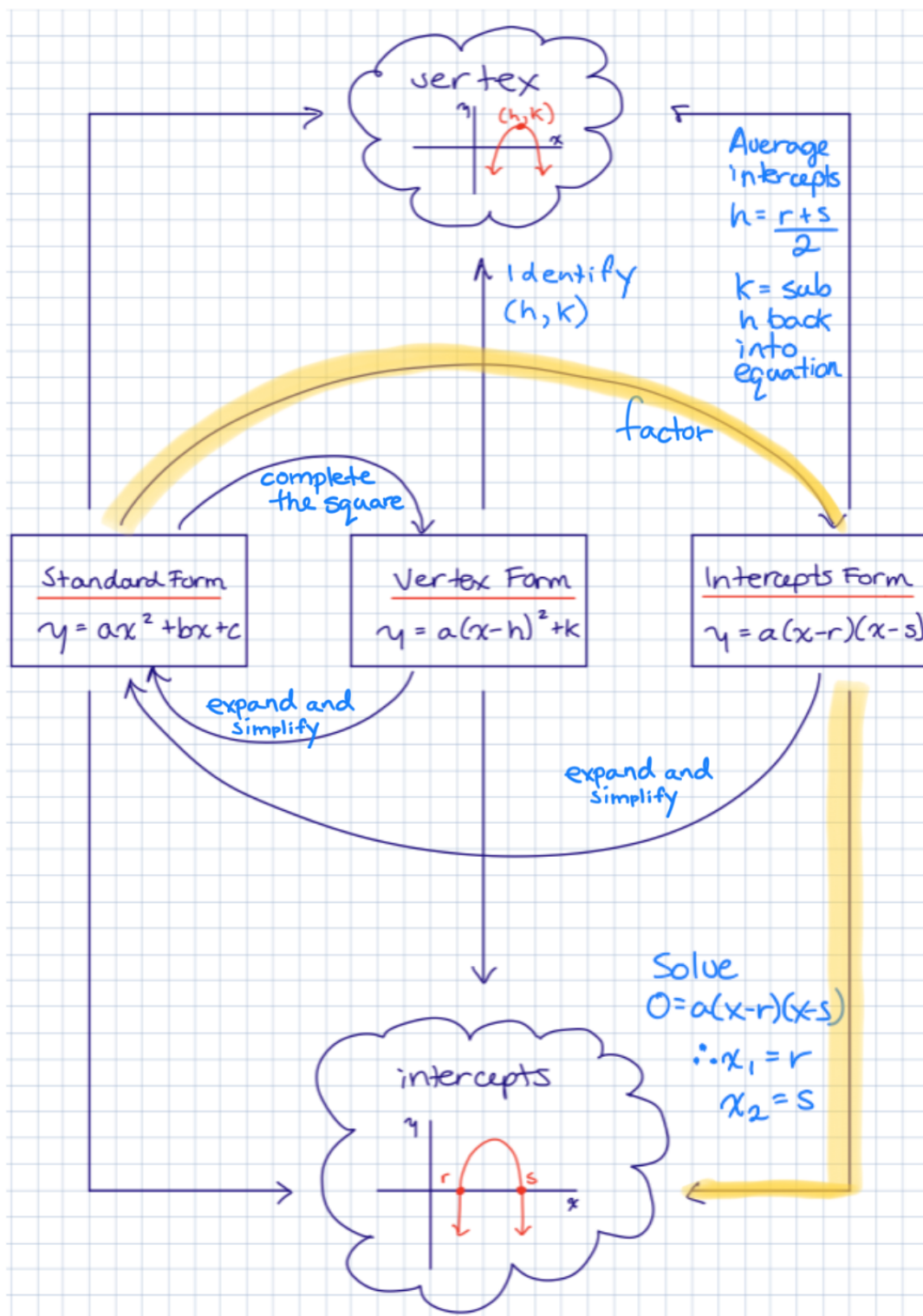


# Solving Quadratic Equations by Factoring

## Quadratic Relations Concept Map



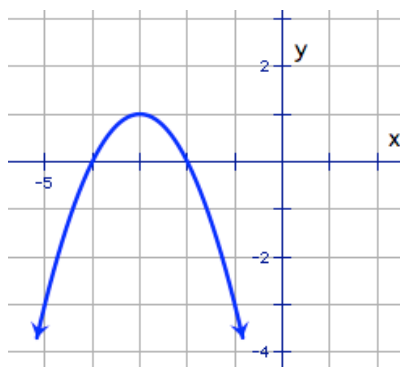
## Introduction

The flight path of a toy rocket, a ball, or any projectile can be predicted using a quadratic model. This model can also be used to determine when and where a projectile will land (the  $x$ -axis is generally used to represent the ground).

In these cases... to find where something lands... we then care about what the  $x$ -intercepts are... that is, where a parabola touches the  $x$ -axis.

“Solving quadratic equations” just means to find the  $x$ -intercepts of the parabola.

You can find the  $x$ -intercepts of a parabola by graphing. What are the  $x$ -intercepts of the parabola shown at right?



Graphing takes time, however... factoring to solve quadratic equations is another method that can be used.

## Solving Quadratic Equations

First, what is the  $y$  value for any point on the  $x$ -axis? That is, an  $x$ -intercept has what  $y$  value?

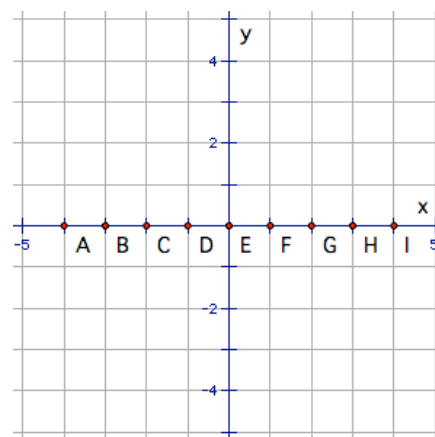
Consider points  $A$  through  $I$  shown to the right.

The  $y$  value for any point on the  $x$ -axis is: \_\_\_\_\_

Now, before we look at solving quadratic equations, let's briefly revisit linear equations.

How would you find the  $x$ -intercept of the linear equation  $y = 2x - 4$  ?

Sub  $y = 0$  and solve:



So, the  $x$ -intercept of the linear equation is:

Solving a quadratic equation is no different.

What are the  $x$ -intercepts of  $y = x^2 - 6x + 8$ ? We sub in  $y = 0$  and solve:

$$0 = x^2 - 6x + 8$$

Now at this point, it is hard to see what the value(s) of  $x$  are.

$$0 = (x - 4)(x - 2)$$

So, we factor the right side.

Now we can see the solutions for  $x$ . The  $x$ -intercepts are  $x = 4$  or  $x = 2$ .

How did we get this?  $x = 4$  is one value that makes the equation  $0 = (x - 4)(x - 2)$  true. For example:

$x = 2$  is the other value that makes the equation "true"...

### Example 1

Solve each quadratic equation, by factoring.

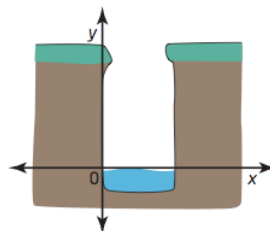
a)  $0 = x^2 - x - 6$       We factor the right side...

b)  $2x^2 + 4x = 0$       We can common factor...

c)  $5x^2 + 19x - 4 = 0$       Complex trinomial...

**Example 2**

The path of a stone thrown into a ravine is modelled by the quadratic relation  $y = -x^2 + 5x + 84$ , where  $x$  represents the distance, in metres, travelled horizontally and  $y$  represents the height, in metres, above the surface of the river at the bottom of the ravine. How far does the stone travel horizontally before it hits the water?

**Opportunity to Learn**

Complete all questions in the provided handout that accompanies this lesson.