Area/Skill - Math	Cognitive Skill Level - Application/Analysis	Correlation to Math Framework - 05.06/05.09	Lesson Number - 42

Activity Title - Pi Digit Distribution

Goal/Objective

To teach students graphing skills and how to compare and contrast different sets of data.

Lesson Outline
Introduction

Discuss that pi is a repeating number. When does it repeat and what is the frequency of each of the numbers? Well, that is the purpose of the lesson.

Activity

Have students compute pi through the first fifty or one-hundred digits. Discuss the frequency of the different digits and have them create a table to show that frequency. Next, have students create a bar graph to display the data in the table. You may also wish to have create circle graphs based on the digits - an excellent use of protractors, fractions, decimals and angles if done by hand. Compare and contrast the different types of displays. Also have students use the data to figure mean, median, and mode.

Debriefing/Evaluation Activity

Ask students questions from the **Handout - Pi Digit Distribution**. Students may wish to further explore the frequency of digits in pi by expanding their calculations through 200 digits, 250 digits, etc.

Real-Life Connection

Pi is part of the calculation used when figuring such things as the area of a circle. Have students review the GED Math Formulas page and identify which formulas use pi. Identify different real-world scenarios that use these formulas and create GED-type questions for each scenario. Have the students share their questions with the class and demonstrate how each questions would be solved.

Materials/Texts/Realia/Handouts

- Handout - **Pi Digit Distribution**
- Paper, pencils
- Graph paper
- Calculators
- Computers with Internet access
- GED Math Formulas page

Extension Activity

Have students research the origin of pi. Who created pi? What does pi stand for? Was pi named for anyone? Students should share their research with the class.

ESE/ESOL Accommodations

- Provide students with the first fifty digits of pi.
- Give students a sample table into which they can tally their numbers.
- Provide students with written definitions of terms and step-by-step examples of how to determine each measure of central tendency.
- Allow students to use calculators to figure mean, median, and mode.

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Activity Title - Pi Digit Distribution

Introduction

Say: The term pi is often used in formulas on the GED Mathematics Test. Often, we use 3 1/7 or 3.14 to represent pi. However, pi is really much longer than this. Today, we are going to use longer "versions" of pi to figure frequency, mean, median, and mode.

Main Activity

Say: Pi is a repeating number that can continue in infinity. *Ask:* When does pi repeat? What is the frequency of each of the numbers? Well, that is we are going to find out today.

Say: First, please compute pi through the first fifty (or one-hundred) digits. You may use paper or pencil or you may use the calculator. Now, I want you to determine the frequency of each of the different digits and create a table to show that frequency.

Have students share their results with the class. *Say:* Next, I want you to display the data from your frequency table in a bar graph format.

Say: Data can be displayed many different ways. Let's see if you can create a circle graph based on the digits. When you create the circle graph, make sure that you determine 100% of the numbers, where each number is a part of the whole.

After students have completed their circle graphs, discuss how the circle graph can also be used to identify such things as percentages, angles (where the entire circle is 360° and each angle a part of that number), and fractional parts.

Say: Now let's figure central measures of tendency, better know as mean, median, and mode. Calculate each of these measures based on the data in your table or chart.

Closure/Conclusion

Use questions from the **Handout - Pi Digit Distribution** to evaluate learning from the lesson.

Follow-Up Lessons/Activities

Students may wish to further explore the frequency of the digits in pi by expanding their calculations through 200 digits, 250 digits, etc.

Have students review the GED Math Formulas page and identify which formulas use pi. Identify different real-world scenarios that use these formulas and create GED-type questions for each scenario. Have the students share their questions with the class and demonstrate how each questions would be solved.

Have students research the origin of "pi" and how it was discovered and named.

GED 2002 Teachers' Handbook of Lesson Plans
Math Lesson 42 Handout

Pi Digit Distribution

Related Questions to Pi Activity

Which digit(s) appears *most* frequently?

Which digit(s) appears *least* frequently?

Which digit would represent the median of this data?

What is the mean of this data rounded to the nearest tenth?

What is the mode of this data?

Do the next 50 digits (digits 51-100) have the same or similar distribution? The next 50 (digits 101-150)? The next 50 (digits 151-200)? The next 50 (digits 201-250)? The next 50 (digits 251-300)? The next 50 (digits 301-350)? The next 50 (digits 351-400)?

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Math Lesson 42 Handout

Pi Digit Distribution – Answer Sheet

Frequency Table – Pi Digits for the First 50 Digits

Digit	Frequency
0	2
1	5
2	5
3	8
4	4
5	5
6	4
7	7
8	5
9	8

Pi Digits 51-100 - 5820974944 5923078164 0628620899 8628034825 3421170679

Pi Digits 101-150 - 8214808651 3282306647 0938446095 5058223172 5359408128

Pi Digits 151-200 - 4811174502 8410270193 8521105559 6446229489 5493038196

Pi Digits 201-250 - 4428810975 6659334461 2847564823 3786783165 2712019091

Pi Digits 251-300 - 4564856692 3460348610 4543266482 1339360726 0249141273

Pi Digits 301-350 - 7245870066 0631558817 4881520920 9628292540 9171536436

Pi Digits 351-400 - 7892590360 0113305305 4882046652 1384146951 9415116094