

REAL LIFE REAL WORLD Activity: Avalanche Rescue Circles

Topic: Diameters & Chords in Circles

Grade Level: 7 - 12

Objective: To model an avalanche search pattern with geometry software.

Time: 30-45 minutes

Introduction

When hikers and skiers go into terrain where there is a risk of avalanches, they take safety equipment including avalanche rescue beacons. An avalanche rescue beacon sends and receives electromagnetic field signals that can travel up to about 30 meters. Signals travel in circular patterns out from the center beacon. The search pattern used to locate a beacon buried in the snow is based on the properties of chords and diameters in circles.

Discuss with Students

1. Review the definitions of a diameter and a chord of a circle. *If desired, have students draw diagrams that show these parts of a circle.*
2. There are several relationships between chords and diameters. Review these with students. *If desired, have students measure distances to discover these relationships.*
 - If a diameter (or radius) is perpendicular to a chord, then it bisects the chord.
 - If a diameter (or radius) bisects a chord, then it is perpendicular to the chord.
 - The perpendicular bisector of a chord will pass through the center of the circle.

Discuss With Student Answers

1. A chord of a circle is a segment whose endpoints are on the circle.
A diameter is a chord that passes through the center of the circle.

Technology Reference

This activity uses the following Cabri Jr. functions:

F2	Point	F3	Perpendicular	F5	Hide/Show
	Segment		Midpoint		Alph-Num
	Circle				Measure: D. & Length

Refer to "Getting Started with Cabri Jr." for more details.

Name _____ Date _____

REAL LIFE REAL WORLD Activity: Avalanche Rescue

When hikers and skiers go into terrain where there is a risk of avalanches, they take safety equipment including avalanche rescue beacons. An avalanche rescue beacon sends and receives electromagnetic field signals that can travel up to about 30 meters. A rescue beacon sends out a signal in a circle whose center is the location of the missing person. The search pattern used to locate a beacon buried in the snow is based on the properties of chords and diameters in circles. In this activity, you will use Cabri Jr. or Cabri II+ to model an avalanche search pattern.

Activity

1. When the rescuer first finds the signal, he or she walks in a straight path until the signal disappears, then turns around and walks in the opposite direction until the signal disappears again. Both ends of this path are marked. Construct a circle to represent the beacon signal and a chord to represent the path of the rescuer.
 - Construct a circle and hide its center.
 - Construct a segment with endpoints on the circle and label it \overline{AB} . See Figure 1.
2. The rescuer walks back to the midpoint of this path.
 - Find the midpoint of \overline{AB} and label it M . See Figure 2.
3. The rescuer walks away from the path at a 90° angle until the signal disappears.
 - Construct a line perpendicular to \overline{AB} through M .
 - Find one intersection point of the perpendicular line and the circle. Label it C . See Figure 3.
4. The rescuer turns around and walks in the opposite direction until the signal disappears again.
 - Find the other intersection point of the perpendicular line and the circle. Label it D .
 - Hide the perpendicular line.
 - Construct a segment connecting points C and D . See Figure 4.
5. The rescuer walks back to the midpoint of this new path. This will be the center of the circle formed by the beacon signals. Dig for the missing person.
 - Find the midpoint of \overline{CD} and label it X .

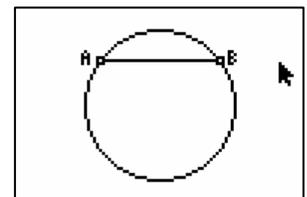


Figure 1

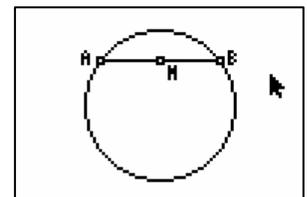


Figure 2

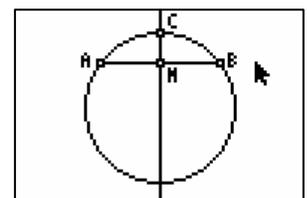


Figure 3

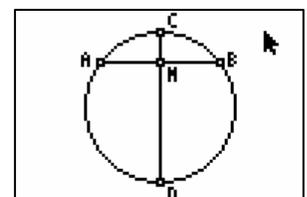


Figure 4

6. Confirm that you have located the center of the circle.
 - Measure the distances from X to A , B , C , and D .

Extensions & Resources

Extension 1

Write a proof of the relationship used in the activity. Given a chord of a circle and its perpendicular bisector, prove that the perpendicular bisector passes through the center of the circle.

Extension 2

Use a compass and straightedge to construct a circle and a chord. Construct the perpendicular bisector of the chord and see that it passes through the center of the circle.

Websites to explore:

Description of Rescue Beacon Search Techniques:

<http://www.geocities.com/Yosemite/Trails/1996/Beacon.html>

Description of Avalanche Safety Equipment:

http://www.wildmed.com/sar_pages/avalanche_rescue.html