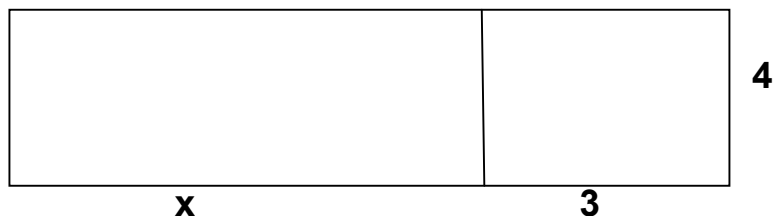## Section 4.1 The Distributive Property and Algebraic Expressions

1. Review of the Distributive Property: If a, b and c are any numbers then it is true that

$$a(b + c) = ab + ac \quad \text{and} \quad a(b - c) = ab - ac.$$

This property can be modeled geometrically by examining the area of the figure below.

Looking at the figure as one piece, we see that it has a length of x + 3 and a width of 4, thus A = 4(x + 3)

Looking at the figure as two pieces, one of which has a length of x and a width of 4 and the other of which has a length of 3 and a width of 4, we see that A = 4(x) + 4(3).

Since the two areas are of the same figure, they must be equal, so

4(x + 3) = 4(x) + 4(3).

Example 1: Use the distributive property to simplify.

a. $3(x+5)$

b. $3(x-5)$

c. $-3(x+5)$

2. Similar Terms: Recall that two terms (addends in an addition expression) are similar if their variable parts are identical. Such terms can be added or subtracted by applying the distributive property. In the answer, the common variable part remains unchanged, but the numbers in front of the variable parts are added or subtracted.

Example 2: Simplify each of the following.

a. $4x + 3x = (4 + 3)x = 7x$

b. $8a + 10a$

c. $3a - 5a = (3 - 5)a = -2a$

d. $3a + 17 + 5a$

3. The Value of an Algebraic Expression: To find the value of an algebraic expression, you must be given the expression and a value of the unknown(s) to substitute into the algebraic expression. After substituting the known value into the expression for the appropriate variable(s), simplify.

Example 3: Find the value of the given expression for the given value of the variable.

a. $7x + 2$, for $x = 3$

b. $7x - 2$, for $x = -3$

c. $x^2 - 3x + 2$, for $x = -2$

4. Angles: An angle is formed by two rays that have the same endpoint. The endpoint is called the vertex of the angle and the rays are the sides of the angle. Angles are measured in degrees. The angle formed by rotating a ray through one complete rotation is 360°. Thus, one-half of a full rotation forms a 180° angle (called a straight angle) and one-fourth of a full rotation forms a 90° angle (called a right angle).

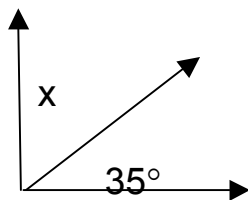Right Angle   Straight Angle
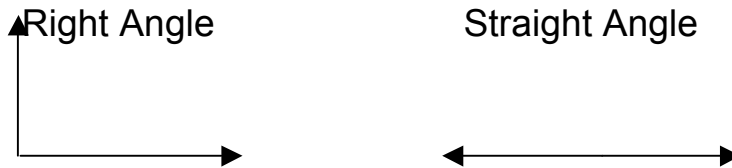
An acute angle is an angle whose measure is between 0° and 90°. An obtuse angle is an angle whose measure is between 90° and 180°.

Acute Angle   Obtuse Angle
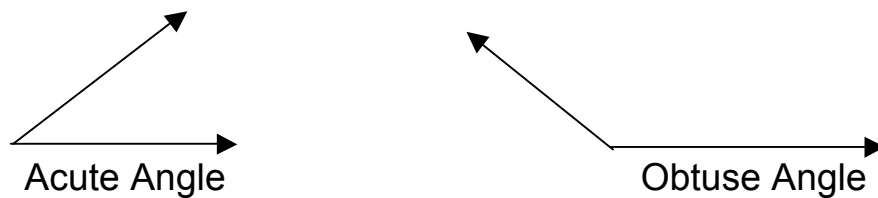
Two angles are complementary if their sum is 90°. Two angles are supplementary if their sum is 180°.
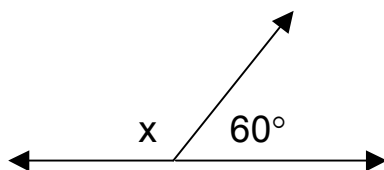
Example 4: Find the missing angle.

x

35°

Practice Problems:
a. Find the missing angle.

x   60°

b. Simplify: 11a −15a

Evaluate each expression for the given value of x.

c. $-3x+2$, for $x = 2$

d. $-3x-5$, for $x = -4$

Answers to Practice Problems:
a. {120°}; b. –4a; c. –4; d. 7