

## Review Exercise Set 23

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

Discriminant =  $b^2 - 4ac$

Exercise 1: Use the discriminant to determine whether the following equation has 2 real number solutions, 1 real number solution, or no real number solutions (both solutions are imaginary).

$$x^2 + 4x + 7 = 0$$

Exercise 2: Use the discriminant to determine whether the following equation has 2 real number solutions, 1 real number solution, or no real number solutions (both solutions are imaginary).

$$x^2 - 10x - 24 = 0$$

Exercise 3: Use the quadratic formula to solve the following equation.

$$4x^2 - 12x + 9 = 0$$

Exercise 4: Use the quadratic formula to solve the following equation.

$$x^2 - 4x - 96 = 0$$

Exercise 5: Use the quadratic formula to solve the following equation.

$$2x^2 - 12x + 54 = 0$$

## Review Exercise Set 23 Answer Key

Exercise 1: Use the discriminant to determine whether the following equation has 2 real number solutions, 1 real number solution, or no real number solutions (both solutions are imaginary).

$$x^2 + 4x + 7 = 0$$

$$a = 1, b = 4, c = 7$$

$$\begin{aligned} b^2 - 4ac \\ &= (4)^2 - 4(1)(7) \\ &= 16 - 28 \\ &= -12 \end{aligned}$$

**Since the discriminant is negative, there are no real number solutions**

Exercise 2: Use the discriminant to determine whether the following equation has 2 real number solutions, 1 real number solution, or no real number solutions (both solutions are imaginary).

$$x^2 - 10x - 24 = 0$$

$$a = 1, b = -10, c = -24$$

$$\begin{aligned} b^2 - 4ac \\ &= (-10)^2 - 4(1)(-24) \\ &= 100 + 96 \\ &= 196 \end{aligned}$$

**Since the discriminant is positive, there are two real number solutions**

Exercise 3: Use the quadratic formula to solve the following equation.

$$4x^2 - 12x + 9 = 0$$

$$a = 4, b = -12, c = 9$$

$$\begin{aligned}
x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
&= \frac{-(-12) \pm \sqrt{(-12)^2 - 4(4)(9)}}{2(4)} \\
&= \frac{12 \pm \sqrt{144 - 144}}{8} \\
&= \frac{12 \pm \sqrt{0}}{8} \\
&= \frac{12}{8} \\
&= \frac{3}{2}
\end{aligned}$$

Exercise 4: Use the quadratic formula to solve the following equation.

$$x^2 - 4x - 96 = 0$$

$$a = 1, b = -4, c = -96$$

$$\begin{aligned}
x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
&= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-96)}}{2(1)} \\
&= \frac{4 \pm \sqrt{16 + 384}}{2} \\
&= \frac{4 \pm \sqrt{400}}{2} \\
&= \frac{4 \pm 20}{2}
\end{aligned}$$

$$x = \frac{4 + 20}{2} \quad \text{or} \quad x = \frac{4 - 20}{2}$$

$$x = \frac{24}{2} \quad x = \frac{-16}{2}$$

$$x = 12 \quad x = -8$$

Exercise 5: Use the quadratic formula to solve the following equation.

$$2x^2 - 12x + 54 = 0$$

$$a = 2, b = -12, c = 54$$

$$\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\&= \frac{-(-12) \pm \sqrt{(-12)^2 - 4(2)(54)}}{2(2)} \\&= \frac{12 \pm \sqrt{144 - 432}}{4} \\&= \frac{12 \pm \sqrt{-288}}{4} \\&= \frac{12 \pm \sqrt{-144 \times 2}}{4} \\&= \frac{12 \pm 12i\sqrt{2}}{4}\end{aligned}$$

$$x = \frac{12 + 12i\sqrt{2}}{4} \quad \text{or} \quad x = \frac{12 - 12i\sqrt{2}}{4}$$

$$x = 3 + 3i\sqrt{2} \quad x = 3 - 3i\sqrt{2}$$