Solving Quadratic Equations by Factoring

Ex.1 $3x^2 + 8x + 4 = 0$

$$\underbrace{3x^2 + 2x}_{\text{Group A}} \underbrace{+6x + 4}_{\text{Group B}} = 0$$

$(3)(4) = 12$

Numbers	Product	Sum
1, 12	12	13
2, 6	12	8

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

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

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

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

$\Rightarrow$ Solutions $\rightarrow$ $-\frac{2}{3}, -2$

Ex. 2 $8x^2 - 10x - 3 = 0$

$$\underbrace{8x^2 + 2x}\ \underbrace{-12x - 3} = 0$$

$(8)(-3) = -24$

Numbers	Product	Sum
1, -24	-24	-23
2, -12	-24	-10

$$2x(4x+1) - 3(4x+1) = 0$$

$$(4x+1)(2x-3) = 0$$

$$4x + 1 = 0$$
$$-1 \quad -1$$
$$4x = -1$$
$$\frac{4x}{4} = \frac{-1}{4}$$
$$x = -\frac{1}{4}$$

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

Solutions $\rightarrow$ $-\frac{1}{4}, \frac{3}{2}$

Solving Quadratic Equations by Factoring

Q.1. $2x^2 + 5x + 3 = 0$

$\underbrace{2x^2 + 2x}\underbrace{+3x + 3} = 0$

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

$(x+1)\cdot(2x+3) = 0$

$(2)(3) = 6$

Numbers	Product	Sum
1, 6	6	7
2, 3	6	5

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

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

$\Rightarrow$ Solutions $\rightarrow$ $-1, \frac{-3}{2}$

Q.2. $6x^2 + 11x + 4 = 0$

$6x^2 + 3x + 8x + 4 = 0$

$3x(2x+1) + 4(2x+1) = 0$

$(2x+1)(3x+4) = 0$

$(6)(4) = 24$

Numbers	Product	Sum
1, 24	24	25
2, 12	24	14
3, 8	24	11

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

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

Solutions $\rightarrow$ $\frac{-1}{2}, \frac{-4}{3}$

Q.3. $3x^2 - 7x - 6 = 0$

$\underbrace{3x^2 + 2x}\underbrace{- 9x - 6} = 0$

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

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

$3x+2 = 0$

$-2 \quad -2$

$3x = -2$

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

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

$x - 3 = 0$

$+3 \quad +3$

$x = 3$

$(3)(-6) = -18$

Numbers	Product	Sum
1, −18	−18	−17
2, −9	−18	−7

$\Rightarrow$ Solutions $\rightarrow -\frac{2}{3}, 3$

Q.4. $2x^2 - 9x - 5 = 0$

$\underbrace{2x^2 + 1x}\underbrace{- 10x - 5} = 0$

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

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

$2x+1 = 0$

$-1 \quad -1$

$2x = -1$

$\frac{2x}{2} = \frac{-1}{2}$

$x = -\frac{1}{2}$

$x - 5 = 0$

$+5 \quad +5$

$x = 5$

$(2)(-5) = -10$

Numbers	Product	Sum
1, −10	−10	−9

$\Rightarrow$ Solutions $\rightarrow -\frac{1}{2}, 5$

Q.5. $3x^2 + 2x - 5 = 0$

$(3)(-5) = -15$

Numbers	Product	Sum
1, -15	-15	-14
3, -5	-15	-2
-3, 5	2	2

$\underbrace{3x^2 - 3x} + \underbrace{5x - 5} = 0$

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

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

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

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

$\Rightarrow$ Solutions $\rightarrow$ $1, -\frac{5}{3}$

Q.6. $2x^2 + 3x - 9 = 0$

$(2)(-9) = -18$

Numbers	Product	Sum
1, -18	-18	-17
2, -9	-18	-7
3, -6	-18	-3
-3, 6	-18	3

$\underbrace{2x^2 - 3x} + \underbrace{6x - 9} = 0$

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

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

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

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

$\Rightarrow$ Solutions $\rightarrow$ $-\frac{3}{2}, -3$