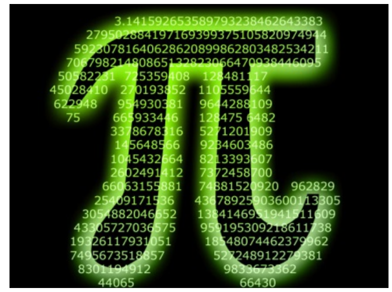
Student Worksheet for Pi



Overview: On March 14 at 1:59pm, folks from all over the world celebrate "Pi Day" with games, activities, and pie-eating contests. Here are my best resources for showing kids how pi shows up in the real world and also how to learn about pi in a way that not only makes sense but isn't flat boring.

What to Learn: Pi is a number (slightly greater than 3) that shows up when you divide the circumference of a circle by its diameter, no matter what size the circle is. It also shows up in other shapes like spheres, ellipses, cylinders, and cones as well as unusual places like summation series, number theory, probability, bell curves, and the Fibonacci series.

Materials:

- This worksheet (all pages)
- 3 tennis balls in a can
- Box of toothpicks
- Chalk (optional)

Questions:

1. Tennis Ball Can: Is the height of a tennis ball can greater than the circumference?

   Hint: Circumference = $2 \pi r$

2. Toothpick Challenge (called *Buffon's Needle*):
   a. Number of Toothpicks Tossed = ________________________

   b. Number of Toothpicks Crossing a Line = ________________________

   c. Ratio: Tossed/Crossed = ________________________

3. Using a calculator, which is closer to the real value of pi?
   a. 22/7 = ________________________

   b. 355/113 = ________________________

4. Play "Pi-Opoly" with friends.
5. Enjoy the additional pages, such as the coloring page, crossword puzzle, word search, cootie-catcher, and more in this packet!
6. "Pie" ideas: Pizza pie, chicken pie, berry or fuit pies, chocolate pie, shepherd pie, and more!

π-Opoly: A Fun Math Game for "Pi Day"

This is a fun game you can play with your kids on *Pi Day*, which is March 15th each year. The rules are very simple, and the goal of the game is not only to have fun, but to learn something new as you go along.

Objective: First one to get 20 tokens is the winner!

Materials: 1 six-sided die, question (?) cards, a pile of pennies or tokens, calculator, scratch paper and pencil for every player and different playing pieces for each player.

Preparation: Cut out the question cards and place face down near the board. Print out the board. Stack the pennies near the board.

Playing the Game:

1. Roll to see who goes first. Number closes to π goes first.
2. On your turn, roll the die and move your playing piece the number of spaces you rolled.
3. Complete the action on the space. If you answer correctly (either the space action or answer a question card correctly), you get a token.
4. Next person's turn!

Symbols on the Spaces:

For a space marked D (diameter), R (radius), V (volume), and A (area), roll the die for the circumference and then determine the diameter, radius, volume, or area as appropriate. For younger kids, skip the calculator and use a value of 3 for π and help them with the math operations. Correct answer gets a token.

For spaces marked with a "?", pick a question card and answer it. Correct answer gets a token!

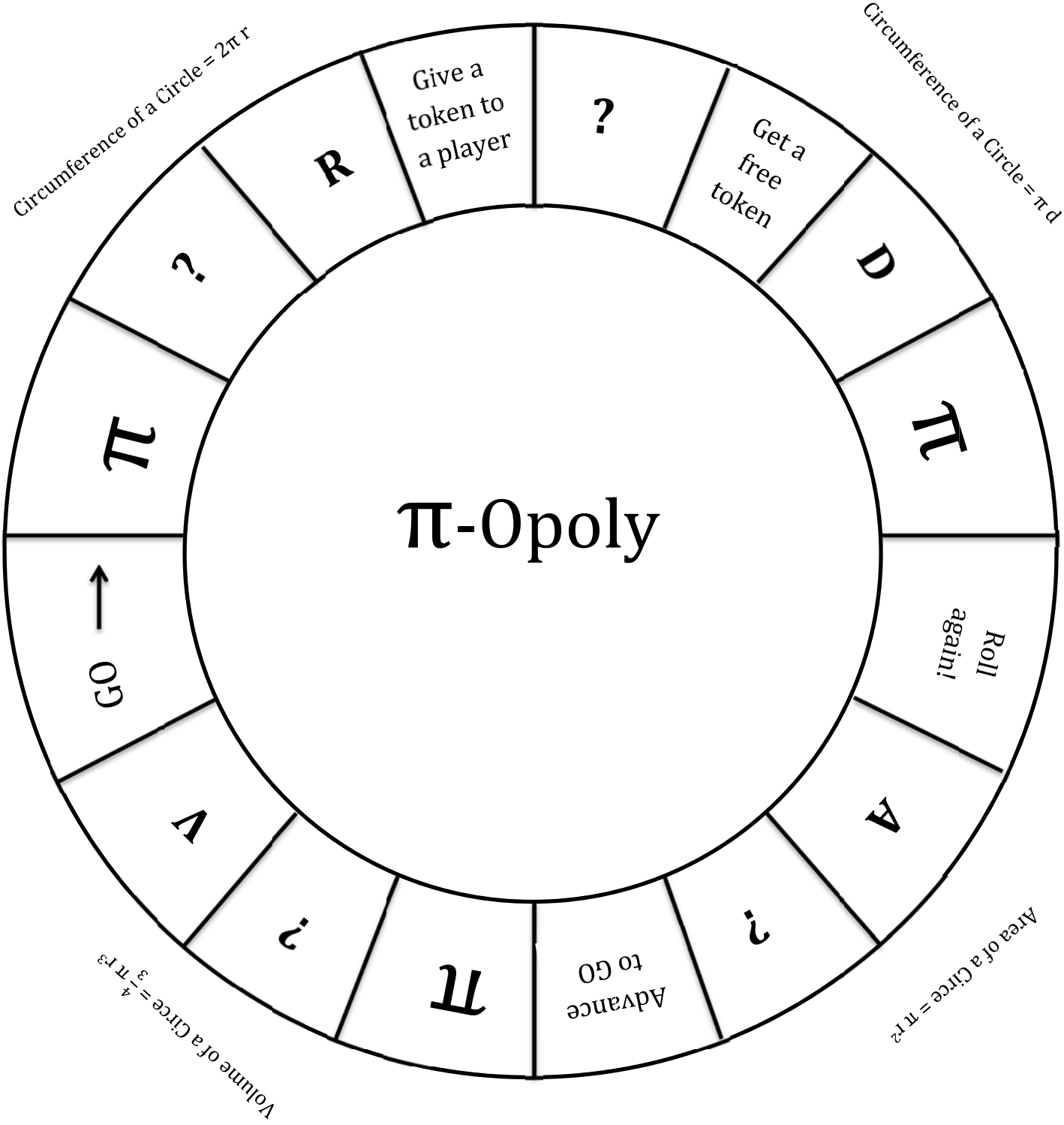
For spaces marked with a "π" symbol, recite as many digits of π as you can, and then move forward that many spaces. For example, if you say *3.1415* then move forward 5 spaces. For *3.1415926535*, move forward 11 spaces.

Every time you pass GO, take a token.

Winning the Game: Winner is the first one with 20 tokens!

Here are the first 1,000 digits of π:
3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706798214808651328230664709384460955058223172535940812848111745028410270193852110555964462294895493038196442881097566593344612847564823378678316527120190914564856692346034861045432664821339360726024914127372458700660631558817488152092096282925409171536436789259036001133053054882046652138414695194151160943305727036575959195309218611738193261179310511854807446237996274956735188575272489122793818301194912983367336244065664308602139494639522473719070217986094370277053921717629317675238467481846766940513200056812714526356082778577134275778960917363717872146844090122495343014654958537105079227968925892354201995611212902196086403441815981362977477130996051870721134999999837297804995105973173281609631859502445945534690830264252230825334468503526193118817101000313783875288658753320838142061717766914730359825349042875546873115956286388235378759375195778185778053217122680661300192787661119590921642019

The area of a circle is 78.5 square inches. Find the circumference. (31.4 inches)	Draw a circle on your paper. Can you split it into 5 equal parts?	Name 4 different kinds of pie.
What is the equation for finding the volume of a ball? ($V = 4/3\ \pi\ r^2$)	How many right angles in a single step of a flight of stairs?	What part of the circle is the circumference? (The line that outlines the circle.)
What is the equation for finding the area of a circle? ($A = \pi\ r^2$)	How many obtuse angles (greater than 90^o) on your chair?	Draw the symbol π on paper.
What is the equation for finding the circumference of a ball? ($C = \pi\ d$ or $C = 2\ \pi\ r$)	How many acute angles (less than 90^o) on your chair?	What part of the circle is the diameter? (The line drawn across the circle that goes through the center.)
What is the last digit of π? (There isn't one!)	When is π used in the real world?	How is the diameter different from the radius?
What is the circumference of a circle whose diameter is 8 mm? (25.12 mm)	What is the 100^{th} digit of π? (9)	Does π ever end? (No!)
What is the 10^{th} digit of pi? (3)	What is the 1000^{th} digit of π? (9)	Who was the first person to approximate π? (Archimedes)
What language is the symbol π? (Greek)	What fraction approximates π well? (355/113)	What do you get when you divide the circumference of a pumpkin by its diameter? (Pumpkin pie!)
Is π upper or lower case? (Both! π and Π)	What part of a circle is the radius? (From the center to a point on the circle)	What % of sailors are pi rates? (3.14%)
Count by 13's until you get to 100. (13, 26, 39, 52, 65, 78, 91)	What is the volume of a pizza? (Volume = pi * z * z * a where z is the radius and a is the thickness.)	What does this mean? $\sqrt{-1}\ \ 2^3\ \ \Sigma\ \ \pi$ and it was delicious! (I ate some pie and it was delicious!)
Count by 5's until you get to 100. (5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95,100)	What fraction approximates π used by Archimedes? (22/7)	What did *i* say to π, and how did π respond? (*i:* "Be rational!" π: "Get real!")
Count by 3's until you get to 100. (3, 6, 9, 12…)	What part of the circle is the area? (The space contained within the circle.)	What about π is irrational? (Can't be expressed as a fraction of integers.)
Count by 9's until you get to 100. (9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99)	Count by 7's until you get to 100. (7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98)	What is the worst thing about getting hit in the face with π? (It never ends.)


π-Opoly
GO
Roll again!
Get a free token
Give a token to a player
Advance to GO
Circumference of a Circle = 2π r
Circumference of a Circle = π d
Area of a Circe = π r²
Volume of a Circe = 4/3 π r³