Review - Trigonometry

Right Triangle Trigonometry

1. A right triangle has opposite = 8, adjacent = 15, and hypotenuse = 17. Determine sin θ, cos θ, and tan θ.

2. A grain auger rises at 30° with a horizontal run of 72 m. Determine the length of the travel pipe.

3. A tree casts a 13.5 m shadow when the sun's angle of elevation is 43°. Determine the height of the tree.

4. A staircase has a rise of 7.5 in and a tread of 10 in. Building regulations state staircases must not exceed 42°. Determine the staircase angle and decide whether the staircase meets code.

5. A ladder is placed 1.5 m from a wall and reaches 5.8 m up the wall. Determine the angle of elevation.

6. A kite string is 30 m long and makes a 40° angle of elevation. Determine the height of the kite.

7. An airplane flying 100 m above the ground sees the runway at an angle of depression of 5°. Determine the horizontal distance to the runway.

8. A zip line travels 250 m horizontally at an angle of depression of 5°. Determine the length of the zip line.

9. A roller coaster rises 50 m along a 40° incline, then descends to ground level over a horizontal distance of 30m. Determine the angle of descent.

10. A flagpole is viewed from a second-storey window. The angle of elevation to the top is 31° and the angle of depression to the base is 40°. The horizontal distance to the pole is 20 m. Determine the total height of the flagpole.

11. A person stands 275 ft from a building. The angle of elevation to the base of an antenna is 32° and the angle of elevation to the top of the antenna is 42°. Determine the height of the antenna.

12. Totem poles are stabilized using two ropes attached 26 m from the base. One rope makes an angle of 47° with the ground and the other makes an angle of 57°. Determine how much longer the longer rope is.

Cosine Law

13. A ship sails west for 50 km and then sails 52.4 km in a direction of 25° north of east. Determine the displacement from the harbour.

14. Checkpoints A and B are 22 m apart. Checkpoint C is 33m from checkpoint A and 28m from checkpoint B. Determine the angle at checkpoint C.

15. A surveyor measures two sides of a triangular property as 17.4m and 23.8m with an included angle of 118°. Determine the length of the third side.

16. A mountain bike frame forms a triangle with side lengths of 50 cm, 54 cm, and 40 cm. Determine all three angles of the frame.

Sine Law

17. A roof has one slanted side measuring 4.5 m and base angles of 35° and 65°. Determine the length of the shorter slanted side.

18. Triangle PQR has side PR = 30 km, ∠Q = 35°, and ∠R = 62°. Determine the length of side p.

19. In triangle ABC, AB = 28 m, AC = 31 m, and ∠B = 62°. Determine ∠C.

20. Triangle RST has side lengths RS = 6.8 cm, ST = 5cm, and RT = 9.1 cm. Solve the triangle.

Applications

21. An observer sees a mountain peak at an angle of elevation of 35°. After walking 250 m closer, the angle of elevation becomes 39°. Determine the height of the mountain.

22. Two ships leave port at 4:00 pm.
    - Ship A travels 11.5 mph at a bearing of 38° east of north.
    - Ship B travels 13 mph at a bearing of 47° east of south.

    Determine how far apart the ships are at 6:00pm.

23. Maria and Roy stand 500 m apart on opposite sides of a stadium and observe a hot air balloon at angles of elevation of 64° and 49°. Determine the distance from Maria to the balloon.

Ambiguous Case

24. Two boats start on opposite sides of a river. One boat travels 200 m directly across the river. The second boat travels 180 m at an angle of 40° relative to the first path. Determine the two possible travel angles for the second boat.

25. A Coast Guard ship and patrol boat are 8.2 km apart.
    - The ship observes a flare at 32° east of north.
    - The patrol boat observes the flare at 54° west of north.

    Determine the distance from the ship to the flare.

26. A plane leaves an airport and flies 240 km at 45° east of north. It then changes direction and flies another 180 km at 30° south of east. Determine:
    a) the straight-line distance from the airport to the plane's final location
    b) the direction of the plane's final location from the airport