

# Prime Factorization

Grade 5 Math • Section 3.4

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 17

## Quick Review and Helpful Hints

**Prime number:** A whole number greater than 1 that has exactly two factors: 1 and itself. First primes: 2, 3, 5, 7, 11, 13, 17, 19, 23, ...

**Composite number:** A whole number greater than 1 with more than two factors.

**Prime factorization:** Write a number as a product of prime factors. Use a **factor tree** or repeated division.  
 $36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$ .

**Example:** Find the prime factorization of 60.

Start by dividing by the smallest prime:  $60 \div 2 = 30$ ,  $30 \div 2 = 15$ ,  $15 \div 3 = 5$ , and 5 is prime. So  $60 = 2 \times 2 \times 3 \times 5 = 2^2 \times 3 \times 5$ .

**Answer:**  $2^2 \times 3 \times 5$

## Practice Problems

Write the prime factorization of each number. Use exponents when possible.

- |                 |                  |                  |
|-----------------|------------------|------------------|
| 1. $12 =$ _____ | 6. $45 =$ _____  | 11. $36 =$ _____ |
| 2. $18 =$ _____ | 7. $48 =$ _____  | 12. $32 =$ _____ |
| 3. $24 =$ _____ | 8. $50 =$ _____  | 13. $27 =$ _____ |
| 4. $30 =$ _____ | 9. $28 =$ _____  | 14. $44 =$ _____ |
| 5. $40 =$ _____ | 10. $42 =$ _____ | 15. $20 =$ _____ |

## Word Problems

16. Is 51 prime or composite? If composite, write its prime factorization.

\_\_\_\_\_

17. Two numbers have the prime factorizations  $2^3 \times 3$  and  $2 \times 3^2$ . What are the two numbers? Find their greatest common factor.

\_\_\_\_\_



## Answer Keys

- |  |  |
|--|--|
| <p>1. <math>2^2 \times 3</math></p> <p>2. <math>2 \times 3^2</math></p> <p>3. <math>2^3 \times 3</math></p> <p>4. <math>2 \times 3 \times 5</math></p> <p>5. <math>2^3 \times 5</math></p> <p>6. <math>3^2 \times 5</math></p> <p>7. <math>2^4 \times 3</math></p> <p>8. <math>2 \times 5^2</math></p> <p>9. <math>2^2 \times 7</math></p> | <p>10. <math>2 \times 3 \times 7</math></p> <p>11. <math>2^2 \times 3^2</math></p> <p>12. <math>2^5</math></p> <p>13. <math>3^3</math></p> <p>14. <math>2^2 \times 11</math></p> <p>15. <math>2^2 \times 5</math></p> <p>16. <math>3 \times 17</math></p> <p>17. 24, 18; GCF = 6</p> |
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### Step-by-Step Explanations

1. Start with the main idea. For prime factorization, break 12 into prime factors. The factorization is  $2^2 \times 3$ . A prime factorization should use only prime numbers.
2. Keep the work tidy. For prime factorization, break 18 into prime factors. The factorization is  $2 \times 3^2$ . Breaking a number into smaller factor pairs is a reliable way to find every prime factor.
3. Look at what the numbers mean. For prime factorization, break 24 into prime factors. The factorization is  $2^3 \times 3$ . Exponents make repeated prime factors shorter and easier to read.
4. Use the setup first. For prime factorization, break 30 into prime factors. The factorization is  $2 \times 3 \times 5$ . A prime factorization should use only prime numbers.
5. Check the size of the answer. For prime factorization, break 40 into prime factors. The factorization is  $2^3 \times 5$ . Breaking a number into smaller factor pairs is a reliable way to find every prime factor.
6. Match the operation to the words. For prime factorization, break 45 into prime factors. The factorization is  $3^2 \times 5$ . Exponents make repeated prime factors shorter and easier to read.
7. Write the important values first. For prime factorization, break 48 into prime factors. The factorization is  $2^4 \times 3$ . A prime factorization should use only prime numbers.
8. Follow the pattern carefully. For prime factorization, break 50 into prime factors. The factorization is  $2 \times 5^2$ . Breaking a number into smaller factor pairs is a reliable way to find every prime factor.
9. Start with the main idea. For prime factorization, break 28 into prime factors. The factorization is  $2^2 \times 7$ . Exponents make repeated prime factors shorter and

easier to read.

10. Keep the work tidy. For prime factorization, break 42 into prime factors. The factorization is  $2 \times 3 \times 7$ . A prime factorization should use only prime numbers.
11. Look at what the numbers mean. For prime factorization, break 36 into prime factors. The factorization is  $2^2 \times 3^2$ . Breaking a number into smaller factor pairs is a reliable way to find every prime factor.
12. Use the setup first. For prime factorization, break 32 into prime factors. The factorization is  $2^5$ . Exponents make repeated prime factors shorter and easier to read.
13. Check the size of the answer. For prime factorization, break 27 into prime factors. The factorization is  $3^3$ . A prime factorization should use only prime numbers.
14. Match the operation to the words. For prime factorization, break 44 into prime factors. The factorization is  $2^2 \times 11$ . Breaking a number into smaller factor pairs is a reliable way to find every prime factor.
15. Write the important values first. For prime factorization, break 20 into prime factors. The factorization is  $2^2 \times 5$ . Exponents make repeated prime factors shorter and easier to read.
16. Follow the pattern carefully. For prime factorization, 51 is composite because it has factors 3 and 17. A prime factorization should use only prime numbers.
17. Start with the main idea. For prime factorization,  $2^3 \times 3 = 24$  and  $2 \times 3^2 = 18$ ; the shared factors are  $2 \times 3 = 6$ . Breaking a number into smaller factor pairs is a reliable way to find every prime factor.



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