IB MATHS AI HL · UNIT 3

Non-Right-Angled Trigonometry: exam practice

10 questions · 31 marks · worked solutions and markschemes

Name _____ Date _____ Score / 31

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/hlai/non-right-angled-trigonometry-exam-practice

1. **2 marks · Paper 2 style · calculator allowed**

In triangle ABC, $A = 52°$, $B = 71°$ and $BC = 18$ cm.

Find AC. **[2]**

2. **2 marks · Paper 2 style · calculator allowed**

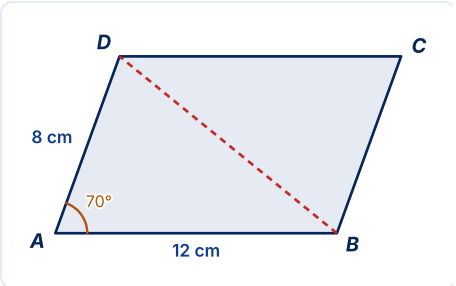
A triangular sail has sides 5.2 m and 3.8 m with an included angle of $64°$.

Find the area of the sail. **[2]**

3. **2 marks · Paper 2 style · calculator allowed**

A parallelogram has sides 12 cm and 8 cm and an angle of $70°$.

Find the length of the shorter diagonal. **[2]**



AB = 12 cm, AD = 8 cm, angle 70°

4. **2 marks · Paper 1 style · calculator allowed**

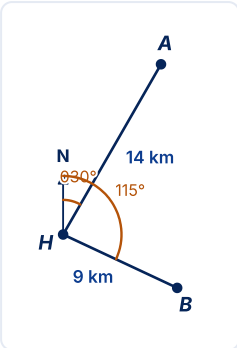
A triangle has area $30\ \text{cm}^2$ and two sides 8 cm and 10 cm, with the included angle acute.

Find the included angle. **[2]**

5. **3 marks · Paper 2 style · calculator allowed**

Two boats leave a harbour at the same time. One travels 14 km on a bearing of $030°$ and the other 9 km on a bearing of $115°$.

Find the distance between the boats. **[3]**



14 km on 030°, 9 km on 115°

6. **3 marks · Paper 2 style · calculator allowed**

A triangular plot has sides 45 m, 60 m and 72 m.

Find the smallest angle of the plot. **[3]**

7. **3 marks · Paper 2 style · calculator allowed**

A ship sails 20 km on a bearing of $060°$ and then 15 km on a bearing of $150°$.

Find its distance from the start. **[3]**

8. **4 marks · Paper 2 style · calculator allowed**

A surveyor at P sees two trees A and B. $PA = 85$ m, $PB = 120$ m and $A\hat{P}B = 38°$.

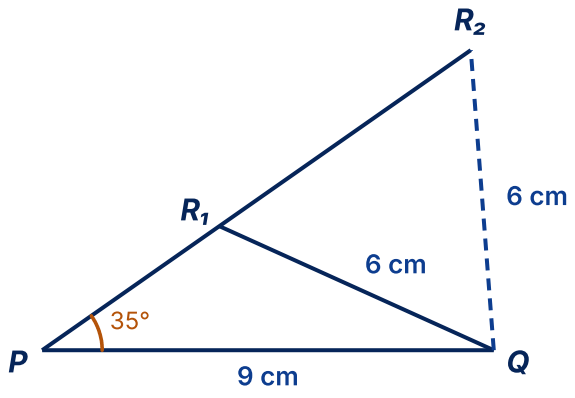
Find the distance AB and the angle $P\hat{A}B$. **[4]**

9. **5 marks · Paper 2 style · calculator allowed**

In triangle PQR, $PQ = 9$ cm, $QR = 6$ cm and $Q\hat{P}R = 35°$.

a. Find the two possible values of $P\hat{R}Q$. **[3]**

b. Find the smallest possible length of PR. **[2]**

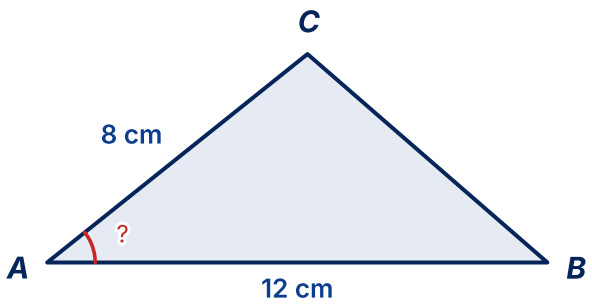


10. **5 marks · Paper 2 style · calculator allowed**

A triangle ABC has $AB = 12$ cm, $AC = 8$ cm and area $30\ \text{cm}^2$.

a. Find the two possible values of $B\hat{A}C$, in degrees. **[3]**

b. Find BC when $B\hat{A}C$ is obtuse. **[2]**



Answers and worked solutions

Question 1

2 marks

Answer: 21.6 cm

$\frac{AC}{\sin 71°} = \frac{18}{\sin 52°}$ **M1**

21.6 cm **A1**

Question 2

2 marks

Answer: $8.88\ \text{m}^2$

$\frac{1}{2}(5.2)(3.8)\sin 64°$ **M1**

$8.88\ \text{m}^2$ **A1**

Question 3

2 marks

Answer: 11.9 cm

$\sqrt{144 + 64 - 192\cos 70°}$ **M1**

11.9 cm **A1**

Question 4

2 marks

Answer: $48.6°$

$40\sin\theta = 30$ **M1**

$48.6°$ **A1**

Question 5

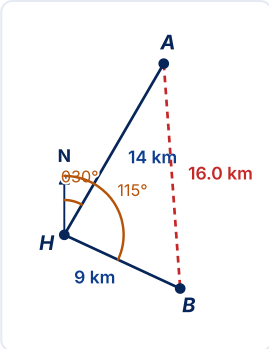
3 marks

Answer: 16.0 km

angle between paths $85°$ **A1**

$d^2 = 14^2 + 9^2 - 2(14)(9)\cos 85°$ **M1**

16.0 km **A1**



Angle $85°$ at H; $AB = 16.0$ km

Question 6

3 marks

Answer: $38.5°$

opposite 45 **R1**

$\cos\theta = \frac{60^2 + 72^2 - 45^2}{2(60)(72)}$ **M1**

$38.5°$ **A1**

Question 7

3 marks

Answer: 25

angle at the turn $90°$ **A1**

$\sqrt{400 + 225}$ **M1**

25 km **A1**

Question 8

4 marks

Answer: $74.5\ m$; $97.4°$

$AB^2 = 85^2 + 120^2 - 2(85)(120)\cos 38°$ **M1**

$AB = 74.5\ m$ **A1**

cosine rule again **M1**

$P\hat{A}B = 97.4°$ **A1**

Question 9

5 marks

Answer: (a) $59.4°, 121°$; (b) (cm) 4.31

a. $\frac{\sin R}{9} = \frac{\sin 35°}{6}$ **M1**

$R = 59.4°$ **A1**

or

$R = 180° - 59.4° = 121°$ **A1**

b. obtuse case:

$P\hat{Q}R = 180° - 35° - 121° = 24.4°$ **(M1)**

$PR = \frac{6\sin 24.4°}{\sin 35°} = 4.31$ cm **A1**

Question 10

5 marks

Answer: (a) $38.7°, 141°$; (b) (cm) 18.9

a. $\frac{1}{2}(12)(8)\sin A = 30$ **M1**

$\sin A = 0.625 \implies A = 38.7°$ **A1**

or $A = 141°$ **A1**

b. $BC^2 = 12^2 + 8^2 - 2(12)(8)\cos A$ **(M1)**

$BC = 18.9$ cm **A1**

Every solution is also on ibmathrevision.com/hlai/non-right-angled-trigonometry-exam-practice
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