4.4 Problems in Two Dimensions

1. A carousel, with a diameter of 20 m, has 12 horses spaced around the circumference at equal distances. If the horses are numbered in order, how far is it directly from the second horse to the fourth?

2. The angle between the shaft and the blade of a hockey stick is 120°. The shaft is 1.5 m long and the blade is 25 cm long. Determine an exact expression for the straight line distance from the top of the shaft to the tip of the blade.

3. A support wire to the top of a newly planted tree is 15 m long. It forms an angle of 30° to the ground. On the same side of the tree, a second wire is also attached to the top of the tree, but it makes an angle of 45° to the ground. Determine an exact expression for the distance between the points where the two support wires are attached to the ground.

4. Marco leaves his camp in search for some firewood. He walks 120 m in the direction 15° east of north and finds some wood. After collecting the wood, he gets slightly disoriented and starts walking in the direction of 15° east of south. After walking 120 m in this direction, he realizes he is not back at his camp and he stops. Find an exact expression to represent the distance he is from the camp.

5. Explain what is meant by the *ambiguous case* in a triangle. Include a diagram illustrating an example.

6. To get to Michael's house, Angela leaves her house travelling at 40 km/h along a road in an easterly direction for 45 min. She then takes a 30° right turn onto a second road and travels at 50 km/h for 30 min before arriving at Michael's house. Determine an exact expression for the distance between the two houses.

7. Two wires are attached to the top of a billboard. One is in front of the billboard, is 100 m long and makes an angle of 45° to the ground. The second wire is attached to the exact same point on the billboard as the first, but it is at the back, and makes an angle of 60° to the ground. To the nearest metre, determine the distance between the two points where the two wires are attached to the ground.

8. In $\triangle ABC$, $\angle A = 40°$ and $c = 37$ cm.
   a) For $\triangle ABC$ to be a right triangle, what is the length of a?
   b) Explain your answer to part a).