Day 5:
Introduction to Algebra and Factoring
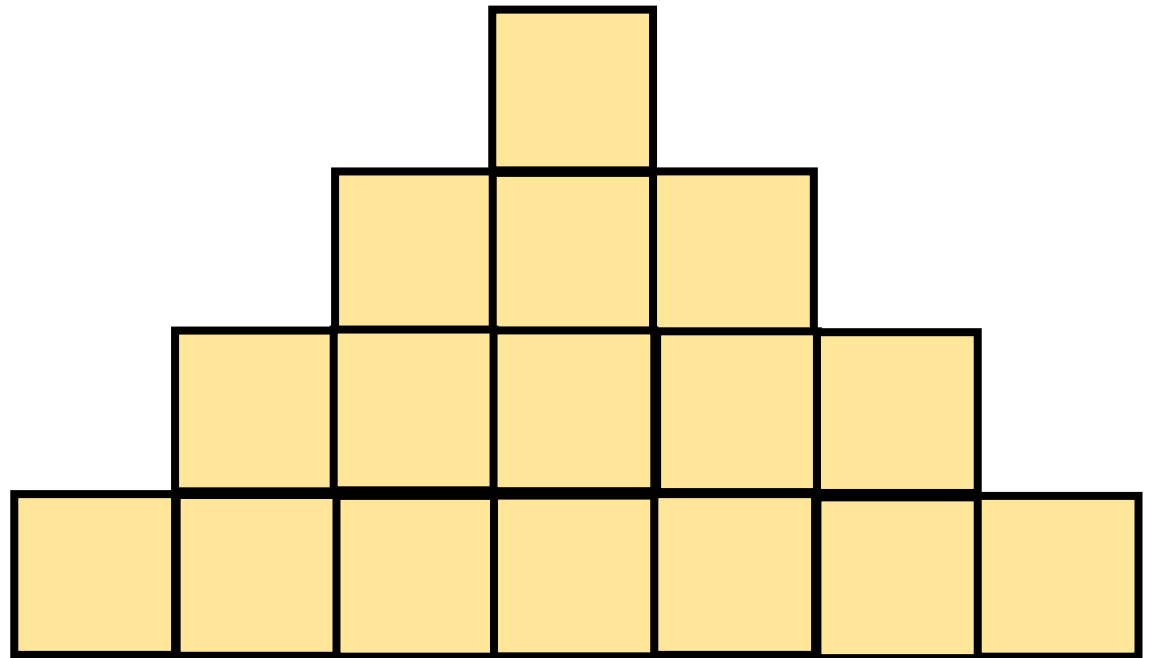
Warm-up

How many yellow boxes are there? Make an equation using integers (whole numbers).

# What is __Algebra__? What do you know?

- Algebra is the use of letters and symbols to represent values and their relations, especially for solving equations.

- The combination of both letters and symbols are called "Algebraic Expressions"

Why do we learn <u>Algebra</u>?

- Algebra helps us solve problems faster and more easily than basic math

- Algebra is necessary to master statistics and calculus

- Algebra may be a job skill later on (business, health, media, science…)

- Algebra can be useful in life outside of the workplace (finances, health plans…)

- Algebra reinforces logical and critical thinking

- Algebra makes up 55 percent of the questions on the GED Math test!

Variables

- A variable is letter is used to represent a number.
- Variables are used in algebraic expressions.

Variables In Algebraic Expression

$$2x + 3p - 10y$$

Variables of algebraic expression
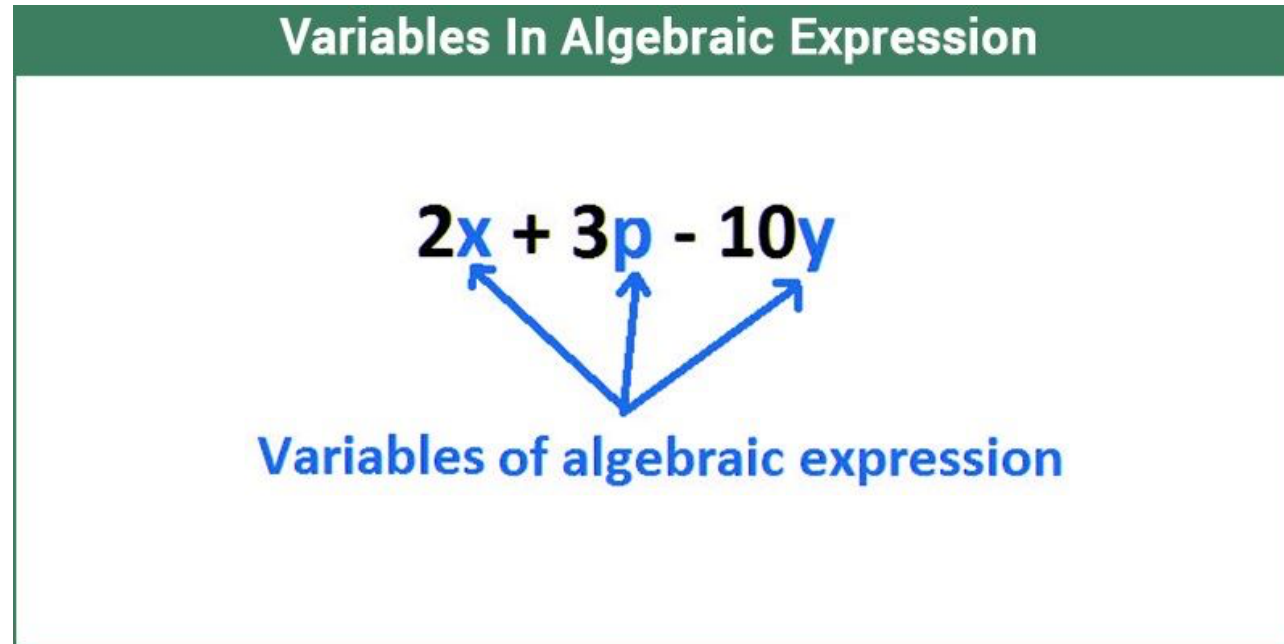
Expressions

- An algebraic expression has numbers and variables, sometimes connected by an operation sign (+, -, etc.)

- A variable may change in value, which allows the expression itself to have different values.

- When you evaluate an algebraic expression, you substitute a number for the variable and solve.

For example:

if $b = 3$, then $b + 12 = 15$. If $b = -1$, then $b + 12 = 11$

Expressions

Words	Symbols
4 more than a number	$x + 4$
5 less than a number; or, The difference between a number (x) and five	$x - 5$

Order in important for division and subtraction.

For example: "6 less than 3" is 3 – 6, but the "difference between 6 and 3" is 6 – 3.

Expressions

Words	Symbols
3 times a number	$3x$
A number times itself	x^2
The product of 8 and a number	$8x$
The product of 6 and x added to the difference between 5 and x	$6x + (5 - x)$
The quotient of 6 and x	$6/x$ or $6 \div x$
One-third of a number increased by 5	$1/3x + 5$

Practice!

- Gabe's current age is 3 times his sister's current age. If x is his sister's current age, which expression represents Gabe's current age?

a) 3x

b) x/3

c) x – 3

d) x + 3

Practice!

- A plumber charges $55 per hour and spends $20 a day on gasoline. Write an algebraic expression to represent his net earnings.

Practice!

- The length of a football field is about 30 yards more than its width. Express the length of the football field in terms of its width, *w.*
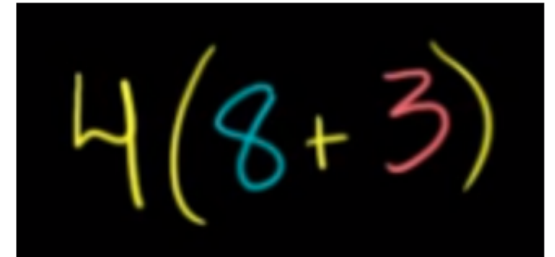
Expressions

To simplify an expression, add like terms. Like terms have the same variable or variables raised to the same power.

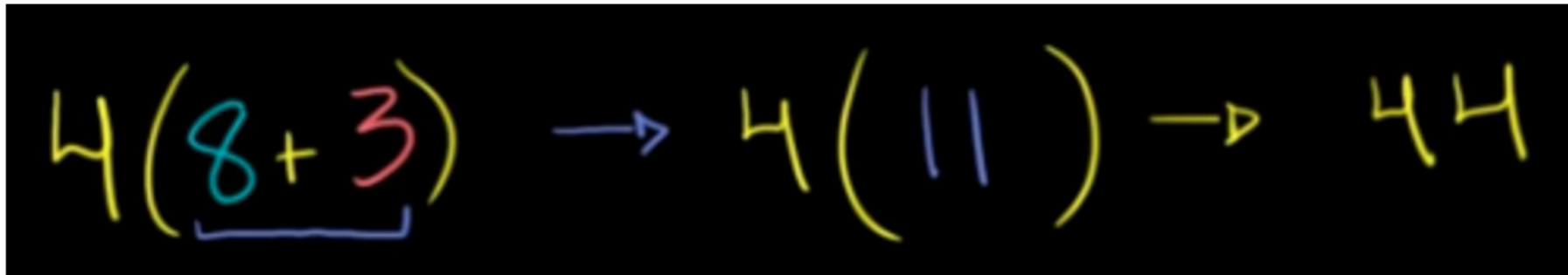**2x and 4x are like terms**

2x + 4x = 6x

If an expression has parentheses (), use the distributive property to simplify.

Normally when we see an expression like this …

$$4(8+3)$$

we just evaluate what's in the parentheses first, then solve it:

$$4(8+3) \rightarrow 4(11) \rightarrow 44$$

This is following the official "order of operations" rule that we've learned in the past.
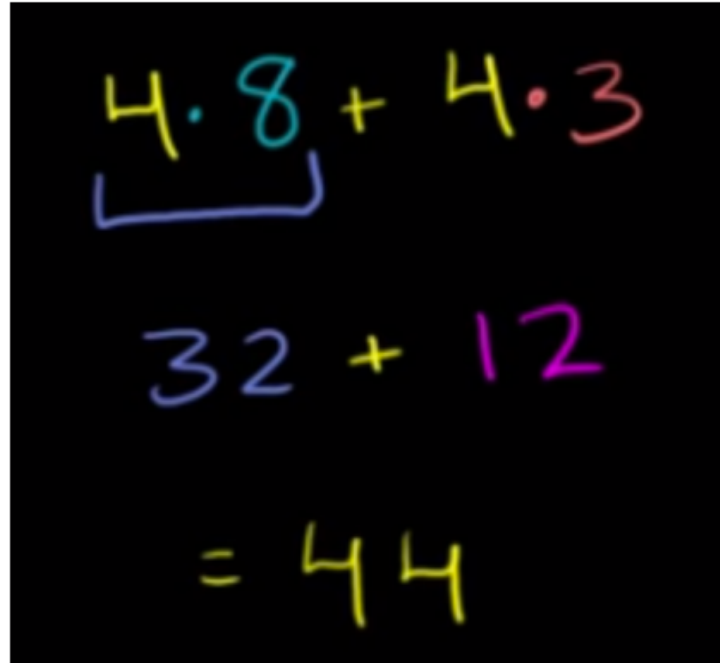
With the distributive property, we multiply the '4' first:

We distribute the 4 to the 8, then to the 3.
Then we need to remember to multiply first, before doing the addition!

$$4 \cdot 8 + 4 \cdot 3$$
$$32 + 12$$
$$= 44$$

We got the same answer, 44, with both approaches!
Why did we do it differently when we could have easily
worked out what was in the brackets first?
This is preparation for when we have variables instead
of numbers inside the parentheses.

Equations

- An algebraic equation is a mathematical statement that shows an algebraic expression on each side of an equal sign. An equation may or may not contain variables.

Expression	Equation
4x + 8x	4x + 8x = 36
6(x + 3) + 1	3 = 6(x + 3) + 1
4	4 = 3 + 1

Algebraic Sentence

Five more than twice a number is forty-three.

always has an equal symbol

translate and write into an equation

$$2x + 5 = 43$$

algebraic expression

constant

Algebraic Equation

Equations

- To solve an equation, find the value of the variable that makes the statement true. To do this, isolate the variable on one side of the equation. Perform inverse operations to isolate the variable. Remember, addition and subtraction are inverse operations, as are multiplication and division.

$$2x - 3 = 7$$
$$+ 3 + 3$$
$$\frac{2x}{2} = \frac{10}{2}$$
$$x = 5$$

$$3x + 5 = 6(x + 4)$$

$$3x + 5 = 6x + 24 \leftarrow$$ Be careful here too!

ditch the $3x$

$$\begin{array}{r} -3x \qquad -3x \\ \hline 5 = 3x + 24 \end{array}$$

ditch the 24

$$\begin{array}{r} -24 \qquad -24 \\ \hline -19 = 3x \end{array}$$

ditch the 3

$$\frac{-19}{3} = \frac{3x}{3}$$

$$\frac{-19}{3} = x$$

Practice!

- The cost of an adult ticket to the theatre is $4 less than 2 times the cost of a child's ticket. If an adult ticket is $20, how much is a child's ticket?

a) $8
b) $10
c) $12
d) $14

Practice!

- Levi paid two bills. The cost of the two bills was $157. The second bill was $5 less than twice the amount of the first bill. Which of the following equations could be used to find the amount of the first bill?

a) $5 - 2x = 157$
b) $2x - 5 = 157$
c) $x - (2x + 5) = 157$
d) $x + (2x + 5) = 157$

Practice!

- Caroline has twice as many yoga classes as aerobics classes. If she is taking 3 yoga and aerobic classes, which of the following equations could be used to find the number of aerobics classes she is taking?

a) $3x = 3$

b) $3x - 1 = 3$

c) $2x - 1 = 3$

d) $x = 3$

Factoring

- *Factors* are numbers, or expressions in (parentheses), which are multiplied together to form a product.

Remember the distributive property:
$a(x+y) = ax + ay$

Write the following in *expanded form*

4 (x - 3)

2 (4v + 5)

x (x + 1)

3y (5 + x)

Simple factors: find the greatest common factor

Write the following in *factored form*

4x − 12

8v + 10

$x^2 + x$

15y + 3xy

(Next week – FOIL)

The FOIL Method is a process used in algebra to multiply two binomials. The lesson on the _Distributive Property_ explained how to multiply a monomial or a single term such as 7 by a binomial such as (4 + 9x).

$$7(4 + 9x)$$

But, what if there was a binomial instead of a single term outside of the parentheses? That is, what if a binomial was being multiplied by another binomial? An example of this is given below.
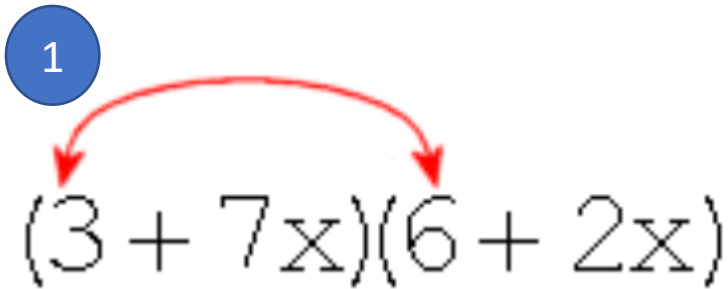
$$(3 + 7x)(6 + 2x)$$

FOIL stands for…

- **F**irst - Multiply the first term in each set of parentheses
- **O**uter - Multiply the outer term in each set of parentheses
- **I**nner - Multiply the inner term in each set of parentheses
- **L**ast - Multiply the last term in each set of parentheses
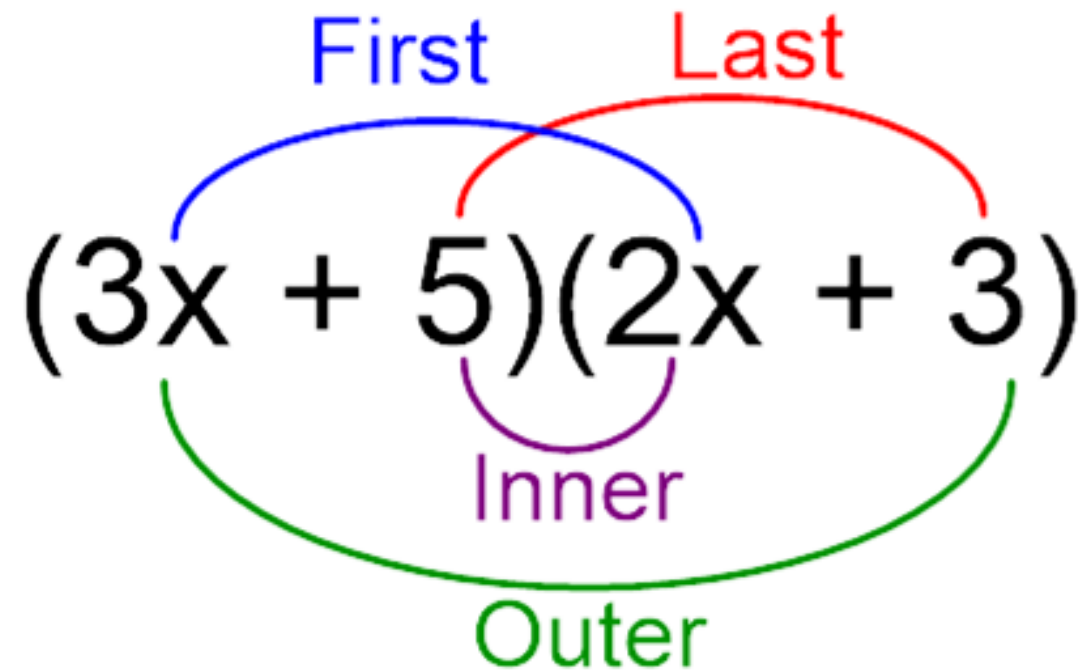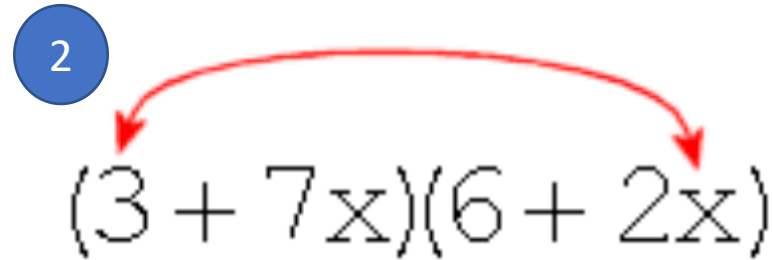
Let's try the FOIL method

1

$$(3 + 7x)(6 + 2x)$$
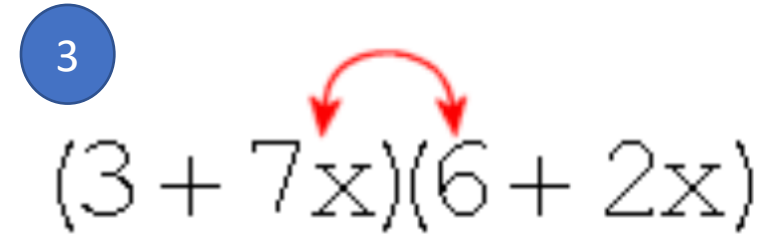
$$18$$

Multiply the first term of each set of parentheses

2

$$(3 + 7x)(6 + 2x)$$
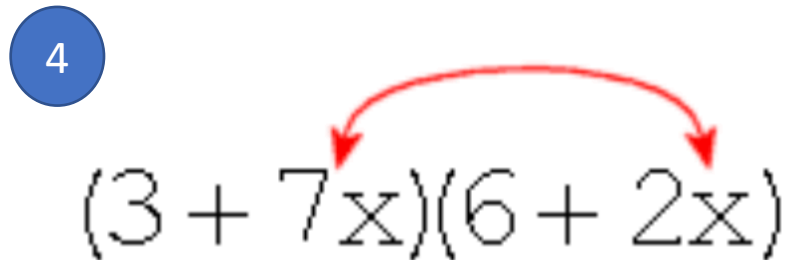
$$18 + 6x$$

Multiply the outer terms

3

$$(3 + 7x)(6 + 2x)$$

$$18 + 6x + 42x$$

Multiply the inner terms

4

$$(3 + 7x)(6 + 2x)$$

$$18 + 6x + 42x + 14x^2$$

Finally multiply the last terms

5

$$18 + 48x + 14x^2$$

Combine like terms

Multiplying Monomials and Polynomials

Simplify each expression.

(z + 4) (z - 5)   (x + 5) (6x - 8)

(r + 5) (6r + 9)   (2p - 3) (p - 6)

Homework!

Active Assignments

NEW Week 5: Introduction to Algebra and Factoring

To begin, select an activity from All Activities

Select New Activity ⊕

📖 **All Activities**

Completion: 0/5 (0%)

No Due Date