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: $2, 3, 5, 7, 11, 13, 17, 19, 23, \ldots$
- **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. $12 =$ _____

2. $18 =$ _____

3. $24 =$ _____

4. $30 =$ _____

5. $40 =$ _____

6. $45 =$ _____

7. $48 =$ _____

8. $50 =$ _____

9. $28 =$ _____

10. $42 =$ _____

11. $36 =$ _____

12. $32 =$ _____

13. $27 =$ _____

14. $44 =$ _____

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

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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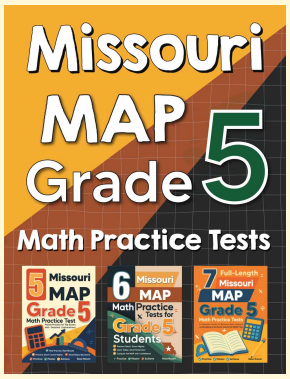

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