LESSON MAKER PRO

Reveal the Zeros

Rewrite quadratic expressions to see when they equal zero.

HIGH SCHOOL · A2S.AF.A

A2S.AF.A "Expressions can be rewritten in equivalent forms by using algebraic properties, including properties of addition, multiplication, and exponentiation, to make different characteristics or features visible."

NAME _____ DATE _____

FACTOR TO SEE ZEROS

Factoring uses the distributive property backward to rewrite a quadratic expression as a product. The product equals zero when at least one factor equals zero. Factor first, then set each factor equal to zero to find the zeros.

WORKED EXAMPLE

Factor $x^2 + 19x + 84$, then find its zeros.

1. Find two numbers whose product is 84 and whose sum is 19: 7 and 12.
2. Split the middle term: $x^2 + 7x + 12x + 84$.
3. Group and factor: $x(x + 7) + 12(x + 7) = (x + 7)(x + 12)$.
4. Set each factor equal to zero: $x + 7 = 0$ or $x + 12 = 0$.

Answer: (x + 7)(x + 12); zeros: -7 and -12

PRACTICE 6 problems

1 Factor $x^2 + 6x + 8$ fully.

ANSWER _____

2 Factor $x^2 - 9x + 20$ fully.

ANSWER _____

3 Factor $x^2 + x - 20$ fully.

ANSWER _____

4 Factor $x^2 - 16$ fully.

ANSWER _____

5 Factor $3x^2 + 18x + 24$ fully, then list its zeros.

ANSWER _____

_____

6 Factor $2x^2 + 11x + 15$ fully, then list its zeros.

ANSWER _____

_____

APPLY IT Show your work

1 An online shop models its weekly profit, in hundreds of dollars, after raising a hoodie price by x dollars as $P(x) = -x^2 + 14x - 40$. Factor P(x), then find the two price increases that give zero profit.

WORK SPACE

ANSWER _____

2 A student designs a rectangular backdrop with area $x^2 + 11x + 24$ square feet. Each side length is x plus a whole number of feet. Factor the area expression to find the two side-length expressions.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Factor $4x^2 - 4x - 15$ fully. Find its zeros and explain how the factored form shows them.

WORK SPACE AND ANSWER

Reveal the Zeros

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Factor $x^2 + 6x + 8$ fully.	**(x + 2)(x + 4)**
2	Factor $x^2 - 9x + 20$ fully.	**(x - 4)(x - 5)**
3	Factor $x^2 + x - 20$ fully.	**(x + 5)(x - 4)**
4	Factor $x^2 - 16$ fully.	**(x - 4)(x + 4)**
5	Factor $3x^2 + 18x + 24$ fully, then list its zeros.	**3(x + 2)(x + 4); zeros: -2 and -4**
6	Factor $2x^2 + 11x + 15$ fully, then list its zeros.	**(2x + 5)(x + 3); zeros: -5/2 and -3**

PART 2 · APPLY IT

1. **P(x) = -(x - 4)(x - 10); price increases of $4 and $10** Factor out -1, then factor $x^2 - 14x + 40$. Set each factor equal to zero.
2. **(x + 3)(x + 8); side lengths: x + 3 feet and x + 8 feet** The numbers 3 and 8 multiply to 24 and add to 11, so they give the constant terms in the two side lengths.

CHALLENGE

(2x + 3)(2x - 5); zeros: -3/2 and 5/2. The product is zero when 2x + 3 = 0 or 2x - 5 = 0.

Accept factors in either order. For zero-finding items, accept the zeros in either order.