

Inquiry Lab

Nets of Cones



HOW can the surface area of a cone be found?



Content Standards
Extension of
8.G.9



Mathematical Practices
1, 3

Corinne is making party hats as decorations for a party. They are in the shape of a cone and will be covered with tissue paper. What is the surface area of the cone that will be covered with tissue paper?

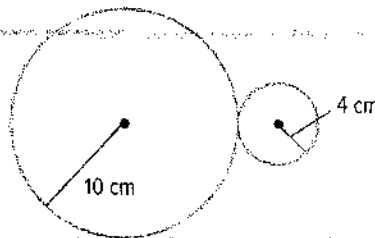


Hands-On Activity 1

In this Activity, you will construct a net of the cone for the party hats. The radius of the base is 4 centimeters. The *slant height* of the cone is 10 centimeters.

Step 1

On a separate sheet of paper, use a compass to draw two circles slightly touching, one with a radius of 10 centimeters and one with a radius of 4 centimeters.



Step 2

You need to find the portion of the circumference from the larger circle that will wrap around the outside of the smaller circle to make the cone. Use the proportion shown to find the central angle measure that represents the portion of the large circle you will use.

$$\frac{\text{circumference of smaller circle}}{\text{circumference of larger circle}} = \frac{\text{portion (in degrees) that is unknown}}{\text{total number of degrees in a circle}}$$

Write and solve the proportion. Round to the nearest whole number.

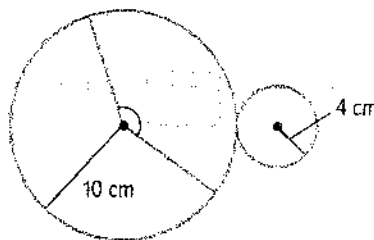
$$\frac{\quad}{\quad} = \frac{x}{360}$$

$$x \approx$$

So, you will need degrees of the larger circle.

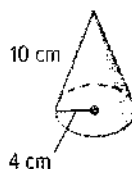
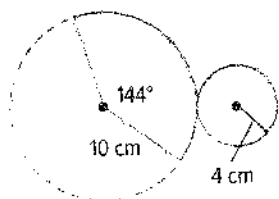
Step 3

Use a protractor to draw the central angle in your larger circle to create the net of the cone.

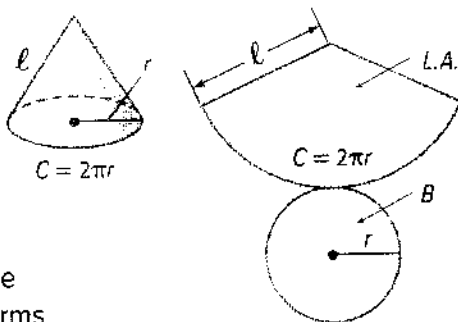


Step 4

The net of the cone is the portion of both circles that are shown by the solid lines. Cut out the net and make the cone.

**Hands-On Activity 2**

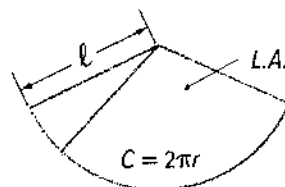
The net shows that the surface area of a cone with slant height ℓ and radius r is the sum of its base B and its lateral area $L.A.$. The base B is a circle. The lateral area $L.A.$ is part of a larger circle.



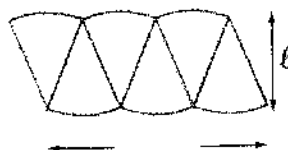
The circumference of the base B is the same length as the part of the larger circle that forms the lateral area of the cone.

Step 1

The figure represents the lateral area of the cone. Divide the figure into 6 equal sections. The first one is done for you.

**Step 2**

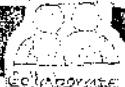
The parallelogram shows the 6 rearranged sections. Write an expression that represents the length of the parallelgram.

**Step 3**

Use the expression from Step 2 to write a formula for the area of the parallelogram, which is the lateral surface area of the cone.

Step 4

Write a formula for the total surface area of the cone.



Investigate

Work with a partner. Draw the net of a cone in the space provided with each of the following dimensions.

1. base radius: 1 inch
slant height: 1.5 inches

The angle measure needed to create the cone is _____°.

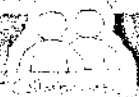
Show
your
work.



2. base radius: 2 centimeters
slant height: 4 centimeters

The angle measure needed to create the cone is _____°.





Analyze and Reflect

Work with a partner. Use the formula from Activity 2 to find the total surface area of each of the following cones given the radius of the base and the slant height. Round the measure of the central angle to the nearest whole number. Round the surface area to the nearest tenth.

	radius of base (r)	slant height (l)	measure of central angle ($^\circ$)	surface area ($\pi r l + \pi r^2$)
3.	2 ft	5 ft		
4.	5 in.	15 in.		
5.	3 cm	20 cm		



6. Refer to Activity 1. What is the lateral area of the party hat that Corinne is covering with tissue paper? Round to the nearest tenth.



Create

7. **MP Make a Conjecture** Suppose the radius of the base of a cone is increased while the slant height stays the same. Make a conjecture about how the lateral surface area is affected.

8. **MP Make a Conjecture** Suppose a cone's slant height is decreased. Make a conjecture about which is affected more: the base or the lateral area. Justify your response.

9. **Inquiry** HOW can the surface area of a cone be found?