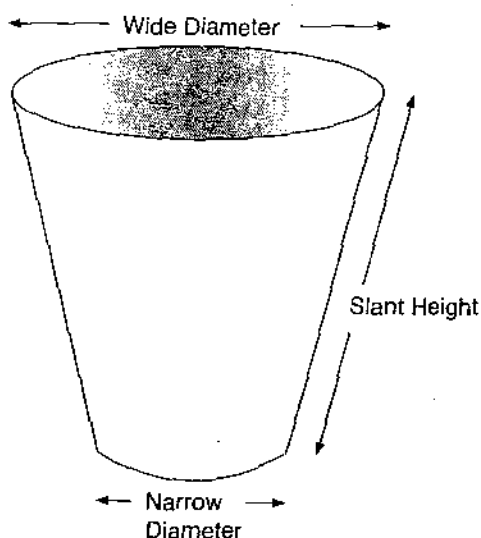


# Modeling Rolling Cups

Cup	Dimensions in inches			
	Wide diameter	Narrow diameter	Slant length	Roll radius
A	$3\frac{1}{2}$	3	$3\frac{3}{4}$	$26\frac{1}{4}$
B	3	2	$3\frac{1}{2}$	$10\frac{1}{2}$
C	$2\frac{1}{2}$	2	$5\frac{3}{4}$	$28\frac{3}{4}$
D	3	3	$4\frac{1}{4}$	Infinite!
E	3	2	6	18
F	$3\frac{1}{2}$	2	$3\frac{3}{4}$	$8\frac{3}{4}$
G	$3\frac{3}{4}$	3	$3\frac{3}{4}$	$18\frac{3}{4}$
H	$3\frac{1}{2}$	0	$3\frac{3}{4}$	$3\frac{3}{4}$



Here is a reminder of the data you saw in the video with a few extra cups added.

1. Describe how each of the three lengths on the picture affect the roll radius. Show how you used the data to explain your ideas.
2. Show how you can use math to predict the radius of the circle rolled by **any** size of cup. Show all your reasoning, including any diagrams and calculations.

### **Before the lesson**

Assessment task: (20 minutes)

Students should do this task in class or for homework a day or more before the formative assessment lesson.

#### *Pretest*

Directions:

Read through the questions and try to answer them as carefully as you can.

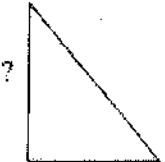
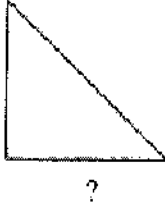
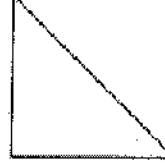
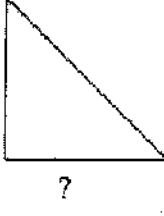
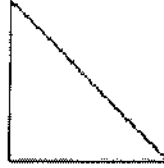
Do not worry too much if you cannot understand and do everything.

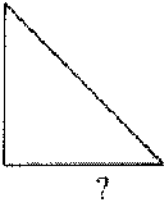

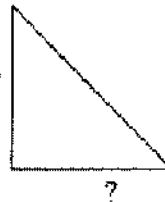
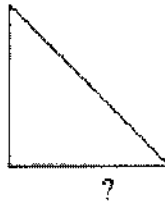
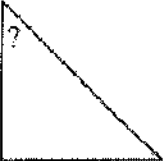
I will teach a lesson with a task like this later in the week..

By the end of that lesson your goal is to answer the questions with confidence.

***Make sure that all triangle diagrams are shown.***

1. A road ascends a hill at an angle of 4 degrees. For every 1000 feet of road, how many feet does the road ascend?
2. A 12-foot slide is attached to a swing set. The slide makes a 65 degree angle with the swing set. Estimate the height of the top of the slide.
3. Michelle's house is 22 miles due north of Jan's house and northeast of Richard's house. Richard's house is due west of Jan's house. How far is it from Michelle's house to Richard's house?
4. When a space shuttle returns from a mission, the angle of its descent to the ground from the final 10,000 feet above the ground is between 17 degrees and 19 degrees horizontal. Determine the minimum and maximum horizontal distance between the landing site and where the descent begins.
5. With its radar, an aircraft spots another aircraft 8000 feet away at a 12 degree angle of depression. Determine the vertical distance and horizontal distance between the two aircraft.
6. Suzie is using a clinometer to determine the height of a building. She places the clinometers 50 feet from the base of the building and measures the angle of elevation to be 72 degrees. Draw a diagram that models this situation and find the distance from the clinometer to the top of the building.

<p>Richard is using a clinometer to determine the height of a radio tower. He places the clinometers 80.8 meters from the base of the tower and measures the angle of elevation to be 76 degrees. Find the height of the tower.</p>	
<p>James is using a clinometer to determine the horizontal distance between his on-site office and David's office. He stands at his office window and calculates the angle of depression to David's office window. James is at an elevation of 80 feet, and David's office is at an elevation of 36 feet. He measures a 25 degree angle of depression. Find the horizontal distance between the offices.</p>	
<p>Richard is using a clinometer to measure the height of the observation deck being used to oversee the projects. He stands on the deck and finds the angle of depression to the top of a building that is 100 feet tall. The building is 466.5 feet from the deck. Richard measures a 42 degrees angle of depression. Find the height of the observation deck.</p>	
<p>James lives in an apartment building near the construction site and can see a skyscraper from his living room window. He would like to know how far his apartment building is from the skyscraper. He uses a clinometer to measure the angle of elevation from his apartment to the top of the skyscraper. The angle of elevation is 38 degrees. He knows that the skyscraper is 630 feet tall and the height of his living room window is 200 feet. Find the distance between James' apartment and the skyscraper to the nearest foot.</p>	
<p>A ladder is leaning against one of the buildings on the construction site at a 50 degree angle. The ladder is 15 feet long. How far up the side of the building does the ladder reach?</p>	

<p>Suppose that the length of the step is 12 inches and the measure of angle A is 60 degrees. Find the rise and run of the step.</p>	
<p>A ramp on one of the buildings rises 5 feet to the top of a wall. The cosine of the angle between the ground and the ramp is 0.866. What is the sine of the angle the ramp forms with the wall?</p>	
<p>The road to the construction site has an angle to the horizontal of 3 degrees. For every feet of road, how many feet does the road ascend?</p>	
<p>A 10-foot ladder is placed against a wall forming a 40 degree angle with the ground. Find the distance from the ladder to the wall.</p>	
<p>In one of the offices, a 2-foot brace holds up a bookshelf on a wall. The bookshelf is 1-foot wide. What is the measure of the angle between the brace and the wall?</p>	
<p>A 14 foot tree on the site makes a 20-foot shadow on the ground. What is the angle between a ray of light and the shadow?</p>	