QUADRTIC EQUATIONS

$$ax^2 + bx + c = 0$$

INCLUDES GOOGLE SLIDES

- For students who:
- are emerging or non-readers
- take alternate assessments
- are in special education
- short-attention span
- lack pre-requisite skills
- benefit from the use of pictures for support
- middle/high school

Quadratics Unit

By
Christa Joy
Special Needs for Special Kids

$$ax^2 + bx + c = 0$$

Table of Contents

Also included in this resource as separate files:
- Lesson plans
- Links and directions to digital activities
- PowerPoint (this is the book in the lesson plan)
- Voice recorded PowerPoint
- Activities in black and white

This unit has 10 days of activities that will guide students through understanding how to read and interpret quadratic equations. The unit is separated into 2 files, one in color and one in black and white.

This unit does not have students solve quadratic equations or quadratic functions.

Day 7

Activity	Notes	Materials
Read the book: *Quadratic Equation* (10 minutes)	• Read through the story, asking lots of questions • Continue to make connections between book and vocabulary board	• Book • Vocabulary board
Vocabulary cards cut and paste (15 minutes)	• Choose the harder option and have students match the definition to the picture. • Use color coding if needed	• Vocabulary cut and paste worksheets • Scissors • Glue • Vocabulary board
Id vertex review (5 minutes)	• Review the worksheets completed yesterday	• Parabola • worksheets
Id vertex of the parabola (10 minutes)	Do the first 2 worksheets where student simply identify with a dot the vertex of each parabola	• Worksheet • Stickers (optional)
Sharing (10 minutes)	• Each student shares one of their finished worksheets showing where the vertex is with the group using the communication method of their choice	• Completed worksheets • Communication devices

Day 8

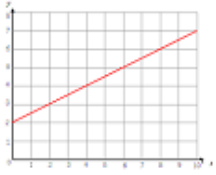| Activity	Notes	Materials
Read the book: *Quadratic Equation* (10 minutes)	• Read through the story, asking lots of questions • Continue to make connections between book and vocabulary board	• Book • Vocabulary board
Group activity (10 minutes)	• Parabola activity (see directions included in this unit)	• Dry erase board • Post-it notes • stickers •
Interpreting parabolas (10 minutes)	• Do 1-2 of the worksheets having students interpret/read the parabola	• Worksheet
Sharing (10 minutes)	• Each student shares one of their finished worksheets with the group using the communication method of their choice	• Completed worksheets • Communication devices
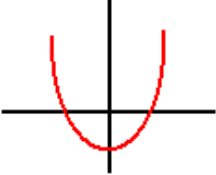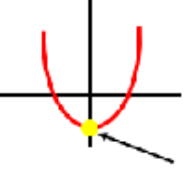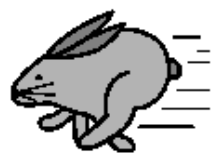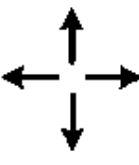
The lesson plans contain:

- Overall tips for teaching students with significant needs
- A quick look at what you will do each day
- Detailed instructions on how that day's lesson should run

This unit covers:

- Labeling parts of the quadratic equation
- Inputting values into the quadratic equation
- Identify parabolas
- Identify vertices of parabolas
- Real-world examples using the quadratic formula

This unit was built using extended content standards from High School for students taking alternative assessments.

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This unit comes with a vocabulary board.

Vocabulary boards are great for ALL students to assist with participation and engagement in group discussions.

Tips on how to use in the unit!!

First, you should know that it is the x^2 that makes it a quadratic equation.

x^2

©Christa Joy, SNSK
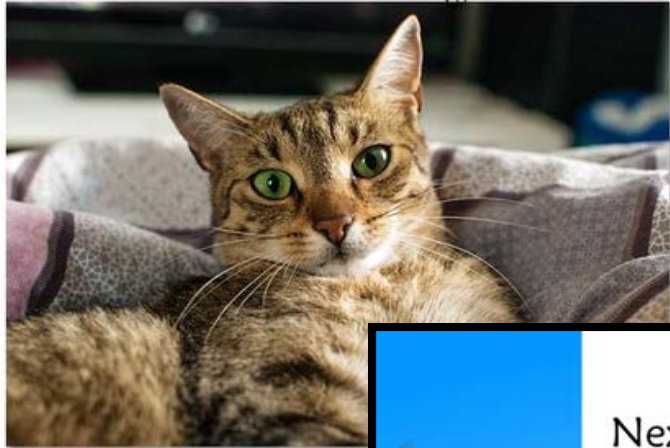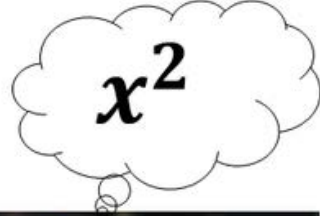
Next, we should understand what each term the quadratic equation means.

$$ax^2 + bx + c = 0$$

a, b, c are known values. That means we know what a, b, c are before we even start.

©Christa Joy, SNSK

There is a 24 slide PowerPoint reviewing how to read and what the quadratic equation means.

- PowerPoint
- voice-recorded PPT
- mp4 movie format

GROUP ACTIVITIES FOR QUADTRATICS UNIT

Vocabulary Card Activities

This unit has more of a focus on the quadratic equation than vocabulary, but it is worth spending a couple of days making sure your students are familiar with the terminology used in this unit.

Scavenger hunt

Here is what you will need:
- one copy of the vocabulary cards to pass out to students
- one teacher has a second set

How to play:
- Paste the teacher set of cards around the room
- Divide the other set of cards amongst the students
- Students walk around with their vocabulary cards looking for a match
- Bring the matches back to the table and share which they found

I Spy Game

Here is what you will need:
- one copy of the vocabulary cards for each student
- one teacher also has a copy of the cards

How to play:
- Hold up one of the cards so only you can see it.
- Describe it with as much detail as you can
- Ask students to hold up the vocabulary card they think you are holding
- Turn it around and ask students to raise their hand if they got it correct

Quadratic Specific Activities

Recreating the quadratic equation

Here is what you will need:
- Sticky notes with each variable written on it. Be sure to include the operator signs, equal sign, and zero (one set for each student)
- Model for students to copy (if needed)

How to play:
- Students arrange their sticky notes in the correct order
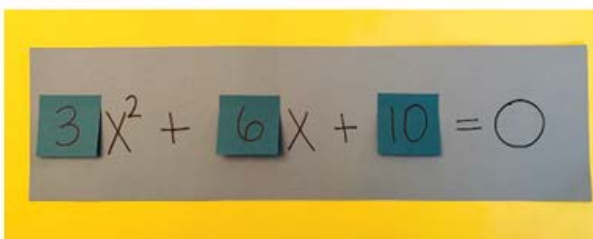- Check against model and rearrange if needed

Substituting Values

Here is what you will need:
- Write the quadratic equation on a long piece of paper (one for each student).
  - Space out the variables
  - Sentence strips (used in elementary school) work great!!
- Sticky notes

How to play:
- Give each student their copy of the quadratic equation
- Write on the board values for the following:
  - A=
  - B=
  - C=
- Student write those numbers on their sticky notes
- Place over the variables (A, B, C) in their equation
- Read the new equation

$$3x^2 + 6x + 10 = \bigcirc$$

There are group activities for students to work with the quadratic equation.

Quadratic equation

An equation where the highest exponent is 2.

$$ax^2 + bx + c = 0$$

known variables

Terms in the equation that have a known value, usually a constant.
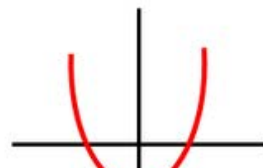
unknown variable

Term in the equation that we not know the value of, represented by the letter X.

parabola

A curve that is shaped like the path of something that is thrown forward and high in the air and falls back to the ground.

Quadratic equation

An equation where the highest exponent is 2.

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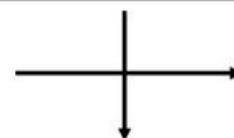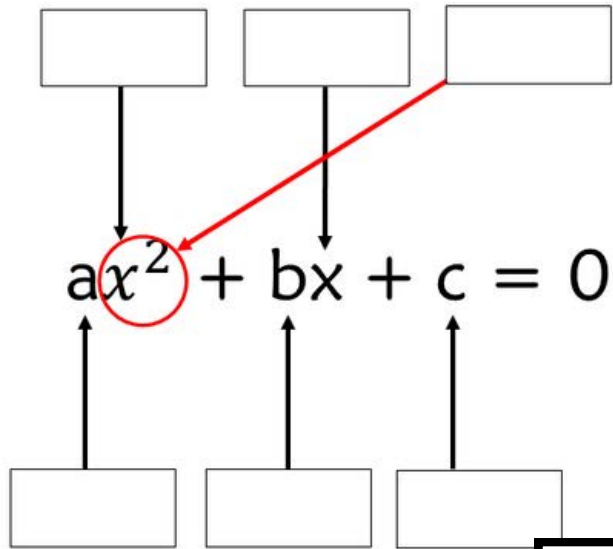
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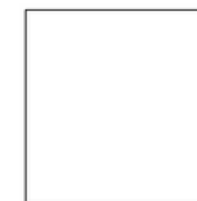
vertex

equation
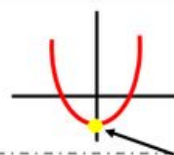
intercept

axes

There are 8 vocabulary cards students will use every day for a group activity. There is also a cut and paste activity.

Label parts of the equation

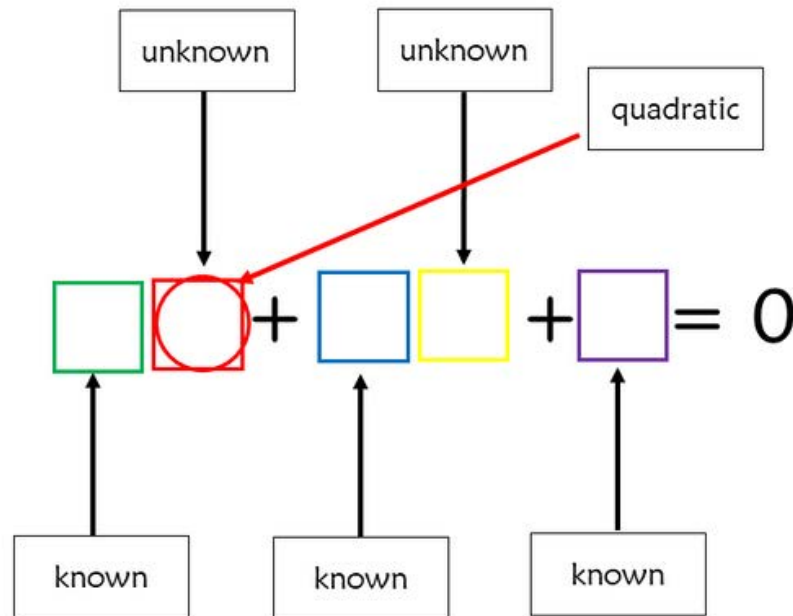Students will label parts of the quadratic equation. There are differentiated versions included for students who need more support.

Fill in values for a,b, and c

Rewrite the quadratic equation using the value of a, b, and c given

1. a= 2   b= 3   c= 4

$$ax^2 + bx + c = 0$$

___x^2 + ___x + ___ = 0

2. a= 5   b= 7   c= 2

$$ax^2 + bx + c = 0$$

___x^2 + ___x + ___ = 0

3. a= 1   b= 9   c= 10

$$ax^2 + bx + c = 0$$

___x^2 + ___x + ___ = 0

There are 2 worksheets where students will fill in values into the quadratic equation. This gives practice in identifying what a quadratic equation looks like.

Identify parabolas

Circle all the graphs that are an example of a parabola.
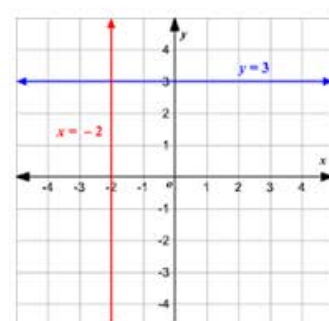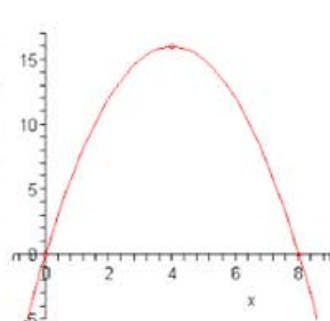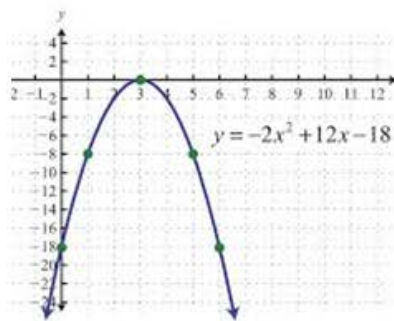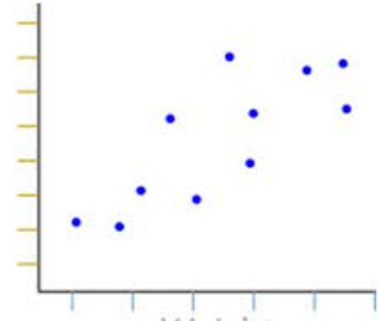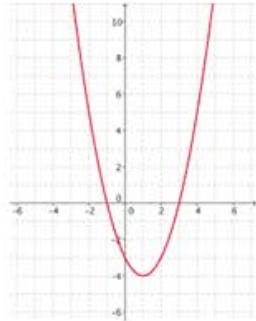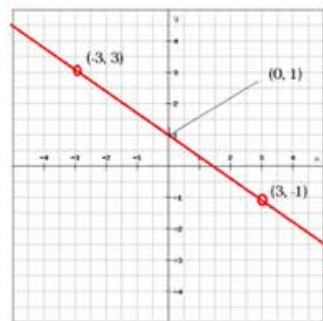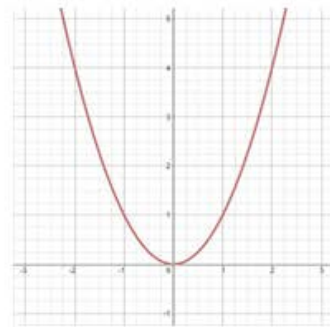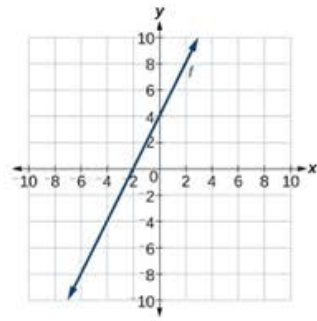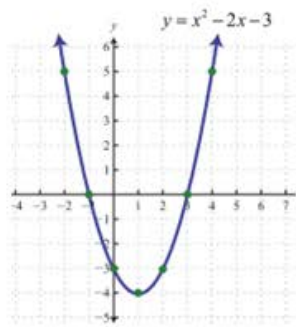
$y = x^2 - 2x - 3$

$y = -2x^2 + 12x - 18$

$y = 3$

$x = -2$

When you graph a quadratic equation, you get a parabola. Here, students will get practice identifying graphs that are a parabola.
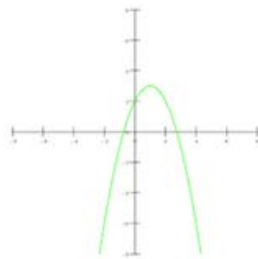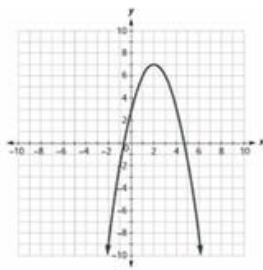
Identify vertices
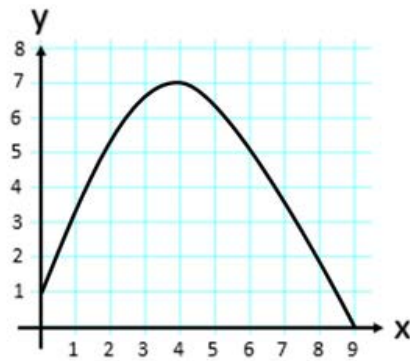
Students will identify a vertex first with a dot, then the actual coordinates on various parabolas.

Jill threw a paper airplane. When she lets it go, it is 4 feet off the ground. Look at the graph below and answer the questions about how the plane traveled.
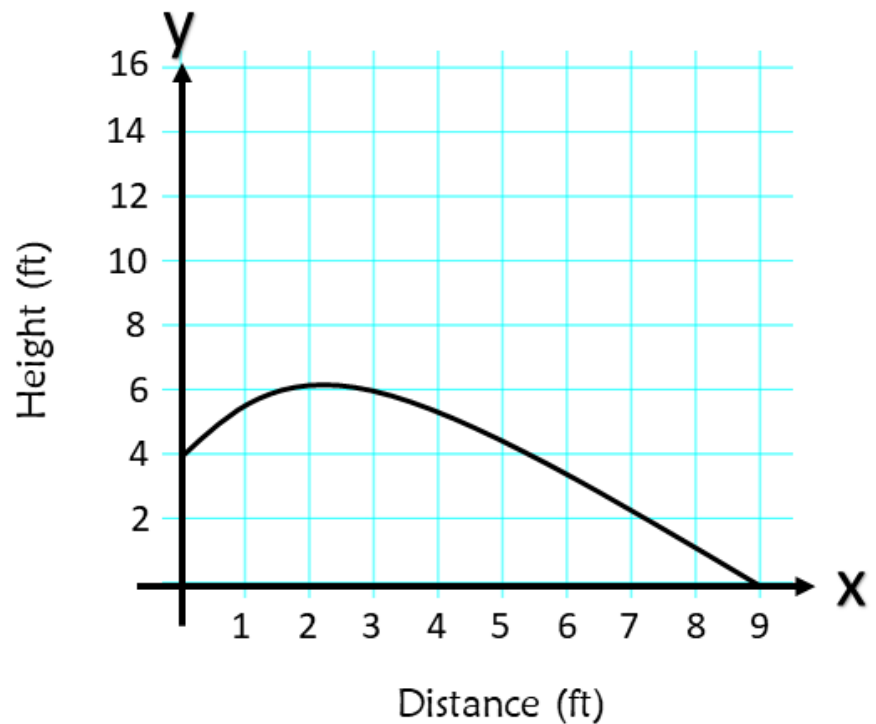
1. How far did the plane go before it hit the ground?

   | | ft |

2. How high did it go?

   | | ft |

3. What is the coordinates of vertex? | x | , | y |

Real-world examples

How does the quadratic equation fit into our everyday lives? Here are 5 examples.
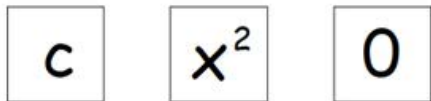
Version 1

1. This is this term that makes the equation quadratic:

   | c | x^2 | 0 |

2. Circle the variables that are **known values** in the quadratic equation:

   | a | x^2 | b | x | c | 0 |

3. Circle the variables that are **unknown values** in the quadratic equation:

   | a | x^2 | b | x | c | 0 |

4. True or false. The quadratic equation can be used to trace the path of an object hat is thrown.

   | true | false | I don't know |

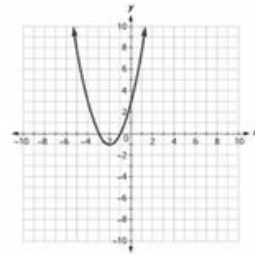5. In the quadratic equation, the variable a equal:

   | x | 0 | 99 |

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Version 2

Print onto cardstock or mount on index cards. Cut pictures apart and show student answer choices for each question.

Q 6

Q 7

intercept   mountain pe

ista Joy, Special Needs for Special Kids
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Version 3
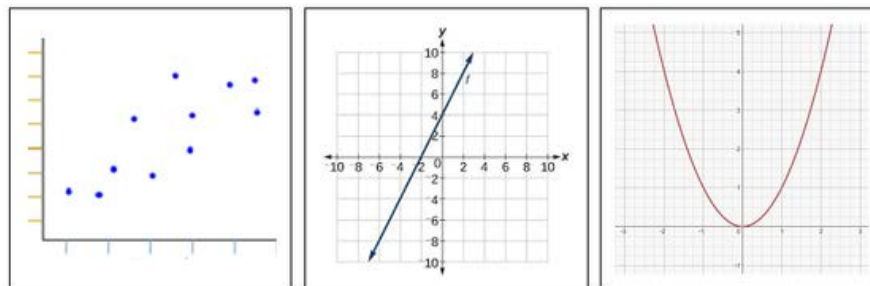
1. This is this term that makes the equation quadratic:
   A. c
   B. x^2
   C. 0

2. Circle the variables that are **known values** in the quadratic equation:
   A. a   D. x
   B. x^2 E. c
   C. b   D. 0

3. Circle the variables that are **unknown values** in the quadratic equation:
   A. a   D. x
   B. x^2 E. c
   C. b   D. 0

4. True or false. The quadratic equation can be used to trace the path of an object hat is thrown.
   A. true
   B. false
   C. I don't know

5. In the quadratic equation, the variable a can never equal:
   A. x
   B. 0
   C. 99

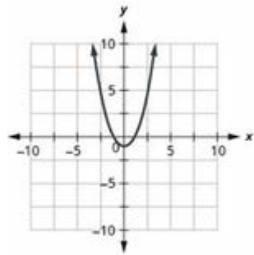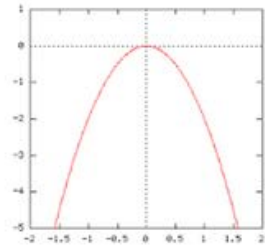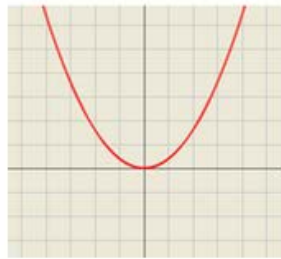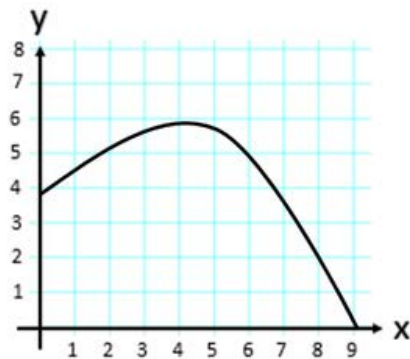6. Which of the following graphs shows a parabola?

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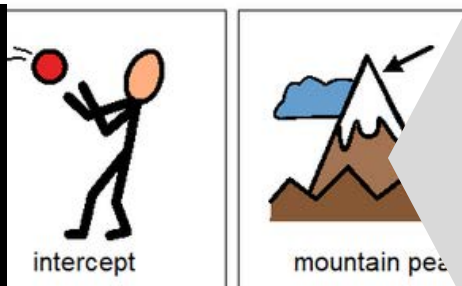

Covers main ideas

FINALLY the assessment!! There are 3 versions.
- 10 questions with 3 picture choices for each question
- cut out the answer choices and glue them on index cards
- traditional multiple choice

Answer key included.

This resource comes in a zipped folder. You will need to unzip the folder to access all the contents which include:

- 10 days of lesson plans
- Color version of activities
- Black and white version of activities
- Quadratic Equations book (PowerPoint) to use with activities
- Digital versions of activities

Also digital activities
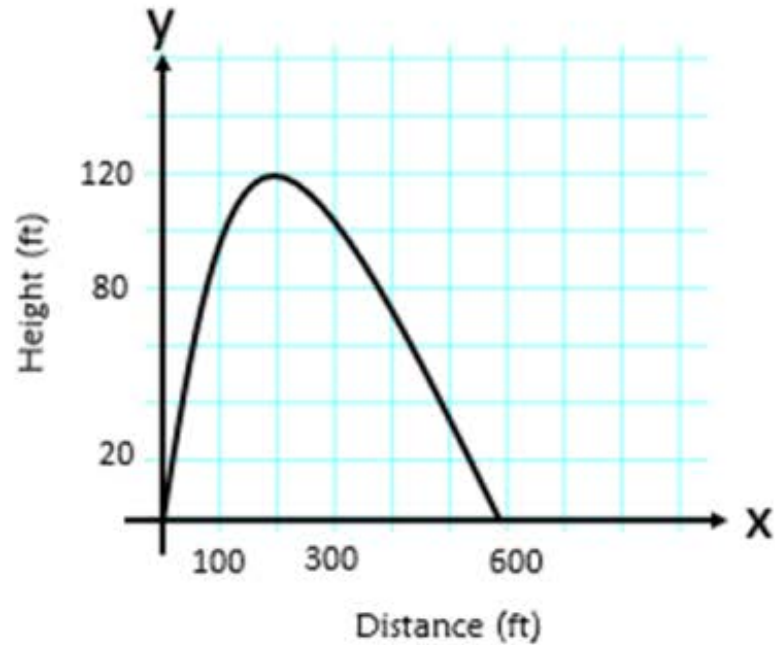
Watch the movie on Quadratic Equations

How else is the quadratic equation used in the real world? An engineer working on a car will use this equation to figure out which brakes are best depending on how fast the car is traveling. That seems pretty important, don't you think?

$V = \dfrac{G \cdot h}{3}$

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This unit also has digital activities. There is a movie version of the book that students can listen to read aloud.

The digital activities have students mainly click and drag their answers. This set has some typing involved.

Tiger hit the golf ball down the fairway. Look at the graph below and answer the questions about how the golf ball traveled.

Fill in the boxes with the correct answers.

1. How far did the golf ball go before it hit the ground?
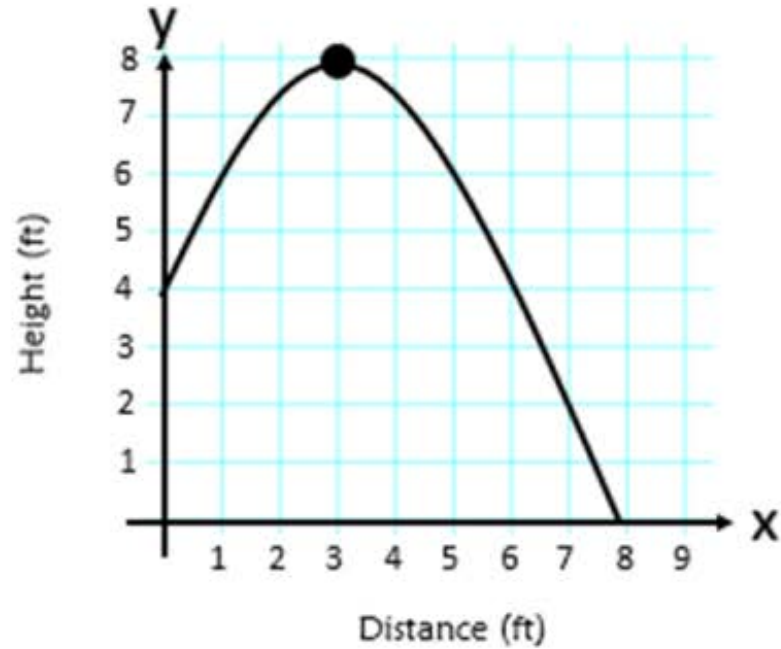
⬚ ft

2. How high did it go?

⬚ ft

3. What is the coordinates of vertex? (X , Y)

Tommy throws the ball to Sally. When he lets go of the ball, it is 4 feet off the ground. Look at the graph below and answer the questions about how the ball traveled.

Fill in the boxes with the correct answers.

3   8

8 ft

8 ft

1. How far away should Sally stand to catch the ball?

ft

2. How high did the ball go?

ft

3. What is the coordinates of vertex?   3 , 8

The second set of slides is differentiated using color. There is no typing in this set of slides.