

Process Standards:

Students will be able to:

- Interpret results in ways that are meaningful for the given context.
- Effectively communicate their mathematical knowledge.
- Exhibit characteristics of a cooperative learner.
- Organize class materials so that they are easily accessible and able to be used as an additional resource in problem solving situations.

Content Standards:

Students will be able to:

- Perform operations and transformations on functions, polynomials, and other mathematical entities.
- Recognize equivalent forms of an expression, equation, function or relation.
- Generate equivalent forms of an expression, equation, function or relation.
- Solve problems that involve quantities.

Some quadratic expressions have a special type of factorization, in which the two factors are the same. For example, $x^2 - 6x + 9$ is equal to the product $(x - 3)(x - 3)$, which can also be written as $(x - 3)^2$. Expressions such as $x^2 - 6x + 9$, which can be written as the square of another expression, are called **square** or **perfect squares**.

Your task in this assignment is to see which quadratic expressions are perfect squares. You should restrict yourself to quadratic expressions whose x^2 - coefficient is 1. That is, you want to find a rule that tells you whether an expression of the form $x^2 + bx + c$ is a perfect square. You will also begin to build an understanding of graphs of quadratic equations in **vertex form**.

1. Multiply out each of these expressions, look at the trinomials you get, and examine how the coefficients of those trinomials are related to the expression you are squaring.

a. $(x + 4)^2$

b. $(x - 5)^2$

c. $(x + 7)^2$

2. Generalize your work from Question 1. State a general rule that will tell you if a quadratic expression with x^2 -coefficient equal to 1 is a perfect square. Explain that rule using an area diagram.
3. In each of these expressions, find a number for the constant term c so that the expression will be a perfect square. This is called **completing the square**.
- a. $x^2 + 6x + c$ b. $x^2 - 12x + c$ c. $x^2 + 9x + c$
4. a. Make a table of values showing at least six number pairs that fit the equation $y = (x - 3)^2$.
- b. Plot those points and then connect your points with a smooth curve that you think represents the graph.
5. Repeat steps a and b of Question 4 for the equation $y = (x - 5)^2$.
6. Repeat steps a and b of Question 5 for the equation $y = (x + 7)^2$.
7. Generalize from the curves you got in Question 3 through 5 to describe the graph of the function $y = (x - h)^2$. Your description should include the coordinates of the vertex for the graph.