Math 191 Fundamentals of Mathematics II
12.6: Area of Circles and the Number Pi
February 21, 2014

What is π?

You probably know the formula for the area of a circle:

But what is π? The Greek letter π (pronounced _____) represents a _____, about 3.14159265.

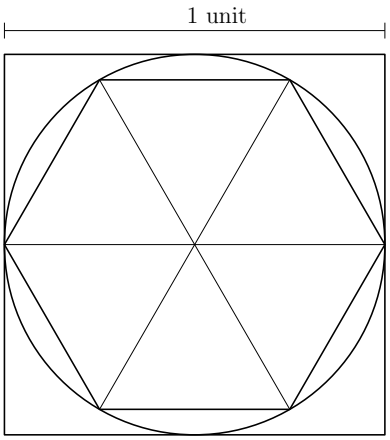
We _____ π to be the _____ of the _____ to its _____.

$\pi = ($ $) \div ($ $)$

No matter what the size of the circle is, this ratio will be the same because every circle is a _____ version of some _____, and when we scale the circle, the _____ and _____ get multiplied by _____.

The fraction _____ is a good approximation for π, but the actual value of π is an _____. In other words, its decimal expansion _____ and does not _____.

1. Using the figure below, explain how you can tell that π is between 3 and 4.



You could also approximate π using a compass, a long strip of paper and a ruler.

- Draw a _____ and a _____.
- _____ the strip of paper around the _____. _____ the strip to be the _____.
- Use the _____ to _____ the strip of paper and the _____ of the circle.
- Compute:

$$\pi = \text{\_\_\_\_\_}$$

2. Explain why this method only *approximates* π instead of computing it exactly.

Formulas Using π: Circumference and Area of Circles

Because π is defines to be the _____, we get the formula

circumference of a circle = $\times$( )

or, if we let C denote _____ and d denote _____,

Because the diameter of a circle is _____ the length of the _____, we can rewrite the formula as

3. Some trees in an orchard need to have their trunks wrapped with a special tape to prevent an attack of pests. Each tree's trunk is about 1 foot in diameter and must be covered with tape from ground level up to a height of 4 feet. The tape is 3 inches wide. Approximately how long a piece of tape is needed for each tree? (Use that one wrap of the tape around the tree is approximately a circle.)

The formula for the area of a circle also uses π. Namely, a circle with _____ has area

Area of a circle = square units.

Why does this formula make sense?

4. Look at the pictures on the separate sheet. In the first picture, a circle has been cut into 8 wedges and rearranged. In the second, the circle was cut into 16 wedges and rearranged. In the third, the circle was cut into 32 wedges and rearranged.

If you imagine cutting the circle into more and more wedges (each of which will become smaller and smaller) and rearranging them as shown,

- What shape do the rearranged pie wedges look more and more like?
- What are the side lengths of this shape?
- What is the area of this shape?

5. Explain why it makes sense that the area of a circle with radius r is πr^2 square units if you know the circumference of a circle of radius r is $2\pi r$.