Using Venn Diagrams to Find the GCD

Activity Overview

In this activity, students use Venn Diagrams to classify numbers. They will first classify multiples of 3, 5, and 6, deciding where to place the least common multiple. Then, students will use the integer division feature to help them classify factors of three different numbers.

Topic: Numbers and Operations

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
- Use factors, multiples, prime factorization, and relatively prime numbers to solve problems.

Teacher Preparation and Notes

- Before beginning the activity, students should clear all lists and turn off functions. To clear the lists, press [2nd] [CATALOG] and scroll down until **ClrAllLists** is highlighted. Press [ENTER] twice. Or press [2nd] [MEM], the select **4:**ClrAllLists. To clear any functions, press [Y=], then press [CLEAR] when the cursor is next to Y1 through Y0.
- **To download the student worksheet, go to education.ti.com/exchange/vdgcd**

NORMAL FLOAT AUTO REAL RADIAN MP

gcd(24,54)

6
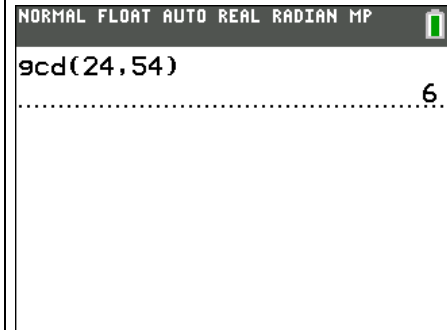
This activity utilizes MathPrint™ functionality and includes screen captures taken from the TI-84 Plus C Silver Edition. It is also appropriate for use with the TI-83 Plus, TI-84 Plus, and TI-84 Plus Silver Edition but slight variances may be found within the directions.

Compatible Devices:
- TI-84 Plus Family
- TI-84 Plus C Silver Edition

Associated Materials:
- Using_Venn_Diagrams_to_Find_the_GCD_Student.pdf
- Using_Venn_Diagrams_to_Find_the_GCD_Student.doc

Tech Tips:
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials
- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

Part 1 – Exploring Multiples

Begin Problem 1 by having students discuss the meaning of the term *multiple*. Students can use several methods to work Exercises 1–6. One option is shown below.

Questions 1–6

Students can use the home screen to find multiples of a number. To use simple addition, as shown on the right, press the initial number, [6], and press [ENTER]. Then press [+] [6] [ENTER]. Continue pressing [ENTER] until students have obtained enough multiples.

Part 2 – Greatest Common Divisor

Questions 7–8

Students may initially struggle with the common meaning of *greatest common factor* (GCF) and *greatest common divisor* (GCD). Help them see that the number in question can be divided by the factor.

For Exercise 7, the key presses are [MATH] ► [9] [2] [4] [,] [5] [4] [)] [ENTER].

Question 9

Students can again use multiple methods to find all the factors of the given numbers. Regular division is one method of finding factors. If the division renders a whole number quotient, the divisor is a factor of the dividend.

Students may also want to explore the int() and remainder features. This will show the actual remainder from the division. Press [MATH] ► [5] [8] [8] [÷] [6] [)] [ENTER], [MATH] ► [0] [8] [8] [2nd] [,] [6] [ENTER], [MATH] ► [5] [8] [8] [÷] [8] [)] [ENTER], and [MATH] ► [0] [8] [8] [2nd] [,] [8] [ENTER] for the examples to the right.

Question 11

If students have not already done so, they should use the **gcd(** command to check that they did in fact find the GCD (or GCF) of the given numbers. Press [MATH] ► [9] [8] [8] [,] [4] [8] [)] [ENTER]. The other examples follow the same key presses.
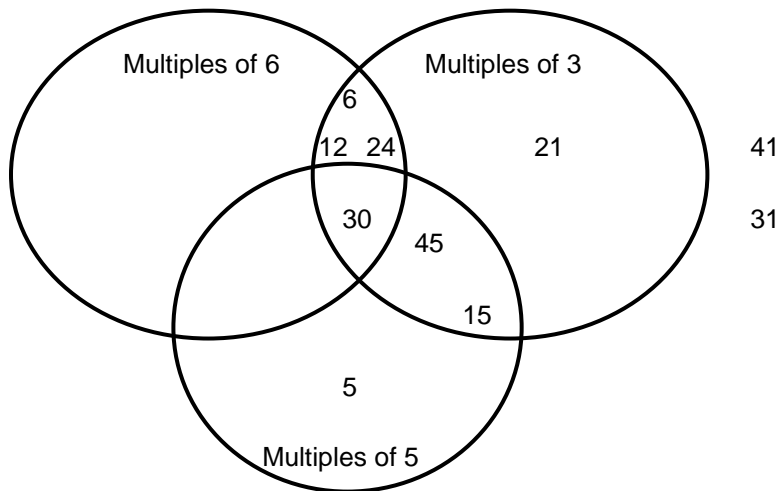
Solutions to Student Worksheet

Part 1

1. Place the following numbers in the correct location in the Venn diagram above.
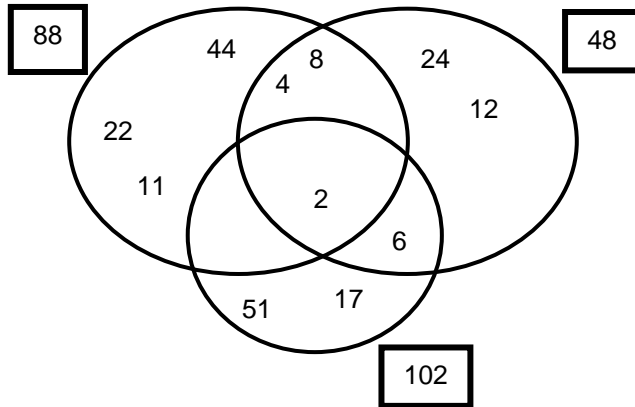   **Answer:**

2. Which numbers share the circles for 3 and 6? **Answer: 6, 12, 24, 30.**

3. What is similar about these numbers?

   Answer: They each are obtained by multiplying either 3 or 6 by another number.

4. Where will you place the Least Common Multiple (LCM) of 5 and 6? What is this number? 3 and 6? 3 and 5?

   Answer: The LCM of 5 and 6 is placed in the overlap section of those 2 circles. Either including or not including 3. For 3 and 6, it will fall in the overlap of those 2 circles. For 3 and 5, the same.

5. Did any numbers fall outside the circles? If yes, what do the numbers have in common?

   Answer: Yes, 41 and 31 are outside the circle. These numbers cannot be obtained by multiplying 3, 6, or 5 by another number.

6. Can you find a number that falls in the "Multiples of 6" and *not* in the overlap area for "Multiples of 3"? Why or why not?

   Answer: No. Any number that belongs in the 6 circle must also be in the 3 circle because 6 is a multiple of 3.

Part 2

7. Find the greatest common divisor of 24 and 54. Write the answer. **Answer: 6**

8. Find the **GCD** of 18 and 90. Write the answer. **Answer: 18**

9. In the following Venn diagram, place all factors of each number in the correct location.

| 88 |
| 44   8   24 |
| 4 |
| 22 |
| 11   2 |
| 6 |
| 51   17 |
| 102 |
| 12 |
| 48 |

10. What must a number have in common with all three numbers to be placed in the overlap of all three circles?

    Answer: A number in the overlap of all 3 circles must be a factor of all 3 numbers.

11. What is the greatest common divisor of 88 and 48? Where is it located in the diagram? What is the greatest common divisor of 88 and 102? Where is it located?

    Answer: 8 is the GCD of 88 and 48. It is in the overlap of their circles. 2 is the GCD of 88 and 102. It is in the overlap.

12. When will a greatest common divisor *not* exist between two numbers?

    Answer: A GCD will not exist when no common factors exist. Examples include 33 and 14.