Worksheet 1-7: Applications of Sine Law and Cosine Law

Sine Law or Cosine Law??   **Opposite Angle $\rightarrow$ Sine Law**   **Contained Angle $\rightarrow$ Cosine Law**

Note: **The longest side is always opposite the largest angle, and the shortest side is always opposite the smallest angle.**

1. Two ships, Alpha and Beta, are located 15 nautical miles apart. Alpha's angle to the port entrance is 55° with respect to Beta. Beta's angle to the port entrance is 45° with respect to Alpha. Which ship is closer to the port entrance? How far is the ship from port? Round your answer to the nearest tenth.

2. Two hikers set out in different directions from a marked tree on the Bruce Trail. The angle formed between their paths measures 50°. After 2 hours, one hiker is 6 km from the starting point and the other is 9 km from the starting point. How far apart are the hikers, to the nearest tenth of a kilometre?

3. The expedition team decides to have a practice run. Two team members head due north at a pace of 4 km/h. The second pair decides to head 60° west of north travelling at the same pace. How far from the first pair is the second pair after 2 hours?

4. Three islands - Fogo, Twillingate, and Moreton's Harbour - form a triangular pattern in the ocean. Fogo and Twillingate are 15 nautical miles apart. The angle between Twillingate and Moreton's Harbour from Fogo is 45°. The angle between Moreton's Harbour and Fogo from Twillingate is 65°. How far is Moreton's Harbour from the other two islands to the nearest nautical mile?

5. The expedition team plans a final practice run to test the range of their communication equipment. One member travels a distance of 12 km due north. Another team member heads 50° east of north and travels a distance of 10 km. How far apart are the two team members? Round your answer to the nearest tenth of a kilometre.

6. An intersection between two country roads makes an angle of 68°. Along one road, 5 km from the intersection, is a dairy farm. Along the other road, 7 km from the intersection, is a poultry farm. How far apart are the two farms? Round your answer to the nearest tenth of a kilometre.

7. The longest side of a triangle is 50 cm. The measures of two angles in the triangle are 42° and 64°. Find the length of the shortest side of the triangle, to the nearest centimetre.

8. A flock of Canada geese are flying in a V-formation that forms an angle of 68°. The lead goose is 12.8 m from the last goose on the left and 13.5 m from the last goose on the right. How far apart are the last two geese in the V-formation, to the nearest tenth of a metre?

Answers: 1. Alpha's closer, 10.8 nautical miles from port entrance**; 2.** 6.9 km**; 3.** 8 km**;**
   4. Moreton from Fogo = 14 nautical miles, Moreton from Twillingate = 11 nautical miles**; 5.** 9.5 km**;**
   6. 6.9 km**; 7.** 35 cm**; 8.** 14.8 m**.**

Practise

8. A shed is 8 ft wide. One rafter makes an angle of 30° with the horizontal on one side of the roof. A rafter on the other side makes an angle of 70° with the horizontal. Calculate the length of the shorter rafter to the nearest foot.

11. The Leaning Tower of Pisa leans 5.5° from its vertical. Suppose that the sun is directly overhead. A surveyor notices that the distance from the base of the tower to the tip of its shadow is 5.35 m. What is the height of the tower on the lower side to the nearest tenth of a metre?

7. A motocross ramp is to be built for an upcoming race. The measures for the sides of the ramp are as shown. Calculate the angle of inclination of the ramp to the nearest degree.

16.5 m

5.5 m

16.0 m
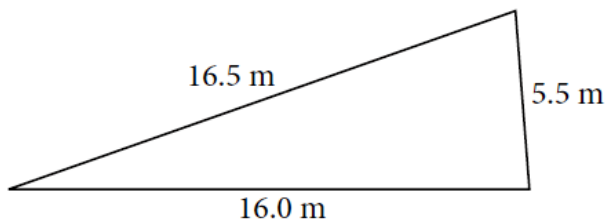
8. Dahliwal is an engineer. For his latest contract, he has to determine the length of a tunnel that is to be built through a mountain. He chooses a point facing the mountain. He measures a distance of 840 m from one end of the tunnel to the point and a distance of 760 m from the other end of the tunnel to the point. The angle at the point to both ends of the tunnel is 62°. Calculate the length of the proposed tunnel to the nearest metre.

62°

760 m   840 m

tunnel
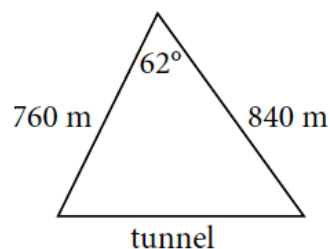
Answers

8. 4 ft

9. from Twillingate: 11 nautical miles; from Fogo:
   14 nautical miles

11. 55.8 m

7. 19°

8. 827 m