

<b>Summary</b>	
In this lesson, students explore the relationships between the factors of a quadratic equation $y = ax^2 + bx + c$ , the x-intercepts of the graph of the equation, and the solutions to the equation $ax^2 + bx + c = 0$ using graphing calculators.	
<b>Utah State Core Standard</b>	
Solve problems using visualization, spatial reasoning, and geometric modeling.	
<ul style="list-style-type: none"> <li>• Solve problems involving absolute value and quadratic functions algebraically and graphically.</li> <li>• Write a quadratic equation when given the rational roots or zeroes of the function.</li> </ul>	
<b>Desired Results</b>	
<b>Benchmark/Enduring Understanding</b>	
Students understand the relationships between the x-intercepts, factors and solutions, allowing them to write equations given a graph and to solve equations graphically.	
<b>Essential Questions</b>	<b>Skills</b>
<p>How do you easily graph quadratic equations that are in factored form?</p> <p>Is there a way to solve quadratic equations that don't factor?</p> <p>How do the solutions of a quadratic equation relate to the graph of the equation?</p>	<ul style="list-style-type: none"> <li>• Graphing quadratic equations</li> <li>• Solving equations graphically</li> <li>• Writing equations given the factors</li> </ul>
<b>Assessment Evidence</b>	
The final question asks students to write about their understanding of the relationships in the lesson.	

<b>Instructional Activities</b>
<p>Launch: Practice simple factoring and explore students' ideas relating to the essential questions.</p> <p>Explore: Students can work on the lesson either independently or in pairs.</p> <p>Summarize: Student responses to the final question should be discussed and summarized. The teachers should provide several examples where students are given the factors of a quadratic and asked to write an equation in factored form and also quadratic equations that don't factor, but with solutions can be approximated graphically.</p>
<b>Materials Needed</b>
<p>Graphing calculators</p> <p>Copies of worksheet</p>

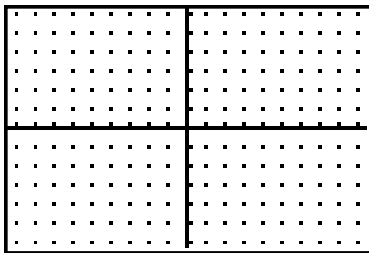
## Factors, $x$ -intercepts, Solutions

Predict what the graph of  $y = (x-1)(x+3)$  will look like. Write your prediction here.

Use your calculator to graph  $y = (x-1)(x+3)$ . Was your prediction correct? Explain.

Set your calculator so that it graphs functions sequentially, rather than simultaneously. In the same viewing window, graph  $y = (x-1)(x+3)$  and  $y = x^2 + 2x - 3$ , using a darker graph line for the second function, so that you can see any differences in the graphs. Explain what you observe and the mathematical reasons for what you are observing.

Carefully draw the graph here.



What are the  $x$ -intercepts of this function? (In other words, where does this function cross the  $x$ -axis?)

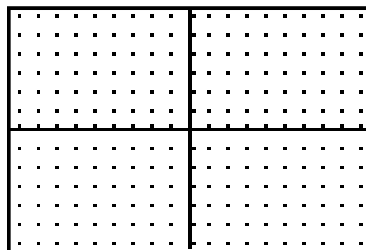
How do the  $x$ -intercepts compare to the factored form of the equation?

Where is the line of symmetry for this function? How does it relate to the  $x$ -intercepts?

Factor the following expression:  $x^2 - x - 6$

What do you predict the graph of  $y = x^2 - x - 6$  will look like? (Be specific.)

Use your calculator to graph the equation. Draw the graph here.



What are the  $x$ -intercepts of this function?

How do they relate to the equation in factored form?

Where is the line of symmetry? How does it relate to the  $x$ -intercepts?

Consider the equation:  $x^2 - x - 6 = 0$  How do the  $x$ -intercepts of the graph of  $y = x^2 - x - 6$  relate to the solutions of the equation?

Find the  $x$ -intercepts of the graph of  $y = x^2 + 2x - 8$ . How do they relate to the solutions of the equation  $x^2 + 2x - 8 = 0$ ?

Write a summary of the relationships between the factors of a quadratic equation  $y = ax^2 + bx + c$ , the  $x$ -intercepts of the graph of the equation, and the solutions to the equation  $ax^2 + bx + c = 0$ . Include your own example to illustrate your explanation.