Solving Quadratic Equations by Factoring

Quadratic Equation - An equation of the form $ax^2 + bx + c = 0$, where a, b and c are real numbers and $a \neq 0$.

Step 1: Set the equation equal to zero.
Step 2: Factor.
Step 3: Set each factor equal to zero and solve for the variable.

Directions: Solve each quadratic equation by factoring.

1. $16x^2 - 1 = 0$ Difference of Two Squares

$4x \quad 4x \quad 1 \quad 1$

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

$4x+1=0 \qquad 4x-1=0$

$-1 \quad -1 \qquad +1 \quad +1$

$\frac{4x}{4} = \frac{-1}{4} \qquad \frac{4x}{4} = \frac{1}{4}$

$x = -1/4 \qquad x = 1/4$

2. $\frac{3x^2}{3} - \frac{15x}{3} - \frac{18}{3} = \frac{0}{3}$ GCF = 3

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

$1 \cdot 6$
$2 \cdot 3$

$(x-6)(x+1) = 0$

$x-6=0 \qquad x+1=0$

$+6 \quad +6 \qquad -1 \quad -1$

$x = 6 \qquad x = -1$

3. $x^3 - 12x^2 = -35x$

$+35x \quad +35x$

$\frac{x^3}{x} - \frac{12x^2}{x} + \frac{35x}{x} = 0$ GCF = x

$x(x^2 - 12x + 35) = 0$

$1 \cdot 35$

$5 \cdot 7$

$x(x-7)(x-5) = 0$

$x = 0$ $\quad x - 7 = 0 \quad +7 \; +7 \quad x = 7$ $\quad x - 5 = 0 \quad +5 \; +5 \quad x = 5$

4. $16x^2 + 24x + 9 = 0$

$4x \; 4x \quad 3 \; 3$ Perfect Square Trinomial

$2(4x \cdot 3) = 2(12x) = 24x$

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

$4x + 3 = 0$

$-3 \; -3$

$\frac{4x}{4} = \frac{-3}{4}$

$x = -3/4$

5. $2x^2 = 19x + 33$

$-19x-33 \quad -19x-33$

$2x^2 - 19x - 33 = 0$

$1 \cdot 2 \qquad 1 \cdot 33$

$3 \cdot 11$

$3x$

$(2x + 3)(x - 11)$

$22x$

$(2x+3)(x-11) = 0$

$2x + 3 = 0 \qquad x - 11 = 0$

$-3 \quad -3 \qquad +11 \quad +11$

$\frac{2x}{2} = \frac{-3}{2} \qquad x = 11$

$x = -\frac{3}{2}$

6. $\frac{3}{4}x^2 - x - 16 = 0$

$\frac{3x^2}{4} - \frac{4 \cdot x}{4 \cdot 1} - \frac{4 \cdot 16}{4 \cdot 1} = \frac{4 \cdot 0}{4 \cdot 1}$

LCD = 4

$\frac{3x^2}{4} - \frac{4x}{4} - \frac{64}{4} = \frac{0}{4}$

$3x^2 - 4x - 64 = 0$

$1 \cdot 3$

$1 \cdot 64$
$2 \cdot 32$
$4 \cdot 16$
$8 \cdot 8$

$4x$

$(3x \quad 4)(x \quad 16)$

$48x$

$16x$

$(3x - 16)(x + 4) = 0$

$12x$

$(3x - 16)(x + 4) = 0$

$3x - 16 = 0 \quad +16 \; +16$

$\frac{3x}{3} = \frac{16}{3}$

$x = \frac{16}{3}$

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

$x = -4$

7. $6x^2 - 3x = 21 + 2x$

$-2x \quad -2x$

$6x^2 - 5x = 21$

$-21 \quad -21$

$6x^2 - 5x - 21 = 0$

$1 \cdot 6$
$2 \cdot 3$

$1 \cdot 21$
$3 \cdot 7$

$9x$

$(2x + 3)(3x - 7) = 0$

$14x$

$(2x + 3)(3x - 7) = 0$

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

$\frac{2x}{2} = \frac{-3}{2}$

$x = -\frac{3}{2}$

$3x - 7 = 0 \quad +7 \; +7$

$\frac{3x}{3} = \frac{7}{3}$

$x = \frac{7}{3}$