

MAC1105 College Algebra
1.4 Practice Problems

Solve the quadratic equation by factoring.

1. $x^2 + 3x - 40 = 0$

$$(x + 8)(x - 5) = 0$$

$$\begin{array}{cc} x + 8 = 0 & x - 5 = 0 \\ +8 & -8 & +5 & +5 \\ x = -8 & & x = 5 \end{array}$$

2. $10x^2 + 7x - 12 = 0$

$$(5x - 4)(2x + 3) = 0$$

$$\begin{array}{cc} 5x - 4 = 0 & 2x + 3 = 0 \\ +4 & +4 & -3 & -3 \\ 5x = 4 & & 2x = -3 \\ \frac{5x}{5} = \frac{4}{5} & & \frac{2x}{2} = \frac{-3}{2} \\ x = 4/5 & & x = -3/2 \end{array}$$

or

$$\begin{array}{l} 10x^2 + 7x - 12 = 0 \\ 10x^2 + 15x - 8x - 12 = 0 \\ 5x(2x + 3) - 4(2x + 3) = 0 \\ (2x + 3)(5x - 4) = 0 \\ 2x + 3 = 0 & 5x - 4 = 0 \\ x = -3/2 & x = 4/5 \end{array}$$

3. $x^2 - 16 = 0$

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

$$\begin{array}{cc} x + 4 = 0 & x - 4 = 0 \\ x = -4 & x = 4 \end{array}$$

Solve the quadratic equation using the square root method.

4. $9x^2 = 25$

$$x^2 = \frac{25}{9}$$

$$\sqrt{x^2} = \sqrt{\frac{25}{9}}$$

$$x = \pm \frac{5}{3}$$

5. $(x - 2)^2 - 9 = 0$

$$+9 + 9$$

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

$$\sqrt{(x - 2)^2} = \sqrt{9}$$

$$x - 2 = \pm 3$$

$$+2 \quad +2$$

$$x = 2 \pm 3$$

$$\begin{array}{l} x = 2 + 3 \\ x = 5 \end{array}$$

$$\begin{array}{l} \text{or } x = 2 - 3 \\ x = -1 \end{array}$$

Solve the quadratic equation by completing the square.

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

Magic #

$(\frac{4}{2})^2 = 2^2 = 4$

$$\begin{aligned} x^2 + 4x &= -6 \\ x^2 + 4x + 4 &= -6 + 4 \\ (x+2)(x+2) &= -2 \\ (x+2)^2 &= -2 \end{aligned}$$

$$\sqrt{(x+2)^2} = \sqrt{-2}$$

$$x+2 = \pm i\sqrt{2}$$

$$x = -2 \pm i\sqrt{2}$$

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

Magic #
 $(\frac{-6}{2})^2 = (-3)^2 = 9$

$$\begin{aligned} x^2 - 6x &= 7 \\ x^2 - 6x + 9 &= 7 + 9 \\ (x-3)(x-3) &= 16 \\ (x-3)^2 &= 16 \end{aligned}$$

$$\begin{aligned} (x-3)^2 &= 16 \\ \sqrt{(x-3)^2} &= \sqrt{16} \end{aligned}$$

$$x-3 = \pm 4$$

$$x = 3 \pm 4$$

$$\begin{aligned} x &= 3+4 & x &= 3-4 \\ x &= 7 & x &= -1 \end{aligned}$$

8. $2x^2 - 4x - 5 = 0$

Magic #
 $(\frac{-2}{2})^2 = (-1)^2 = 1$

$$\begin{aligned} \frac{2x^2 - 4x}{2} &= \frac{-5}{2} \\ x^2 - 2x &= \frac{-5}{2} \\ x^2 - 2x + 1 &= \frac{-5}{2} + 1 \\ (x-1)(x-1) &= \frac{-5}{2} + \frac{2}{2} \end{aligned}$$

$$\begin{aligned} (x-1)^2 &= \frac{-3}{2} \\ \sqrt{(x-1)^2} &= \sqrt{\frac{-3}{2}} \\ x-1 &= \pm \sqrt{\frac{-3}{2}} \\ x &= 1 \pm \sqrt{\frac{-3}{2}} \end{aligned}$$

$$\begin{aligned} x &= 1 \pm \sqrt{\frac{-3}{2}} \\ &= 1 \pm \frac{\sqrt{-3}}{\sqrt{2}} \\ &= 1 \pm \frac{\sqrt{14}}{2} \\ &= 1 \pm \frac{\sqrt{14}}{2} \end{aligned}$$

Solve the quadratic equation using the quadratic formula.

9. $3x^2 - 4x - 9 = 0$

$a=3 \quad b=-4 \quad c=-9$

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-9)}}{2(3)} \\ &= \frac{4 \pm \sqrt{16 + 108}}{6} \end{aligned}$$

$$\begin{aligned} &= \frac{4 \pm \sqrt{124}}{6} \\ &= \frac{4 \pm \sqrt{4 \cdot 31}}{6} \\ &= \frac{4 \pm 2\sqrt{31}}{6} \end{aligned}$$

$$\begin{aligned} &= \frac{4 \pm 2\sqrt{31}}{6} \\ &= \frac{2 \pm \sqrt{31}}{3} \end{aligned}$$

10. $2x^2 + x + 6 = 0$

$a=2 \quad b=1 \quad c=6$

$$\begin{aligned} x &= \frac{-1 \pm \sqrt{1^2 - 4(2)(6)}}{2(2)} \\ &= \frac{-1 \pm \sqrt{1 - 48}}{4} \\ &= \frac{-1 \pm \sqrt{-47}}{4} \end{aligned}$$

$$= \frac{-1 \pm i\sqrt{47}}{4}$$