**Using the Quadratic Formula**

1. Fill in the blanks below:
* The quadratic formula gives solutions to the equation $ax^{2}+bx+c=$ \_\_\_\_\_\_.

This formula may also be used to find the \_\_\_-intercepts for the function

$y=f\left(x\right)=ax^{2}+bx+c$.

* The quadratic formula states that $x=-\frac{b}{2a}\pm \frac{\sqrt{b^{2}-4ac}}{2a}$. This formula gives two possible values for *x.* The first is $-\frac{b}{2a}+\frac{\sqrt{b^{2}-4ac}}{2a}$. The second value is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Notice that the first term in the formula, $-\frac{b}{2a}$, is the \_\_\_-coordinate of the vertex of the parabola.
* $x= -\frac{b}{2a}$ is the equation of the parabola’s line of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The expression under the radical symbol, $b^{2}-4ac$, is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
1. Use the quadratic formula to solve the equation $x^{2}-4x-10=0$.

Step 1. Identify *a, b,* and *c*: *a = \_\_\_\_\_\_\_ b = \_\_\_\_\_\_\_ c = \_\_\_\_\_\_\_\_*

Step 2. Substitute: $x=-\frac{b}{2a}\pm \frac{\sqrt{b^{2}-4ac}}{2a}$ *x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Step 3. Write out the two values for *x.*  Leave radicals in your answers.

 *x =\_\_\_\_\_\_\_\_\_\_\_* or *x* = \_\_\_\_\_\_\_\_\_\_\_\_

 Step 4. Use a calculator to find approximate values of *x* (to the nearest 0.001).

 *x ≈ \_\_\_\_\_\_\_\_\_\_\_* or *x* ≈ \_\_\_\_\_\_\_\_\_\_\_\_

1. a. Solve the equation $x^{2}+10x+15=0$ by completing the square.

b. Solve $x^{2}+10x+15=0$ using the quadratic formula.

c. Show that your solutions are equivalent.

1. a. Solve the equation $x^{2}-7x-18=0$ by factoring.

b. Solve $x^{2}-7x-18=0$ using the quadratic formula.

c. Show that your solutions are equivalent.

d. Here’s how one student solved $x^{2}-7x-18=0$ using the quadratic formula:

*a* = 1, *b* = –7, c = –18.

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

$$x=-\frac{-7}{2∙1}\pm \frac{\sqrt{-7^{2}-4∙1∙(-18)}}{2∙1}$$

$$x=-\frac{-7}{2}\pm \frac{\sqrt{-49+72}}{2}=\frac{7}{2}\pm \frac{\sqrt{23}}{2}$$

Find this student’s mistake and correct it.

1. The function $y=-5x^{2}+10x+0.5$ models the height of a soccer ball in meters *x* seconds after it has been kicked.
2. Use the quadratic formula to find the maximum height and the time it takes the ball to reach the ground.



1. Sketch a graph of the function based on the results of (a).
2. Check your answer to (b) with a graphing calculator.
3. For each quadratic function, find the value of the discriminant $b^{2}-4ac$. Then use a calculator to make a graph and determine the number of *x*-intercepts.

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| --- | --- | --- | --- |
| **Function** | **Value of** $b^{2}-4ac$ | **Is the discriminant positive, negative, or zero?** | **Number of*****x*-intercepts** |
| $$y=x^{2}+2x+5$$ |  |  |  |
| $$y=x^{2}-3x-7$$ |  |  |  |
| $$y=2x^{2}+10x+5$$ |  |  |  |
| $$y=-x^{2}-4x-8$$ |  |  |  |
| $$y=3x^{2}+24x+48$$ |  |  |  |

1. Based on the above table, is there a relationship between the discriminant and the number of *x*-intercepts? Make a conjecture and explain why it might be true.