This document illustrates two methods of factoring quadratic expressions. You may be familiar with the AC method. The SWING method is an alternative method that you may find easier to use.

Notice that Steps 1 through 3 are identical for both methods. Also note that you must put your quadratic expression in standard form before starting this process to insure you assign the correct values to $a, b$, and $c$.

| AC |  |  | SWING |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Factor the expression $6 x^{2}-11 x-7$ |  |  |  |  |  |
| STEP 1 Factor out the GCF if possible |  |  | STEP 1 Factor out the GCF if possible |  |  |
| STEP 2 Multiply $a$ and $c$ |  |  | STEP 2 Multiply $a$ and $c$ |  |  |
| $\square$$a$ <br> 6 | $c$ | $a \times c$ |  | $c$ | $a \times c$ |
|  | -7 | -42 |  | -7 | -42 |
| STEP 3 Write out the factors of $a \times c$. Find the two factors that add up to $b$. |  |  | STEP 3 Write out the factors of $a \times c$. Find the two factors that add up to $b$. |  |  |
| Factors of$a \times c$ |  | Sum of Factors | Factors of$a \times c$ |  | Sum of Factors |
| 1 | -42 | -41 | 1 | -42 | -41 |
| 2 | -21 | -19 | 2 | -21 | -19 |
| 3 | -14 | -11 | 3 | -14 | -11 |
| 6 | -7 | -1 | 6 | -7 | -1 |
| STEP 4 Rewrite the $b x$ term as the sum of the two factors identified in step 3. $a x^{2}+f_{1} x+f_{2} x+c$ <br> For our example the expression becomes $6 x^{2}+3 x+-14 x-7$ |  |  | STEP 4 Construct two factors as follows where $f_{1}$ and $f_{2}$ are the two factors identified in step 3. $\left(x+\frac{f_{1}}{a}\right)\left(x+\frac{f_{2}}{a}\right)$ <br> Then simplify the fractions if possible. |  |  |
| STEP 5 Group the first two terms and the last two terms. Then divide out a common factor from each group.$\begin{aligned} & \left(6 x^{2}+3 x\right)+(-14 x-7) \\ & 3 x(2 x+1)-7(2 x+1) \end{aligned}$ |  |  | For our example the interim factors are$\left(x+\frac{3}{6}\right)\left(x-\frac{14}{6}\right)$ |  |  |
| STEP 6 Factor out the common term. If there is no common term, look for an error in a previous step. In our example $(2 x+1)$ is the common term. This leaves is with$(2 x+1)(3 x-7)$ |  |  | STEP 5 Multiply each factor by the simplified denominator to get rid of the fractions $2\left(x+\frac{1}{2}\right) 3\left(x-\frac{7}{3}\right)$ <br> This leaves us with $(2 x+1)(3 x-7)$ |  |  |

Another example.

| AC | SWING |
| :--- | ---: |
| Factor the expression $3 x^{2}-20 x+28$ |  |

STEP 1 Factor out the GCF if possible
STEP 2 Multiply $a$ and $c$

| $a$ | $c$ | $a \times c$ |
| :---: | :---: | :---: |
| 3 | 28 | 84 |

STEP 3 Write out the factors of $a \times c$. Find the two factors that add up to $b$.

| Factors of |  | Sum of |
| :---: | :---: | :---: |
| Factors |  |  |$|$| -1 | -84 | -85 |
| :---: | :---: | :---: |
| -2 | -42 | -44 |
| -3 | -28 | -31 |
| -4 | -21 | -25 |
| -6 | -14 | -20 |

STEP 4 Rewrite the $b x$ term as the sum of the two factors identified in step 3.

$$
a x^{2}+f_{1} x+f_{2} x+c
$$

For our example the expression becomes

$$
3 x^{2}+-6 x+-14 x+28
$$

STEP 5 Group the first two terms and the last two terms. Then divide out a common factor from each group.

$$
\begin{aligned}
& \left(3 x^{2}-6 x\right)+(-14 x+28) \\
& 3 x(2 x-2)-14(2 x-2)
\end{aligned}
$$

STEP 6 Factor out the common term. If there is no common term, look for an error in a previous step. In our example $(2 x-2)$ is the common term. This leaves is with

$$
(2 x-2)(3 x-14)
$$

STEP 1 Factor out the GCF if possible
STEP 2 Multiply $a$ and $c$

| $a$ | $c$ | $a \times c$ |
| :---: | :---: | :---: |
| 3 | 28 | 84 |

STEP 3 Write out the factors of $a \times c$. Find the two factors that add up to $b$.

| Factors of <br> $a \times c$ |  | Sum of <br> Factors |
| :---: | :---: | :---: |
| -1 | -84 | -85 |
| -2 | -42 | -44 |
| -3 | -28 | -31 |
| -4 | -21 | -25 |
| -6 | -14 | -20 |

STEP 4 Construct two factors as follows where $f_{1}$ and $f_{2}$ are the two factors identified in step 3 .

$$
\left(x+\frac{f_{1}}{a}\right)\left(x+\frac{f_{2}}{a}\right)
$$

Then simplify the fractions if possible.
For our example the interim factors are

$$
\left(x+\frac{-6}{3}\right)\left(x+\frac{-14}{3}\right)
$$

Simplified

$$
(x-2)\left(x-\frac{14}{3}\right)
$$

STEP 5 Multiply each factor by the simplified denominator to get rid of the fractions

$$
(x-2) 3\left(x-\frac{14}{3}\right)
$$

This leaves us with

$$
(x-2)(3 x-14)
$$

