LESSON MAKER PRO

Reveal the Features

Rewrite quadratics to show zeros and extreme values.

HIGH SCHOOL · HSA-SSE.B.3

CCSS.Math.Content.HSA-SSE.B.3 "Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. *"

NAME _____ DATE _____

CHOOSE THE USEFUL FORM

Factoring a quadratic can reveal its zeros because a product is 0 when at least one factor is 0. Completing the square can reveal a minimum or maximum because vertex form shows the value at the vertex.

WORKED EXAMPLE

Factor $x^2 + 11x + 24$. Then state the zeros.

1. Find two factors of 24 that add to 11: 3 and 8.
2. Rewrite: $x^2 + 11x + 24 = (x + 3)(x + 8)$.
3. Set each factor equal to 0: $x + 3 = 0$ or $x + 8 = 0$.

Answer: (x + 3)(x + 8); zeros: x = -3 and x = -8

PRACTICE 6 problems

1 Factor $x^2 + 5x - 6$. Then state its zeros.

ANSWER _____

2 Factor $x^2 - 12x + 35$. Then state its zeros.

ANSWER _____

3 Factor $2x^2 - 14x$. Then state its zeros.

ANSWER _____

4 Factor $x^2 - 4x - 12$. Then state its zeros.

ANSWER _____

5 Rewrite $x^2 + 4x - 1$ in vertex form. State its minimum value and where it occurs.

ANSWER _____

6 Rewrite $3x^2 + 12x$ in vertex form. State its minimum value and where it occurs.

ANSWER _____

APPLY IT Show your work

1 The robotics club models its profit P(x), in hundreds of dollars, from selling x batches of custom keychains by $P(x) = -x^2 + 16x - 60$. Rewrite P(x) in factored form. What two sales amounts give a profit of 0?

WORK SPACE

ANSWER _____

2 A student DJ's net earnings E(x), in hundreds of dollars, after x weekend events are $E(x) = -2x^2 + 20x - 18$. Rewrite E(x) in vertex form. What is the greatest net earnings, and at how many events does it occur?

WORK SPACE

ANSWER _____

CHALLENGE One step up

For $Q(x) = x^2 - 14x + 40$, write both a factored form and a vertex form. Use the factored form to state the zeros, and use the vertex form to state the least value. Explain which form reveals each property.

WORK SPACE AND ANSWER

Reveal the Features

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Factor $x^2 + 5x - 6$. Then state its zeros.	**$(x + 6)(x - 1)$; zeros: $x = -6$ and $x = 1$**
2	Factor $x^2 - 12x + 35$. Then state its zeros.	**$(x - 5)(x - 7)$; zeros: $x = 5$ and $x = 7$**
3	Factor $2x^2 - 14x$. Then state its zeros.	**$2x(x - 7)$; zeros: $x = 0$ and $x = 7$**
4	Factor $x^2 - 4x - 12$. Then state its zeros.	**$(x - 6)(x + 2)$; zeros: $x = 6$ and $x = -2$**
5	Rewrite $x^2 + 4x - 1$ in vertex form. State its minimum value and where it occurs.	**$(x + 2)^2 - 5$; minimum value: -5 at $x = -2$**
6	Rewrite $3x^2 + 12x$ in vertex form. State its minimum value and where it occurs.	**$3(x + 2)^2 - 12$; minimum value: -12 at $x = -2$**

PART 2 · APPLY IT

1. **$P(x) = -(x - 6)(x - 10)$; a profit of 0 occurs at 6 batches and 10 batches.** Factor out -1, then factor $x^2 - 16x + 60$. Set each factor equal to 0 to find $x = 6$ and $x = 10$.
2. **$E(x) = -2(x - 5)^2 + 32$; the greatest net earnings are $3,200 at 5 events.** Factor -2 from the quadratic and linear terms, then complete the square. The squared term is 0 at $x = 5$, so the maximum is 32 hundreds of dollars.

CHALLENGE

$Q(x) = (x - 4)(x - 10)$ and $Q(x) = (x - 7)^2 - 9$. The zeros are $x = 4$ and $x = 10$. The least value is -9 at $x = 7$. Factored form reveals the zeros, and vertex form reveals the least value.

Accept equivalent factored forms with factors in either order and equivalent vertex forms with correct simplification. For minimum and maximum questions, require both the extreme value and the x-value where it occurs.