Discovering π

(adapted from Mary Laycock's *Hands-on Math for Secondary Teachers*)

Materials

circular or cylindrical objects (plates, jar lids, cans, film canisters, etc.)
measuring tape (or meter stick and string)
basic function calculator (optional)

To Do and Notice

Recall that *diameter* is the distance across a circle and *circumference* is the distance around the circle. Let's go hunting for circles: Use centimeters as your units to measure the diameter and circumference of each circle you find. (Remember that the base of a cylinder is also a circle!) Then record your data on the chart below. To complete the chart, use your circumference and diameter measurements from each circle and find the *sum*, *difference*, *product*, and *quotient* of each set of data. Make sure you include your units. What do you notice about the data? (Hint: check out the last column.)

Object	Circumference (C)	Diameter (d)	C+d	C–d	C•D	C/d

What's Going On?

You probably noticed that one of the columns gives you almost the same value for *every circle*. Your neighbor's chart will be the same. This number is usually a little more than 3—very close to the constant ratio *pi*. The more carefully you make your measurements, the closer this value comes to *pi*. *Pi* is the ratio of any circle's circumference to its diameter. *Pi* is an *irrational number*, which means that it cannot be written as a ratio of two integers and that its decimal expansion goes on forever and is non-repeating. If we stop the decimal expansion of *pi* at a certain place, we get only an approximation of the number *pi*; the more decimal places we keep, the better the approximation we get.
Pi = 3.141592653589793..., and a very common approximation is *pi* 3.14.

Notice that the linear centimeter units remain as linear measurements when you add or subtract the circumference and diameter. The product of two linear measurements gives you *square units*. The quotient has no units, as centimeters/centimeters "cancel out." *Pi* is *unitless*.