Right-Angled Trigonometry: exam practice

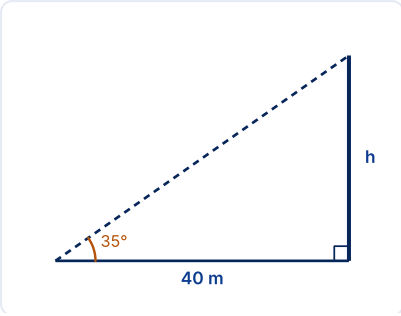
10 questions · 36 marks · worked solutions and markschemes

Name _____ Date _____ Score / 36

- 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/right-angled-trigonometry-exam-practice

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

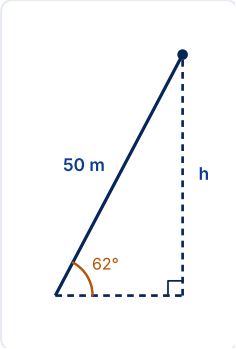
From a point on level ground 40 m from the foot of a building, the angle of elevation of the top is $35°$. Find the height of the building. **[2]**



40 m away, elevation 35°

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

A kite is flown on a straight string of length 50 m that makes an angle of $62°$ with the horizontal ground. Find the height of the kite above the ground. **[2]**

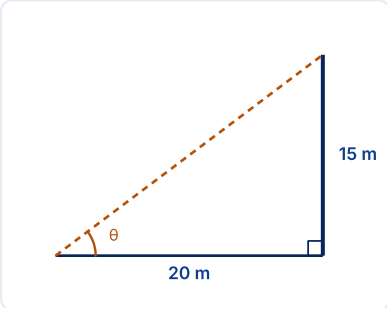


String 50 m at 62°

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

A vertical building is $15\ \text{m}$ tall. At a certain time of day, it casts a horizontal shadow of exactly $20\ \text{m}$ on the ground.

Calculate the angle of elevation of the sun.

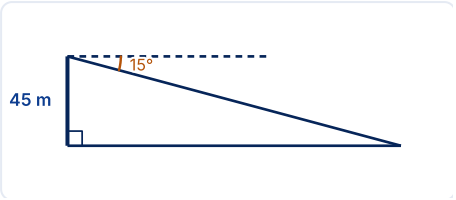


Height 15 m, shadow 20 m

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

A lighthouse is $45\ \text{m}$ tall. From the top of the lighthouse, the angle of depression to a boat at sea is $15°$.

Assuming the base of the lighthouse is at sea level, calculate the horizontal distance from the base of the lighthouse to the boat.

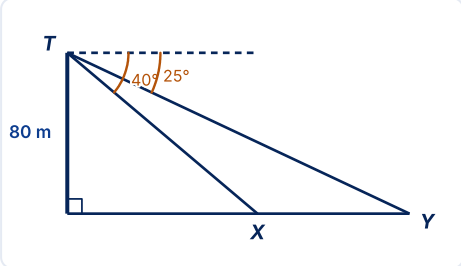


Lighthouse 45 m; depression 15°

5. **4 marks · Paper 2 style · calculator allowed**

From the top of a cliff 80 m high, the angles of depression of two boats, in line with the foot of the cliff, are $25°$ and $40°$.

Find the distance between the two boats. **[4]**

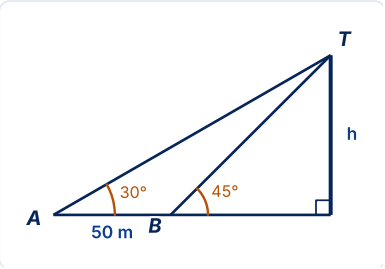


Cliff 80 m; depressions 40° and 25°

6. **5 marks · Paper 2 style · calculator allowed**

Two observers, A and B, are standing on horizontal ground on the same side of a vertical tower. The distance between observer A and observer B is 50 m. From observer A, the angle of elevation to the top of the tower is $30°$. From observer B, who is closer to the tower, the angle of elevation is $45°$.

Calculate the exact height of the tower.



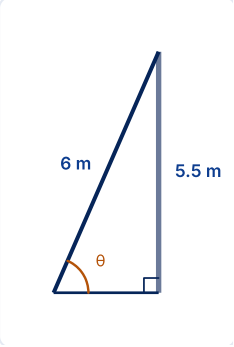
Elevations 30° and 45°, 50 m apart

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

A ladder 6 m long leans against a vertical wall and reaches 5.5 m up the wall.

(a) Find the angle the ladder makes with the ground. **[2]**

(b) Find the distance from the foot of the ladder to the wall. **[2]**



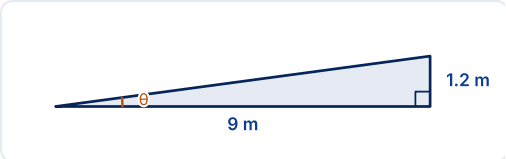
Ladder 6 m, height 5.5 m

8. **4 marks · Paper 1 style · calculator allowed**

A wheelchair ramp rises 1.2 m over a horizontal distance of 9 m.

(a) Find the angle of the ramp to the horizontal. **[2]**

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



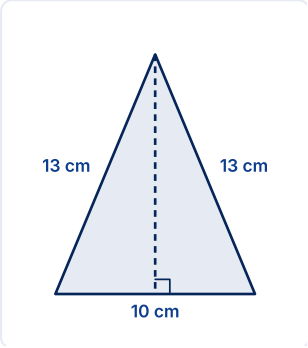
Rise 1.2 m over 9 m

9. **4 marks · Paper 1 style · calculator allowed**

An isosceles triangle has a base of 10 cm and two equal sides of 13 cm.

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

(b) Find the size of one of the base angles. **[2]**



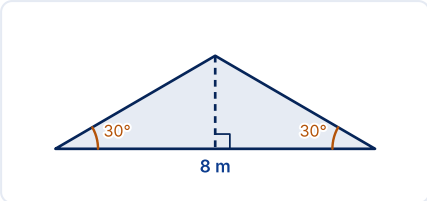
Base 10 cm, equal sides 13 cm

10. **4 marks · Paper 1 style · calculator allowed**

A symmetrical roof spans 8 m and each side slopes at $30°$ to the horizontal.

(a) Find the length of one sloping side. **[2]**

(b) Find the height of the roof. **[2]**



Span 8 m, slopes 30°

Answers and worked solutions

Question 1 — 2 marks

Answer: $28.0\,m$

$40\tan 35°$ **(M1)**

$28.0\,m$ **A1**

Question 2 — 2 marks

Answer: $44.1\,m$

$50\sin 62°$ **(M1)**

$44.1\,m$ **A1**

Question 3 — 3 marks

Answer: $36.9°$

Opposite side is the height $15\,m$, adjacent side is the shadow $20\,m$: $\tan\theta = \frac{15}{20}$ **M1**

Use inverse tangent:

$\theta = \tan^{-1}(0.75)$ **M1**

$\theta \approx 36.9°$ **A1**

Question 4 — 4 marks

Answer: 168

The angle of elevation from the boat to the top of the lighthouse equals the angle of depression, $15°$ (alternate angles). **(M1)**

Use tangent in the right-angled triangle: $\tan(15°) = \frac{45}{d}$ **M1**

Rearrange: $d = \frac{45}{\tan(15°)}$ **(A1)**

$d = 167.94\cdots \approx 168$ m **A1**

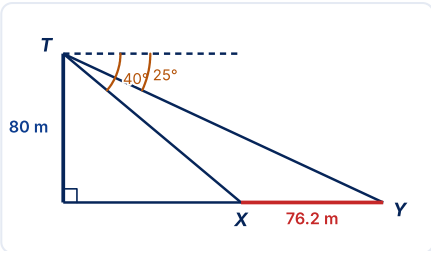
Question 5 — 4 marks

Answer: $76.2\,m$

$\dfrac{80}{\tan 25°} = 171.5\ldots$ **(M1)(A1)**

$\dfrac{80}{\tan 40°} = 95.3\ldots$ **(A1)**

$76.2\,m$ **A1**



$XY = 76.2$ m

Question 6 — 5 marks

Answer: $25(\sqrt{3}+1)$

Let x be the distance from B to the tower: $\tan 45° = \frac{h}{x}$ and $\tan 30° = \frac{h}{x+50}$ **M1**

Since $\tan 45° = 1$, $h = x$ **A1**

Substitute $x = h$ and $\tan 30° = \frac{1}{\sqrt{3}}$: $\frac{1}{\sqrt{3}} = \frac{h}{h+50}$ **M1**

Rearrange:

$\sqrt{3}h = h + 50 \implies h(\sqrt{3}-1) = 50$ **M1**

$h = \frac{50}{\sqrt{3}-1} = 25(\sqrt{3}+1)\,m$ $(\approx 68.3\,m)$ **A1**

Question 7 — 4 marks

Answer: (a) $66.4°$; (b) $2.40\,m$

(a)

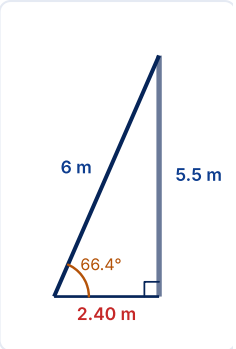
$\sin\theta = \dfrac{5.5}{6}$ **(M1)**

$66.4°$ **A1**

(b)

$\sqrt{6^2 - 5.5^2}$ **(M1)**

$2.40\,m$ **A1**



Angle $66.4°$; foot 2.40 m from the wall

Question 8 — 4 marks

Answer: (a) $7.59°$; (b) $9.08\,m$

(a)

$\tan\theta = \dfrac{1.2}{9}$ **(M1)**

$7.59°$ **A1**

(b)

$\sqrt{9^2 + 1.2^2}$ **(M1)**

$9.08\,m$ **A1**

Question 9 — 4 marks

Answer: (a) 12 cm; (b) $67.4°$

(a)

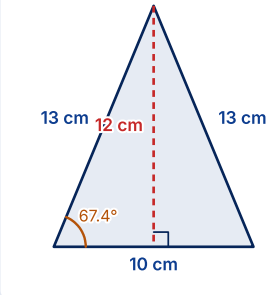
$\sqrt{13^2 - 5^2}$ **(M1)**

12 cm **A1**

(b)

$\cos\theta = \dfrac{5}{13}$ **(M1)**

$67.4°$ **A1**



Height 12 cm; base angle $67.4°$

Question 10 — 4 marks

Answer: (a) $4.62\ m$; (b) $2.31\ m$

(a)

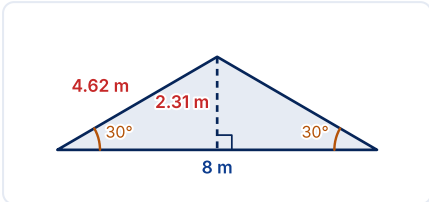
$\dfrac{4}{\cos 30°}$ **(M1)**

$4.62\ m$ **A1**

(b)

$4\tan 30°$ **(M1)**

$2.31\ m$ **A1**



Each half: 4 m across

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