Today’s Objective

Students will be able to use the box method and combine like terms.

Unit 7
Lesson 1
What is the “Box Method?” It is a way to multiply with variables, an easier way to distribute.

Can you expand integers (normal numbers)? Yes

Multiply (74)(392) = 29008
Multiply (70+4)(300+90+2) = 29008

Why is the method used? to double distribute
Multiply using the “Box Method”

<table>
<thead>
<tr>
<th></th>
<th>300</th>
<th>+90</th>
<th>+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>+21,000</td>
<td>+6,300</td>
<td>+140</td>
</tr>
<tr>
<td>+4</td>
<td>+1,200</td>
<td>+360</td>
<td>+8</td>
</tr>
</tbody>
</table>

Write down all of the boxes.

21,000 + 6,300 + 140 + 1,200 + 360 + 8 is 29,008

Combine like terms

There must be a sign in every box.

Page #3
Lesson 7.1
Definition
To write the answer in an easier way.

Example(s)
- $4x^2 + 3x^2 = 7x^2$
- $4x^2 - 3x^2 = x^2$

Facts
- Used only with Add and Subtract
- The exponent does NOT change.

Non-Example(s)
- $4x^2 + 3x^3 \neq 7x^5$
- Not the same exponent
Combine Like Terms: Does the exponent change?

No why? The exponent is multiplication.

**Addition** vs. **Subtraction**

\[
(x^3) + (x^3) = 2x^3 \\
x^3 + x^3 = 2x^3
\]

\[
(5x^3) - (x^3) = 4x^3 \\
5x^3 - x^3 = 4x^3
\]

Exponent change? No Exponent change? No

Why? We did not multiply a variable by a variable.
Today’s New Vocab (4 of 4)

Combine Like Terms
Will the answer have an equal sign? No
Why? No equal sign in the question.

Line 1: \((7x^3 + 3x^2) - (9x - 5x^2)\)

Line 2: \(7x^3 + 3x^2 - 9x + 5x^2\)

Line 3: \(7x^3 + 3x^2 + 5x^2 - 9x\)

Line 4: \(7x^3 + 8x^2 - 9x\)
If $A=(2x^2 + 6x + 5 )$ and $B=(6x^2 +3x + 5)$, what is $A-B$?

\[(2x^2 + 6x + 5 ) - (6x^2 +3x + 5)\]

\[2x^2 + 6x + 5 - 6x^2 - 3x - 5\]

\[2x^2 - 6x^2 + 6x - 3x + 5 - 5\]

\[-4x^2 + 6x - 3x + 5 - 5\]

\[-4x^2 + 3x + 0\]

\[-4x^2 + 3x\]
What is the sum of $8x^2 - x + 4$ and $x - 5$?

\[
(8x^2 - x + 4) + (x - 5)
\]

Distribute:

\[
8x^2 - x + 4 + x - 5
\]

Commutative:

\[
8x^2 - x + x + 4 - 5
\]

Combine like terms:

\[
8x^2 + 0x - 1
\]
Today’s Objective

Students will be able to multiply binomials.
Simplify the following expressions. Are they equivalent? **YES**

- \(x(x)\)
- \(x^2\)

- \(-2x^2 + 3x^2\)
- \(x^2\)

Does the exponent change?

- Yes. Why?
  - Multiplying variables

Does the exponent change?

- No Why?
  - Combining variables
Today’s New Vocab (1 of 4)

Axis of Symmetry – x = lines that splits the graph in half.

Root, Zero, or Solutions – Where the graph crosses the x-axis.

Vertex – The maximum or Minimum point on the graph.
Today’s New Vocab (2 of 4)

When \( x = -1 \) and \( x = 3 \), write the factors

\[
\begin{align*}
  x & = -1 & \text{Solution} & x & = 3 & \text{Solution} \\
  +1 & +1 & & -3 & -3 & \\
  x + 1 & = 0 & x - 3 & = 0 \\
  (x + 1) & = 0 & (x - 3) & = 0 \\
  (x + 1) (x - 3) & = 0
\end{align*}
\]

To write the factors, you need to sign switch from the solutions.
Determine the product of the following expression.

\[(x + 1)(x - 3)\]

Write all boxes down

\[x^2 + 1x - 3x - 3\]

Like Terms

\[x^2 - 2x - 3\]
Graph the polynomial \( f(x) = (x + 1)(x - 3) \)

**BOX the Roots**

\[
\begin{align*}
X &= -1 \\
X &= 3 \\
(-1,0) & (3,0)
\end{align*}
\]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-3</td>
</tr>
<tr>
<td>1</td>
<td>-4</td>
</tr>
<tr>
<td>2</td>
<td>-3</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

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Lesson 7.3
Determine the product of the following expression.

\[(x + 2)(2x - 4)\]

Write all boxes down:

\[
\begin{array}{ccc}
\text{x} & 2x & -4 \\
+2 & +2x^2 & -4x \\
\text{+2} & +4x & -8 \\
\end{array}
\]

Like Terms:

\[2x^2 - 4x + 4x - 8\]

\[2x^2 - 8\]
Monday August 3, 2020 Exit Ticket

\[ G(x) = 2x^2 - 8 \quad \text{and} \quad F(x) = (x + 2)(2x - 4) \]

<table>
<thead>
<tr>
<th>x</th>
<th>F(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>-6</td>
</tr>
<tr>
<td>0</td>
<td>-8</td>
</tr>
<tr>
<td>1</td>
<td>-6</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Is (-2,0) a solution to the system?

Yes, because it is on both lines and both tables.
Today’s Objective

Students will be able to graph quadratics.
Graph the polynomial \( f(x) = (x + 1)(x + 4) \)

Is the Vertex a Minimum or Maximum?

Minimum

Why? Vertex is at the bottom of the graph.
Today’s New Vocab (1 of 4)

Factor the polynomial $f(x) = x^2 + 5x + 4$

BOX the Solutions

Can you get the factors from the graph? Yes How?

Change the signs on the Solutions.

$$f(x) = (x + 1)(x + 4)$$
Solve for $x$ when $x^2 + 5x + 4 = 0$?

$(x + 1)(x + 4) = 0$

Set both parentheses equal to zero.

$(x + 1) = 0$  Factor  $(x + 4) = 0$  Factor

$x + 1 = 0$  

$x = -1$  Solution

$x + 4 = 0$  

$x = -4$  Solution

This graph will cross the x-axis at $(-4,0)$ and $(-1,0)$.
Graph the polynomial $f(x) = -2(x - 1)^2$

**BOX the Zero's**

$x = 1$

(1,0)

Can the vertex also be a zero? **YES**

<table>
<thead>
<tr>
<th>$x$</th>
<th>$f(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-8</td>
</tr>
<tr>
<td>0</td>
<td>-2</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>-2</td>
</tr>
<tr>
<td>3</td>
<td>-8</td>
</tr>
</tbody>
</table>
Today’s New Vocab (4 of 4)

Graph the polynomial \( f(x) = 2x^3 - 12x^2 + 10x \)

BOX the Zero’s

Write the solutions.

\[
\begin{array}{c|c}
  x & f(x) \\
  \hline
  0 & 0 \\
  1 & 0 \\
  5 & 0 \\
\end{array}
\]

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Lesson 7.4
Compare the graph of \( f(x) = x^2 \) to the graph of \( g(x) = (x - 2)^2 + 3 \). Which two directions did the \( g(x) \) shift (move)? 2 right and 3 up.
What is $f(6) - g(6)$? $36 - 19 = 17$

$f(x) = x^2$

$g(x) = (x - 2)^2 + 3$

$f(6) = (6)^2$

$g(6) = (6 - 2)^2 + 3$

$f(6) = 36$

$g(6) = (4)^2 + 3$

Show your work.

$g(6) = 16 + 3$

$g(6) = 19$
Today’s Objective

Students will be able to graph quadratic (radical) equations.
How do you graph radical equations?

1. Graph the function $f_1(x) = \sqrt{x}$.

2. Plot the points and draw the curve.

2 steps

Lesson 7.5
Definition
A radical (root) is an operation to remove (undo) an exponent.

Example(s)
\[ \sqrt{x} \quad x^{\frac{1}{2}} \]
\[ \sqrt{9} = 3 \quad \sqrt{16} = 4 \]

Facts
- Opposite of an exponent
- Fractional exponent

Non-Example(s)
\[ x^2 \quad x^3 \quad x \]

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Lesson 7.5
Today's New Vocab (2 of 4)

Perfect Squares

Calculate the (square) roots.

\[ \sqrt{9} = 3 \quad \sqrt{49} = 7 \]
\[ \sqrt{16} = 4 \quad \sqrt{100} = 10 \]
\[ \sqrt{25} = 5 \quad \sqrt{144} = 12 \]
\[ \sqrt{36} = 6 \]
Graph the function $f(x) = \sqrt{x}$

How is this calculated?

<table>
<thead>
<tr>
<th>$x$</th>
<th>$f(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
</tr>
</tbody>
</table>

$f(x) = \sqrt{x}$

$f(9) = \sqrt{9}$

$f(9) = 3$
Today’s New Vocab (4 of 4)
Graph the function \( f(x) = \sqrt{x + 5 + 3} \)

<table>
<thead>
<tr>
<th>x</th>
<th>f(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5</td>
<td>3</td>
</tr>
<tr>
<td>-4</td>
<td>4</td>
</tr>
<tr>
<td>-1</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

How did the graph shift?
5 units left
3 units up
Graph \( f(x) = \sqrt{x} + 2 \) over the domain \(-2 \leq x \leq 7\).

Is there shading on the graph?

No, it is an equation.

Intervals have no ARROWS.
Evaluate $f(-2)$ and $f(7)$ when $f(x) = \sqrt{x + 2}$.

$f(x) = \sqrt{x + 2}$

$f(-2) = \sqrt{(-2) + 2} = \sqrt{0} = 0$

$f(-2) = 0$

$f(7) = \sqrt{(7) + 2} = \sqrt{9} = 3$

$f(7) = 3$

(-2,0) is a point on the line.

(7,3) is a point on the line.
Today’s Objective

Students will be able to review objectives from Unit 7.
#5: Evaluate the function when \( x = 8 \).

\[
f(x) = 3x^2 - 4x - 2 \quad \text{when} \quad f(8) = ?
\]
\[
f(8) = 3(8)^2 - 4(8) - 2
\]
\[
f(8) = 3(64) - 32 - 2
\]
\[
f(8) = 192 - 32 - 2
\]
\[
f(8) = 158
\]
#10: What is the product of $(3x-3)$ and $(x+1)$?

Product means multiply

$$3x^2 + 3x - 3x - 3$$

$$= 3x^2 - 3$$

$$\begin{array}{c|c}
3x^2 & 3x \\
3x & +3x \\
\hline
-3x & -3 \\
\hline
3x^2 & +3x \\
\hline
-3 & -3 \\
\end{array}$$

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Unit 7 Review
Today's (2 of 4)
#11: Make a table, graph.

<table>
<thead>
<tr>
<th>x</th>
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</thead>
<tbody>
<tr>
<td>-2</td>
<td>9</td>
</tr>
<tr>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-3</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

12. Write the Solutions

x = -1 and x = 1
Today’s New Vocab (3 of 4)

#17. Solve the quadratic equation for x.

\[(x + 3)^2 = 49\]

\[\sqrt{(x + 3)^2} = \sqrt{49}\]

\[(x + 3) = 7\]

\[x + 3 = 7\]

\[-3\]

\[x = 4\]
Today’s New Vocab (4 of 4)

#14: Simplify the expression.

\[(4x^2 - 7x + 3) - (5x^2 + 2x - 6)\]

\[4x^2 - 7x + 3 - 5x^2 - 2x + 6\]

\[4x^2 - 5x^2 - 7x - 2x + 3 + 6\]

\[-1x^2 - 9x + 9\]
#9: What is equivalent to $2x^2(4x + 5)$?

$2x^2(4x + 5)$ distribute

$8x^3 + 10x^2$

Is $2x^2$ a factor? Yes