

Exponents are generally used for prime factors that occur more than once in a factorization. The prime factorization of an integer is *unique* (there is only one) except for the order of the factors.

A factor of two or more integers is called a **common factor** of the integers. The **greatest common factor (GCF) of two or more integers** is the greatest integer that is a factor of all the given integers.

**Example 3** Find the GCF of 882 and 945.

**Solution** First find the prime factorization of each integer. Then form the product of the *smaller* powers of each common prime factor.

$$882 = 2 \cdot 3^2 \cdot 7^2 \qquad 945 = 3^3 \cdot 5 \cdot 7$$

The common prime factors are 3 and 7.

The smaller powers of 3 and 7 are  $3^2$  and 7.

$\therefore$  the GCF of 882 and 945 is  $3^2 \cdot 7$ , or 63. **Answer**

## Oral Exercises

Give all the positive factors of each number.

1. 12            2. 15            3. 37            4. 1            5. 30            6. 41

State whether or not the number is prime. Give the prime factorization of the number.

7. 31            8. 32            9. 46            10. 51            11. 81            12. 39  
13. 36            14. 100            15. 45            16. 47            17. 71            18. 98

Find the GCF of each pair of numbers.

19. 15 and 25            20. 12 and 18            21. 22 and 35            22. 23 and 46

## Written Exercises

**Sample** List all pairs of factors of each integer.    a. 20    b. -20

**Solution** a. (1)(20)    (-1)(-20)    b. (1)(-20)    (-1)(20)  
(2)(10)    (-2)(-10)    (2)(-10)    (-2)(10)  
(4)(5)    (-4)(-5)    (4)(-5)    (-4)(5)

List all pairs of factors of each integer.

- A** 1. 13            2. 22            3. 24            4. 18            5. 29  
6. 49            7. 40            8. 101            9. -121            10. -52

- |         |         |        |        |        |
|---------|---------|--------|--------|--------|
| 11. -33 | 12. -48 | 13. 53 | 14. 67 | 15. 26 |
| 16. 64  | 17. 68  | 18. 83 | 19. 38 | 20. 74 |

Find the prime factorization of each number. A calculator may be helpful.

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|--------|---------|---------|---------|
| 21. 16 | 22. 34  | 23. 69  | 24. 65  |
| 25. 75 | 26. 88  | 27. 27  | 28. 54  |
| 29. 99 | 30. 120 | 31. 104 | 32. 128 |

- B**
- |          |         |         |          |
|----------|---------|---------|----------|
| 33. 125  | 34. 200 | 35. 450 | 36. 476  |
| 37. 1089 | 38. 840 | 39. 782 | 40. 2310 |

Find the GCF of each group of numbers. A calculator may be helpful.

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|--------------|--------------|--------------|
| 41. 66, 90   | 42. 132, 220 | 43. 182, 196 |
| 44. 132, 242 | 45. 330, 945 | 46. 348, 426 |
- C**
- |                   |                   |                  |
|-------------------|-------------------|------------------|
| 47. 1176, 1617    | 48. 1925, 6300    | 49. 56, 98, 126  |
| 50. 105, 126, 210 | 51. 141, 198, 364 | 52. 90, 126, 252 |

## Mixed Review Exercises

Simplify.

- |   |                           |                       |
|---|---------------------------|-----------------------|
| 1. $\frac{1}{3}(6x + 3) + 2\left(\frac{1}{2}x - 1\right)$ | 2. $(5 + 4)^2$            | 3. $3^2 + (2 + 1)^2$  |
| 4. $3x - 4 - (2x + 6)$                                    | 5. $3ab(2a^2)3a$          | 6. $3x^3(4y)2y$       |
| 7. $(3x)^3x$  | 8. $2n(3n^2 - 4n) + 8n^2$ | 9. $(-2)^5x^5$        |
| 10. $x(x^2 + 3) - x^2(x - 2)$                             | 11. $(2y + 5)(y + 3)$     | 12. $(x - 4)(3x + 4)$ |

## Computer Exercises

- Write a BASIC program that uses the INT function to determine whether an integer entered with an INPUT statement is even or odd.
- Write a BASIC program that uses the INT function to determine whether one integer is a factor of another integer. Each integer should be entered with an INPUT statement.
- Write a BASIC program that uses the INT function and a FOR . . . NEXT loop to determine whether a number is *composite*. (A composite number is a number, such as 4, 6, 8, 9, and 10, that has two or more prime factors. Use a flag (F) to indicate whether the number is prime (F=0) or composite (F=1). When running your program, enter only integers greater than one.