Lesson 3 Factoring where there is Greatest Common Factor

Recall: Expanding

\[ y = 2x(x+3) \quad y = 2(x + 3)(x + 4) \quad y = x(x+1) \]

\[ y = x^2 + x \]
\[ y = 2x^2 + 8x + 6x + 14 \]
\[ y = 2x^2 + 14x + 24 \]
\[ y = x(x+1) \]

Factoring is the exact opposite:

\[ y = 2x^2 + 6x \quad y = 2x^2 + 14x + 24 \quad y = x^2 + x \]

To factor where there is a common factor:

- Common factor
  - if form ax^2 + bx you are done
  - if a trinomial or a difference of squares determine two numbers:
    - whose product equals the constant term of the polynomial “c”
    - whose sum equals the coefficient of the x-term of the trinomial “b”

In other words:

M ( multiply)
A ( add )
N ( numbers )

Practice Coming up with the number pairs that work:

<table>
<thead>
<tr>
<th>Multiplies to:</th>
<th>Adds to:</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>7</td>
<td>5, 2</td>
</tr>
<tr>
<td>-14</td>
<td>5</td>
<td>-7, -2</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>-6, 4</td>
</tr>
<tr>
<td>12</td>
<td>7</td>
<td>3, 4</td>
</tr>
<tr>
<td>-8</td>
<td>-2</td>
<td>-4, 2</td>
</tr>
<tr>
<td>0 ( one number must be 0)</td>
<td>8</td>
<td>-2, 8</td>
</tr>
</tbody>
</table>
Examples"

\[ x^2 + 15x \]
\[ = x(x+15) \quad M: 0 \]
\[ N: 0, 15 \]
\[ 2x^2 + 16x \]
\[ = 2(x^2 + 8x) \quad M: 0 \]
\[ A: 8 \]
\[ N: 0, 8 \]

\[ 4x^2 - 8x - 60 \]
\[ = 4(x^2 - 2x - 15) \quad M: -15 \]
\[ N: -3, 5 \]
\[ 3x^2 + 21x + 36 \]
\[ = 3(x^2 + 7x + 12) \quad M: 12 \]
\[ A: -2 \]
\[ N: 3, 4 \]

\[ 2x^2 - 12x - 20 \]
\[ = -(x^2 - 12x + 20) \quad M: 20 \]
\[ N: -2, 10 \]
\[ 2x^2 - 10x + 28 \]
\[ = -2(x^2 + 5x - 14) \quad M: 14 \]
\[ A: -2 \]
\[ N: 7, 2 \]

\[ 4x^2 - 8 \]
\[ = 4(x^2 - 2) \quad M: 2 \]
\[ A: x^2 \]
\[ 3x^2 - 24x + 48 \]
\[ = 3(x^2 - 8x + 16) \quad M: 16 \]
\[ A: -8 \]
\[ N: -4, 4 \]

\[ 5x^2 + 45 \]
\[ = 5(x^2 + 9) \quad M: -9 \]
\[ A: 0 \]
\[ N: 3, -3 \]
\[ 2x^2 + 18x + 40 \]
\[ = 2(x^2 + 9x + 20) \quad M: 20 \]
\[ A: 9 \]
\[ N: 5, 4 \]