

Name: \_\_\_\_\_

## What is the Meaning of Pi? Calculations and Applications

When a circle is measured, the distance around it is about 3 times its diameter. Scientists even 1000's of years ago had this figured out. This constant is now known as Pi. It is an irrational number with a never ending string of nonrepeating numbers after the decimal but for simplicity sake, it is shortened to 3.14. This activity is designed to prove the constant Pi using household circular objects and the following equation:

$$\pi = \frac{C}{d}$$

**Problem:** To prove that the value of Pi is about 3.14

**Hypothesis:** If I measure carefully then my average value for Pi should be close to 3.14.

**Materials:**

- String
- Ruler or yard/meter stick
- Pencil

**Method:**

1. Gather 10 circular household or classroom objects that may include pie plates, serving plates, paper plates, frying pans, drinking glasses or mugs.
2. Using a long piece of string, wrap it around the outside edge of your object. Hold the free end of the string with one hand, and wrap the string around the object until you meet your other hand. For accuracy, put a pencil mark on the string where the two ends meet.
3. Remove the string from your object and lay it out along a ruler or yard (meter) stick. Make sure the free end is lined up with '0' on your ruler. Record the

measurement, to two decimal places, under *circumference* in the observation chart.

4. Using the ruler, measure the diameter of your object - the length from side to side through the middle of the circle. Record your measurement, again to two decimal places, under *diameter* in the observation chart.
5. Repeat steps 2 to 5 for each circular object.
6. Calculate Pi for each object using the formula above. Record your calculation under *Pi* in the observation chart.
7. Calculate an average Pi value for all ten objects measured. Add the Pi values and divide by 10. Record your calculation in *Average Pi* in the observation chart.

Observations:

Pi Calculations for 10 Objects

Object	Distance around the outside of an object <b>Circumference</b> (inches)	Distance across the middle of an object <b>Diameter</b> (inches)	Distance around divided by distance across <b>Pi</b> ( $\pi$ )
Average Pi:			

Conclusion:

What did you notice about the numbers in the last column (value for Pi)?

Was your hypothesis supported? Was your average Pi value close to 3.14?

Why or why not?

## Application Problems Using Pi

Use the following equations to solve everyday problems using Pi:

- the surface area of a cylinder:  $2\pi rh + 2\pi r^2$
- volume of a cylinder:  $\pi r^2 h$
- circumference of a circle can also be calculated:  $2\pi r$
- area of a circle:  $\pi r^2$
- volume of a sphere:  $\frac{4}{3}\pi r^3$
- surface area of a sphere:  $4\pi r^2$

Follow the following format when solving the following word problems:

- Given
- Required to Find
- Formula
- Solution
- Concluding sentence with answer

1. You've baked a pie. You have three friends and want to make sure each one has an equal volume to eat. Remember your pie is like a very wide cylinder. It has a diameter of 20 inches and a height of approximately 2 inches. What is the volume of your pi? How much volume will each person get to eat?



2. You have a swimming pool with a diameter of 30 ft. It has a height of 5 ft. What volume of water will you need to fill the pool? You need a solar blanket to help keep the water warm. What is the surface area of the blanket you will need for this pool?

## Solutions to Application Problems

1. Given:  $d=20\text{inches}$       RTF: V of Pie  
 $h=2\text{inches}$

Formula: V of pie (cylinder)  $=\pi r^2 h$        $V = \pi r^2 h$

Solution:  $r = d/2$        $= 3.14 \times (10\text{inches})^2 \times 2\text{inches}$   
 $= 20\text{inches}/2$        $= 628\text{inches}^3$   
 $= 10\text{inches}$

Volume of pie per person  $= 628\text{inches}^3 / 3$   
 $= 209.33\text{inches}^3$

The volume of the entire pie is  $628\text{inches}^3$ . Each of the three friends receives  $209.33\text{inches}^3$  of pie.

2. Volume of the pool  $= 3532.50\text{ft}^3$  and the surface area of the pool is  $7065\text{ft}^2$ . You would need  $3532.50\text{ft}^3$  of water to fill the pool. You would need a circular blanket with an area of  $7065\text{ft}^2$ .