

Pi Day Activity

1 Grade Level and Topics

This activity is appropriate for elementary and middle schools students, and should take up to 1 full class period, but can certainly be shortened or extended depending on how many digits of π you would like to display. This lesson was especially appropriate for special education students and visual learners.

2 Introduction

Geometrically, the mathematical constant π is the ratio of a circle's circumference to its diameter. π also has the property that it is an *irrational* number, which means that it cannot be expressed exactly as the ratio of two integers ($\frac{22}{7}$ is commonly used to approximate π , but does not exactly equal π .) An irrational number like π has infinitely many digits in its decimal expansion, and does not end in any sort of repeating pattern of digits. This activity explores what it means to be an irrational number, and uses a color representation to help students visualize this property.

3 Materials

- 10 different colors of construction paper, about 50 pieces total. Each piece should be cut into 4 strips lengthwise. Students can do the cutting, or the teacher can pre-cut to save time.
- Tape or stapler and staples (for attaching paper together)
- A print-out of the digits of pi, attached.

4 Activity

- Begin by discussing π , and what it means to be a rational or irrational number. Explain that π is an irrational number, and we are going to model it today with a paper chain.
- For each of the 10 different colors of construction paper, assign a digit from 0-9. Using the 10-pack of construction paper from Walmart, a sample distribution is: 0-white, 1-black, 2-red, 3-orange, 4-yellow, 5-green, 6-blue, 7-purple, 8-pink, 9-brown. Write this on the board or give each student a key so they have a reference.
- Divide the decimal expansion of π into sets of 20 digits, and distribute a set to each pair of 2 students. Be sure to order or number the sets of digits, so you know which order they go in.

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- Ask each pair to make a paper chain corresponding to their set of digits. For example, the pair of students with the first set of digits “3.14” will make a paper chain consisting of orange-black-yellow. Once group 1 and 2 finish their chains, they may connect their chains at the appropriate points, etc.
- If time permits, assign pairs that are finished additional sets of 20 digits.
- Continue to attach the completed chains together in the correct order. At the end, you should have one really long paper chain that represents the irrationality of π in color.
- Have your students talk about anything they notice within the first 200 digits. For example, count the number of “blues” and compare it to the number of “pinks”. How would this change if we extended the chain to 400 digits?

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5 Sample Worksheet - Pi Expansion to 200 digits

Make the paper chain that is assigned to your group according to our color-digit key.

Group	Digits
Group 1	314 159 265 358 979 323 846
Group 2	264 338 327 950 288 419 71
Group 3	693 993 751 058 209 749 44
Group 4	592 307 816 406 286 208 99
Group 5	862 803 482 534 211 706 79
Group 6	821 480 865 132 823 066 47
Group 7	093 844 609 550 582 231 72
Group 8	535 940 812 848 111 745 02
Group 9	841 027 019 385 211 055 59
Group 10	644 622 948 954 930 381 96

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