



### Factoring Secrets

## The ac-Method

This worksheet describes a method for factoring expressions of the type  $ax^2 + bx + c$ . This method is faster than the trial-and-error method.

**Example 1:** Factor  $6x^2 - x - 2$ .

**Solution:**

**Step 1:** Identify  $a$ ,  $b$ , and  $c$  for the expression.

$$a = 6, b = -1, c = -2$$

**Step 2:** Multiply  $a$  by  $c$  (i.e. multiply the coefficient of the  $x^2$  term by the constant term).

$$ac = -12$$

**Step 3:** Determine the possible pairs of factors that could yield the product  $a \cdot c$ :

$$-12 = -1 \times 12 = -2 \times 6 = -3 \times 4 = -4 \times 3 = -6 \times 2 = -12 \times 1$$

**Step 4:** Decide which of the pairs of factors will add up to  $b$ .

$$b = -1, \text{ and } -4 + 3 = -1.$$

**Step 5:** Replace the middle term by an equivalent expression using the two factors.

$$6x^2 - x - 2 = 6x^2 + (-4x + 3x) - 2 = 6x^2 - 4x + 3x - 2$$

**Step 6:** Factor by grouping.

$$\begin{aligned} 6x^2 - 4x + 3x - 2 &= (6x^2 - 4x) + (3x - 2) \\ &= 2x(3x - 2) + 1(3x - 2) \\ &= (2x + 1)(3x - 2) \end{aligned}$$

**Example 2:** Factor  $6x^2 + 19x + 10$ .

**Solution:**

**Step 1:** Identify  $a$ ,  $b$ , and  $c$  for the expression.

$$a = 6, b = 19, c = 10$$

**Step 2:** Multiply  $a$  by  $c$  (i.e. multiply the coefficient of the  $x^2$  term by the constant term).

$$ac = 60$$

**Step 3:** Determine the possible pairs of factors that could yield the product  $a \cdot c$ :

$$60 = 1 \times 60 = 2 \times 30 = 3 \times 20 = 4 \times 15 = 5 \times 12 = 6 \times 10 \text{ and the negative versions of these.}$$

**Step 4:** Decide which of the pairs of factors will add up to  $b$ .

$$b = 19, \text{ and } 4 + 15 = 19.$$

**Step 5:** Replace the middle term by an equivalent expression using the two factors.

$$6x^2 + 19x + 10 = 6x^2 + 4x + 15x + 10$$