

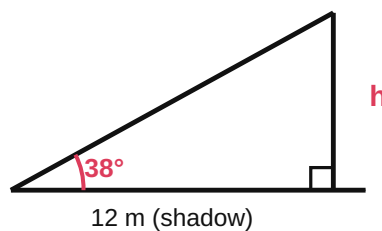
Boost Free Lessons - Year 10 Maths

Lesson 16: Trigonometry: 2D Applications

Name: _____ Grade: _____ Date: _____

Worked Example 1

A tree casts a shadow 12 m long, and the angle of elevation of the sun is 38° . Find the height of the tree.



1. Draw the right-angled triangle. The shadow is the adjacent side and the tree is the opposite side.
2. Opposite and Adjacent means use tan: $\tan 38^\circ = \frac{h}{12}$.
3. Multiply both sides by 12: $h = 12 \times \tan 38^\circ$.
4. $12 \times 0.7813 = 9.37...$

$h \approx 9.4 \text{ m}$

Worked Example 2

From the top of a 40 m cliff, the angle of depression to a boat is 25° . Find the distance of the boat from the base of the cliff.

1. The angle of depression is measured **down** from the horizontal at the top.
2. It equals the angle of elevation from the boat, because they are alternate angles on parallel lines.
3. The cliff is opposite the angle and the distance is adjacent, so use tan: $\tan 25^\circ = \frac{40}{d}$.
4. The unknown is on the bottom, so $d = \frac{40}{\tan 25^\circ} = \frac{40}{0.4663}$.

$d \approx 85.8 \text{ m}$

Remember: The angle of elevation is measured up from the horizontal and the angle of depression down from it. They are always equal to each other. Draw the triangle and label the sides before choosing a ratio.



Question 1: Find the missing length, correct to 1 decimal place.

1. Elevation 30° , adjacent 20 m. Find the opposite side.

2. Elevation 45° , adjacent 15 m. Find the opposite side.

3. Elevation 60° , adjacent 10 m. Find the opposite side.

4. Depression 35° , height 25 m. Find the horizontal distance.

5. Elevation 20° , hypotenuse 30 m. Find the opposite side.

6. Elevation 50° , opposite 18 m. Find the adjacent side.

7. Depression 40° , adjacent 60 m. Find the opposite side.

8. Elevation 65° , opposite 22 m. Find the hypotenuse.



Question 2: Answer the following, correct to 1 decimal place.

1. A ladder 6 m long leans at 65° to the ground. How high up the wall does it reach?
2. A kite flies on a 60 m string at 40° to the ground. How high is the kite?
3. A ramp rises 2 m over a horizontal distance of 15 m. Find its angle of elevation.
4. From a 30 m tower, the angle of depression to a car is 20° . How far is the car from the base?
5. A hill rises at 12° over a slope length of 500 m. Find the vertical height gained.
6. A flagpole casts a 9 m shadow when the sun is at 55° . Find the height of the flagpole.



Question 3: Answer the following questions, correct to 1 decimal place.

1. A building is 45 m tall. From a point on the ground the angle of elevation to the top is 32° . How far is that point from the building?
2. A plane at 2 000 m sees an airport at an angle of depression of 15° . Find the horizontal distance to the airport.
3. A ladder reaches 4 m up a wall at 70° to the ground. How long is the ladder?
4. A slide is 5 m long and set at 30° to the ground. How high is the top of the slide?
5. Explain why the angle of elevation from A to B equals the angle of depression from B to A.





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Answers: Trigonometry: 2D Applications**Question 1**

- | | |
|-----------|-----------|
| 1. 11.5 m | 5. 10.3 m |
| 2. 15.0 m | 6. 15.1 m |
| 3. 17.3 m | 7. 50.3 m |
| 4. 35.7 m | 8. 24.3 m |

Question 2

- | | |
|----------------|------------|
| 1. 5.4 m | 4. 82.4 m |
| 2. 38.6 m | 5. 104.0 m |
| 3. 7.6° | 6. 12.9 m |

Question 3

1. 72.0 m
2. 7 464.1 m
3. 4.3 m
4. 2.5 m
5. The horizontal lines at A and B are parallel, so the two angles are alternate angles and therefore equal.

