

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 2×3^2 . What are the two numbers? Find their greatest common factor.



Answer Keys

- | | |
|--------------------------|---------------------------|
| 1. $2^2 \times 3$ | 10. $2 \times 3 \times 7$ |
| 2. 2×3^2 | 11. $2^2 \times 3^2$ |
| 3. $2^3 \times 3$ | 12. 2^5 |
| 4. $2 \times 3 \times 5$ | 13. 3^3 |
| 5. $2^3 \times 5$ | 14. $2^2 \times 11$ |
| 6. $3^2 \times 5$ | 15. $2^2 \times 5$ |
| 7. $2^4 \times 3$ | 16. 3×17 |
| 8. 2×5^2 | 17. 24, 18; GCF = 6 |
| 9. $2^2 \times 7$ | |

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 2×3^2 . 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 2×5^2 . 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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