# 6.7: Solving Quadratic Equations by Factoring (cont'd)

Note Title 11/5/2018

6.7.3

**Ex:** Solve.

$$x^2 - 19x = -60$$

$+60 \quad +60$

$$x^2 - 19x + 60 = 0$$

$$(x-4)(x-15) = 0$$

$x - 4 = 0$ or $x - 15 = 0$

$+4 \quad +4 \qquad +15 \quad +15$

$x = 4 \qquad x = 15$

Sol'n Set: $\{4, 15\}$

**Recall:**

* Equations get solved
* Expressions get simplified or factored

$x^2 \quad 60 \qquad x^2 - 19x + 60$ (+) same signs, sum of $19x$

$x \cdot x$

$1 \cdot 60$
$2 \cdot 30$
$3 \cdot 20$
$4 \cdot 15$ ($4x$)
$5 \cdot 12$
$6 \cdot 10$ ($15x$)

**Check:**

$(x-4)(x-15)$
$x^2 - 15x - 4x + 60$
$x^2 - 19x + 60$

**Recall:** Steps for solving a quadratic equation.

1) Write in standard form $ax^2 + bx + c = 0$.
2) Factor the nonzero side.
3) Set each factor equal to zero. (Apply the Zero Product Property).
4) Solve the resulting equations.

**Ex:** Solve.

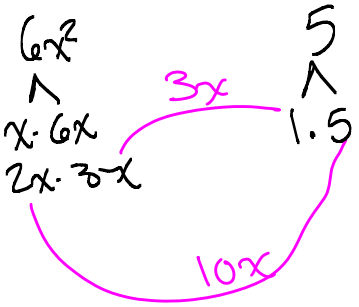
$$6x^2 - 5 = 7x$$

$$-7x \quad -7x$$

$$6x^2 - 7x - 5 = 0$$

$$(2x+1)(3x-5) = 0$$

| | |
|---|---|
| $2x+1=0$ | $3x-5=0$ |
| $-1 \quad -1$ | $+5 \quad +5$ |
| $2x=-1$ | $3x=5$ |
| $\frac{2x}{2}=\frac{-1}{2}$ | $\frac{3x}{3}=\frac{5}{3}$ |
| $x=-\frac{1}{2}$ | $x=\frac{5}{3}$ |




**Check:** $(2x+1)(3x-5)$

$= 6x^2 - 10x + 3x - 5$

$= 6x^2 - 7x - 5$ ✓

Soln Set: $\left\{-\frac{1}{2}, \frac{5}{3}\right\}$

**Ex:** Solve.

$$(w+5)(w-3) = 20$$

$$w^2 - 3w + 5w - 15 = 20$$

$$w^2 + 2w - 15 = 20$$

$$-20 \quad -20$$

$$w^2 + 2w - 35 = 0$$

$$(w-5)(w+7) = 0$$

| | or | |
|---|---|---|
| $w-5=0$ | | $w+7=0$ |
| $w=5$ | | $w=-7$ |

Soln Set: $\{5, -7\}$

**Ex:** Solve.

$$x^2 = 9$$
$$-9 \quad -9$$
$$x^2 - 9 = 0$$
$$(x+3)(x-3) = 0$$

$x+3=0$ | $x-3=0$

$-3 \quad -3$ | $+3 \quad +3$

$x=-3$ | $x=3$

Recall: $a^2-b^2=(a+b)(a-b)$

Sol'n Set: $\{3,-3\}$

Also written: $\{\pm 3\}$

read "plus or minus 3"

**Ex:** $9x - 6x^2 = -x^3$

$+x^3 \qquad +x^3$

$$x^3 + 9x - 6x^2 = 0$$
$$x^3 - 6x^2 + 9x = 0$$
$$x(x^2 - 6x + 9) = 0$$
$$x(x-3)(x-3) = 0$$

$x=0$ | $x-3=0$ | $x-3=0$

$x=3$ | $x=3$

Sol'n Set: $\{0,3\}$

$x^2$: $x \cdot x$

$9$: $1 \cdot 9$, $3 \cdot 3$

Check: $(x-3)(x-3)$

$= x^2 - 3x - 3x + 9$

$= x^2 - 6x + 9$ ✓

**Ex:** Solve. $128 - 18x^2 = 0$

$$-18x^2 + 128 = 0$$

$$-2(9x^2 - 64) = 0$$

$$-2(3x+8)(3x-8) = 0$$

$-2 = 0$ cannot be true. False for every $x$!

This factor does not contribute any solutions.

$3x + 8 = 0$

$-8 \quad -8$

$3x = -8$

$\frac{3x}{3} = \frac{-8}{3}$

$x = -\frac{8}{3}$

$3x - 8 = 0$

$+8 \quad +8$

$3x = 8$

$\frac{3x}{3} = \frac{8}{3}$

$x = \frac{8}{3}$

Solution Set:

$\left\{-\frac{8}{3}, \frac{8}{3}\right\}$

or $\left\{\pm\frac{8}{3}\right\}$

**Ex:** $5x(2x-5)(x+4) = 0$ Solve.

$5x = 0$

$\frac{5x}{5} = \frac{0}{5}$

$x = 0$

$2x - 5 = 0$

$2x = 5$

$\frac{2x}{2} = \frac{5}{2}$

$x = \frac{5}{2}$

$x + 4 = 0$

$x = -4$

Sol'n Set:

$\left\{0, \frac{5}{2}, -4\right\}$

# 7.7: Ratios and Proportions



**Example:** A cookie recipe requires 6 cups of flour for 4 dozen cookies. How many cups of flour are needed to make 10 dozen cookies?

$$\frac{6 \text{ cups}}{4 \text{ dozen}} = \frac{?}{10 \text{ dozen}}$$

$$\frac{6 \text{ cups}}{4 \text{ doz}} = \frac{x}{10 \text{ doz}}$$

$$\left(\frac{10 \text{ doz}}{1}\right)\frac{6 \text{ cups}}{4 \text{ doz}} = \frac{x}{10 \text{ doz}}\left(\frac{10 \text{ doz}}{1}\right)$$

$$\frac{60 \text{ cups}}{4} = x$$

$$15 \text{ cups} = x.$$

So 15 cups of flour are needed

**Tip:**

**Cross-multiplication**

If $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

$$\frac{a}{b} \times \frac{c}{d}$$

**EX:** Solve. $\frac{15}{2} = \frac{7}{4x}$

Cross-multiply: $15(4x) = 7(2)$

$60x = 14$

$\frac{60x}{60} = \frac{14}{60} \div 2 \div 2$

$x = \frac{7}{30}$

$\left\{\frac{7}{30}\right\}$ Sol'n Set

**EX:** $\frac{y+2}{8} = \frac{2y}{5}$

$5(y+2) = 2y(8)$

$5y + 10 = 16y$

$-5y \quad -5y$

$10 = 11y$

$\frac{10}{11} = \frac{11y}{11}$

$\frac{10}{11} = y \implies$ Sol'n Set: $\left\{\frac{10}{11}\right\}$