# 7.5 Solving Quadratic Equations by Factoring

To **solve an equation** like $ax^2 + bx + c = y$ means to **find the values of the variable** that causes the left side of the equation to equal the right side. **If $y=0$,** then we're really just solving for the x-intercepts.

Remember: Zeros/ roots are just asking for the x intercepts.

Example 1 Solve the by factoring $2x^2 - 14x - 60 = 0$ and verify the solutions

GCF=2

Factor $2(x^2 - 7x - 30) = 0$

$2(x+3)(x-10) = 0$

$x + 3 = 0$ $x - 10 = 0$

$x = -3$ $x = 10$

zero product property: Set each factor equal to zero

To verify your solutions substitute answers into the original equation to see if it satisfies the equation.

$x = \{-3, 10\}$ ← solution set

Example 2 Determine the **roots** of the following equations.

a) $75p^2 - 192 = 0$

$3(25p^2 - 64) = 0$

$3(5p-8)(5p+8) = 0$

$5p - 8 = 0$ $5p + 8 = 0$

$\frac{5p}{5} = \frac{8}{5}$ $\frac{5p}{5} = \frac{-8}{5}$

$p = \frac{8}{5}$ $p = \frac{-8}{5}$

$x = \{\frac{8}{5}, -\frac{8}{5}\}$ or $\{1.6, -1.6\}$

c) $0 = -2(2x-7)(4x-1)$

$2x - 7 = 0$ $4x - 1 = 0$

$\frac{2x}{2} = \frac{7}{2}$ $\frac{4x}{4} = \frac{1}{4}$

$x = \frac{7}{2}$ $x = \frac{1}{4}$

$x = \{\frac{7}{2}, \frac{1}{4}\}$ or $\{3.5, 0.25\}$

b) $4x^2 + 28x + 49 = 0$

$2x \cdot 7 = 14x$, $2x \cdot 7 = 14x$, $28x$

Perfect Square trinomial ∴ only one solution and one x-intercept

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

$2x + 7 = 0$

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

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

$x = \{\frac{-7}{2}\}$ or $\{-3.5\}$

d) $1.4y^2 + 5.6y - 16.8 = 0$

$(10)\frac{14}{10}y^2 + (10)\frac{56}{10}y - (10)\frac{168}{10} = 0(10)$

$14y^2 + 56y - 168 = 0$

$7(2y^2 + 8y - 24) = 0$

$7 \cdot 2(y^2 + 4y - 12) = 0$

$14(y+6)(y-2) = 0$

$y + 6 = 0$ $y - 2 = 0$

$y = -6$ $y = 2$

$x = \{-6, 2\}$

Example 3 a) Mrs. Hock claimed that she solved a quadratic equation by graphing. She found the zeros were $-\frac{4}{3}$ and 5. Find **AN** equation that she might have solved. (Remember that many parabolas have the same x-intercepts. What variable distinguishes between these different parabolas?)

$(3)\ x = -\frac{4(3)}{3}$ $\quad x \overset{-5}{=} 5^{-5}$

$3x \overset{+4}{=} -4+4$ $\quad x-5=0$

$3x+4=0$

Pick "a" any value $y = a(3x+4)\ (x-5)$

$\boxed{y = 2(3x+4)(x-5)}$

b) Find THE equation of the parabola that has the same x- intercepts as question (a) but passes through the point (2,3)

x y

$y = a(3x+4)(x-5)$

$3 = a(3(2)+4)(2-5)$

$3 = a(10)(-3)$

$\frac{3}{-30} = \frac{-30a}{-30}$

$-\frac{1}{10} = a$

$\boxed{y = -\frac{1}{10}(3x+4)(x-5)}$

Example 4 Suppose your best friend solved the quadratic equation as shown:

$4x^2 = 9x$ ← set equation equal to zero first.

$\frac{4x^2}{x} = \frac{9x}{x}$ Divided both sides by x ← can't divide by x because x could = 0.

$4x = 9$

$x = \frac{9}{4}$ or 2.25

Is this solution correct? If not, identify the error. Then, solve the quadratic correctly.

No,

Correct solution

$4x^2 = 9x$ $\quad -9x \quad -9x$

$4x^2 - 9x = 0$

$x(4x-9) = 0$

$x=0 \qquad 4x-9 \overset{+9}{=} 0^{+9}$

$\frac{4x}{4} = \frac{9}{4}$

$x = 2.25$

$x = \{0, 2.25\}$

Assignment: page 405 #2, 4ad, 6(ad), 7,10, 11