ILLAWARRA TUTORING

In this worksheet you will apply your trigonometric skills to solve practical problems. Each question involves real-world situations where you will use the basic trigonometric ratios to determine unknown heights, distances or lengths. Work carefully through each problem and check your answers.

Easy Questions

1. Use the trigonometric ratio to find the length of the side opposite the 30° angle in a right-angled triangle when the adjacent side is 10 m.

2. In a right-angled triangle, determine the length of the side opposite the 60° angle if the hypotenuse is 20 m.

3. A tree casts a shadow of 15 m and the angle of elevation of the sun is 45°. Calculate the height of the tree.

4. An observer of height 2 m spots a boat on the water. If the angle of depression from the observer to the boat is 5°, determine the horizontal distance from the observer to the boat.

5. A ladder leans against a wall forming a 60° angle with the ground. If the ladder is 10 m long, find the vertical height reached by the ladder.

Intermediate Questions

6. An observer stands 30 m from a building. The angle of elevation to the top of the building is 40°. Calculate the height of the building.

7. From point P on level ground, the angle of elevation to the top of a tower is 55°. Moving 50 m closer to the tower (point Q), the angle of elevation becomes 70°. Determine the height of the tower.

8. A surveyor wishes to determine the width of a river. From a point A on one bank, the line of sight directly across the river (point B) and to a point further down the bank (point C) form an angle of 20° at A. If the distance along the bank between B and C is 30 m, calculate the width of the river.

9. An observer on a cliff 50 m high sees a boat. If the angle of depression to the boat is 15°, find the horizontal distance from the base of the cliff to the boat.

10. An observer located 100 m from the launch point of a balloon measures its angle of elevation as 30°. A short time later, the angle increases to 60°. Calculate the height of the balloon at the later time.

11. A ramp is built to reach a platform. If the ramp makes an angle of 10° with the horizontal and its horizontal projection is 5 m, determine the length of the ramp.

12. A building casts a shadow of 8 m when the angle of elevation of the sun is 60°. Compute the height of the building.

13. From a fixed point, the angle of elevation to the top of a flagpole is 35°, while the angle to the top of a nearby building is 30°. If the flagpole is known to be 5 m taller than the building, determine the height of the building.

14. A person standing on level ground observes two towers. The angle of elevation to tower A is 25° and to tower B is 35°. If the towers are 40 m apart along the ground, determine the heights of both towers.

15. A ladder rests against a wall forming an angle of 70° with the ground. If the top of the ladder slips down by 1 m, calculate approximately by how much the base moves away from the wall. (Assume the ladder's length remains constant.)

16. A surveyor measures the angle of elevation to the top of a hill from two points 100 m apart. The angles recorded are 20° from the nearer point and 25° from the further point. Determine the height of the hill.

17. An architect designs a roof with a pitch of 30° relative to the horizontal. If the horizontal span of the roof is 8 m, calculate the length of a roof rafter.

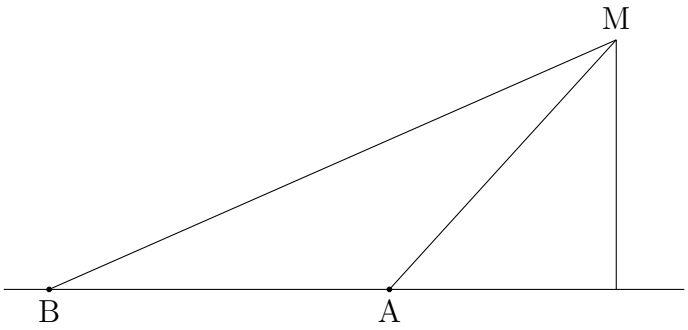
18. From two points on the ground, separated by 20 m, the angles of elevation to the top of a building are measured as 40° and 45°. Determine the height of the building.

19. A person on a boat observes a lighthouse. If the angle of elevation to the top of the lighthouse is 5° and the lighthouse stands 80 m tall, compute the horizontal distance from the boat to the base of the lighthouse.

20. A cable is attached from the top of a tower to a point on the ground 30 m from the base. If the cable makes an angle of depression of 25° as seen from the top, determine the height of the tower.

Hard Questions

21. An observer measures the angle of elevation to the top of a mountain as 30° from point A. Moving 150 m farther from the mountain to point B, the angle decreases to 25°. Using the diagram, calculate the height of the mountain.



22. A person standing on a riverbank observes the top of a bridge. From position X the angle of elevation is 40°. After moving 20 m closer to the bridge (position Y), the angle becomes 50°. Determine the height of the bridge.

23. A balloon is rising vertically. When an observer 200 m from the launch point first measures an angle of elevation of 10°, and 5 s later the angle is 25°, calculate the balloon's average rate of ascent during this interval.

24. A kite is flying at a fixed height. As it moves away from an observer, the angle of elevation decreases from 65° to 50° over a horizontal distance of 15 m. Find the height at which the kite is flying.

25. From the top of a cliff, two ships are observed such that the angles of depression to the ships are 10° and 15°. If the ships are 100 m apart along the sea, compute the height of the cliff.

26. A tree of height 5 m stands near a hill. From the base of the tree the angle of elevation to the top of the hill is 12°, and from the top of the tree the angle is 18°. Determine how much taller the hill is than the top of the tree.

27. A surveyor measures the angle of elevation to the top of a building as 22° from a point 50 m from the building. After moving 20 m further away, the angle becomes 18°. Calculate the building's height.

28. An aircraft is observed while approaching an airport. From one position the angle of elevation is 40°, and from a point 100 m farther from the airport the angle is 35°. Assuming the aircraft maintains a constant altitude, determine that altitude.

29. While standing on a hillside, a person observes a valley. From one point the angle of depression to the valley is 25°. After walking 30 m along the slope, the angle of depression becomes 20°. Calculate the vertical height of the hillside above the valley floor.