# 9-6 Solving Quadratic Equations by Factoring

## *Objective*

I can and I will solve quadratic equations by factoring.

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You have solved quadratic equations by graphing. Another method used to solve quadratic equations is to factor and use the Zero Product Property.

**Zero Product Property**

For all real numbers $a$ and $b$,

| WORDS | NUMBERS | ALGEBRA |
|---|---|---|
| If the product of two quantities equals zero, at least one of the quantities equals zero. | $3(0) = 0$<br>$0(4) = 0$ | If $ab = 0$,<br>then $a = 0$ or $b = 0$. |

## Watch This: Use the Zero Product Property

**Use the Zero Product Property to solve the equation. Check your answer.**

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

$x - 7 = 0$ or $x + 2 = 0$ *Use the Zero Product Property.*

$x = 7$ or $x = -2$ *Solve each equation.*

The solutions are 7 and −2.

## Watch This Continued

**Use the Zero Product Property to solve the equation. Check your answer.**

***Check*** $(x - 7)(x + 2) = 0$

| | |
|---|---|
| $(7 - 7)(7 + 2)$ | $0$ |
| $(0)(9)$ | $0$ |
| $0$ | $0$ ✓ |

***Check*** $(x - 7)(x + 2) = 0$

| | |
|---|---|
| $(-2 - 7)(-2 + 2)$ | $0$ |
| $(-9)(0)$ | $0$ |
| $0$ | $0$ ✓ |

*Substitute each solution for x into the original equation.*

# 9-6 Solving Quadratic Equations by Factoring

## Example 1)

***Use the Zero Product Property to solve each equation. Check your answer.***

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

$(0)(0+4)$ $(-4)(-4+4)$ $(-4)(0)$

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

$-4 \quad -4$

$x = -4$

0 and -4

## Example 2)

***Use the Zero Product Property to solve the equation. Check your answer.***

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

$x + 4 = 0$ $\qquad$ $x - 3 = 0$

$x = -4$ $\qquad$ $x = 3$

# 9-6 Solving Quadratic Equations by Factoring

If a quadratic equation is written in standard form, $ax^2 + bx + c = 0$, then to solve the equation, you may need to factor before using the Zero Product Property.

# 9-6 Solving Quadratic Equations by Factoring

## Watch This!

**Solve the quadratic equation by factoring. Check your answer.**

$x^2 - 6x + 8 = 0$

$(x - 4)(x - 2) = 0$ *Factor the trinomial.*

$x - 4 = 0$ or $x - 2 = 0$ *Use the Zero Product Property.*

$x = 4$ or $x = 2$ *Solve each equation.*

The solutions are 4 and 2.

***Check***

| $x^2 - 6x + 8 = 0$ | |
|---|---|
| $(4)^2 - 6(4) + 8$ | 0 |
| $16 - 24 + 8$ | 0 |
| $0$ | $0$ ✓ |

***Check***

| $x^2 - 6x + 8 = 0$ | |
|---|---|
| $(2)^2 - 6(2) + 8$ | 0 |
| $4 - 12 + 8$ | 0 |
| $0$ | $0$ ✓ |

## Ex. 3)

***Solve the quadratic equation by factoring. Check your answer.***

$x^2 + 4x = 21$

$-21 \quad -21$

$x^2 + 4x - 21$

$-21$

$7 \quad -3$

$4$

$(x+7)(x-3) = 0$

$x+7=0 \qquad x-3=0$

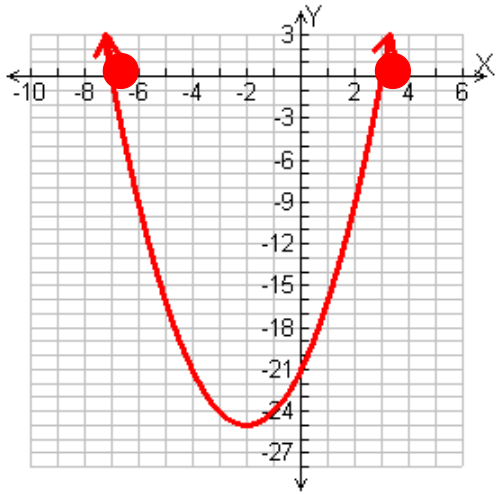
$x=-7 \qquad x=3$

## Example 3 Continued)

**Solve the quadratic equation by factoring. Check your answer.**

$$x^2 + 4x = 21$$

***Check*** Graph the related quadratic function. The zeros of the related function should be the same as the solutions from factoring.




The graph of $y = x^2 + 4x - 21$ shows that two zeros appear to be $-7$ and 3, the same as the solutions from factoring. ✓

## Example 4)

**Solve the quadratic equation by factoring. Check your answer.**

$x^2 - 12x + 36 = 0$

$(x-6)(x-6)$

$x = 6$

## Example 5)

$-2x^2 = 20x + 50$

$+2x^2 \quad +2x^2$

$0 = 2x^2 + 20x + 50$

$2x^2 + 20x + 50 = 0$

*The equation must be written in standard form. So add $2x^2$ to both sides.*

$2(x^2 + 10x + 25) = 0$

*Factor out the GCF 2.*

$2(x + 5)(x + 5) = 0$

*Factor the trinomial.*

$2 \neq 0$ or $x + 5 = 0$

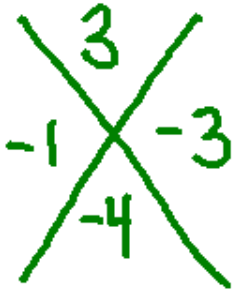
*Use the Zero Product Property.*

$x = -5$

*Solve the equation.*

## Example 6)

$3x^2 - 4x + 1 = 0$




| | $3x$ | $-1$ |
|---|---|---|
| $x$ | $3x^2$ | $-1x$ |
| $-1$ | $-3x$ | $1$ |

$(3x-1)(x-1)$

$3x-1=0$

$+1 \quad +1$

$\frac{3x}{3} = \frac{1}{3}$

$x = \frac{1}{3}$

$x-1=0$

$x=1$

# Let's Practice!

Pg. 653, #4 - 13