



Name _____ Date _____

Prime Factorization (Pages 235–238)

When a whole number greater than one has exactly two factors, 1 and itself, it is a **prime number**. When it has more than two factors, it is a **composite number**. The numbers 0 and 1 are neither prime nor composite.

Finding the Prime Factorization of a Number

When a composite number is expressed as a product of prime numbers, that is the **prime factorization** of the number. Use a **factor tree** to find the prime factorization.

EXAMPLES

A Find the prime factorization of 420.

$$\begin{aligned} \text{Use a factor tree. } & 420 \\ & 2 \times 210 \\ & 2 \times 2 \times 105 \\ & 2 \times 2 \times 3 \times 35 \\ & 2 \times 2 \times 3 \times 5 \times 7 \end{aligned}$$

The prime factorization of 420 is $2^2 \cdot 3 \cdot 5 \cdot 7$.

B Find the prime factorization of 270.

$$\begin{aligned} 270 &= 10 \times 27 \\ &= 2 \times 5 \times 3 \times 9 \\ &= 2 \times 5 \times 3 \times 3 \times 3 \end{aligned}$$

Write the prime factors in order using exponents.

$$270 = 2 \times 3^3 \times 5$$

Try These Together

1. Is 21 *prime, composite, or neither*?

HINT: Does 21 have factors other than one and itself?

2. Is 34 *prime, composite, or neither*?

HINT: Can you divide 34 evenly by a whole number other than 1 or 34?

PRACTICE

Determine whether each number is prime, composite, or neither.

3. 3

4. 17

5. 55

6. 0

7. 113

8. 357

Find the prime factorization of each number.

9. 24

10. 12

11. 30

12. 18

13. 60

14. 58

15. 98

16. 117

17. What is the greatest prime number that is less than 20?

18. What is the least prime number that is a factor of 36?

19. **School** In physical education class, Mr. Montgomery wants to divide the class into equal-sized teams. He wants the least number of teams possible that have more than one person. If there are 32 students in the class, how could he divide them?



20. **Standardized Test Practice** What is the prime factorization of 624?

A $2^4 \cdot 3^2 \cdot 4$

B $2^4 \cdot 3 \cdot 13$

C $2^3 \cdot 3 \cdot 13$

D $2^2 \cdot 3 \cdot 4^2$

Answers: 1. composite 2. composite 3. prime 4. prime 5. composite 6. neither 7. prime 8. composite 9. $2^3 \cdot 3$
10. $2^2 \cdot 3$ 11. $2 \cdot 3 \cdot 5$ 12. $2 \cdot 3^2$ 13. $2^2 \cdot 3 \cdot 5$ 14. $2 \cdot 29$ 15. $2 \cdot 7^2$ 16. $3^2 \cdot 13$ 17. 19 18. 2
19. 2 teams of 16 students each 20. B