Solving Quadratic Equations By Using the Quadratic Formula

Practice Questions

Solve the first 2 questions using the quadratic formula.

1. $x^2 - 40 = 3x$

2. $\frac{1}{6}m^2 - \frac{11}{6}m + 3 = 0$

3. State the solutions to, $y^2 - 2y - 17 = 0$, as **exact** answers in simplest form.

4. State the solutions to, $\frac{-1}{2}w^2 - 2w + 3 = 0$, as **approximate** answers to 2 decimals.

5. One root to the quadratic equation, $4x^2 + 15x + \mathbf{c} = 0$, is -2. Find the value of **c**.

6. As Pascal was using the quadratic formula, he wrote:

$$x = \frac{-43 \pm \sqrt{1849 - 4(a)(30)}}{8}$$

Write the quadratic equation he was using, in the form, $\mathbf{a}x^2 + \mathbf{b}x + \mathbf{c} = 0$, identifying the values of **a**, **b**, and **c**.

7. One solution to the quadratic equation, $3v^2 - \mathbf{b}x - 63 = 0$, is 7. Find the value of **b**, and the other solution.

8. One leg of a right angle triangle is 7 cm more than the other leg. If the hypotenuse of the triangle is 17 cm, find the lengths of the 2 legs.

9. Suppose the braking distance(d), in feet, of a car travelling(v) miles per hour, is given by: $d(v) = 2.2v + \frac{v^2}{20}$.

   Determine the speed of the car if the stopping distance was 425 feet.

10. Pascal was attempting to solve, $-x^2 - 24 = -14x$, using the quadratic formula. He was having a bad day and made several errors. Identify and correct all of his errors.

Step 1 $\qquad x = \dfrac{14 \pm \sqrt{(14)^2 - 4(-1)(-24)}}{-2}$

Step 2 $\qquad x = \dfrac{14 \pm \sqrt{196 + 96}}{-2}$

Step 3 $\qquad x = -7 \pm \sqrt{292}$

Step 4 $\qquad x = 10.1$

Solving Quadratic Equations By Using the Quadratic Formula

Practice QuestionsAnswers

Solve the first 2 questions using the quadratic formula.

1. $x^2 - 40 = 3x$

   Set the equation equal to zero.

   $x^2 - 3x - 40 = 0$

   a = 1 b = -3 c = -40

   $x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-40)}}{2(1)}$

   $x = \frac{3 \pm \sqrt{9+160}}{2}$

   $x = \frac{3+13}{2}$ and $x = \frac{3-13}{2}$

   x = 8 and x = -5

2. $\frac{1}{6}m^2 - \frac{11}{6}m + 3 = 0$

   In order to deal with integers, factor out a $\frac{1}{6}$ from each term.

   $\frac{1}{6}(m^2 - 11m + 18) = 0$

   a = 1 b = -11 c = 18

   $x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(1)(18)}}{2(1)}$

   $x = \frac{11 \pm \sqrt{121-72}}{2}$

   $x = \frac{11+7}{2}$ and $x = \frac{11-7}{2}$

x = 9 and x = 2

3. State the solutions to, $y^2 - 2y - 17 = 0$, as **exact** answers in simplest form.

a = 1 b = -2 c = -17

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-17)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{4 + 68}}{2}$$

$$x = \frac{2 \pm \sqrt{72}}{2}$$

$$\sqrt{72} = \sqrt{36}\,\sqrt{2}$$

$$= 6\sqrt{2}$$

$$x = \frac{2 \pm 6\sqrt{2}}{2}$$

$x = 1 + 3\sqrt{2}$ and $x = 1 - 3\sqrt{2}$

4. State the solutions to, $\frac{-1}{2}w^2 - 2w + 3 = 0$, as **approximate** answers to 2 decimals.

$a = \frac{-1}{2}$ b = -2 c = 3

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(\frac{-1}{2})(3)}}{2(\frac{-1}{2})}$$

$$x = \frac{2 \pm \sqrt{4 + 6}}{-1}$$

$x = \frac{2 + \sqrt{10}}{-1}$ and $x = \frac{2 - \sqrt{10}}{-1}$

x = -5.16 and x = 1.16

5. One root to the quadratic equation, $4x^2 + 15x + \mathbf{c} = 0$, is -2. Find the value of **c**.

$4(-2)^2 + 15(-2) + c = 0$

$16 - 30 + c = 0$

$-14 + c = 0$

$c = 14$

6. As Pascal was using the quadratic formula, he wrote:

$$x = \frac{-43 \pm \sqrt{1849 - 4(a)(30)}}{8}$$

Write the quadratic equation he was using, in the form, $\mathbf{a}x^2 + \mathbf{b}x + \mathbf{c} = 0$, identifying the values of **a**, **b**, and **c**.

Recalling that the formula is: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$,

Since -43 is in the position of **b**, **b** is the opposite sign, or 43.

The value of **c** is 30.

Since 2**a** = 8, **a** = 4.

The quadratic equation he was using was, $4x^2 + 43x + 30 = 0$.

7. One solution to the quadratic equation, $3v^2 - \mathbf{b}x - 63 = 0$, is 7. Find the value of **b**, and the other solution.

Since 7 is a solution, it can be substituted into the equation to make a true statement. This fact will allow us to find the value of **b**.

$3(7)^2 - b(7) - 63 = 0$

$147 - b(7) - 63 = 0$

$84 - b(7) = 0$

$84 = 7b$

$b = 12$

Use the quadratic equation, $3v^2 - 12x - 63 = 0$, to find the other root.

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(3)(-63)}}{2(3)}$$

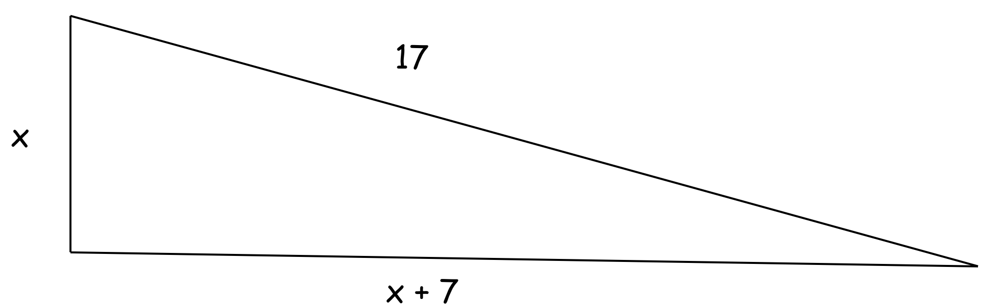
$$x = \frac{12 \pm \sqrt{144 + 756}}{6}$$

$x = \frac{12 + 30}{6}$ and $x = \frac{12 - 30}{6}$

$x = 7$ and $x = -3$

The other root is -3.

8. One leg of a right angle triangle is 7 cm more than the other leg. If the hypotenuse of the triangle is 17 cm, find the lengths of the 2 legs.



Using the Pythagorean theorem, $17^2 = (x^2) + (x + 7)^2$

$(x^2) + (x^2 + 14x + 49) = 289$

$2x^2 + 14x - 240 = 0$

$2(x^2 + 7x - 120) = 0$

a = 1 **b = 7** **c** = -120

$$x = \frac{-7 \pm \sqrt{(7)^2 - 4(1)(-120)}}{2(1)}$$

$$x = \frac{-7 \pm \sqrt{49 + 480}}{2}$$

x = $\frac{-7+23}{2}$ and x = $\frac{-7-23}{2}$

x = 8 and x = -15

In the context of this problem, -15 is called an extraneous root, because the distance represented by x in the diagram must be positive. The solution is

x = 8.

The lengths of the legs of the triangle are 8 and 15(8 + 7).

9. Suppose the braking distance(d), in feet, of a car travelling(v) miles per hour, is given by: d(v) = 2.2v + $\frac{v^2}{20}$.

Determine the speed of the car if the stopping distance was 425 feet.

425 = 2.2v + $\frac{v^2}{20}$

$\left(\frac{1}{20}\right)v^2 + 2.2v - 425 = 0.$

$\left(\frac{1}{20}\right)[v^2 + 44v - 8500] = 0$

a = 1 **b** = 44 **c** = -8500

x = $\frac{(-44) \pm \sqrt{(44)^2 - 4(1)(-8500)}}{2(1)}$

x = $\frac{-44 \pm \sqrt{1936 + 34000}}{2}$

x = $\frac{-44 + \sqrt{35936}}{2}$ and x = $\frac{-44 - \sqrt{35936}}{2}$

x = 72. 8 and x = -116.8

Since the negative root does not make sense in the context of this problem, it is called an extraneous root. The speed of the car is 72.8 miles/hour.

10. Pascal was attempting to solve, $-x^2 - 24 = -14x$, using the quadratic formula. He was having a bad day and made several errors. Identify and correct all of his errors.

Step 1 $\quad x = \dfrac{14 \pm \sqrt{(14)^2 - 4(-1)(-24)}}{-2}$

Step 2 $\quad x = \dfrac{14 \pm \sqrt{196 + 96}}{-2}$

Step 3 $\quad x = -7 \pm \sqrt{292}$

Step 4 $\quad x = 10.1$

Set the quadratic equation equal to zero.

$-x^2 + 14x - 24 = 0$

a = -1 **b** = 14 **c** = -24

The first error is in step 1. The first (14) should be negative.

The second error is in step 2. The sign is incorrect under the root sign. It should read: $\sqrt{196 - 96}$.

In step 3, there are 2 errors. It is not correct to simplify 14/-2 to equal -7. The -2 would also have to be divided into the root as well, which it isn't.

As well, the root should read: $\sqrt{100}$.

Step 4 should have 2 answers listed, not just 1. The listed answer is not correct.

The correct answers should be:

$x = \frac{-14 \pm \sqrt{100}}{-2}$

$x = \frac{-14+10}{-2}$ and $x = \frac{-14-10}{-2}$

$x = 2$ and $x = 12$