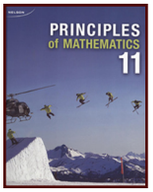

Please refer to pages 414–418, Examples 1 and 4, of *Principles of Mathematics 11* for more examples using the quadratic formula.

Practice Run

1. A quadratic equation is given as $36a^2 - 22 = 3$.

   a. Use the quadratic formula to solve the equation.

   b. Explain how the equation could be solved by factoring.

   c. Solve by factoring.

2. Solve $6x^2 + 5x + 12 = 4x^2 + 15$ using the quadratic formula.

Compare your answers.

1. A quadratic equation is given as $36a^2 - 22 = 3$.

   a. Use the quadratic formula to solve the equation.

$$36a^2 - 22 = 3$$
$$36a^2 - 22 - 3 = 3 - 3$$
$$36a^2 - 25 = 0$$
$$a = 36, b = 0, c = -25$$
$$x = \frac{-0 \pm \sqrt{0^2 - 4(36 \cdot (-25))}}{2(36)}$$
$$x = \frac{\pm\sqrt{3600}}{72}$$
$$x = \frac{\pm 60}{72}$$
$$x = \frac{\pm 5}{6}$$
$$x = \frac{5}{6} \text{ and } -\frac{5}{6}$$

Left Side	Right Side
$36a^2 - 22$	3
$36\left(-\frac{5}{6}\right)^2 - 22$	
$36\left(\frac{25}{36}\right) - 22$	
$25 - 22$	
3	3
LS = RS	

Left Side	Right Side
$36a^2 - 22$	3
$36\left(\frac{5}{6}\right)^2 - 22$	
$36\left(\frac{25}{36}\right) - 22$	
$25 - 22$	
3	3
LS = RS	

   b. Explain how the equation could be solved by factoring.

   Rearrange the equation so one side is equal to zero. Factor using the difference of squares method. Equate each factor to zero and solve for x.

   c. Solve by factoring.

$$36a^2 - 22 - 3 = 3 - 3$$
$$36a^2 - 25 = 0$$
$$\sqrt{36a^2} = 6a$$
$$\sqrt{25} = 5$$
$$(6a + 5)(6a - 5) = 0$$
$$6a + 5 = 0 \text{ and } 6a - 5 = 0$$
$$a = -\frac{5}{6} \text{ and } a = \frac{5}{6}$$

2. Solve $6x^2 + 5x + 12 = 4x^2 + 15$ using the quadratic formula.

$$6x^2 + 5x + 12 = 4x^2 + 15$$
$$6x^2 - 4x^2 + 5x + 12 - 15 = 4x^2 - 4x^2 + 15 - 15$$
$$2x^2 + 5x - 3 = 0$$
$$a = 2, b = 5, c = -3$$
$$x = \frac{-5 \pm \sqrt{5^2 - 4(2 \cdot (-3))}}{2(2)}$$
$$x = \frac{-5 \pm \sqrt{25 + 24}}{4}$$
$$x = \frac{-5 \pm \sqrt{49}}{4}$$
$$x = \frac{-5 \pm 7}{4}$$
$$x = \frac{2}{4} \text{ and } x = \frac{-12}{4}$$
$$x = \frac{1}{2} \text{ and } x = -3$$

Left Side	Right Side
$6x^2 + 5x + 12$	$4x^2 + 15$
$6\left(\frac{1}{2}\right)^2 + 5\left(\frac{1}{2}\right) + 12$	$4\left(\frac{1}{2}\right)^2 + 15$
$6\left(\frac{1}{4}\right) + \left(\frac{5}{2}\right) + 12$	$4\left(\frac{1}{4}\right) + 15$
$\frac{6}{4} + \frac{5}{2} + 12$	$\frac{4}{4} + 15$
$\frac{3}{2} + \frac{5}{2} + \frac{24}{2}$	$1 + 15$
16	16
LS = RS	

Left Side	Right Side
$6x^2 + 5x + 12$	$4x^2 + 15$
$6(-3)^2 + 5(-3) + 12$	$4(-3)^2 + 15$
$6(9) + (-15) + 12$	$4(9) + 15$
$54 - 15 + 12$	$36 + 15$
51	51
LS = RS	

Not all quadratic equations will have two unique and real solutions. If the **radicand** in the quadratic formula is zero, there will be two equal solutions. If the radicand is negative, there will be no real solutions.

Quadratic Formula
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

The value of the radicand in the quadratic formula is consistent with what you would expect to see if you solved a quadratic equation graphically.