

Worksheet 1-4: Applications of Trigonometric Ratios

1. From the top of the Niagara Escarpment, Juan sees a car below at an angle of depression (or descent) of 40° . Juan is approximately 100 m above the car. How far is the car from the base of the escarpment, to the nearest metre?



2. In construction, the pitch of a roof may be given as “7-12” in feet. This means the maximum height of the roof is 7 ft and the distance from the midpoint of the base of the roof to the outer wall is 12 ft. Calculate the roof’s angle of inclination, to the nearest degree.



3. Safety by-laws state that for a ladder to be stable, the angle of the base of the ladder makes with the ground should be between 70° and 80° . A safety inspector at a construction site notices a painter on a 10-m ladder that is leaning against a wall. The base of the ladder is 1.5 m away from the wall. Does the inspector have cause to be concerned? Explain.

4. The CN Tower is 553.33 m high. Linda looks up at the top of the tower at a 15° angle of elevation. She calculates the distance, d , from the base of the tower as follows:

$$\frac{d}{553.33} = \tan 15^\circ$$

$$d = 553.33 \times \tan 15^\circ$$

$$d \doteq 148$$

Explain why Linda's solution is incorrect. Write a correct solution.

5. Two buildings are 20 m apart. The angle of elevation from the top of the shorter building to the top of the taller building is 20° . The angle of depression from the top of the shorter building to the base of the taller building is 45° . What is the height of the taller building, to the nearest metre?



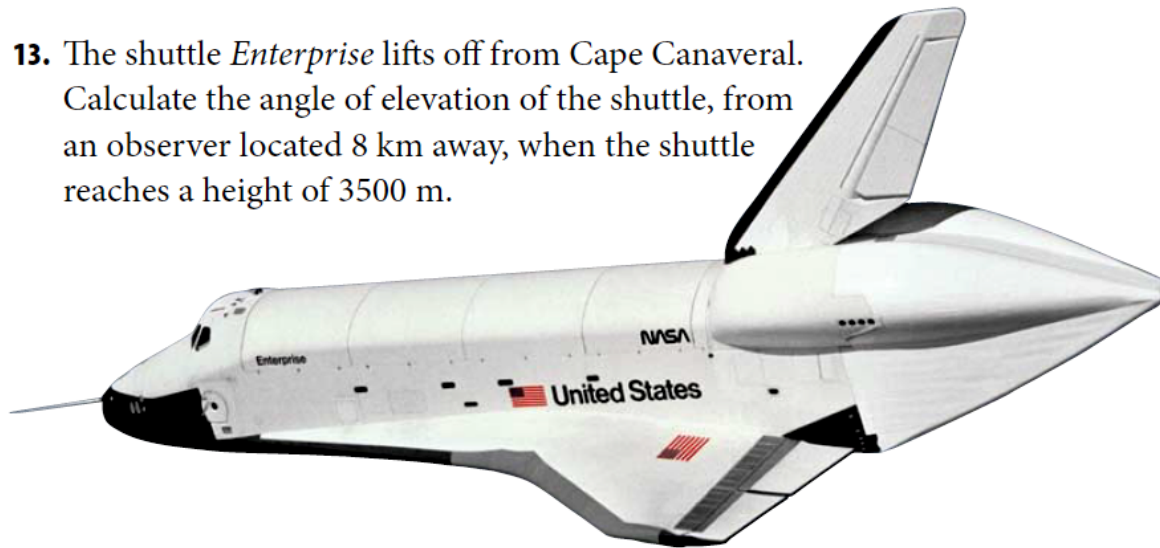
6. From the top of a 200-m high cliff, in the same direction, the angles of depression of two boats on the water are 20° and 25° . How far apart are the boats, to the nearest metre? What assumptions must you make in order to calculate the distance between the two boats?



Answers: 1. 119 m; 2. 30° ; 3. yes, the angle is 81° , greater than the safety range required; 4. reversed adjacent and opposite sides in the fraction, 2065 m; 5. 27 m; 6. 121 m, boats are anchored and no change in positions.

Practise

2. From the top of a bridge over the Burlington Canal, Maria looks down at a sailboat at an angle of depression of 15° . The bridge is 18 m above the water. Calculate the horizontal distance from the bridge to the sailboat.
3. A 7.6-m flagpole is 4.6 m away from a pedestrian. What is the angle of elevation from where the pedestrian is standing to the top of the flagpole?
13. The shuttle *Enterprise* lifts off from Cape Canaveral. Calculate the angle of elevation of the shuttle, from an observer located 8 km away, when the shuttle reaches a height of 3500 m.



14. The Instrument Landing System (ILS) common to most major airports uses radio beams to bring an aircraft down a 3° glide slope. A pilot noted that his height above the ground was 200 m. How far would the pilot have to travel before landing on the runway?

**Answers**

1. 4° 13. 24°
 2. 67 m 14. 3821 m
 3. 59°
 4. 1°
 5. 5 ft