

# 1-2

## Notes

### Order of Operations and Evaluating Expressions

Exponents are used to represent repeated multiplication of the same number. For example,  $4 \times 4 \times 4 \times 4 \times 4 = 4^5$ . The number being multiplied by itself is called the base; in this case, the base is 4. The number that shows how many times the base appears in the product is called the exponent; in this case, the exponent is 5.  $4^5$  is read *four to the fifth power*.

#### Problem

How is  $6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6$  written using an exponent?

The number 6 is multiplied by itself 7 times. This means that the base is 6 and the exponent is 7.  $6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6$  written using an exponent is  $6^7$ .

### Exercises

Write each repeated multiplication using an exponent.

1.  $4 \times 4 \times 4 \times 4 \times 4$

2.  $2 \times 2 \times 2$

3.  $1.1 \times 1.1 \times 1.1 \times 1.1 \times 1.1$

4.  $3.4 \times 3.4 \times 3.4 \times 3.4 \times 3.4 \times 3.4$

5.  $(-7) \times (-7) \times (-7) \times (-7)$

6.  $11 \times 11 \times 11$

Write each expression as repeated multiplication.

7.  $4^3$

8.  $5^4$

9.  $1.5^2$

10.  $\left(\frac{2}{7}\right)^4$

11.  $x^7$

12.  $(5n)^5$

13. Trisha wants to determine the volume of a cube with sides of length  $s$ . Write an expression that represents the volume of the cube.

# 1-2 Notes (continued)

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## Order of Operations and Evaluating Expressions

The order of operations is a set of guidelines that make it possible to be sure that two people will get the same result when evaluating an expression. Without this standard order of operations, two people might evaluate an expression differently and arrive at different values. For example, without the order of operations, someone might evaluate all expressions from left to right, while another person performs all additions and subtractions before all multiplications and divisions.

You can use the acronym P.E.M.A. (**P**arentheses, **E**xponents, **M**ultiplication and **D**ivision, and **A**ddition and **S**ubtraction) to help you remember the order of operations.

### Problem

How do you evaluate the expression  $3 + 4 \times 2 - 10 \div 5$ ?

$$3 + 8 - 10 \div 5$$

$$= 3 + 8 - 2$$

$$= 11 - 2$$

$$= 9$$

There are no parentheses or exponents, so first, do any multiplication or division from left to right.

Do any addition or subtraction from left to right.

## Exercises

Simplify each expression.

14.  $(5 + 3)^2$

15.  $(8 - 5)(14 - 6)$

16.  $(15 - 3) \div 4$

17.  $\left(\frac{22+3}{5}\right)$

18.  $40 - 15 \div 3$

19.  $20 + 12 \div 2 - 5$

20.  $(4^2 + 5^2)^2$

21.  $4 \times 5 - 3^2 \times 2 \div 6$

**Write and simplify an expression to model the relationship expressed in the situation below.**

22. Manuela has two boxes. The larger of the two boxes has dimensions of 15 cm by 25 cm by 20 cm. The smaller of the two boxes is a cube with sides that are 10 cm long. If she were to put the smaller box inside the larger, what would be the remaining volume of the larger box?