Student directions *Equation Grapher* activity 2: Parabolic graphs
 20-30 minutes untested

Learning Goals: Students will be able to:
- Sketch how a parabola changes as a, b, and c vary ($y=ax^2 + bx + c$)
- Predict how a parabola will look given equations in a variety of forms.

Directions: Work with a partner on this activity to share ideas and paper. Remember that talking about your learning helps you understand and recall what you learn. Use one part of your graph paper for each number.

1. Sketch the line $y=x^2$ on your graph paper.
    a. Use another color to draw what you think $y=2x^2$ will look like.
    b. Use the *Equation Grapher* simulation to check your ideas. Make corrections if necessary.
    c. Design and do experiments to test how changing the number in front of x^2 changes the look of lines.

2. Your friend, Eli, asked you to help them with his graphing homework. What would you tell Eli to help him use the number in front of x^2? Draw graphs that would help you explain the idea to Eli.

3. Sketch the line $y=x^2$ on your graph paper.
    a. Use another color to draw what you think $y=x^2 + 2$ will look like.
    b. Use the *Equation Grapher* simulation to check your ideas. Make corrections if necessary.
    c. Design and do experiments to test how changing the last number changes the parabola.

4. Your friend, Vanessa, heard that you helped Eli understand graphing so she asked to you to help her. What would you tell Vanessa to help her use the number at the end of the equation? Draw graphs that would help you explain the idea to Van.

5. Sketch the line $y=x^2$ on your graph paper.
    a. Use another color to draw what you think $y=x^2 + 2x$ will look like.
    b. Use the *Equation Grapher* simulation to check your ideas. Make corrections if necessary.
    c. Design and do experiments to test how changing the number in front of x changes the parabola.

6. Your friend, Ryan asked to you to help him how to use the number in front of x? Draw graphs that would help you explain the idea to Ryan.

7. Now put all three ideas together to sketch $y=3x^2+2x+4$. Check your sketch and make corrections if necessary.

8. Sketch graphs for the following, checking your work.
    a. $y = 2x^2+3x-2$
    b. $y = -1x^2+2x+3$
    c. $y = 3x^2+1/3x -1$
    d. $y= 3x^2-2x + 4$
    e. $y=1/2x^2+1/4x-2$

9. Bob is trying to graph the line $y = 2 -.3x^2 + 1/2x$. He can't understand how this problem fits with the lesson because the x^2 isn't at the beginning of the equation.
    a. What could you tell Bob to help him?
    b. Sketch what you think the graph will look like.
    c. Use the sim to check your graph and then make any corrections.