### FACTORING - Factoring by Grouping with AC Method

If both signs are +, trial + error may be faster.

<table>
<thead>
<tr>
<th>$\text{Factors of } 56$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 \times 56$</td>
</tr>
<tr>
<td>$2 \times 28$</td>
</tr>
<tr>
<td>$4 \times 14$</td>
</tr>
<tr>
<td>$7 \times 8$</td>
</tr>
<tr>
<td>$8 \times 7$</td>
</tr>
</tbody>
</table>

Look at the sign of $C$. If positive (+), find the sum of the factors (add). If negative (-), find the difference of the factors (subtract). Use absolute values, look for the $B$ value in the second column.

<table>
<thead>
<tr>
<th>$3 \times 12 = 36$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 \times 36$</td>
</tr>
<tr>
<td>$2 \times 18$</td>
</tr>
<tr>
<td>$3 \times 12$</td>
</tr>
<tr>
<td>$4 \times 9$</td>
</tr>
<tr>
<td>$6 \times 6$</td>
</tr>
</tbody>
</table>

Rewrite the $B$ term using the factors found. If addition was used on the factors, use the sign of $B$ as the common sign. If subtraction was used on the factors, use the sign of $B$ on the big (bully) factor and the opposite sign on the small factor.

<table>
<thead>
<tr>
<th>$3 \times (x - 3)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\downarrow$</td>
</tr>
<tr>
<td>$(3x + 4)(x - 3)$</td>
</tr>
<tr>
<td>$\downarrow$</td>
</tr>
<tr>
<td>Check using FOIL.</td>
</tr>
</tbody>
</table>

For $A = 1$, go directly from top to bottom.
Examples

\[3\gamma^2 + 19\gamma - 14\]

Subtraction

Use sign of 19

on the big number (21)

\[1\times42\]
\[2\times21\]
\[42 - 19\]
\[3\gamma^2 + 21\gamma - 2\gamma - 14\]
\[3\gamma (\gamma + 7) - 2(\gamma + 7)\]
\[(\gamma + 7)(3\gamma - 2)\]

\[2\gamma^2 + 7\gamma + 3\]

Addition

Use sign of 7

as the common sign

\[1\times6\]
\[2\times3\]
\[6 + 7\]
\[3\gamma^2 + 6\gamma + \gamma + 3\]
\[2\gamma (\gamma + 3) + 1(\gamma + 3)\]
\[(\gamma + 3)(2\gamma + 1)\]

\[12\gamma^2 - 23\gamma + 10\]

Addition

Use sign of 23

as the common

sign

\[1\times120\]
\[2\times60\]
\[3\times40\]
\[4\times30\]
\[5\times24\]
\[6\times20\]
\[8\times15\]
\[120 + 23\]
\[-23\gamma\]
\[10\times12\]
\[+12\gamma\]
\[12\gamma^2 - 15\gamma - 8\gamma + 10\]
\[3\gamma (4\gamma - 5) - 2(4\gamma - 5)\]
\[(4\gamma - 5)(3\gamma - 2)\]

This method doesn’t always work.

\[4\gamma^2 - 9\gamma + 6\]

\[24 + 9\]
\[1\times24\]
\[2\times12\]
\[3\times8\]
\[4\times6\]
\[6\times4\]
\[25\]
\[14\]
\[11\]
\[10\]

9 is not found, so this trinomial is prime and can’t be factored with this method.

\[20\gamma^2 - 7\gamma - 3\]

Subtraction

Use sign of 7

on the big number (20)

\[1\times60\]
\[2\times30\]
\[3\times20\]
\[4\times15\]
\[6\times10\]
\[60 - 7\]
\[59\]
\[25\]
\[17\]
\[11\]
\[7\]

\[-7\gamma\]

\[20\gamma^2 + 5\gamma - 12\gamma - 3\]
\[5\gamma (4\gamma + 1) - 3(4\gamma + 1)\]
\[(4\gamma + 1)(5\gamma - 3)\]

To check, use FOIL

\[(4\gamma + 1)(5\gamma - 3)\]