Making Witches Hats from Cones

ID: XXXX

Name _____

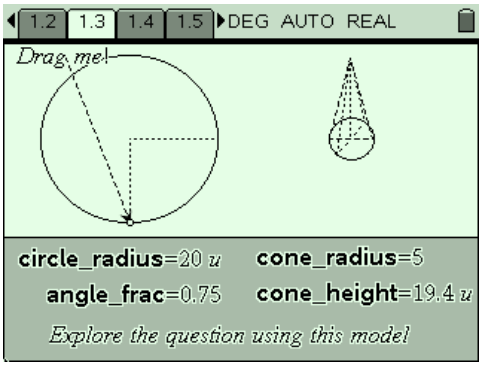
Class _____

In this activity, you will make cones from circles, exploring the relationship between the size of the sector cut from the original circle, the radius of the base and the height of the cone produced.

Open the file *GeomActXX_Cones_and_Witches_Hats_EN.tns* on your handheld and follow along with your teacher to work through the activity. Use this document as a reference and to record your answers.

The Problem

From a sheet of cardboard 40 cm square, I need to make a conical witches hat for my child's party. If we assume that she has a circular head of diameter 14 cm, what is the tallest hat I can make?



Assume that I will make the cone by cutting a sector from a circle: what angle will I need to make this sector?

Try cutting sectors of different angles from circles of different sizes – work with a partner and record the measurements of each in a systematic way.

Can you make any predictions about the size of the angle and the height of the witches hat?

Exercises

1.Using the geometric model provided, find the size of the sector angle and the height of the cone that would fit my daughter's head.

2. If k is the ratio of the sector angle to the full circle, then define the arc length of the sector in terms of k and the circle radius.

3. After removing the sector, what remains of the circle circumference becomes the circumference of the base of the cone. Define this.

4. Use the cone circumference to define the radius of the cone base. What is the relationship between the radius of the cone base and the radius of the original circle?

5. Explain why the slant height of the cone equals the circle radius? Use Pythagoras' Theorem to define a formula for the height of the cone.

6. Using these formulas, find the height of a cone made from a 20 cm radius circle with a sector ratio of two thirds.

7. What sector ratio would be needed to produce a cone which would fit my daughter's head (diameter 14 cm)?

8. What relationship exists between the sector angle ratio (k) and the height of the cone? Verify using the graph of data captured from our geometric model.

9. Using a circle of diameter 40 cm, could you make a cone of height 15 cm that would fit on your head? Investigate.

