CHAPTER 9: Quadratic Functions Algebra I – 8th Grade Length: 8 Days

Lesson: 9-1 Quadratic Graphs and Their Properties

Objective: To graph quadratic functions of the form $y = ax^2$ and $y = ax^2 + c$. **Standards:** F.IF.7.a – Graph linear and quadratic functions and show intercepts, maxima, and minima.

Plan:

- A. Standard Form
 - a. $y = ax^2 + bx + c$, where $a \neq 0$.
 - b. Simplest form: $f(x) = x^2$ or $y = x^2$. This is called the **parent function**.
 - c. Parabola.
- B. Axis of Symmetry.
 - a. Line dividing the parabola into two equal halves.
- C. Vertex
 - a. The highest or lowest point of the parabola.
 - b. On the axis of symmetry.
 - c. Minimum: lowest point when a parabola opens up.
 - d. Maximum: highest point when a parabola opens down.
- D. Graphing $y = ax^2$.
 - a. Make a table.
 - b. Domain
 - c. Range
 - d. Reflection
 - e. Example
 - i. $f(x) = 2x^2$

ii.
$$f(x) = -\frac{1}{2}x^2$$

- E. Comparing Widths of Parabolas
 - a. Coefficient *a* affects the width and direction.
 - b. When *a* is negative, it opens down.
 - c. When a < 1, the graph widens.
 - d. When a > 1, the graph narrows.
- F. Graphing $y = ax^2 + c$
 - a. *c* tells us to move the parent graph up or down.
 - b. When c < 0, move down.
 - c. When c > 0, move up.

Homework:

p. 550 #8-10, 14-17, 20-23, 34-36, 58

Lesson: 9-2 Quadratic Functions

Objective: To graph quadratic functions in the form: $y = ax^2 + bx + c$.

Standard: F.IF.7.a – Graph linear and quadratic functions and show intercepts, maxima, and minima.

Plan:

- G. Review from 9-1
 - a. *a* affects width
 - b. *c* always crosses y-axis
- H. Axis of Symmetry
 - a. *b* affects the axis of symmetry
 - b. Example
 - i. $y = x^2 vs. y = x^2 + 2x$ 1. New axis of symmetry is x = -1
 - c. Equation: $x = \frac{-b}{2a}$
 - d. Example

i.
$$y = 3x^2 - 2x + 1$$

- I. Finding the vertex from $y = ax^2 + bx + c$
 - a. *Remember that the axis of symmetry runs through the vertex.
 - b. $x = \frac{-b}{2a}$ is going to be the x-coordinate of the vertex. Plug in to find y-coordinate.
 - c. Examples

i.
$$y = x^2 - 6x + 4$$

ii. $y = -2x^2 - 8x - 3$

Homework:

p. 556-557 #7-12, 16-21

Lesson: 9-3 Solving Quadratic Equations

Objective: To solve quadratic equations by graphing and using square roots.

Standard: A.REI.4.b – Solve quadratic equations by inspection.

Plan:

A. Solutions (set = to 0)

- a. Found by graphing or finding square roots if possible.
- b. Solutions are x-intercepts
 - i. Roots of equation
 - ii. Zeros of the function
 - iii. Examples
 - 1. 2 solutions
 - 2. 1 solution
 - 3. 0 solutions
- B. Solve by Graphing
 - a. Example

i. $y = x^2 - 3$

- C. Solving by Using Square Roots
 - a. Not always possible
 - b. Only in the form: $x^2 = k$
 - c. Examples
 - i. $2x^2 36 = 0$ ii. $3x^2 + 15 = 0$

Homework:

p. 564-565 #9-13, 20-23, 72, 74

Lesson: Quiz 9-1 through 9-3

Standard: F.IF.7.a – Graph linear and quadratic functions and show intercepts, maxima, and minima; A.REI.4.b – Solve quadratic equations by inspection.

Plan:

- A. Check homework from the previous night.
- B. Go over any last minute questions.
- C. Pass out Quiz 9-1 through 9-3.

Homework:

No assignment.

Lesson: 9-4 Factoring to Solve Quadratic Equations Objective: To solve quadratic equations by graphing. Standards: A.REI.4.b – Solve quadratic equations by factoring.

Plan:

A. Zero-Product Property

- a. If ab = 0, then a = 0 or b = 0.
- b. So, if (x + 3)(x + 2) = 0, then x + 3 = 0 or x + 2 = 0
- c. Find solutions
 - i. Examples

1.
$$(5x-1)(x+3)=0$$

2.
$$(2x+3)(x-4)=0$$

- B. Solve by Factoring
 - a. Examples
 - i. $x^2 5x 14 = 0$ ii. $x^2 + 14x = -49$ iii. $2x^2 - 15x + 18 = 0$ iv. $3x^2 + 13x = -14$

Homework:

p.571-572 #8-11, 17-22

Lesson: 9-6 Quadratic Formula

Objective: To solve quadratic equations using the quadratic formula. **Standard:** A.REI.4.a – Derive the quadratic formula.

Plan:

A.
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
 when $a \neq 0$
a. Another way to solve quadratic equations.
b. Example: $x^2 - 4x = 21$
i. Get into standard form.
ii. Plug in ABC's
iii. Finding the x-ints
c. Examples
i. $x^2 - 8 = 2x$
ii. $6x^2 + 13x - 17 = 0$

Homework:

p. 586 #7-15, 50-52

Lesson: 9-6 cont. The Discriminant

Objectives: To find the number of solutions of a quadratic equation. **Standard:** A.REI.4.a – Derive the quadratic formula.

Plan:

A. What is it? a. $b^2 - 4ac$ b. Tells us how many real solutions we have. B. Using the discriminant a. $b^2 - 4ac > 0$ means 2 soultions b. $b^2 - 4ac = 0$ means 1 soultion c. $b^2 - 4ac < 0$ means 0 soultions d. Examples: i. $x^2 - 6x + 7 = 0$ ii. $2x^2 - 4x + 2 = 0$ iii. $2x^2 - 3x + 5 = 0$ work:

Homework:

p. 587 #16-21, 29-34

Lesson: Chapter 9 Review

Objective: To review for the Chapter 9 Test

Standards: A.REI.4.a – Derive the quadratic formula; F.IF.7.a – Graph linear and quadratic functions and show intercepts, maxima, and minima; A.REI.4.b – Solve quadratic equations by inspection; A.REI.4.b – Solve quadratic equations by factoring.

Plan:

A. Stations review activity

Homework:

p. 604-605 #7-10, 23-26, 38-41

Lesson: Chapter 9 Test

Standards: A.REI.4.a – Derive the quadratic formula; F.IF.7.a – Graph linear and quadratic functions and show intercepts, maxima, and minima; A.REI.4.b – Solve quadratic equations by inspection; A.REI.4.b – Solve quadratic equations by factoring.

Homework:

No assignment.