LESSON MAKER PRO

Form Reveals More

Rewrite expressions to uncover 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 HELPFUL FORM

Use factored form, a(x - r)(x - s), when you need the zeros because r and s make the expression equal 0. Use vertex form, a(x - h)^2 + k, when you need a greatest or least value because the vertex is (h, k). A positive a gives a minimum, and a negative a gives a maximum.

WORKED EXAMPLE

Rewrite x^2 + 13x + 36 in factored form. Then state its zeros.

1. Find two numbers with product 36 and sum 13: 4 and 9.
2. Write the factors: x^2 + 13x + 36 = (x + 4)(x + 9).
3. Set each factor equal to 0: x = -4 or x = -9.

Answer: (x + 4)(x + 9); zeros: x = -4 and x = -9

PRACTICE 6 problems

1 Rewrite x^2 - 11x + 24 in factored form. Then state its zeros.

ANSWER _____

2 Rewrite x^2 + 3x - 18 in factored form. Then state its zeros.

ANSWER _____

3 Rewrite 6x^2 + 7x - 3 in factored form. Then state its zeros.

ANSWER _____

4 Rewrite x^2 + 12x + 20 in vertex form. State its minimum value and where it occurs.

ANSWER _____

5 Rewrite -3x^2 + 18x - 20 in vertex form. State its maximum value and where it occurs.

ANSWER _____

6 Rewrite 3(x + 2)^2 - 27 in standard form. State its minimum value and where it occurs.

ANSWER _____

APPLY IT Show your work

1 A pop-up esports tournament models its profit with P(t) = -t^2 + 20t - 84, where P is profit in hundreds of dollars and t is the number of hours after opening. Rewrite P(t) in factored form. When does the tournament break even?

WORK SPACE

ANSWER _____

2 An online art shop models daily profit with P(p) = -p^2 + 16p + 45, where p is the price, in dollars, of a sticker pack. Rewrite P(p) in vertex form. What price gives the greatest profit, and what is that profit?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

For f(x) = 2x^2 - 20x + 32, write one equivalent form that reveals the zeros and another equivalent form that reveals the minimum value. State both properties.

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_____

ANSWER KEY

Form Reveals More

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Rewrite x^2 - 11x + 24 in factored form. Then state its zeros.	**(x - 3)(x - 8); zeros: x = 3 and x = 8**
2	Rewrite x^2 + 3x - 18 in factored form. Then state its zeros.	**(x + 6)(x - 3); zeros: x = -6 and x = 3**
3	Rewrite 6x^2 + 7x - 3 in factored form. Then state its zeros.	**(3x - 1)(2x + 3); zeros: x = 1/3 and x = -3/2**
4	Rewrite x^2 + 12x + 20 in vertex form. State its minimum value and where it occurs.	**(x + 6)^2 - 16; minimum value: -16 at x = -6**
5	Rewrite -3x^2 + 18x - 20 in vertex form. State its maximum value and where it occurs.	**-3(x - 3)^2 + 7; maximum value: 7 at x = 3**
6	Rewrite 3(x + 2)^2 - 27 in standard form. State its minimum value and where it occurs.	**3x^2 + 12x - 15; minimum value: -27 at x = -2**

PART 2 · APPLY IT

1. **P(t) = -(t - 6)(t - 14); the tournament breaks even at t = 6 hours and t = 14 hours.** Factor out -1, then factor t^2 - 20t + 84. The zeros of the factored expression give the break-even times.
2. **P(p) = -(p - 8)^2 + 109; a price of $8 gives a greatest profit of $109.** Complete the square to write the expression in vertex form. Because the squared term has a negative coefficient, the vertex gives the greatest profit.

CHALLENGE

Factored form: 2(x - 2)(x - 8), so the zeros are x = 2 and x = 8. Vertex form: 2(x - 5)^2 - 18, so the minimum value is -18 at x = 5.

Accept factors in either order and equivalent vertex forms with correct values. For zero questions, students should state both x-values, and for extreme-value questions, students should state both the value and the x-value where it occurs.