Lesson 2-3 Solving Multi-Step Equations

Before we can solve more complicated equations, we need to practice two procedures called **combining like terms** and using the **distributive property**. These are both essential for solving multi-step equations.

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:
$5x + 3x = 8x$ $\quad 6x + 7y - 2x = 4x + 7y$

Circle the like terms in each group of expressions:

1. $4x,\ 6y,\ -7x,\ x,\ -6z$
2. $-3m,\ 2r,\ 7n,\ 5s,\ -9m$
3. $-4a,\ c,\ 8b,\ 4d,\ 6t,\ -3u$

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

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

Add like terms in the following expressions:

6. $3x+5x-x+7x-6x=$
7. $-7x-2x+x-9x=$
8. $3x-2x-8x+5x=$
9. $6x+2x-6x-x+3x-4x=$

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

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.

$2(x+3)=2x+6$ $\quad -3(x-6)=-3x+18$ $\quad 4(2x-6+x)=8x-24+4x=\ 12x - 24$

Use the distributive property to simplfy the following expressions:

12. $-5(2x-4+3x)$
13. $-2(x-4)+3(3x-2)$

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. $3(-2x+1)=9$
15. $-4(2x-3)=32$

Practice adding like terms and using the distributive property to simplify the following expressions:

16. $5(2n-3)$

17. $2x-9-7x+5$

18. $8y-10y+3-y$

19. $-3(5z+1)+6z$

20. $-2(3m-1)-3(3m-5)$

21. $4x-5-2(3x-7)$

First, use the distributive property and add like terms and as you solve the following equations. Check your answers at the bottom of the page.

22. $2(y-4)+4y=16$

23. $2(3x+2)-4x=-16$

24. $10-2n-5=19$

25. $5m-3-2m=12$

26. $-2a+3(2a-4)=24$

27. $3c-c-4+2c=16$

28. $2(3x-1)-3(x-4)=-11$

29. $5z-2(z+3)+2z=14$

Scrambled answers for #22-29: -10, -7, -7, 4, 4, 5, 5, 9