IB MATHS AI SL · UNIT 3

Non-Right-Angled Trigonometry: exam practice

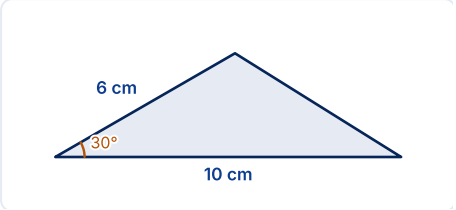
10 questions · 38 marks · worked solutions and markschemes

Name _____ Date _____ Score / 38

- 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/slai/non-right-angled-trigonometry-exam-practice

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

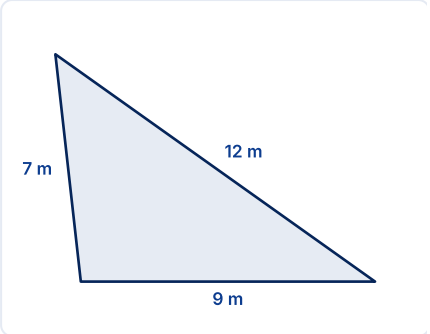
Find the exact area of a triangle with sides 6 cm and 10 cm, and an included angle of $30°$.



6 cm, 10 cm, included angle 30°

2. **3 marks · Paper 1 style · calculator allowed**

A triangle has sides of length 7 m, 9 m and 12 m. Find the size of its largest angle. **[3]**



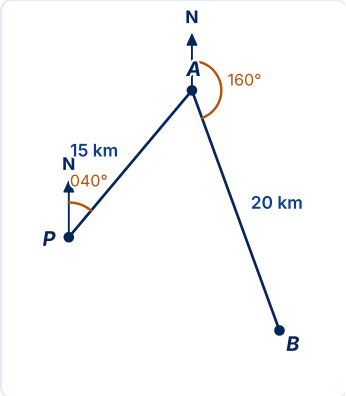
Sides 7 m, 9 m, 12 m

3. **3 marks · Paper 1 style · calculator allowed**

A triangular field has sides of length 40 m, 50 m, and 60 m. Calculate the size of the largest angle in the field.

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

A ship leaves port P and travels $15\ \text{km}$ on a bearing of $040°$ to point A. It then turns and travels $20\ \text{km}$ on a bearing of $160°$ to point B. Calculate the exact straight-line distance from port P to point B.



15 km on 040°, then 20 km on 160°

5. **4 marks · Paper 1 style · calculator allowed**

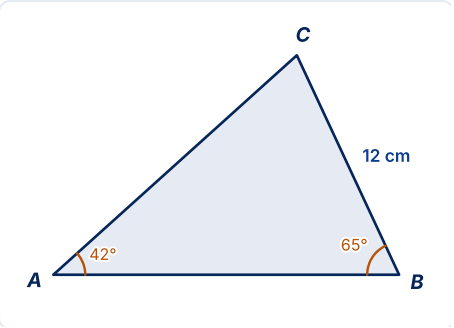
In triangle PQR, $p = 8$ m, $q = 12$ m, and angle $P = 30°$. Given that angle Q is obtuse, calculate the size of angle Q, correct to 1 decimal place.

6. **4 marks · Paper 1 style · calculator allowed**

In triangle ABC, $\hat{A} = 42°$, $\hat{B} = 65°$ and $BC = 12$ cm.

(a) Find AC. **[2]**

(b) Find AB. **[2]**



A = 42°, B = 65°, BC = 12 cm

7. **4 marks · Paper 1 style · calculator allowed**

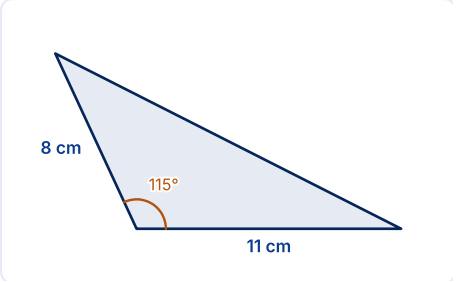
In triangle ABC, $AB = 8$ cm, $BC = 10$ cm and the area of the triangle is 30 cm^2. Angle B is acute. Find the size of angle B and the length of AC.

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

A triangle has sides of 8 cm and 11 cm with an angle of $115°$ between them.

(a) Find the area of the triangle. **[2]**

(b) Find the length of the third side. **[2]**



8 cm, 11 cm, included angle 115°

9. **4 marks · Paper 2 style · calculator allowed**

The area of triangle DEF is $45\ \text{cm}^2$. Side $d = 10$ cm and side $e = 12$ cm, and the included angle F is acute.

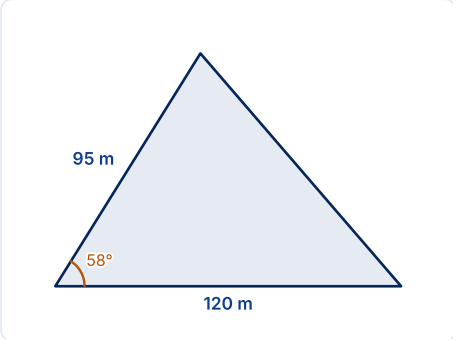
1. Find the size of angle F. **[2 marks]**
2. Find the length of side f. **[2 marks]**

10. **6 marks · Paper 2 style · calculator allowed**

A triangular plot of land has two sides of 120 m and 95 m, with an angle of $58°$ between them.

(a) Find the area of the plot. **[2]**

(b) Fencing costs €12 per metre. Find the cost of fencing the whole boundary, to the nearest euro. **[4]**



120 m, 95 m, included angle 58°

Answers and worked solutions

Question 1

2 marks

Answer: 15

Substitute into $\text{Area} = \frac{1}{2}ab\sin C$:

$\text{Area} = \frac{1}{2}(6)(10)\sin 30°$ M1

$\text{Area} = 30 \times 0.5 = 15\ \text{cm}^2$ A1

Question 2

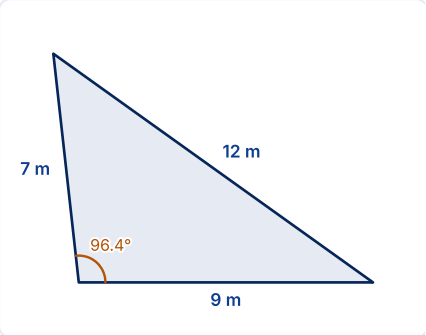
3 marks

Answer: $96.4°$

$$\cos\theta = \frac{7^2 + 9^2 - 12^2}{2(7)(9)}$$ (M1)

(A1)

$96.4°$ A1



Largest angle opposite the longest side

Question 3

3 marks

Answer: $82.8°$

The largest angle θ is opposite the longest side, $60\ m$ (M1)

Substitute into the cosine rule:

$\cos\theta = \frac{40^2+50^2-60^2}{2(40)(50)} = \frac{500}{4000} = 0.125$ M1

$\theta = \cos^{-1}(0.125) = 82.8°$ (3 s.f.) A1

Question 4

4 marks

Answer: $5\sqrt{13}$

Back-bearing from A to P:

$040° + 180° = 220°$, so

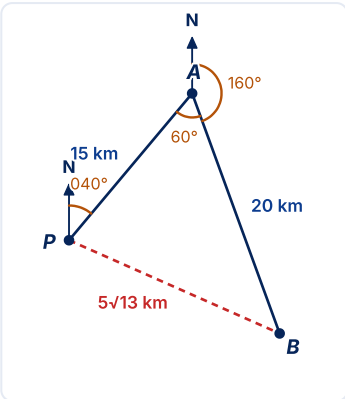
$\angle PAB = 220° - 160°$ M1

$\angle PAB = 60°$ A1

Cosine rule:

$PB^2 = 15^2 + 20^2 - 2(15)(20)\cos 60° = 225 + 400 - 300 = 325$ M1

$PB = \sqrt{325} = 5\sqrt{13}$ km A1



Angle $PAB = 60°$; $PB = 5\sqrt{13}$ km

Question 5

4 marks

Answer: $131.4°$

Set up the sine rule:

$\frac{\sin Q}{12} = \frac{\sin 30°}{8}$ M1

$\sin Q = \frac{12(0.5)}{8} = 0.75 \implies$ acute angle

$= \arcsin(0.75) = 48.59\ldots°$ A1

Q is obtuse:

$Q = 180° - 48.59\ldots°$ M1

$Q \approx 131.4°$ A1

Question 6

4 marks

Answer: (a) 16.3 cm; (b) 17.2 cm

(a)

$$\frac{AC}{\sin 65°} = \frac{12}{\sin 42°}$$ (M1)

16.3 cm A1

(b)

$\hat{C} = 73°$ (A1)

17.2 cm A1

Question 7

4 marks

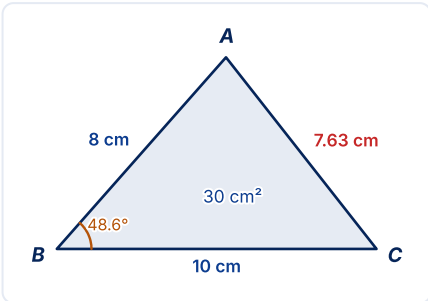
Answer: (B) $48.6°$; (AC) 7.63

$\frac{1}{2}(8)(10)\sin B = 30 \Rightarrow \sin B = 0.75$ M1

$B = 48.6°$ (48.590…) A1

$AC^2 = 8^2 + 10^2 - 2(8)(10)\cos 48.590\ldots°$ M1

$AC = 7.63$ cm (7.6269…) A1



$B = 48.6°$; $AC = 7.63$ cm

Question 8

4 marks

Answer: (a) $39.9\ \text{cm}^2$; (b) 16.1 cm

(a)

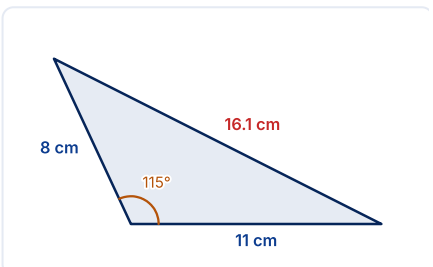
$$\frac{1}{2}(8)(11)\sin 115°$$ (M1)

$39.9\ \text{cm}^2$ A1

(b)

$\sqrt{64 + 121 - 176\cos 115°}$ (M1)

16.1 cm A1



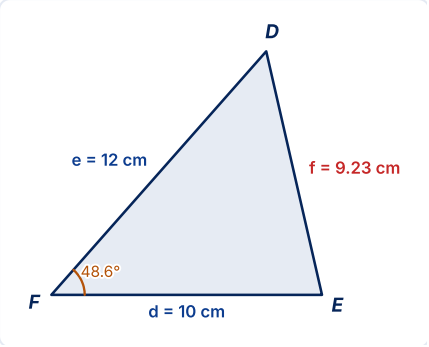
Third side 16.1 cm

Question 9

4 marks

Answer: (a) $48.6°$; (b) 9.23

1. $\frac{1}{2}(10)(12)\sin F = 45 \Rightarrow \sin F = 0.75$
   M1
   $F = 48.6°$ (48.590…) **A1**
2. $f^2 = 10^2 + 12^2 - 2(10)(12)\cos 48.590\ldots°$
   M1
   $f = 9.23\ \text{cm}$ (9.2333…)
   A1



$F = 48.6°$; $f = 9.23$ cm

Question 10

6 marks

Answer: (a) $4830\ \text{m}^2$; (b) €3858

(a)

$\frac{1}{2}(120)(95)\sin 58°$ **(M1)**

$4830\ \text{m}^2$ **A1**

(b)

third side

$\sqrt{120^2 + 95^2 - 2(120)(95)\cos 58°}$ **(M1)**

$= 106.5\ldots m$ **(A1)**

perimeter $321.5\ldots m$ **(A1)**

€3858 **A1**

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