

Topics: Distributive Property, Simplifying Algebraic Expressions

Materials List

- ✓ Pens or pencils
- ✓ Bingo game cards (see page 3)
- ✓ Scratch paper

This activity can be used to teach:
Order of Operations (Common Core Math Standards: Grade 5, Operations and Algebraic Thinking, 1), Expressions (Common Core Math Standards: Expressions and Equations, Grade 6, 1-4, 6; Grade 7, 1-2)

Simple Expressions Bingo

Have Fun Simplifying Algebraic Expressions

BINGO				
$-80x + 60$	$4c + 28$	$3x - 63$	$-40z + 32$	$4x - 8$
$33c - 18$	$28a + 8$	$-6b - 12$	$-10m + 60$	$-2y + 26$
$5x + 20$	$12p + 6$	Free	$25q + 20$	$28y + 21$

Play Bingo by correctly matching algebraic expressions. Get 5 in a row and win!

Assembly

1. Provide each player with a Bingo game card and the list of 32 simplified algebraic expressions (see page 3 & **The Math Behind the Activity** on page 2).
2. Each player creates a personalized Bingo card and writes a unique simplified expression (from the list) in each of the empty boxes on the Bingo card (copy each simple expressions only once).

Playing the Game (players may pair up or play individually)

1. Teacher picks and writes one of following algebraic expressions on whiteboard:

Algebraic Expression	Simplified Expression	Algebraic Expression	Simplified Expression
$-6(4x + 3)$	$-24x - 18$	$9(11 - 2m)$	$-18m + 99$
$-8(2x - 2)$	$-16x + 16$	$3(2a - 3)$	$6a - 9$
$4(7a + 2)$	$28a + 8$	$8(x + 3)$	$8x + 24$
$-10(m - 6)$	$-10m + 60$	$-9(3 - w)$	$9w - 27$
$3(x - 21)$	$3x - 63$	$5(x + 4)$	$5x + 20$
$-5(5q - 4)$	$-25q + 20$	$12(2 - 3x)$	$-36x + 24$
$6(2p + 1)$	$12p + 6$	$30(x + 2)$	$30x + 60$
$8(4 - 5z)$	$-40z + 32$	$10(x + 10)$	$10x + 100$
$20(3 - 4x)$	$-80x + 60$	$-9(2x - 3)$	$-18x + 27$
$5(y - 8)$	$5y - 40$	$-4(5x - 1)$	$-20x + 4$
$4(3x - 2)$	$12x - 8$	$-2(x + 4)$	$-2x - 8$
$6(r - 3)$	$6r - 18$	$-6(b + 2)$	$-6b - 12$
$4(c + 7)$	$4c + 28$	$7(2x - 2)$	$14x - 14$
$5(x + 3)$	$5x + 15$	$-2(y - 13)$	$-2y + 26$
$-4(-4x - 4)$	$16x + 16$	$-3(6 - 11c)$	$33c - 18$
$-7(4y - 3)$	$-28y + 21$	$4(x - 2)$	$4x - 8$

2. Players simplify the selected algebraic expression on a piece of paper and then compare the answer with the simplified expressions written on their own personalized bingo card. (Tip: Write simplified expressions in descending order.) Players circle any matching answers on their cards. Recommendation: The teacher circles each expression after it is called.
3. Repeat above 2 steps until someone succeeds in obtaining 5 matches in a straight line (horizontal, vertical or diagonal) and yells out BINGO!
4. Continue play until a total of 5 winners have been declared, a fixed time is past, and/or other desired outcome is reached.

The Math Behind the Activity

Algebra is a branch of mathematics that uses letters or other symbols to represent numbers, with rules for manipulating these symbols. Some historians trace the origins of Algebra to ancient Babylonian mathematics, roughly four thousand years ago. An *algebraic expression* is one or more algebraic terms in a phrase. It can include variables, constants, and operating symbols, such as plus and minus signs. It's only a phrase, not the whole sentence, so it doesn't include an equal sign. (for example, $3x^2 + 2y + 7xy + 5$). In an algebraic expression, terms are the elements separated by the plus or minus signs. This example has four terms, $3x^2$, $2y$, $7xy$, and 5 . Terms may consist of variables (letters or symbols; in this example x and y are variables) and coefficients (numbers multiplied with variables; in this example 3 , 2 , and 7 are coefficients), or constants (numbers without variables; in the example, 5 is a constant).

In the game of *Simple Expressions Bingo*, descending order refers to the exponents or powers of the variables. Ascending means the powers of the variables are going up from left to right in the expression; descending means that the powers are going down from left to right.

When an arithmetic expression has more than one operation, it is necessary to know the following rules to correctly evaluate the expression:

- 1) **P** Simplify all operations inside **parentheses** first.
- 2) **E** Simplify all **exponents**, working from left to right.
- 3) **M & D** Perform all **multiplications** and **divisions**, working from left to right.
- 4) **A & S** Perform all **additions** and **subtractions**, working from left to right.

To help recall the order of operations, use the mnemonic **PEMDAS**, which stands for **P**lease **E**xclude **M**y **D**ear **A**unt **S**ally!

Some algebraic expressions can become quite complex with multiple terms & operations between parenthesis & other operations. Rearranging and simplifying algebraic expressions using the Distributive Property can be helpful at times to solve more difficult problems.

The Distributive Property states that the product of a number and a sum is equal to the sum of the individual products of the addends and the number:

$$a(b + c) = a \cdot b + a \cdot c \quad \text{and} \quad (b + c)a = b \cdot a + c \cdot a$$
$$a(b - c) = a \cdot b - a \cdot c \quad \text{and} \quad (b - c)a = b \cdot a - c \cdot a$$

The multiplication algorithm is an example of the Distributive Property:

$$\begin{array}{r} 14 \\ \times 76 \\ \hline 84 = 14 \times 6 \\ + 980 = 14 \times 70 \\ \hline 1064 = 14 \times (70 + 6) \end{array}$$

Taking it Further .

- Use expressions with multiple variables - e.g., the simplified expression of $-5(x + 2y - 3)$ is $-5x - 10y + 15$.
- Use expressions with multiple terms within parenthesis - e.g., $4(a+8) - 3(2a-3)$ is simplified to $-2a + 41$
- Mix up single term, single variable expressions with multiple variable and/or multiple terms within parenthesis for the more advanced students.
- Have students create their own algebraic expressions.

Web Resources (Visit www.raft.net/raft-idea?isid=599 for more resources!)

- Number properties (associative, commutative, distributive): www.purplemath.com/modules/numbprop.htm
- Simplifying with parentheses: www.purplemath.com/modules/simp Paren.htm
- Properties of Arithmetic: <http://www.coolmath.com/prealgebra/06-properties/index.html>
- Teacher designed math courses from the New Jersey Center for Teaching & Learning – <https://njctl.org/courses/math>

Copy 24 different simplified expressions, from the list below, onto the blank spots on the bingo card.

Tip: Circle each expression on the list after copying it.

$-18m + 99$	$-80x + 60$	$-24x - 18$	$-18x + 27$
$6a - 9$	$5y - 40$	$-16x + 16$	$-20x + 4$
$8x + 24$	$12x - 8$	$28a + 8$	$-2x - 8$
$9w - 27$	$6r - 18$	$-10m + 60$	$-6b - 12$
$5x + 20$	$4c + 28$	$3x - 63$	$14x - 14$
$-36x + 24$	$5x + 15$	$-25q + 20$	$-2y + 26$
$30x + 60$	$16x + 16$	$12p + 6$	$33c - 18$
$10x + 100$	$-28y + 21$	$-40z + 32$	$4x - 8$

Copy 24 different simplified expressions, from the list below, onto the blank spots on the bingo card.

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BINGO

		<i>Free</i>	

BINGO

		<i>Free</i>	