WARM-UP

Matching Equivalent Forms of an Equation

An equation is considered to be in *factored form* when the product of the factors is equal to 0. Match each factored form of the equation with its equivalent standard form and nonstandard form.

FOIL

Factored Form		Standard Form		Nonstandard Form	
a.	$(x-1)(x-3)=0$	A.	$x^2-x-2=0$	1.	$x^2-5x=-6$
b.	$(x-2)(x-3)=0$	B.	$x^2+x-2=0$	2.	$(x-1)^2=4$
c.	$(x+1)(x-2)=0$	C.	$x^2-4x+3=0$	3.	$x^2-x=2$
d.	$(x-1)(x+2)=0$	D.	$x^2-5x+6=0$	4.	$x(x+1)=2$
e.	$(x+1)(x-3)=0$	E.	$x^2-2x-3=0$	5.	$x^2-4x=-3$

$x^2+x=2$

$x^2-3x-x+3=x^2-4x+3$

$x^2-3x-2x+6=x^2-5x+6$

$x^2-2x+x-2=x^2-x-2$

$x^2+2x-x-2=x^2+x-2$

$x^2-3x+x-3=x^2-2x-3$

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7.4 Solve Polynomial Equations in Factored Form:

Essential Question How can you solve a polynomial equation?

Core Vocabulary

factored form, *p. 378*
Zero-Product Property, *p. 378*
roots, *p. 378*
repeated roots, *p. 379*

Previous
polynomial
standard form
greatest common factor (GCF)
monomial

What You Will Learn

- Use the Zero-Product Property.
- Factor polynomials using the GCF.
- Use the Zero-Product Property to solve real-life problems.

Who is Sherlock Holmes?

What conclusion would Sherlock come to if you told him that "a" times "b" times "c" = 0 ?

abc = 0

a, b, or c must = 0

Sherlock's conclusion is called the Zero Product Property!

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Using the Zero-Product Property

A polynomial is in **factored form** when it is written as a product of factors.

Standard form	Factored form
$x^2 + 2x$	$x(x + 2)$
$x^2 + 5x - 24$	$(x - 3)(x + 8)$

When one side of an equation is a polynomial in factored form and the other side is 0, use the **Zero-Product Property** to solve the polynomial equation. The solutions of a polynomial equation are also called **roots**, zeros, x-intercepts.

Core Concept

Zero-Product Property

Words If the product of two real numbers is 0, then at least one of the numbers is 0.

Algebra If a and b are real numbers and $ab = 0$, then $a = 0$ or $b = 0$.

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Examples:

Solve each equation.

a. $(2x)(x - 4) = 0$

$\frac{2x}{2} = \frac{0}{2}$ $\quad x - 4 = 0$

$x = 0$ $\quad +4 \ +4$

$x = 4$

$x = 0, 4$

b. $(x - 3)(x - 9) = 0$

$x - 3 = 0$ $\quad x - 9 = 0$

$+3 \ +3$ $\quad +9 \ +9$

$x = 3$ $\quad x = 9$

$x = 3, 9$

```
2(0)(0-4)
2(4)(4-4)
```

```
0
0
```

CHECK!

```
(3-3)(3-9)
(9-3)(9-9)
```

```
0
0
```

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When two or more roots of an equation are the same number, the equation has repeated roots.

STUDY TIP

You can extend the Zero-Product Property to products of more than two real numbers.

Solve each equation.

a. $(2x + 7)(2x - 7) = 0$

$2x + 7 = 0$ $\quad 2x - 7 = 0$

$-7 \ -7$ $\quad +7 \ +7$

$\frac{2x}{2} = \frac{-7}{2}$ $\quad \frac{2x}{2} = \frac{7}{2}$

$x = -\frac{7}{2}$ $\quad x = \frac{7}{2}$

$x = \pm\frac{7}{2}$

b. $(x - 1)^2 = 0$

$(x-1)(x-1) = 0$

$x - 1 = 0$ $\quad x - 1 = 0$

$+1 \ +1$ $\quad +1 \ +1$

$x = 1$ $\quad x = 1$

$x = 1$

c. $(x + 1)(x - 3)(x - 2) = 0$

$x + 1 = 0$ $\quad x - 3 = 0$ $\quad x - 2 = 0$

$-1 \ -1$ $\quad +3 \ +3$ $\quad +2 \ +2$

$x = -1$ $\quad x = 3$ $\quad x = 2$

$x = -1, 2, 3$

*** You can check your answers when it says to solve!***

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Factor out the greatest common monomial factor from $4x^4 + 24x^3$.

$4x^3(1x + 6)$

$4x^3(x+6)$

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1) set equal to zero - keep squared term positive
2) put in factored form ( ) ( ) GCF
3) use ZPP each factor = 0 and solve for your variable

Solve.

a. $4x^2 + 12x = 0$

$(4x)(1x+3)=0$

$\frac{4x}{4}=\frac{0}{4}$ $\quad x+3=0$

$x=0$ $\quad -3\ -3$

$x=-3$

$x=-3,0$

b. $-10a^2 = 8a$

$-8a\ -8a$

$-10a^2-8a=0$

$(-2a)(5a+4)=0$

$\frac{-2a}{-2}=\frac{0}{-2}$ $\quad 5a+4=0$

$a=0$ $\quad -4\ -4$

$\frac{5a}{5}=\frac{-4}{5}$

$a=-\frac{4}{5}$

$a=-\frac{4}{5},0$

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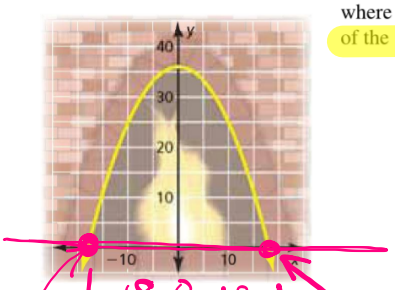
Real-Life Application

You can model the arch of a fireplace using the equation $y = -\frac{1}{9}(x + 18)(x - 18)$, where x and y are measured in inches. The x-axis represents the floor. Find the width of the arch at floor level.



18 ° 18

-18 x? 18

36 in

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Write a polynomial equation that has −6 and 4 as solutions.

$x = -6, 4$

$+6 \quad -4 \quad +6 \quad -4$

$(x+6)(x-4)=0$

FOIL $x^2 - 4x + 6x - 24 = 0$

$x^2 + 2x - 24 = 0$

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7.4 Solve Polynomial Eq's in Factored Form:

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