ALBERT

Name _____ Date _____

Zeros, Vertex and Symmetry of Quadratics Worksheet

Algebra 1 · Common Core HSF-IF.C.8a

> Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

Practice

Builds the skill step by step.

1. $f(x) = (x - 2)(x - 6)$. What is its axis of symmetry? Give the value c in $x = c$.

2. What is the vertex of $f(x) = (x - 2)(x - 6)$?

3. Factor to find the zeros of $f(x) = x^2 - 10x + 21$. List them from least to greatest.

4. Complete the square to find the minimum value of $f(x) = x^2 + 4x + 7$.

5. What is the axis of symmetry of $f(x) = -2(x - 5)^2 + 1$? Give the value c in $x = c$.

6. Which form of a quadratic shows its maximum or minimum value directly?

   A. vertex form, $a(x - h)^2 + k$

   B. factored form

   C. standard form

   D. none of them

7. A ball's height is $h(t) = -16t^2 + 32t$ feet. What is its maximum height?

8. For $h(t) = -16t^2 + 32t$, at what time t does the ball reach its maximum height?

9. A parabola has $f(1) = f(5)$. What is its axis of symmetry? Give the value c in $x = c$.

10. Which form of a quadratic shows its zeros directly?

    A. vertex form

    B. factored form

    C. none of them

    D. standard form

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On Level

Grade-level practice.

1. What is the vertex of $f(x) = x^2 - 6x + 8$?

2. A company's profit is $P(x) = -2x^2 + 40x - 150$ dollars for x items. What is the maximum profit?

3. For $P(x) = -2x^2 + 40x - 150$, how many items give the maximum profit?

4. For $P(x) = -2x^2 + 40x - 150$, at what numbers of items is the profit 0? List them from least to greatest.

5. Explain what the zeros 5 and 15 of $P(x) = -2x^2 + 40x - 150$ mean for the company.

6. What is the minimum value of $f(x) = 3x^2 - 12x + 1$?

7. A parabola has its axis of symmetry at $x = 5$, and $f(2) = 7$. For what other value of x is $f(x) = 7$?

8. A rocket's height is $h(t) = -5t^2 + 40t$ meters. What is its maximum height?

9. Which form shows the y-intercept most directly?

   A. vertex form

   B. factored form

   C. standard form, $ax^2 + bx + c$

   D. none of them

10. A rectangle's area is $A(x) = x(30 - x)$. What is the largest possible area?

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Challenge

Multi-step and word problems that stretch it.

1. A ball's height is $h(t) = -16t^2 + 96t + 112$ feet. When does it hit the ground?

2. For $h(t) = -16t^2 + 96t + 112$, what is the maximum height?

3. A parabola has vertex $(-1, 4)$ and passes through $(1, 0)$. What are its zeros? List them from least to greatest.

4. $f(x) = 2(x - 3)^2 - 8$. What are its zeros? List them from least to greatest.

5. Revenue is $R(p) = p(200 - 4p)$ dollars at price p. What is the maximum revenue?

6. For $R(p) = p(200 - 4p)$, at what price p is revenue greatest?

7. Explain why the axis of symmetry of a parabola is halfway between its zeros.

8. $f(x) = x^2 + bx + 9$ has exactly one zero, and b is positive. What is b?

9. A pen against a wall uses 60 m of fence for three sides: $A(x) = x(60 - 2x)$. What is the largest area?

10. $f(x) = -(x - 4)^2 + 9$ can also be written as $-(x - 1)(x - 7)$. What do the two forms show together?

    A. a maximum of 4 and zeros at 9 and 0

    B. two different functions

    C. a minimum of 9 and zeros at -1 and -7

    D. a maximum of 9 at $x = 4$, and zeros at 1 and 7