

# Finding the Parts: Prime Factorization

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**Strand:** Number and Number Sense

**Topic:** Prime Factorization

**Primary SOL:** **5.NS.2 The student will demonstrate an understanding of prime and composite numbers, and determine the prime factorization of a whole number up to 100.**

c) Determine the prime factorization for a whole number up to 100.

## Materials

- Number Cards for Finding the Parts (attached)
- Number Cards for Finding the Parts – Modified (attached)
- Finding the Parts Recording Sheet (attached)

## Vocabulary

*composite number, prime number, factor, prime factorization*

## Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Write the number 8 on the board, and have partners brainstorm the factors. Have a volunteer share the factors found and record them on the board as pairs. ( $1 \times 8$ ,  $2 \times 4$ ) Ask students “*How do we know these are the factors?*” “*Does anyone else have a different pair of factors?*” Ensure that students can justify their reasoning. (e.g., these are the numbers that can be multiplied to make the product of 8)
2. Review the difference between a prime number (*natural number, **other than one**, that only has two different factors, one and the number itself*) and a composite number (*natural number that has factors other than one and itself*). Ask students if the number 3 is prime or composite. Have a volunteer share their response and justify how they know it is prime. Ask students if the number 9 is prime or composite. Have a volunteer share their response and justify how they know it is composite. Ask students if they think the number 1 is prime or composite. Have volunteers share their responses. Return to the definition of prime numbers (without reading other than one). Discuss with students why the number 1 does not meet the definition.
3. Return to the factor pairs for the number 8 written on the board. Ask students to think about the factor pair  $2 \times 4$ . “*In this factor pair, do you think the number 2 is prime or composite?*” Call on someone to share and justify their answer. “*What about the number 4? Is there a way we could make another factor pair for this number besides one and the number itself?*” Guide them to notice that the number four has the factors of  $2 \times 2$ . Ask students to discuss whether this new pair of factors can be made another way besides one and the number itself. Based on their previous understanding of prime numbers, they should recognize that there is no other way. On the board record under the  $2 \times 4$ , write  $2 \times 2 \times 2$ . Tell students that they will be working to break composite numbers into their most basic parts, prime numbers, through prime factorization.
4. Distribute the Number Cards for Finding the Parts to small groups and the Finding the Parts Recording Sheet to each student. Have students work in their group to match the

number to its corresponding factors until the factors of the number are all prime numbers. Students should record the prime factorization for each single natural number on their recording sheet in Part 1.

5. Bring the class back together for whole-class discussion. Have volunteers share what their group found to be the prime factorization for each number. Have students justify their thinking as they share their responses. To close out the lesson, have students work with a partner, or individually, to complete Part 2 of the Finding the Parts Recording Sheet with a partner.

### Assessment

- **Questions**
  - How can you determine that you have only prime numbers as factors of your number?
  - What is the difference between factors of a number and prime factorization of a number?
- **Journal/writing prompts**
  - Can you factor out one number in multiple ways? If so, will the prime factorization be the same? Why or why not?
  - Explain how to factor the number 40 to get the prime factorization.
- **Other Assessments**
  - Use an exit ticket and have students identify the prime factorization of 16.

### Extensions and Connections (for all students)

- Factor Trees are a visual way for students to see the prime factorization process.
- Extend exploration of prime factorization to higher numbers and have students explain their process for factoring these numbers to their prime factorization.

### Strategies for Differentiation (for all students)

- Use the modified version of Number Cards for Finding the Parts.
- Model determining the prime factorization of additional numbers (10, 15, etc.).

**Note: The following pages are intended for classroom use for students as a visual aid to learning.**

### Number Cards for Finding the Parts

Copy the cards on card stock, and cut out. One set of cards per group.

<b>12</b>	<b>18</b>	<b>20</b>	<b>27</b>
<b>4 x 3</b>	<b>6 x 3</b>	<b>4 x 5</b>	<b>9 x 3</b>
<b>2 x 2 x 3</b>	<b>2 x 3 x 3</b>	<b>2 x 2 x 5</b>	<b>3 x 3 x 3</b>
<b>24</b>	<b>32</b>	<b>54</b>	<b>72</b>
<b>4 x 6</b>	<b>4 x 8</b>	<b>6 x 9</b>	<b>8 x 9</b>
<b>2 x 2 x 6</b>	<b>2 x 2 x 8</b>	<b>2 x 3 x 9</b>	<b>2 x 4 x 9</b>
<b>2 x 2 x 2 x 3</b>	<b>2 x 2 x 2 x 4</b>	<b>2 x 3 x 3 x 3</b>	<b>2 x 2 x 2 x 9</b>
	<b>2 x 2 x 2 x 2 x 2</b>		<b>2 x 2 x 2 x 3 x 3</b>

### Number Cards for Finding the Parts - Modified

Copy the cards on card stock, and cut out. One set of cards per group.

<b>12</b>	<b>18</b>	<b>20</b>	<b>27</b>
<b>4 x 3</b> <b>2 x 2 x 3</b>	<b>6 x 3</b> <b>2 x 3 x 3</b>	<b>4 x 5</b> <b>2 x 2 x 5</b>	<b>9 x 3</b> <b>3 x 3 x 3</b>
<b>24</b>	<b>32</b>	<b>54</b>	<b>72</b>
<b>4 x 6</b> <b>2 x 2 x 6</b> <b>2 x 2 x 2 x 3</b>	<b>4 x 8</b> <b>2 x 2 x 8</b> <b>2 x 2 x 2 x 4</b> <b>2 x 2 x 2 x 2 x 2</b>	<b>6 x 9</b> <b>2 x 3 x 9</b> <b>2 x 3 x 3 x 3</b>	<b>8 x 9</b> <b>2 x 4 x 9</b> <b>2 x 2 x 2 x 9</b> <b>2 x 2 x 2 x 3 x 3</b>

### Finding the Parts Recording Sheet

Name \_\_\_\_\_

Date \_\_\_\_\_

Part 1: Record the Prime Factorization from the Finding the Parts Cards.

1. 12 \_\_\_\_\_

2. 18 \_\_\_\_\_

3. 20 \_\_\_\_\_

4. 24 \_\_\_\_\_

5. 27 \_\_\_\_\_

6. 32 \_\_\_\_\_

7. 54 \_\_\_\_\_

8. 72 \_\_\_\_\_

Part 2: Match the number to the correct Prime Factorization.

36

42

56

60

$2 \times 2 \times 2 \times 7$

$2 \times 2 \times 3 \times 5$

$2 \times 3 \times 7$

$2 \times 2 \times 3 \times 3$