

lesson forty - student resource sheet

Lesson Objective: Explore quadratic functions in standard form and their essential characteristics by graphing (describe effect of changes in "a" and "c" using $f(x) = ax^2 + c$). Determine vertex, root, axis of symmetry, and maximum or minimum point.

Vocabulary Box

quadratic function – An equation in the form $f(x) = ax^2 + bx + c$, where a, b, and c are constants and $a \neq 0$. Example: $f(x) = x^2 + 4x - 12$.

parabola – The u-shape of the graph of a quadratic function.

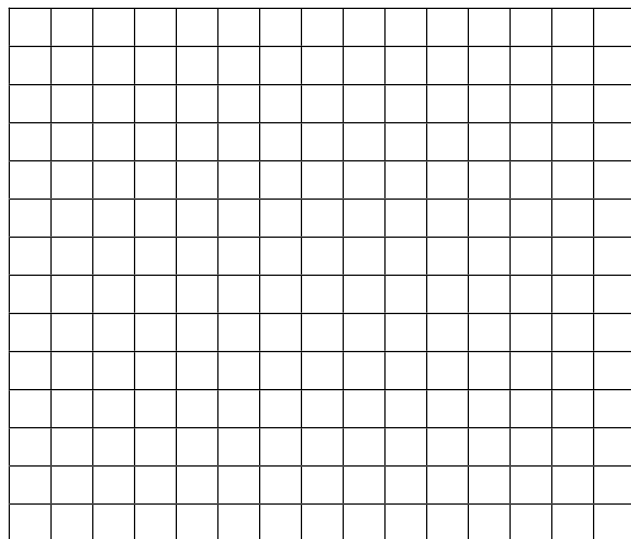
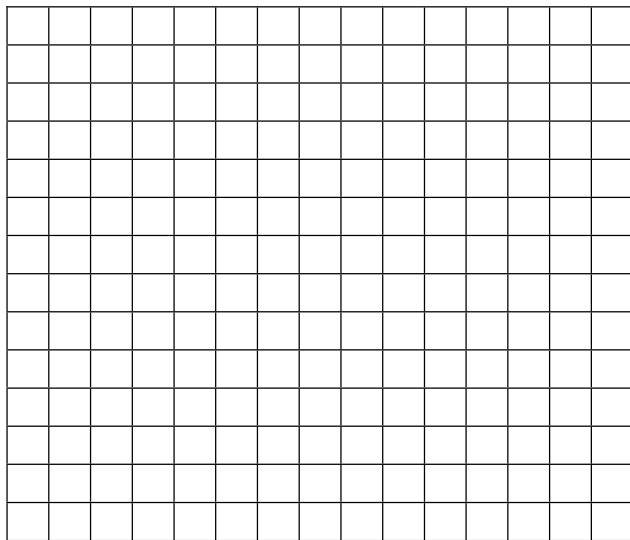
vertex of the graph of a quadratic function – The maximum or highest point of a parabola when $a < 0$, or the minimum or lowest point of a parabola when $a > 0$.

root – The roots of an equation are the same as the solutions to the equation. They are also the same as the x-intercepts of the graph of the equation.

axis of symmetry – A line that passes through a figure in such a way that the part of the figure on one side of the line is a mirror reflection of the part on the other side of the line.

maximum point – The highest point on the graph of a function.

minimum point – The lowest point on the graph of a function.





Independent Practice

Please complete the following practice problems on your own. Your teacher will review the answers.

Directions: Graph each function. Identify its roots, its axis of symmetry, its vertex, and whether its vertex is a maximum point or a minimum point.

1. $f(x) = x^2$

2. $f(x) = -x^2$

3. $f(x) = -4x^2$

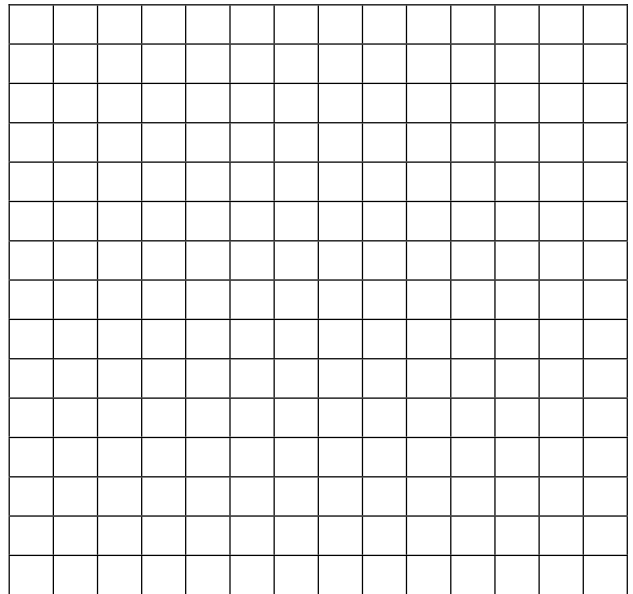
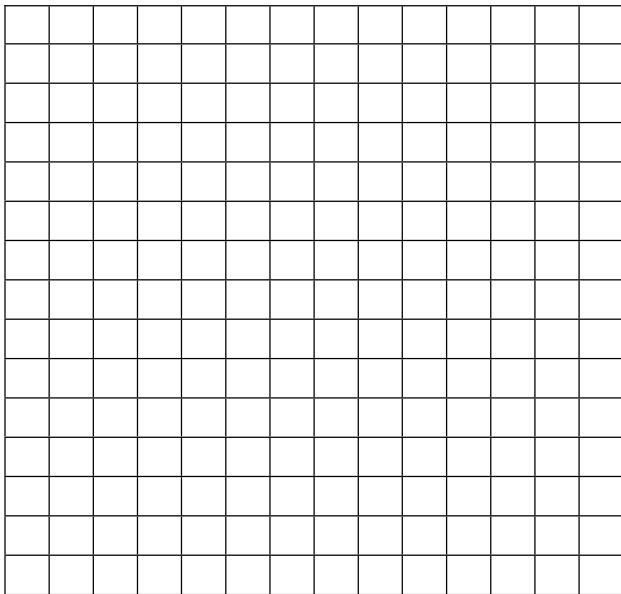
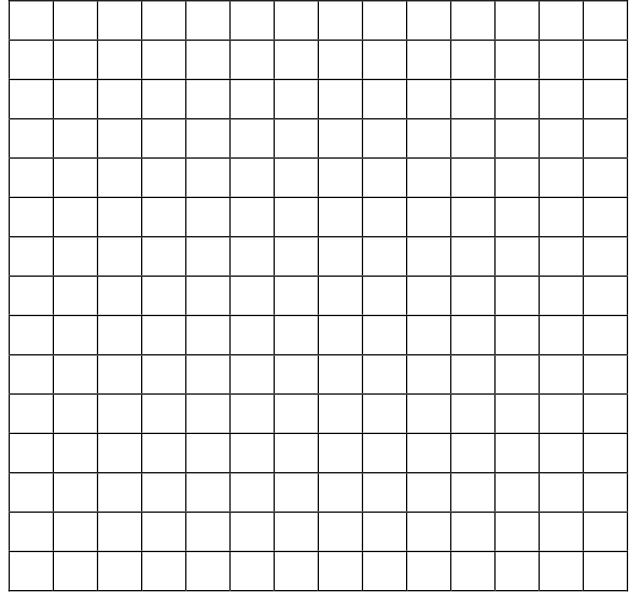
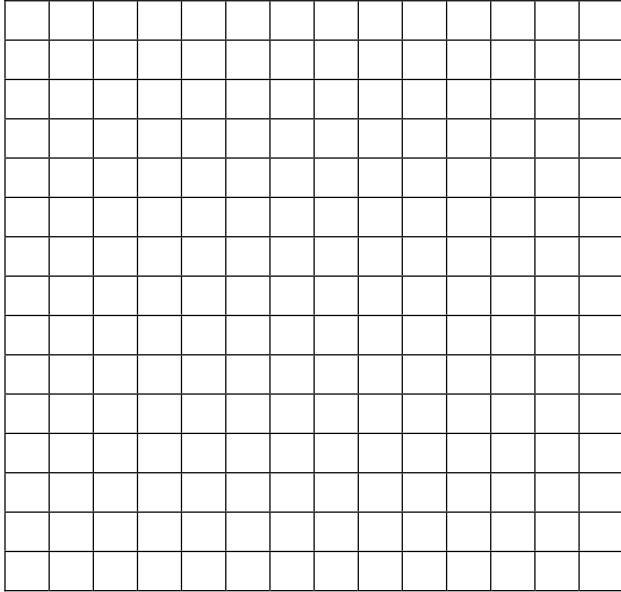
4. $f(x) = x^2 - 4$

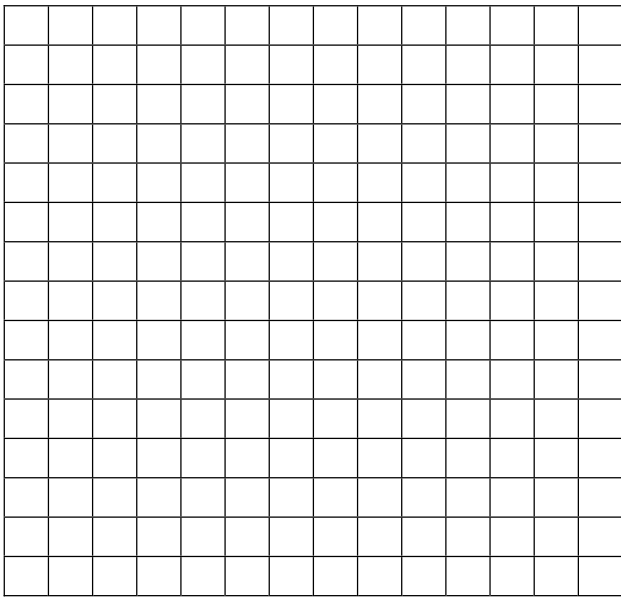
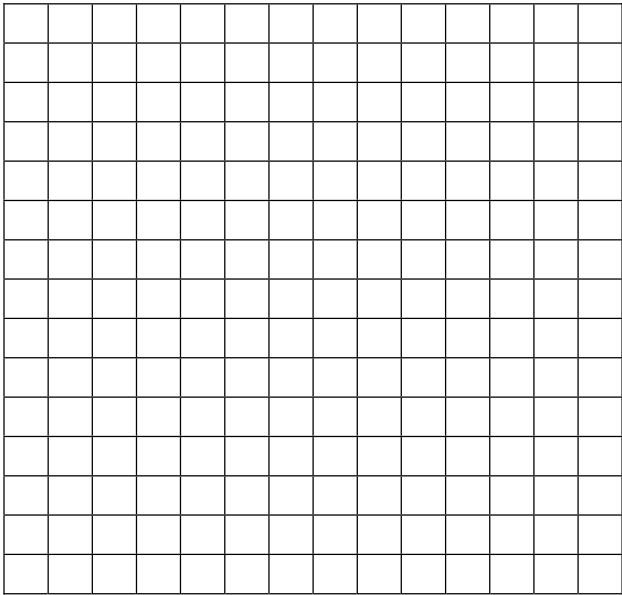
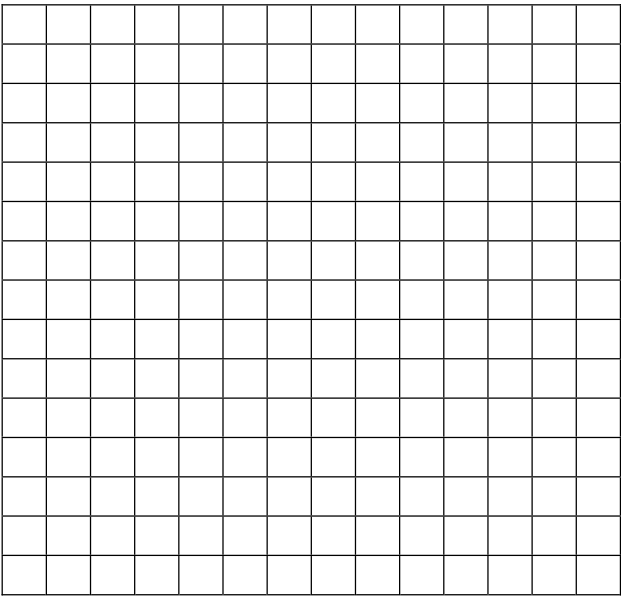
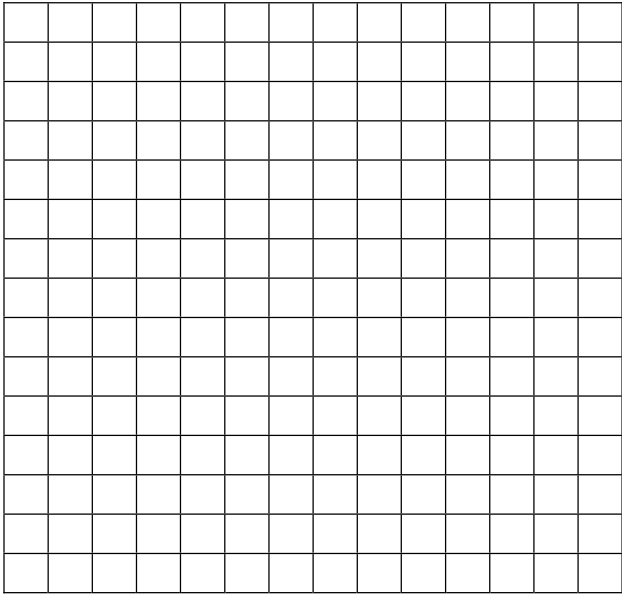
5. $f(x) = -x^2 - 2$

6. $f(x) = 3x^2 + 4$

7. $f(x) = -2x^2 + 8$

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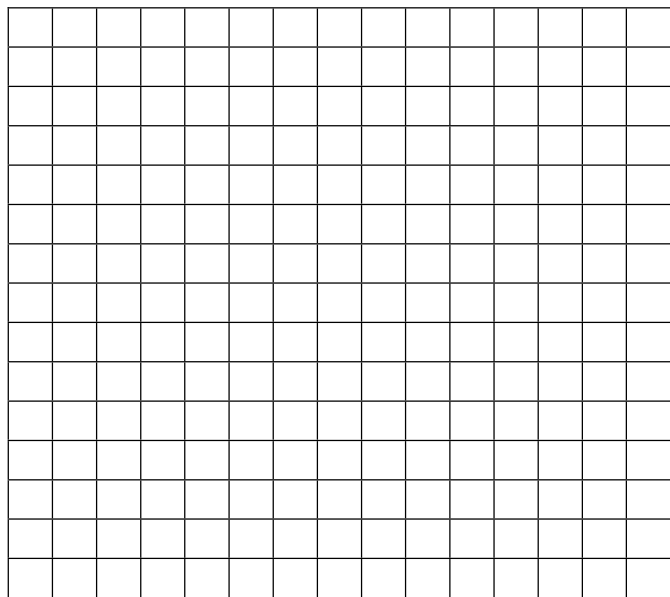
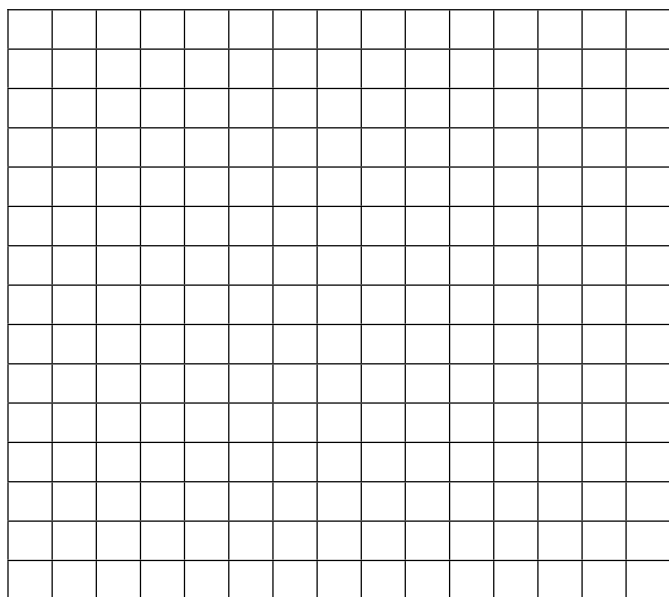
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Directions: Graph each function. Identify its roots, its axis of symmetry, its vertex, and whether its vertex is a maximum point or a minimum point.

A. $f(x) = x^2 + 2x + 1$

B. $f(x) = 4x^2 - 12x + 9$



Problem Solving

The distance that a dropped object is above the ground can be approximated by the quadratic function:

$$d(t) = -16t^2 + h$$

h is the height in feet from which the object was dropped, and t is the time in seconds since the object was released.

1. An object was dropped from a height of 576 feet.
 - What is the distance between the object and the ground after 1 second?
 - After 2 seconds?
 - After how many seconds will the object strike the ground?
2. An object, which was dropped from a specific height, hits the ground after 4 seconds. From what height was the object dropped?
3. Badwater Basin in Death Valley, California, has an elevation of 282 feet below sea level. Dante's View, with an elevation of 5475 feet above sea level, overlooks Badwater Basin.
 - How much higher is Dante's View than Badwater Basin?
 - If an object is dropped from the height of Dante's View, how long would it take to hit the floor of Badwater Basin?

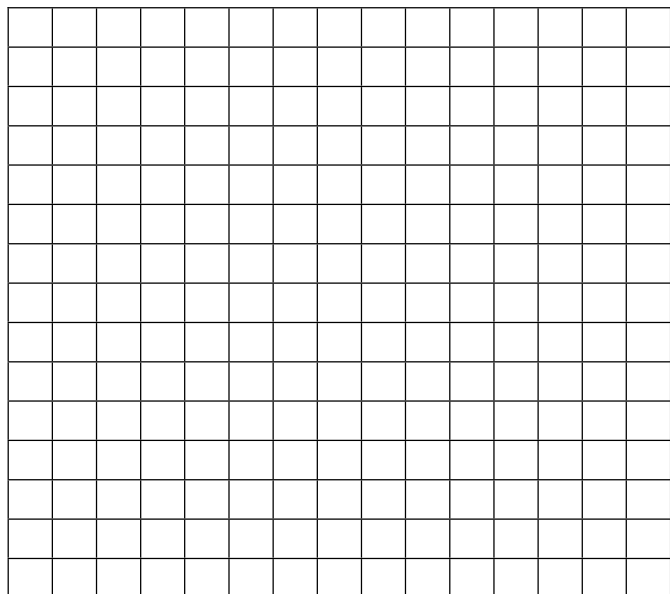
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4. Speedy Squirrel was bragging to the neighborhood chipmunks that she could drop an acorn from a branch that was 144 feet above the ground and then run down to the ground and catch it before it hit the ground.
 - How much time would she have to get in position to catch the acorn?
 - How much time would she have if she dropped the acorn from 64 feet above the ground?
 - From 16 feet above the ground?
 - From what height should Speedy Squirrel attempt her feat, or should she just forget about it?



Directions: On graph paper or on your dry-erase board, as appropriate:

1. Graph the function $f(x) = 2x^2 - 18$.
2. Identify its roots, its axis of symmetry, its vertex, and whether its vertex is a maximum point or a minimum point.
3. Identify the values of a and c , and explain their influences on the graph.



lesson forty one - student resource sheet

Lesson Objective: Solve quadratic equations by completing the square.

Vocabulary Box

completing the square – The process of finding values for a, b, and c, such that $ax^2 + bx + c$ is a perfect square trinomial.



Guided Practice

You will complete the following practice problems with your partner. Then your teacher will review the answers.

Directions: Solve each equation.

1. $-7x^2 + 80 = 17$

2. $(x - 11)^2 = 64$

3. $x^2 + 12x = 25$

4. $x^2 - 8x - 14 = 6$

5. $7x^2 - 42x = 21$

6. $-2x^2 - 6x + 7 = 11$



Summary/Closure

A. Vocabulary Words

Directions: Unscramble the words and symbols to make a correct definition.

Completing the trinomial is a perfect process for finding square values called a and b, such that, $ax^2 + bx + c$, is the square of c.

B. Summarize What We Learned Today

Directions: Write an example of a quadratic equation that will need to be solved by using all of the steps of the process of completing the square. Then solve the equation by completing the square. Then explain how to solve a quadratic equation by completing the square. You will use this explanation as a personal reference sheet.

lesson forty two - student resource sheet

Lesson Objective: Solve quadratic equations by completing the square.

Vocabulary Box

completing the square – The process of finding values for a, b, and c, such that $ax^2 + bx + c$ is a perfect square trinomial.



Independent Practice

Please complete the following practice problems on your own. Your teacher will review the answers.

Directions: Solve each equation.

1. $x^2 - 13 = -4$

2. $-5x^2 = -55$

3. $(x - 17)^2 = 225$

4. $3(x + 4)^2 = 27$

5. $x^2 + 7x = 18$

6. $x^2 - 12x + 36 = 75$

7. $x^2 - 16x + 100 = 37$

8. $-5x^2 - 60x = 35$

9. $9x^2 + 81x + 80 = -100$



Directions: Solve each equation.

A. $x^2 + \frac{1}{3}x + \frac{1}{36} = \frac{4}{9}$ (Express your answers as exact fractions.)

B. $x^2 + 6x + 36 = 18$

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Problem **Solving**

Directions: Find the next three terms in each pattern. Then write a rule for the pattern; let n = the number of the term. Then use your rule to find the 31st term in the pattern.

Example: 5, 8, 11, 14, 17, _____, _____, _____

- 20, 23, 26
- $3n + 2$
- $3(31) + 2 = 95$

1. -3, -1, 1, 3, 5, _____, _____, _____

2. 1, 4, 9, 16, 25, _____, _____, _____

3. -3, -12, -27, -48, -75, _____, _____, _____

4. 2, 6, 12, 20, 30, _____, _____, _____

5. 5, 11, 19, 29, 41, _____, _____, _____



Directions: Solve each equation.

1. $(x - 13)^2 = 81$

2. $x^2 + 14x = 30$

3. $2x^2 + 20x + 37 = 5$
