

Coconut Pie

## WHAT IS PI?

How do we measure shapes? One easy way is to measure a shape's total outline, also known as its **perimeter**. Using the suggested materials below, can you measure the perimeter of a square or a rectangular object?

- Standard ruler or cloth tape measure.
- String or yarn.
- Calculator.
- Differently shaped objects (e.g., square, rectangle, triangle, circle).

Now, try to measure the outside of a circle.

### Did you do something differently?

The total outline of a circle is called its **circumference**. A straight line drawn through the center of a circle is called the **diameter**. Half of the diameter is the **radius**.

It can be hard to find the exact circumference of a circle. But there is one number that makes it possible to easily calculate a circle's circumference: **pi**.

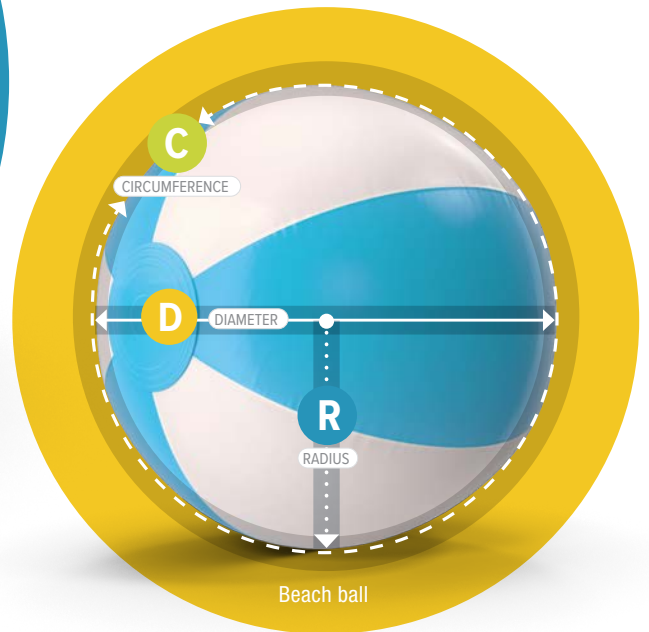
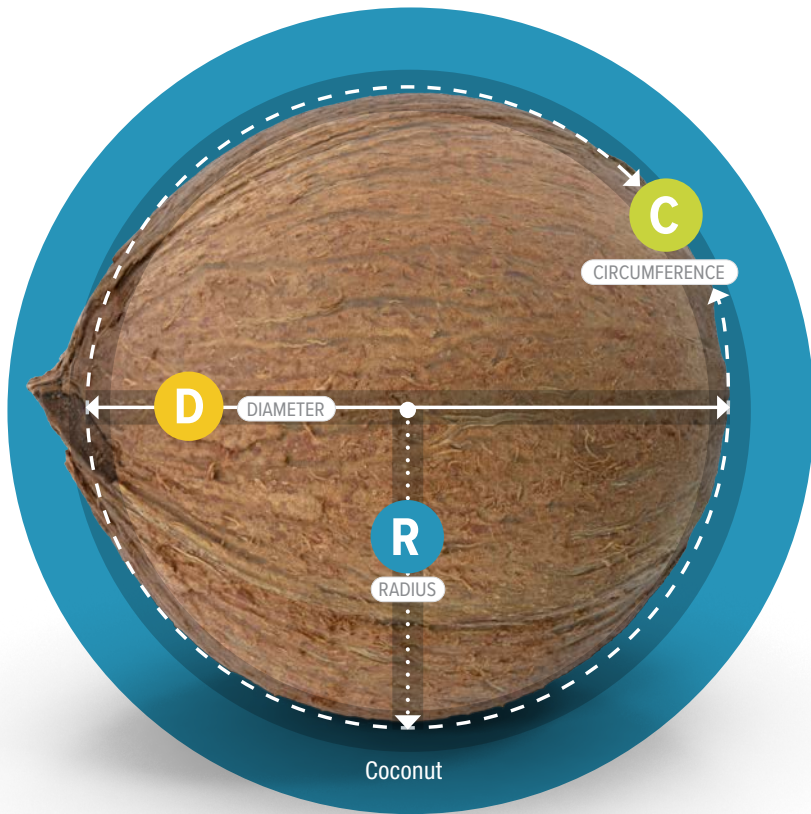
**Definition:** Pi is the ratio of a circle's circumference to its diameter.

Represented by the Greek letter  $\pi$ , pi is approximated at 3.14159. It is a number that never ends and eventually repeats in a continual pattern forever.

**3.141592653589793238462643+**

PI NUMBER SEQUENCE

**Age Level:** 6-10 (elementary).  
**Key Definitions:** Pi, Circumference, Perimeter, Diameter, Radius.  
**Objective:** To explore object sizes and compare with measurements and calculations.



## HOW DOES PI WORK?

Practice by measuring the objects on the page. Then, measure objects around the house.

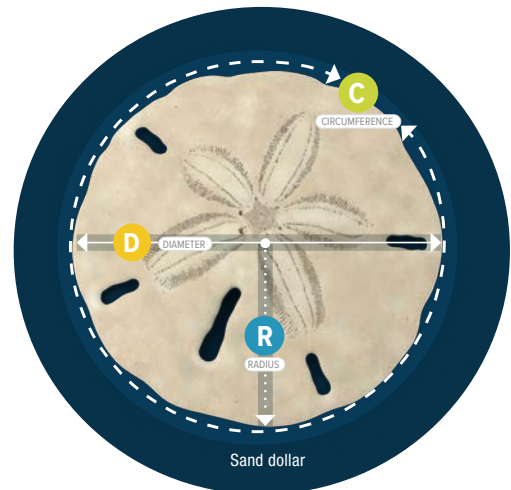
**Is it easier to measure flat circles or round hemispheres?**

Name of object: \_\_\_\_\_

Object circumference: \_\_\_\_\_

Object diameter: \_\_\_\_\_

Now plug in your numbers:



$$\frac{\text{CIRCUMFERENCE}}{\text{DIVIDED BY}} \div \text{DIAMETER} = \text{WHAT NUMBER?}$$

# USING PI

What if you don't know the object circumference, but you do have one of the other measurements, like radius or diameter? Will the equation work?



Try it out and plug in the numbers:

$$\begin{array}{ccccccc}
 \underline{\quad 3.14159 \quad} & \times & \underline{\quad \quad \quad} & = & \underline{\quad \quad \quad} \\
 \text{PI} & & \text{MULTIPLIED BY} & & \text{DIAMETER} & & \text{CIRCUMFERENCE}
 \end{array}$$

Try using the radius or diameter of objects you've already measured. You can plug the diameter into the equation right away, but don't forget that the radius must be multiplied by 2, since it's only half of the diameter.

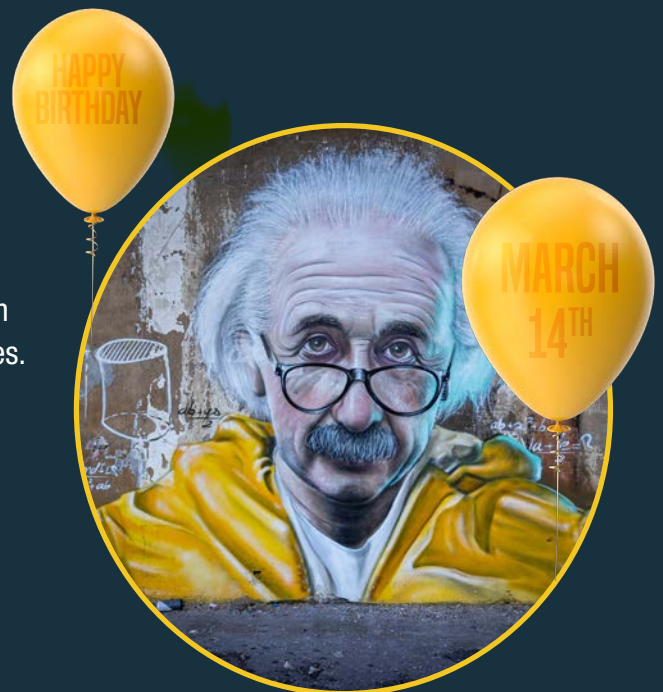
**Is the calculated circumference close to what you measured?**

# HISTORY OF PI DAY

Pi Day is celebrated on March 14, because the date (3/14) corresponds with the first three numbers of pi (3.14). The day was founded in 1988 by physicist Larry Shaw who hosted the first event at the Exploratorium, a science museum located in San Francisco. During the first celebration of the day, children enjoyed a circular parade and ate fruit pies.

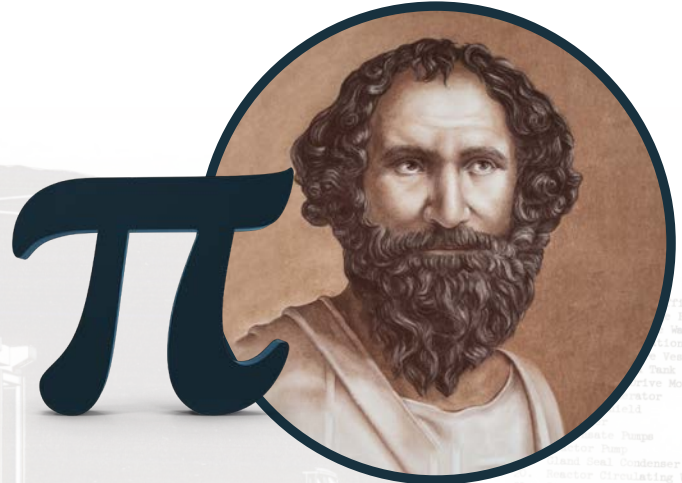
In 2009, the U.S. House of Representatives declared Pi Day as an official national holiday. It also happens to be Albert Einstein's birthday!

Today, you can celebrate science, technology, engineering, and math (STEM) on this fun holiday with pi-related events and at-home activities, as well as by making and eating an actual pie.



# ARCHIMEDES OF SYRACUSE

Long before there were calculators, there was a Greek mathematician who was credited with discovering pi: Archimedes of Syracuse. Around 250 B.C., Archimedes used **polygons** — or shapes made with lines — to approximate the circumference of a circle. First known as “Archimedes’s constant,” pi became more exact over the course of centuries, as mathematicians continued to improve upon Archimedes’s original work. Today, pi is used every day in construction, GPS navigation, computer science, and more.



## PI IN PUERTO RICO

You can bet the scientist and engineers at the U.S. Department of Energy Office of Legacy Management (LM) have used pi. How do we know? Because the Boiling Nuclear Superheater (BONUS) Decommissioned Reactor Site in Rincón, Puerto Rico, is a **dome with a 160-foot diameter** made of steel, covered with a concrete shell. Domes, having a circular base, are one of the strongest architectural shapes.

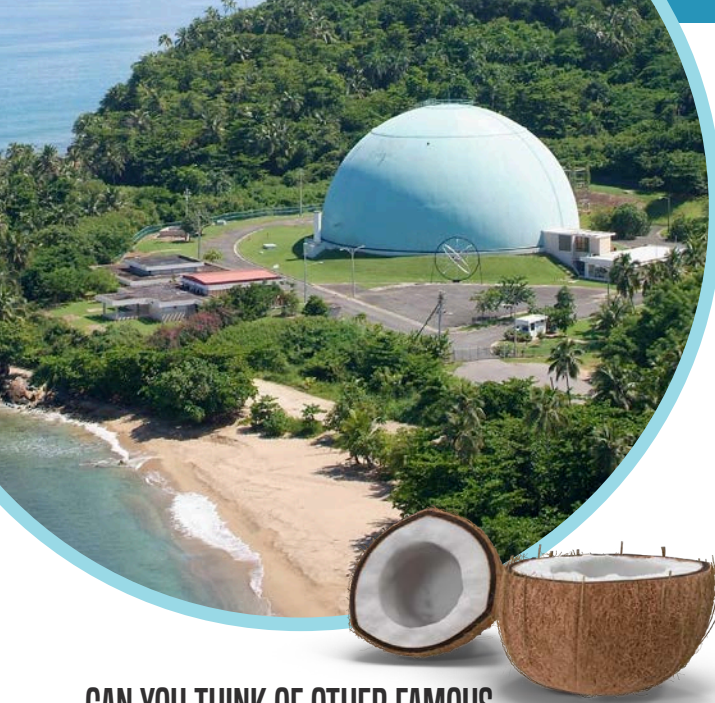
### The BONUS dome was built to withstand:

- **STRONG WINDS (UP TO 150 MILES PER HOUR OR CATEGORY 4 HURRICANES).**
- **EARTHQUAKES (ABOVE A MAGNITUDE OF 7 ON THE RICHTER SCALE).**
- **TSUNAMIS (USUALLY THE AFTERMATH OF AN EARTHQUAKE).**
- **INTENSE INTERNAL PRESSURES (UP TO 720 POUNDS PER SQUARE FOOT).**

BONUS is protected by an earthen embankment, which provides an elevated position of 40 feet (12 meters) above sea level.

Having learned how to use Pi, can you figure out the circumference of the BONUS dome?

$$\begin{array}{ccccccc}
 \underline{3.14159} & \times & \underline{160} & = & \underline{\hspace{2cm}} \\
 \text{PI} & & \text{DIAMETER} & & \text{CIRCUMFERENCE} \\
 & \text{MULTIPLIED BY} & & & 
 \end{array}$$



## MORE ABOUT BONUS

BONUS was built in 1960 as a prototype to test new technology for the creation of nuclear power. It was decommissioned in 1970. Today, the Puerto Rico Electric Power Authority owns the land and buildings. LM is responsible for the long-term surveillance and maintenance of the site.

The distinctly round building, referred to by locals as “Domes,” was listed on the U.S. National Register of Historic Places in 2007. It stands near Domes Beach in the city of Rincón and serves as a reminder of our nation’s nuclear history.

**In honor of BONUS’s nuclear scientists and engineers, let’s celebrate Pi Day with an island favorite: coconut pudding pie.**

### CAN YOU THINK OF OTHER FAMOUS BUILDINGS THAT HAVE DOMES?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

## COCONUT PUDDING PIE

### INGREDIENTS:

- 1 frozen pie crust.
- 14 oz. can sweetened condensed milk.
- ½ cup cold milk.
- ½ cup coconut milk.
- 1 large box instant vanilla pudding.
- 1 cup shredded sweetened coconut.
- 8 oz. frozen whipped topping (thawed).
- ½ cup toasted shredded coconut.

### INSTRUCTIONS:

- 1 Bake the pie crust according to package directions. Let it cool.
- 2 Mix the condensed milk, milk, coconut milk, and instant pudding until thick. Fold in the shredded sweetened coconut. Pour the mixture into the cooled pie crust.
- 3 Top the pie with the thawed whipped topping. Garnish with toasted coconut. Chill the pie in a refrigerator for at least two hours.



*yummy...*

# COUNTING TO $\pi$

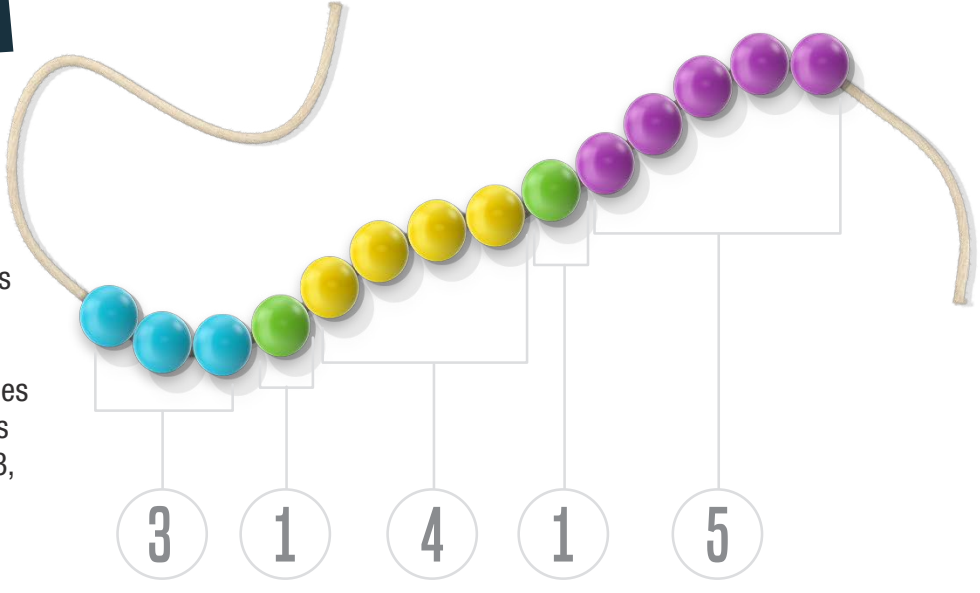
3.1415926535897932+

**MATERIALS:**

- Yarn or string.
- Colored beads.

Sort the beads into different colors and quantities. Thread the beads onto the string or length of yarn. Using different colors and quantities to represent the different numbers of the pi sequence (e.g., blue for 3, green for 1, yellow for 4).

When you're done, you can use your beaded string as a key chain, necklace or a bracelet, too.



## IF YOU COULD MAKE ANY KIND OF PIE, WHAT WOULD IT BE?

Draw and color a picture of your favorite pie.

*My flavor of pie is:*

\_\_\_\_\_