

## Activity 4

## Factors Galore C: Prime Factorization

Students will use the TI-73 calculator's ability to simplify fractions to find the prime factorization of a number.

## Activity

**Note:** Before you begin, make sure the calculator is set to **Mansimp** to manually simplify fractions and to **b/c** to input fractions.

1. Press **[MODE]**, use the arrows to move to **b/c**, and press **[ENTER]**.
2. Move to **Mansimp** and press **[ENTER]**.
3. Press **[2nd]** **[QUIT]** to return to the Home screen.

To find the prime factorization of a number, enter the number as the numerator and the denominator of a fraction. (You are entering the number as a fraction to take advantage of the **[SIMP]** key on the TI-73. The **[SIMP]** key simplifies the fraction one factor at a time.)

For example, to find the prime factorization of 24: Type 24, press **[b/c]**, type 24, and press **[ENTER]**.

**Tip:** Remind students that any number divided by itself is equivalent to 1. You may want to “prove” this to them by dividing 24 by 24.

## Concept

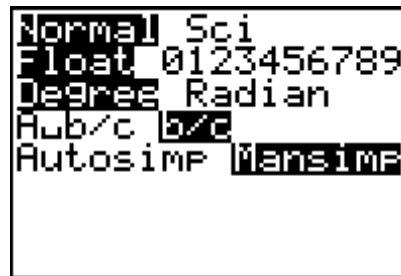
- ◆ Number sense

## Skills

- ◆ Simplifying fractions
- ◆ Using prime and composite numbers
- ◆ Using factors
- ◆ Prime factorization
- ◆ Calculator skills: **[MODE]**, **[b/c]**, **[SIMP]**

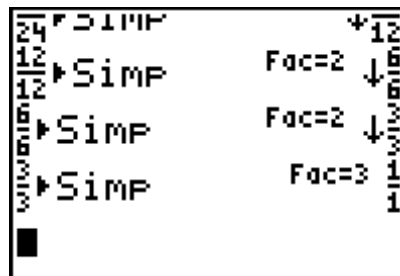
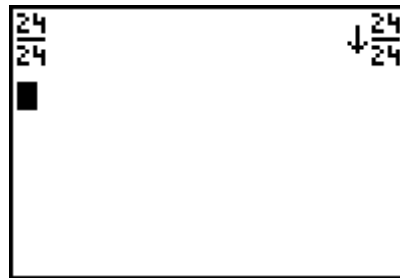
## Materials

- ◆ Student Activity sheets (page 18)
- ◆ TI-73 calculators



The arrow next to the fraction means that the fraction can be simplified. Press **[SIMP]** **[ENTER]**. The calculator will display the new fraction simplified by the lowest prime factor. Record this factor on the Student Activity sheet. Repeat the **[SIMP]**, **[ENTER]**, record process until the fraction has been simplified completely.

**Tip:** For the first two numbers or so, it would be beneficial for the students to do the mathematics on notebook paper to show what the calculator is doing here.  $24/24$  divided by  $2/2$  equals  $12/12$ .  $12/12$  divided by  $2/2$  equals  $6/6$  and so on. Discuss with students why the calculator is choosing the factor it is choosing. (It is choosing the lowest common prime factor of numerator and denominator).



Ask students these questions:

- ◆ Will the calculator always display 1 as the last factor? Why or why not?
- ◆ Why don't we record 1 as a prime factor?

**Tip:** The last common factor will be 1. Do not allow students to record this factor because it is not a prime number.

The product of the common factors is the prime factorization of the number. The factors for 24 will be 2, 2, 2, 3. Students can write this as  $2 \times 2 \times 2 \times 3$ . Ask students if there is a shorter way to write this. (Using powers,  $2 \times 2 \times 2$  is  $2^3$ . The prime factorization using powers would be  $2^3 \times 3$ .)

### Wrap-Up

Discuss the process the calculator is using to get the factors. (It is simplifying the fractions by reducing the fraction by the lowest prime factor each time until the fraction is completely simplified.)

### Assessment

Explain how you would show that this is the prime factorization of a number. (Make sure students understand the meaning of a prime number and can explain that the product of the prime factors is equal to the number.)

### Extension

- ◆ Show students an alternate way to find the prime factorization of a number by using a factor tree. First, choose any two numbers that you could multiply to get the number. For example, for 24, you could choose 6 and 4. Then do the same for those numbers (the 6 and 4 in this example) until you have all prime numbers.

*Example:*

$$\begin{array}{r}
 24 \\
 / \quad \backslash \\
 6 \quad 4 \\
 / \quad \backslash \quad / \quad \backslash \\
 2 \quad 3 \quad 2 \quad 2
 \end{array}$$

The prime factorization is  $2 \times 3 \times 2 \times 2$ .

*Prime Factorization Teacher Key*

NUMBER	PRIME FACTORS	PRIME FACTORIZATION	PRIME FACTORIZATION (use powers)
24	2,2,2,3	$2 \times 2 \times 2 \times 3$	$2^3 \times 3^1$
30	2,3,5	$2 \times 3 \times 5$	$2^1 \times 3^1 \times 5^1$
36	2,2,3,3	$2 \times 2 \times 3 \times 3$	$2^2 \times 3^2$
48	2,2,2,2,3	$2 \times 2 \times 2 \times 2 \times 3$	$2^4 \times 3^1$
124	2,2,31	$2 \times 2 \times 31$	$2^2 \times 31^1$
128	2,2,2,2,2,2,2	$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$	$2^7$
212	2,2,53	$2 \times 2 \times 53$	$2^2 \times 53^1$
64	2,2,2,2,2,2	$2 \times 2 \times 2 \times 2 \times 2 \times 2$	$2^6$
175	5,5,7	$5 \times 5 \times 7$	$5^2 \times 7^1$
420	2,2,3,5,7	$2 \times 2 \times 3 \times 5 \times 7$	$2^2 \times 3^1 \times 5^1 \times 7^1$
844	2,2,211	$2 \times 2 \times 211$	$2^2 \times 211^1$
343	7,7,7	$7 \times 7 \times 7$	$7^3$
999	3,3,3,37	$3 \times 3 \times 3 \times 37$	$3^3 \times 37^1$



Name \_\_\_\_\_

Date \_\_\_\_\_

## Activity 4

### Factors Galore C: Prime Factorization

Use the **SIMP** key on your calculator to determine the prime factors for each number. Then complete the table.

NUMBER	PRIME FACTORS	PRIME FACTORIZATION	PRIME FACTORIZATION (use powers)
24	2,2,2,3	$2 \times 2 \times 2 \times 3$	$2^3 \times 3^1$
30			
36			
48			
124			
128			
212			
64			
175			
420			
844			
343			
999			

1. What is the calculator doing when you press **SIMP** **ENTER**?

\_\_\_\_\_

2. Explain how you would prove that this is the prime factorization of a number.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Is  $2^5$  and  $5^2$  the prime factorization of the same number? Explain why or why not.

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