

# ADA PINPOINT TOPIC PACKS

- (1)Sine, Cosine Rules and Area of Triangles (11 Qns)  
(2)Combined Sine and Cosine Rules (0 Qns)

50\_to\_100\_Percent\_Pinpoint\_AI\_Pack

Time Allocation = 57mins , Max = 50 Marks

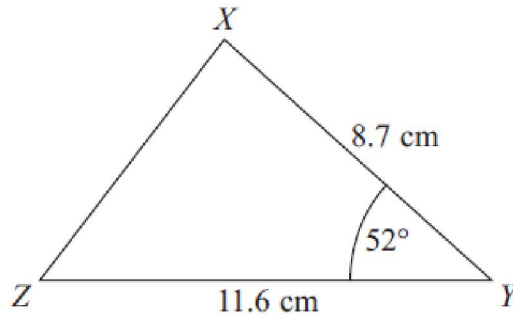
Calculated Grade Boundaries:

Grade	Marks
5-	4
5	7
5+	10
6-	14
6	17
6+	20
7-	24
7	27
7+	30
8-	34
8	37
8+	40
9-	44
9	47
9+	50



## Question 1 (AO1): 49% of students got this right (5 marks)

17.

In the triangle  $XYZ$ 

$XY = 8.7 \text{ cm},$

$YZ = 11.6 \text{ cm},$

Angle  $XYZ = 52^\circ$

- (a) Work out the area of triangle  $XYZ$ .  
Give your answer correct to 3 significant figures.

.....  $\text{cm}^2$   
(2)

- (b) Work out the length of  $XZ$ .  
Give your answer correct to 3 significant figures.

.....  $\text{cm}$   
(3)

## Question 2 (AO2): 40% of students got this right (4 marks)

19. Here is a triangle  $ABC$ .

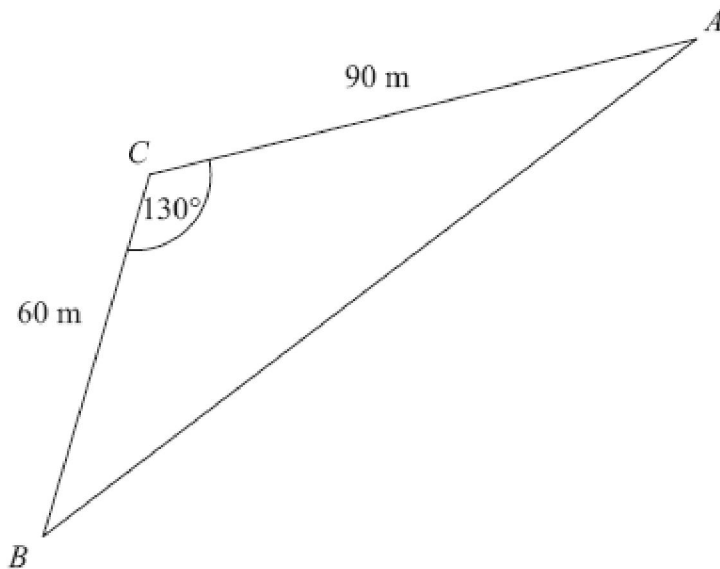


Diagram **NOT**  
accurately drawn

$AC = 90$  m.

$BC = 60$  m.

Angle  $ACB = 130^\circ$ .

Calculate the perimeter of the triangle.

Give your answer correct to one decimal place.

..... m

(Total 4 marks)

## Question 3 (AO2): 31% of students got this right (4 marks)

10. A circular clock face, centre  $O$ , has a minute hand  $OA$  and an hour hand  $OB$ .  
 $OA = 10$  cm.  
 $OB = 7$  cm.

Calculate the length of  $AB$  when the hands show 5 o'clock.  
Give your answer correct to 3 significant figures.

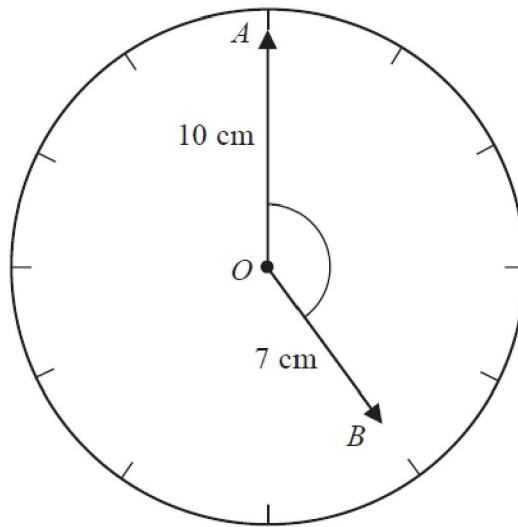
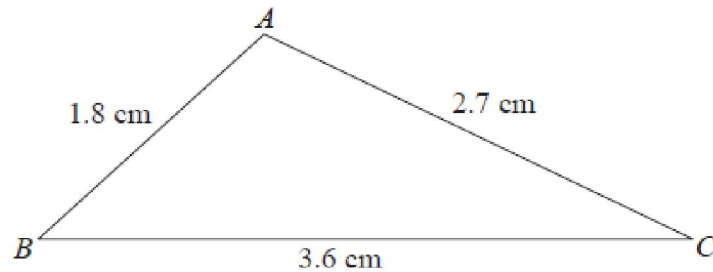


Diagram **NOT**  
accurately drawn

## Question 4 (AO1): 28% of students got this right (5 marks)

11. The diagram shows a triangle  $ABC$ .



- (a) Work out the size of angle  $A$ .  
Give your answer correct to 1 decimal place.
- (b) Work out the area of triangle  $ABC$ .  
Give your answer correct to 1 decimal place.

## Question 5 (AO1): 26% of students got this right (4 marks)

20.

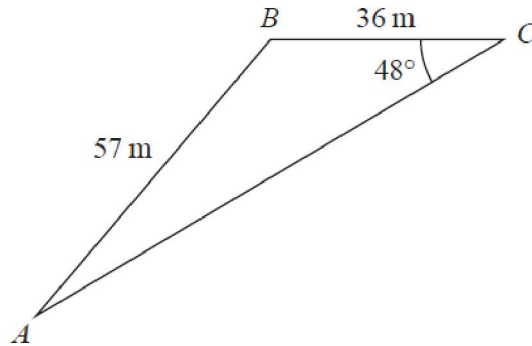


Diagram **NOT**  
accurately drawn

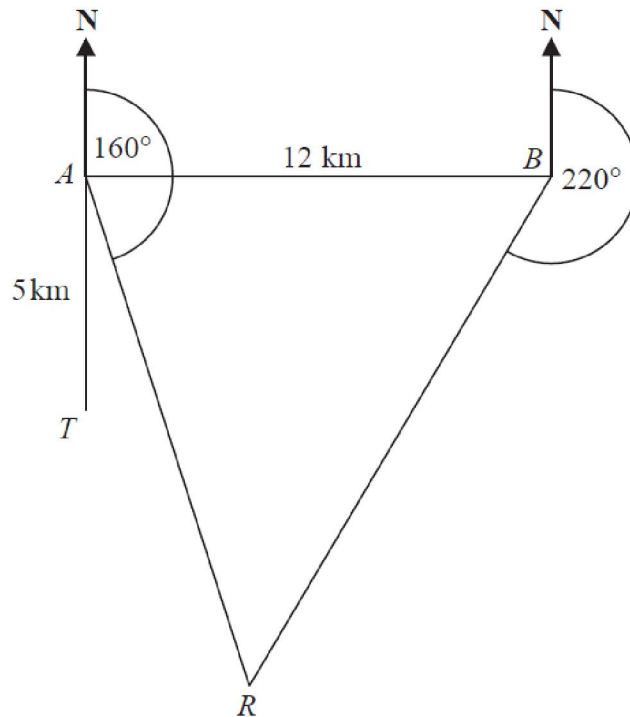
Work out the area of triangle  $ABC$ .  
Give your answer correct to 3 significant figures.

.....  $\text{m}^2$

(Total 4 marks)

## Question 6 (AO3): 21% of students got this right (5 marks)

17.

Diagram **NOT**  
accurately drawn

There is a coastguard station at point  $A$  and at point  $B$ .  
 $B$  is due East of  $A$ .  
 The distance from  $A$  to  $B$  is 12 km.

There is a rowing boat at point  $R$ .  
 $R$  is on a bearing of  $160^\circ$  from  $A$ .  
 $R$  is on a bearing of  $220^\circ$  from  $B$ .

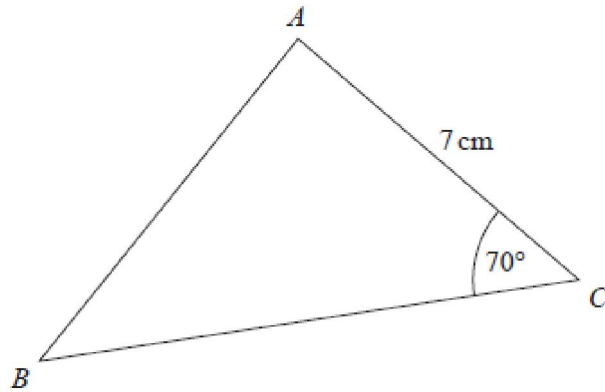
There is a speedboat at point  $T$ .  
 $T$  is 5 km due South of  $A$ .

Work out the shortest distance from  $T$  to  $R$ .  
 Give your answer correct to 1 decimal place.  
 You must show all your working.



## Question 7 (AO3): 16% of students got this right (5 marks)

24.



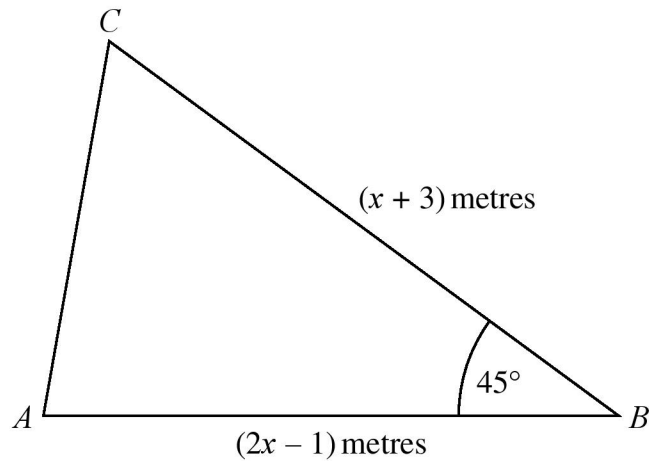
The area of triangle  $ABC$  is  $42 \text{ cm}^2$

Find the length of  $AB$ .

Give your answer correct to 3 significant figures.

## Question 8 (AO3): 13% of students got this right (5 marks)

15



The area of triangle  $ABC$  is  $6\sqrt{2} \text{ m}^2$ .

Calculate the value of  $x$ .

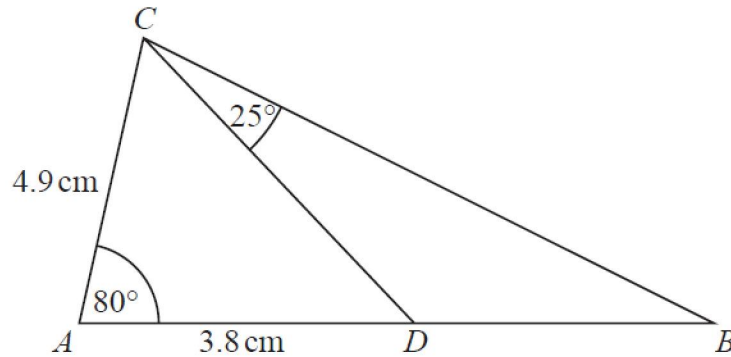
Give your answer correct to 3 significant figures.

(Total for Question 15 is 5 marks)

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## Question 9 (AO3): 10% of students got this right (5 marks)

21

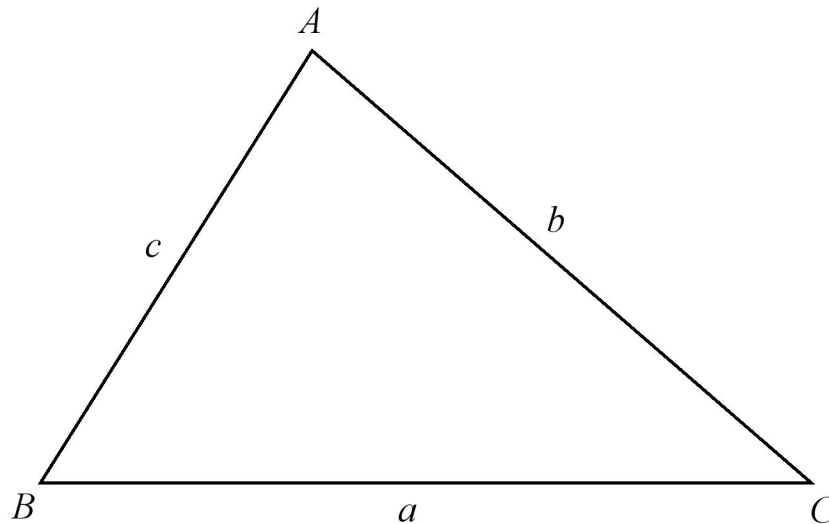


$ABC$  is a triangle.  
 $D$  is a point on  $AB$ .

Work out the area of triangle  $BCD$ .  
Give your answer correct to 3 significant figures.

## Question 10 (AO2): 5% of students got this right (3 marks)

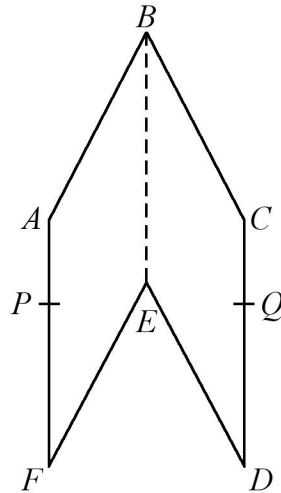
- 21 The diagram shows an acute-angled triangle  $ABC$ .



Prove that area of triangle  $ABC = \frac{1}{2}ab \sin C$

## Question 11 (AO3): (No Calc) 3% of students got this right (5 marks)

22 The diagram shows a hexagon  $ABCDEF$ .



$ABEF$  and  $CBED$  are congruent parallelograms where  $AB = BC = x$  cm.  
 $P$  is the point on  $AF$  and  $Q$  is the point on  $CD$  such that  $BP = BQ = 10$  cm.

Given that angle  $ABC = 30^\circ$ ,

prove that  $\cos PBQ = 1 - \frac{(2-\sqrt{3})}{200} x^2$

(Total for Question 22 is 5 marks)

## Answers to Qn 1 (AO1): 49% of students got this right

17.	(a)	$\frac{1}{2} \times 11.6 \times 8.7 \times \sin 52^\circ$	39.8	2	M1 $\frac{1}{2} \times 11.6 \times 8.7 \times \sin 52^\circ$ or complete method to find area using trig and/or Pythagoras and $\frac{1}{2}$ base $\times$ height A1 39.75 – 39.8
	(b)	$XZ^2$ $= 8.7^2 + 11.6^2 - 2 \times 8.7 \times 11.6 \times \cos 52^\circ$ $= 85.985$	9.27	3	M1 $8.7^2 + 11.6^2 - 2 \times 8.7 \times 11.6 \times \cos 52^\circ$ M1 for correct order of evaluation or 85.985 A1 answer in the range 9.27 – 9.275

## Answers to Qn 2 (AO2): 40% of students got this right

19.	$c^2 = 60^2 + 90^2 - 2 \times 60 \times 90 \times \cos 130^\circ$ $c^2 = 3600 + 8100 - 10\,800 \times -0.6427876$ $c^2 = 11\,700 + 6942.106$ $c^2 = 18642.106$ $c = \sqrt{18642.106} = 136.536$ Perimeter $= 60 + 90 + 136.536$	286.5	4	M1 for substituting values correctly into cosine rule formula e.g. $60^2 + 90^2 - 2 \times 60 \times 90 \times \cos 130^\circ$ M1 for correct order of evaluation A1 for finding value of missing side in range 136 to 137 A1 for answer in range 286 to 287
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## Answers to Qn 3 (AO2): 31% of students got this right

10.	$5 \times (360 \div 12) (= 150)$ $(AB^2 =) 10^2 + 7^2 - 2 \times 10 \times 7 \times \cos ("150")$ $(AB^2 =) 149 - 140 \cos ("150")$ $(AB^2 =) 270.24...$	16.4	4	M1 Angle $AOB$ . M1 Accept the use of the cosine rule with any angle but sides (10 and 7) must be in correct places. A1 (awrt) 270 A1 (awrt) 16.4
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Answers to Qn 4 (AO1): 28% of students got this right

Question		Working	Answer	Mark	Notes
11	(a)		104.5°	3	<p>M1 for substitution into the cosine rule e.g.  <math>3.6^2 = 1.8^2 + 2.7^2 - 2 \times 1.8 \times 2.7 \times \cos A</math></p> <p>M1 for <math>\cos A = \left( \frac{1.8^2 + 2.7^2 - 3.6^2}{2 \times 1.8 \times 2.7} \right)</math></p> <p><math>\left[ = \left( \frac{3.24 + 7.29 - 12.96}{9.72} \right) = (-0.25) \right]</math></p> <p>A1 for 104.47.....</p>
	(b)		2.4	2	<p>M1 (ft) for <math>\frac{1}{2} \times 1.8 \times 2.7 \times \sin(a)</math></p> <p>A1 for an answer in the range 2.3 to 2.4 or ft from their (a) if supported by correct working.</p>

## Answers to Qn 5 (AO1): 26% of students got this right

20.		$\frac{\sin A}{36} = \frac{\sin 48}{57}$ $A = \sin^{-1} \left( \frac{\sin 48}{57} \times 36 \right) \text{ or}$ $A \text{ in range } 27.9 - 28$ $\frac{1}{2} \times 57 \times$ $36 \sin (180 - 48 - "28")$ $ (= 995.49...)$		4	<p>M1 or <math>\frac{36}{\sin A} = \frac{57}{\sin 48}</math></p> <p>M1 dep</p> <p>M1 dep on the first M1</p> <p>A1</p> <p>or <math>\frac{1}{2} \times 57 \times 36 \sin (48)</math> with AC in range 74 – 74.5</p> <p>or AC from a correct method</p>
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## Answers to Qn 6 (AO3): 21% of students got this right

17.			6.2	5	<p>M1 for a method to find an angle  <math>RAB = 70, ABR = 50, BRA = 60</math> or <math>TAR = 20</math></p> <p>M1 for substitution into sine formula <math>\frac{AR}{\sin "50"} = \frac{12}{\sin "60"}</math></p> <p>M1 for use of sine rule to find <math>AR</math>, <math>AR = \frac{12}{\sin "60"} \times \sin "50"</math>  <math>(= 10.61)</math></p> <p>M1 for substitution into cosine formula  <math>TR^2 = 5^2 + "10.61"{}^2 - 2 \times 5 \times "10.61" \times \cos 20 (= 37.92)</math></p> <p>A1 for 6.15 – 6.2</p>
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## Answers to Qn 7 (AO3): 16% of students got this right

24		12.3	P1	for process to start, e.g. correct substitution into $\frac{1}{2}ab \sin C$ , e.g. $0.5 \times 7 \times BC \times \sin 70 = 42$
			P1	(dep on P1) for process to rearrange to find $BC$ , e.g. $BC = \frac{42}{0.5 \times 7 \times \sin 70}$ oe (=12.77013327)
			P1	(dep on first P1) for process to find $AB$ , e.g. $AB^2 = 7^2 + "BC"'^2 - 2 \times 7 \times "BC" \times \cos 70$
			P1	for correct order of operations or 150.929(30436946)
			A1	for answer in range 12.28 – 12.3

## Answers to Qn 8 (AO3): 13% of students got this right

## Question 15 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{1}{2}(x+3)(2x-1)\sin 45 = 6\sqrt{2}$	P1	This mark is given for setting up an expression for the area in the form $\frac{1}{2}ab\sin C$
	$\frac{1}{2}(2x^2 - 5x + 3)\sin 45 = 6\sqrt{2}$	P1	This mark is given for expanding the brackets in the expression to form an equation
	$\frac{1}{2}(2x^2 - 5x + 3)\frac{1}{\sqrt{2}} = 6\sqrt{2}$ $2x^2 - 5x + 3 = 24$	P1	This mark is given for a process to set up the equation and rearrange to the form $ax^2 + bx + c + d$
	$2x^2 - 5x - 27 = 0$ $x = \frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times -27}}{4}$	P1	This mark is given for a substitution into the quadratic formula
	2.63	A1	This mark is given for the correct answer only

## Answers to Qn 9 (AO3): 10% of students got this right

Paper 1MA1: 3H			
Question	Working	Answer	Notes
21		10.4	<p>P1 starts process by using cosine rule to find <math>CD</math>  eg <math>(CD)^2 = 4.9^2 + 3.8^2 - 2 \times 4.9 \times 3.8 \times \cos 80</math>  (= 31.98..)</p> <p>P1 uses sine rule to find angle <math>ACD</math> or angle <math>ADC</math>  eg <math>\frac{\sin C}{3.8} = \frac{\sin 80}{5.655}</math> or <math>\frac{\sin D}{4.9} = \frac{\sin 80}{5.655}</math></p> <p>P1 uses sine rule to find <math>BC</math> or <math>BD</math>  eg <math>\frac{BD}{\sin 25} = \frac{5.655}{\sin 33.6}</math></p> <p>P1 process to find area eg <math>1/2 ab \sin C</math>  A1 for 10.4 to 10.43</p>

## Answers to Qn 10 (AO2): 5% of students got this right

Question	Working	Answer	Mark	Notes
21		Shown	M1  M1  C1	for use of sine to find height, e.g. $\sin C = \frac{h}{b}$  for use of expression for the height of the triangle, e.g. $\text{area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} ab \sin C$  for complete proof
Question Order Created by Pinpoint Learnings Automatic Differentiation Algorithm				

## Answers to Qn 11 (AO3): (No Calc) 3% of students got this right

## Question 22 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\cos 30^\circ = \frac{\sqrt{3}}{2}$	B1	This mark is given for a correct statement about the value of $\cos 30^\circ$ (seen anywhere)
	$PQ^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos PBQ$ $= 200 - 200 \cos PBQ$	M1	This mark is given for applying the cosine rule to find an expression for $PQ^2$
	$AC^2 = x^2 + x^2 - 2 \times x \times x \times \cos 30^\circ$ $= 2x^2 - 2x^2 \frac{\sqrt{3}}{2}$ $= 2x^2(1 - \frac{\sqrt{3}}{2})$ $= (2 - \sqrt{3})x^2$	M1	This mark is given for applying the cosine rule to find an expression for $AC^2$
	$\cos PBQ = \frac{200 - PQ^2}{200} = 1 - \frac{PQ^2}{200}$	M1	This mark is given for rearranging to find an expression for $\cos PBQ$
	$\cos PBQ = 1 - \frac{PQ^2}{200} = 1 - \frac{AC^2}{200}$ $= 1 - \frac{(2 - \sqrt{3})x^2}{200}$	A1	This mark is given for a conclusion of proof with all working seen