

## Expand, Combine and Solve

KEY



**B**ecause we used the “cups and coins” concept to get started solving equations we have been able to perform two algebraic procedures without naming them. In order to prepare for solving more difficult equations we will now study these procedures more closely. They are called **combining like terms** and using the **distributive property**. These both helped us in the “unbagging” process.

**Like terms** are terms in an expression that have the same variable(s).  
 The variable(s) must match to be *like terms*.  
 For example,  $5x$  and  $3x$  are like terms, but  $6x$  and  $7y$  are not like terms.  
 To **combine like terms** you add them together:  
 $5x + 3x = 8x$        $6x + 7y - 2x = 4x + 7y$

Circle the like terms in each group of expressions:

1.  $(4x)$ ,  $6y$ ,  $(-7x)$ ,  $(x)$ ,  $-6z$       2.  $(-3m)$ ,  $2r$ ,  $7n$ ,  $5s$ ,  $(-9m)$       3.  $-4a$ ,  $c$ ,  $8b$ ,  $4d$ ,  $6t$ ,  $-3u$   
none

Consider which are the like terms in the following groups and again circle the like terms:

4.  $(3xy)$ ,  $6x$ ,  $-8y$ ,  $(-5xy)$ ,  $(7yx)$  same as  $7xy$       5.  $4a$ ,  $(6a^2)$ ,  $-5ab$ ,  $-b^2$ ,  $(9a^2)$

Add like terms in the following expressions:

6.  $3x + 5x - x + 7x - 6x = (8x)$       7.  $-7x - 2x + x - 9x = (-17x)$   
 8.  $3x - 2x - 8x + 5x = (-2x)$       9.  $6x + 2x - 6x - x + 3x - 4x = (0)$

To solve an equation, you may need to add like terms before you do anything else. Try solving these equations for the variable  $x$ :

10.  $3x + 4 + 2x = 19$   
 $5x + 4 = 19$   
 $5x = 15$        $x = 3$
11.  $-2x + 6x - 5 = 11$   
 $4x - 5 = 11$   
 $4x = 16$        $x = 4$

The **distributive property** is the mathematical name for the process used to unpack the bags in the cups and coins problems. The *distributive property* multiplies the expression outside of the parentheses to all of the terms inside the parentheses.

$$2(x+3) = 2x + 6$$

$$-3(x-6) = -3x + 18$$

$$4(2x - 6 + x) = 8x - 24 + 4x = 12x - 24$$

Use the distributive property to simplify the following expressions:

12.  $-5(2x - 4 + 3x) = -10x + 20 - 15x = (-25x + 20)$       13.  $-2(x - 4) + 3(3x - 2) = -2x + 8 + 9x - 6 = (7x + 2)$

When solving an equation, you may need to use the distributive property before you do anything else. Try solving these equations for the variable  $x$ :

14.  $3(-2x + 1) = 9$   
 $-6x + 3 = 9$   
 $-6x = 6$   
 $x = -1$
15.  $-4(2x - 3) = 32$   
 $-8x + 12 = 32$   
 $-8x = 20$   
 $x = -\frac{5}{2}$