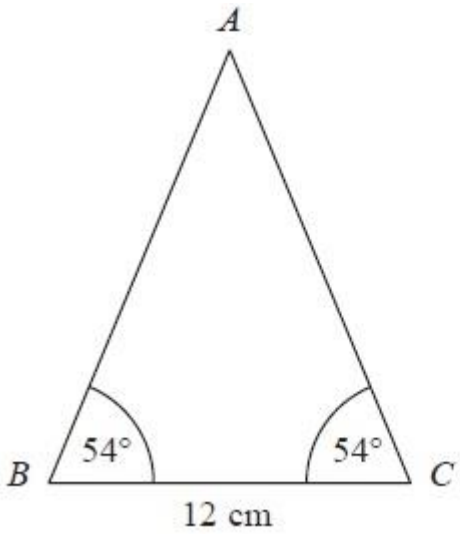


Diagram **NOT** accurately drawn

Work out the area of the triangle.

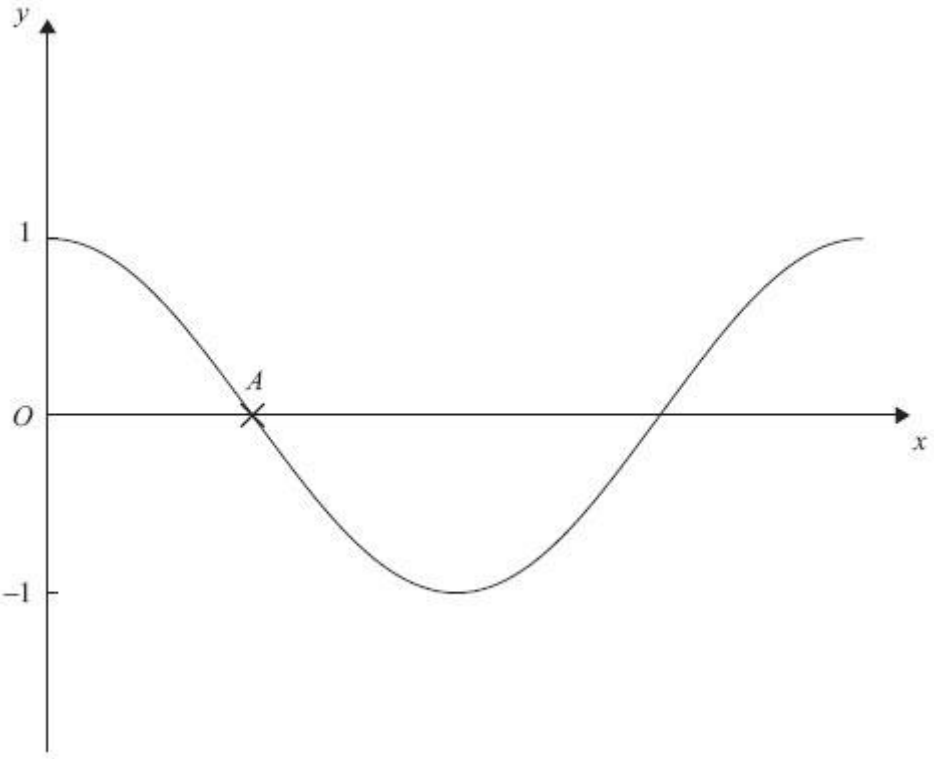
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question is 4 marks)

Q2.

The diagram shows a sketch of the graph of $y = \cos x°$



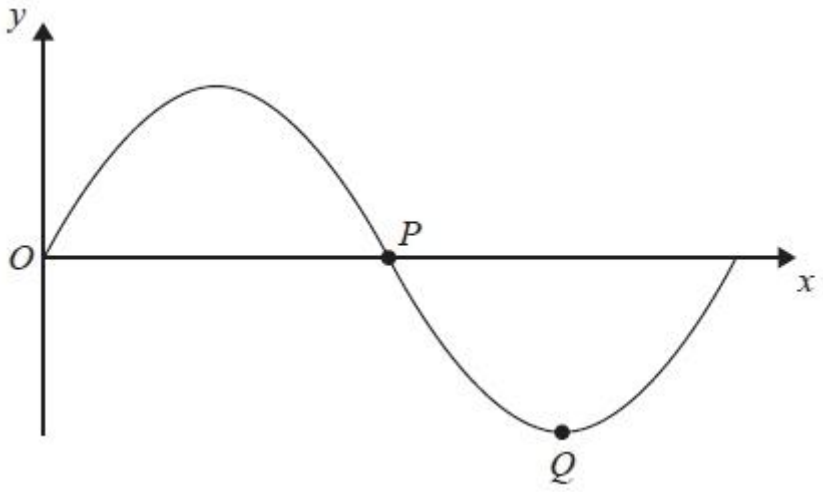
Write down the coordinates of the point *A.*

.....

(Total for Question is 1 mark)

Q3.

The diagram shows part of a sketch of the curve $y = \sin x°$.



(a) Write down the coordinates of the point P.

(..... , ...)

(1)

(b) Write down the coordinates of the point Q.

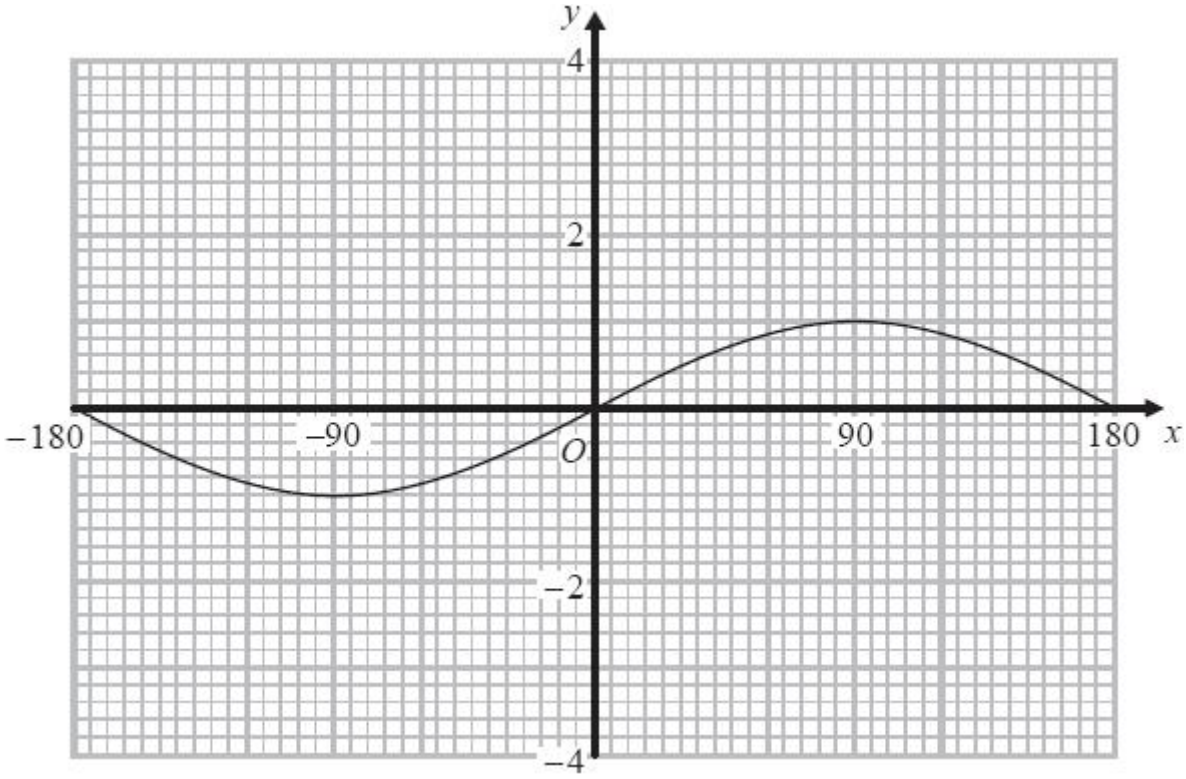
(..... , ...)

(1)

(Total for Question is 2 marks)

Q4.

Here is the graph of $y = \sin x°$ for $-180 \leq x \leq 180$



On the grid above, sketch the graph of $y = \sin x° + 2$ for $-180 \leq x \leq 180$

(Total for question is 2 marks)

Q5.

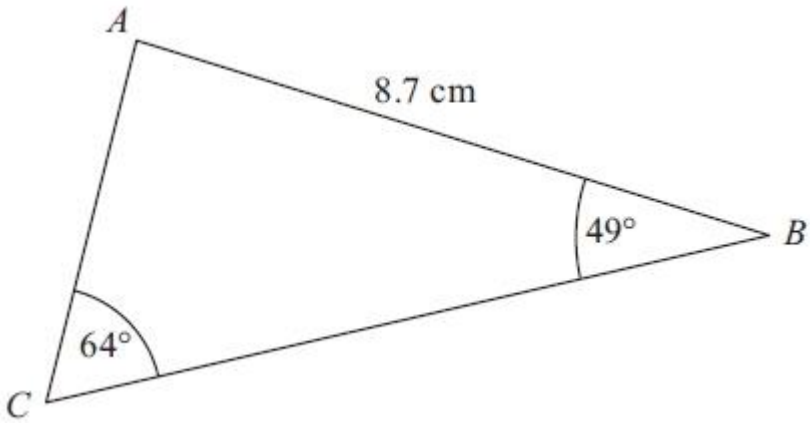


Diagram **NOT** accurately drawn

ABC is a triangle.

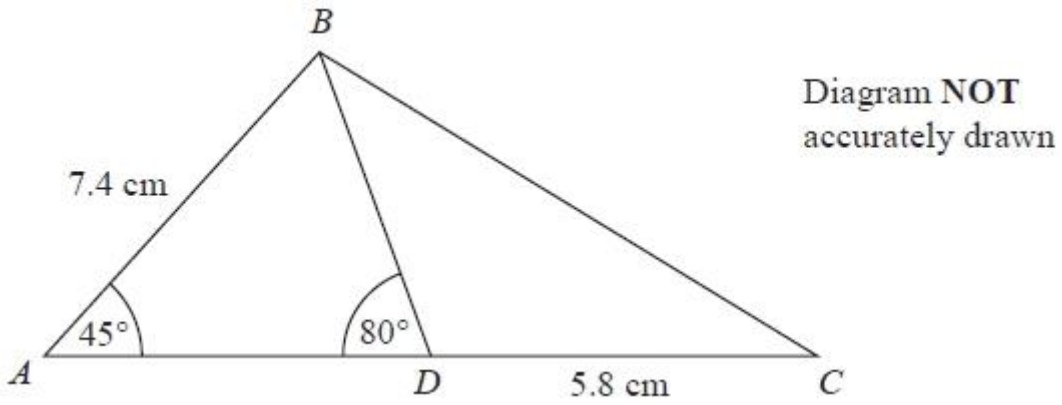
AB = 8.7 cm.
Angle *ABC* = 49°.
Angle *ACB* = 64°.

Calculate the area of triangle *ABC*.
Give your answer correct to 3 significant figures.

. . . . . cm^2

(Total for Question is 5 marks)

Q6.



ABC is a triangle.
D is a point on *AC*.
Angle *BAD* = 45°
Angle *ADB* = 80°
AB = 7.4 cm
DC = 5.8 cm

Work out the length of *BC*.
Give your answer correct to 3 significant figures.

..... cm

(Total for question = 5 marks)

Q7.

The diagram shows triangle *LMN*.

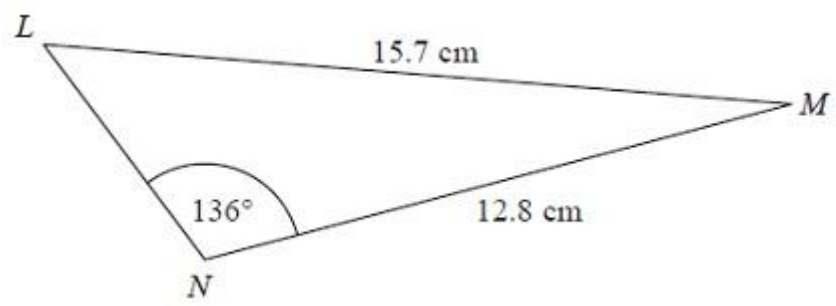


Diagram **NOT** accurately drawn

Calculate the length of *LN*.

Give your answer correct to 3 significant figures.

..... cm

(Total for Question is 5 marks)

Q8.

ABCD is a quadrilateral.

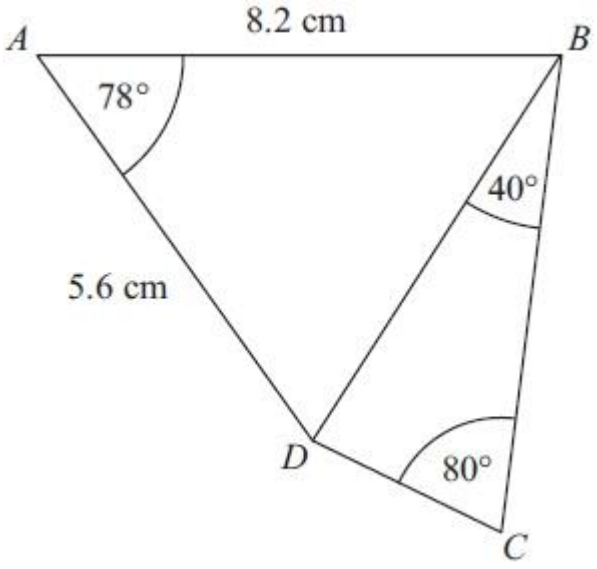


Diagram **NOT** accurately drawn

Work out the length of *DC*.
Give your answer correct to 3 significant figures.

. . . . . cm

(Total for Question is 6 marks)

Q9.

In triangle *RPQ*,

RP = 8.7 cm
PQ = 5.2 cm
Angle *PRQ* = 32°

(a) Assuming that angle *PQR* is an acute angle,
calculate the area of triangle *RPQ*.
Give your answer correct to 3 significant figures.

.....cm^2

(4)

(b) If you did not know that angle *PQR* is an acute angle, what effect would this have on your calculation of the area of triangle *RPQ*?

.....

.....

.....

(1)

(Total for question = 5 marks)

Q10.

Jerry wants to cover a triangular field, *ABC*, with fertiliser.

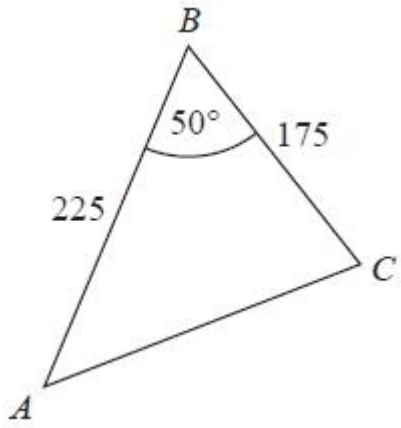


Diagram **NOT** accurately drawn

Here are the measurements Jerry makes

angle *ABC* = 50° correct to the nearest degree,
BA = 225 m correct to the nearest 5 m,
BC = 175 m correct to the nearest 5 m.

Work out the upper bound for the area of the field.
You must show your working.

.....m^2

(Total for Question is 3 marks)

Q11.

* The diagram shows the triangle *PQR*.

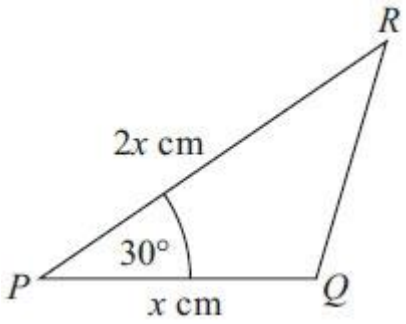


Diagram **NOT** accurately drawn

PQ = *x* cm
PR = 2*x* cm
Angle *QPR* = 30°

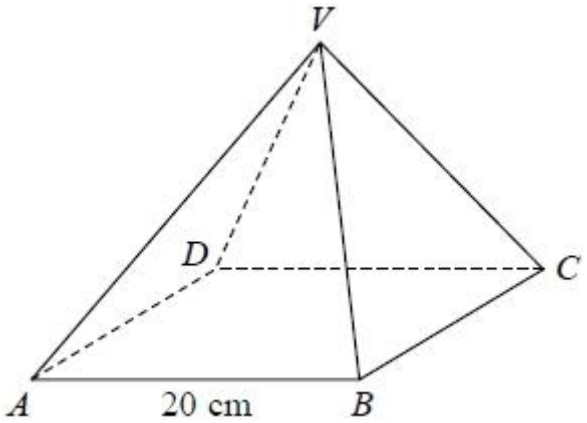
The area of triangle *PQR* = *A* cm^2

Show that $x = \sqrt{2A}$

(Total for Question is 3 marks)

Q12.

VABCD is a solid pyramid.



ABCD is a square of side 20 cm.

The angle between any sloping edge and the plane *ABCD* is 55°

Calculate the surface area of the pyramid.
Give your answer correct to 2 significant figures.

.....cm^2

(Total for question = 5 marks)

Examiner's Report

Q1.
This was the first question on the paper that was poorly attempted. The preferred route taken by candidates was to find either AB or AC, which was nearly always correctly done. Most of these candidates then went on to substitute their values into ½abSinC with just a few using the wrong value for the included angle. A few candidates, having found the slant height, used it as the perpendicular height of the triangle when calculating the area using ½ b×h, resulting in the loss of marks. It was rare to see the triangle split into two right angled triangles and tan54 used to find the height, though those who chose this route usually did it well.

Q2.

This question proved to be a good discriminator between the most able candidates. In part (a) the most commonly seen incorrect answers seen included (1, 0) and (0, 90).

Q3.

The first two parts of the question were basically about how well candidates knew their trigonometric curves. The response was very poor with very few being able to give the correct coordinates. Surprisingly for this target level, there were candidates who gave the correct values, but reversed − for example (0, 180) instead of the correct (180, 0)

Q4.

There were a few good answers to part (a) and some further students managed to score 1 mark for a reasonably convincing translation parallel to the *y*-axis.

Q5.

This question was often omitted and it was generally not well done by those who did attempt it. A number of candidates treated the triangle as right angled and used cos/sin/tan to find one of the sides. Those who used the sine rule were mostly able to find at least one side successfully. Many candidates found both missing sides which was unnecessary. Most knew that they had to use 1/2*ab*sin*C* for the area but sometimes did not use the angle included by their two sides.

Q6.

From this point on, a significant number of students failed to attempt these later questions in the paper. In this question many incorrectly assumed ABC was 90° and tried to use Pythagoras. Some tried to use Sine Rule but frequently substituted incorrect values; few considered the need to use Cosine Rule.

Q7.
Many candidates started off by using the Cosine Rule with the angle 136 or basic trigonometry, but alone this would not have led to a complete solution. It was rare to find Cosine Rule being used correctly as a first stage. In some cases a start using the Sine Rule was not developed, as a significant number of candidates did not know what to do with it once they had substituted the numbers. Those who did so successfully usually went on to use Cosine Rule or Sine Rule again to complete the solution. Premature rounding spoilt many solutions.

Q8.

There were some who did not understand the topic and associated this question with Pythagoras and right-angled trigonometry. The majority deduced Cosine rule was needed and correctly substituted in their values. In many cases the order of operations in Cosine Rule was flawed, resulting in an incorrect length for DB. Many then went on to use Sine Rule, with greater success and sound method shown resulted in additional marks.

Q9.
No Examiner's Report available for this question

Q10.

Seeing the correct bounds was rare and 225.5 and 175.5 or 230 and 180 were often seen as the upper bounds of *BA* and *BC* respectively. Many students however earned the first mark for a correct upper bound for the angle.

Use of $\frac{1}{2}absinC$ was good, however it was not uncommon to see the students' upper bounds for *BA* and BC and then sin 50° used.

Q11.

The majority of candidates who realised that they had to use ½ *ab* sin *C* for the area of the triangle often substituted the given lengths and angle correctly but then could not progress any further. Some good fully correct proofs were seen but a very few candidates were unable to gain full marks because their calculators were clearly set in radian or gradian rather than degree mode.

Q12.
No Examiner's Report available for this question

Mark Scheme

Q1.

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
		49.5	4	M1 for $\tan 54 = \frac{\text{height}}{6}$ M1 for (height =) 6 × tan54 (=8.2-8.3) M1 for $\frac{1}{2}$ × '8.258..' × 12 A1 for 49.2 - 50 **OR** M1 for $\cos 54 = \frac{6}{AC}$ M1 for $(AC =) \frac{6}{\cos 54}$ (=10.2(07...)) M1 for $\frac{1}{2}$ × 12 × '10.207' × sin54 A1 for 49.2 - 50 **OR** M1 for $\frac{AC}{\sin 54} = \frac{12}{\sin 72}$ M1 for $(AC =) \frac{12}{\sin 72}$ × sin54 (=10.2(07...)) M1 for $\frac{1}{2}$ × 12 × '10.207' × sin54 A1 for 49.2 – 50

Q2. (part (a) only)

		Working	Answer	Mark	Notes
	(a)		(90, 0)	1	B1 for (90, 0) (condone ($\pi/2$, 0))
	(b)		Correct graph	1	B1 for graph through (0, 2) (90, 0) (180, -2) (270, 0) (360, 2) professional judgement

Q3. (parts (a) and (b) only)

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
	(a)		180, 0	1	B1 for 180, 0 Accept π, 0
	(b)		270, –1	1	B1 for 270, –1 accept $\frac{3\pi}{2}$, –1
	(c)		$a = 2$ $b = 3$ $c = 1$	3	B1 cao B1 cao B1 cao

Q4. (part (a) only)

Question		Working	Answer	Mark	Notes
	(a)		Graph drawn	2	B2 correct graph drawn (B1 for a graph translated up/down)
	(b)		Graph drawn	2	B2 for correct graph drawn (B1 for a graph reflected in the x axis or stretched by sf 2 parallel to the y axis)

Q5.

Question		Working	Answer	Mark	Notes
		$AC/\sin 49 = 8.7/\sin 64$ $AC = 8.7/\sin 64 \times \sin 49$ (= 7.305...) $\frac{1}{2} \times 8.7 \times 7.305... \times \sin(180 - 64 - 49)$	29.3	5	M1 for $AC/\sin 49 = 8.7/\sin 64$ oe M1 for $(AC =) 8.7/\sin 64 \times \sin 49$ A1 for 7.3(05...) M1 for $\frac{1}{2} \times 8.7 \times$ '7.305' $\times \sin(180 - 64 - 49)$ A1 for 29.19 – 29.3 **OR** M1 for $\frac{BC}{\sin(180 - 64 - 49)} = 8.7/\sin 64$ oe M1 for $(BC =) 8.7/\sin 64 \times \sin$'67' A1 for 8.9(10...) M1 for $\frac{1}{2} \times 8.7 \times$ '8.910' $\times \sin 49$ A1 for 29.19 – 29.3 **OR** (*X* is point such that *AX* is perpendicular to *BC*) M1 for $AX = 8.7 \times \sin 49$ (= 6.565...) **or** $XB = 8.7 \times \cos 49$ (= 5.707...) M1 for $XB = 8.7 \times \cos 49$ (= 5.707...) **and** $CX =$ '6.565' ÷ tan 64 oe (= 3.202...) A1 for 8.9(10...) **or** 5.7(07...) and 3.2(02...) M1 for $\frac{1}{2} \times$ '6.565...' $\times$ ('5.707' + '3.202') oe A1 for 29.19 – 29.3

Q6.

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
			8.52	5	M1 for $\frac{BD}{\sin 45} = \frac{7.4}{\sin 80}$ oe M1 for $(BD =) \frac{7.4}{\sin 80} \times \sin 45$ (= 5.3133..) M1 for $5.8^2 + \text{'5.31'}^2 - 2 \times 5.8 \times \text{'5.31'} \cos 100$ M1 (dep) for correct order of evaluation or 72.5(73...) A1 for 8.51 – 8.52 OR M1 for $\frac{AD}{\sin(180-80-45)} = \frac{7.4}{\sin 80}$ oe M1 for $(AD =) \frac{7.4}{\sin 80} \times \sin(180-80-45)$ (= 6.15...) M1 for $7.4^2 + (\text{'6.15'} + 5.8)^2 - 2 \times 7.4 \times (\text{'6.15'} + 5.8) \times \cos 45$ M1 (dep) for correct order of evaluation or 72.5(7398...) A1 for 8.51 – 8.52

Q7.

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
	180-136- "34.4" =9.504	3.73	5	M1 for $\frac{\sin L}{12.8} = \frac{\sin 136}{15.7}$ M1 for $L = \sin^{-1}\left(\frac{\sin 136}{15.7} \times 12.8\right)$ or or $\sin^{-1} 0.566...$ A1 for 34.4 - 34.5 M1 for $\frac{LN}{\sin(180-136-'34.4')} = \frac{15.7}{\sin 136}$ or $\frac{LN}{\sin(180-136-'34.4')} = \frac{12.8}{\sin '34.4'}$ or $(LN^2 =) 15.7^2 + 12.8^2 - 2 \times 15.7 \times 12.8 \times \cos(180 - 136 - '34.4')$ A1 for 3.73 - 3.74

Q8.

Question		Working	Answer	Mark	Notes
		$DB^2 = 5.6^2 + 8.2^2 - 2 \times 5.6 \times 8.2\cos 78$ $DB^2 = 79.505...$ $DB = 8.9165795..$ $\frac{8.9165..}{\sin 80} = \frac{DC}{\sin 40}$ $DC = \frac{8.9165.. \times \sin 40}{\sin 80}$ $= 8.9165.. \times 0.6572..$ $= 5.8198$	5.82	6	M1 Cosine rule: $DB^2 = 5.6^2 + 8.2^2 - 2 \times 5.6 \times 8.2 \times \cos 78$ M1 $\sqrt{79.505...}$ (=8.9165795..) A1 for DB = 8.90 to 8.92 M1 $\frac{"8.9165.."}{\sin 80} = \frac{DC}{\sin 40}$ M1 $\frac{"8.9165.." \times \sin 40}{\sin 80}$ (=5.8198) A1 for answer 5.80 to 5.83 If working in RAD or GRAD award method marks only. RAD: DB=13.318.., DC=-9.98.. GRAD: DB=8.2152..., DC=5.0773...

Q9.

Paper 1MA1: 2H			
Question	**Working**	**Answer**	**Notes**
(a)		130	P1 start to process eg draw a labelled triangle or use of sine rule $\frac{\sin Q}{8.7} = \frac{\sin 32}{5.2}$
			P1 process to find of Q eg. $Q = \sin^{-1}\left[\frac{\sin 32}{5.2} \times 8.7\right]$
			P1 process to find area of triangle PRQ.
			A1 22.5 – 22.6
(b)			C1 angle PRQ is obtuse so need to find area of two triangles.

Q10.

Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
			15500 to 15600	3	B1 for 50.5 (accept 50.4$\dot{9}$) or 227.5 (accept 227.4$\dot{9}$) or 177.5 (accept 177.4$\dot{9}$) M1 for 0.5 × "227.5" × "177.5" ×sin"50.5" A1 for an answer in the range 15575 to 15580 from using three **correct** upper bounds

Q11.

Question		Working	Answer	Mark	Notes
		A = ½ ×x× 2x sin30° A =½ ×2x^2×0.5 **OR** Height = 2$x$sin 30° = x $A=\frac{x\times x}{2}=\frac{x^2}{2}$ **OR** Height = x sin 30 = x/2 A = ½ ×2x× x/2= x^2/2	$x=\sqrt{2A}$ shown	3	M1 (A =) ½ ×x× 2x sin30° A1 A = x^2 ×0.5 **or** A = x^2/2 C1 for completion with all steps shown **OR** M1 height = 2$x$sin 30 (= x) A1 A = x^2×0.5 **or** A = x^2/2 C1 for completion with all steps shown **OR** M1 for height = x sin 30 (= x/2) A1 A = x^2 ×0.5 **or** A = x^2/2 C1 for completion with all steps shown

Q12.

Paper 1MA1: 3H			
Question	**Working**	**Answer**	**Notes**
	$AC^2 = 20^2 + 20^2 = 800$ $AX^2 = 10^2 + 10^2 = 200$ $\sqrt{200} \times \tan 55 = VX \quad (= 20.19...)$ $VM^2 = \sqrt{"20.19"^2 + 10^2} \quad (= 22.54...)$ $4 \times \frac{1}{2} \times "22.54" \times 20 + 20^2$	1300	Let X be centre of base, M be midpoint of AB P1 process to find AC or AX P1 process to find VX or VA P1 process to find height of sloping face or angle of sloping face. P1 process to find surface area of one triangular face. A1 For 1300 – 1302