Solving Quadratic Equations - Lesson 2

Solving Quadratic Equations
(by Rearranging)

LI

- Solve a quadratic equation by rewriting it in Standard Form.

SC

- Manipulate equations.

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1

Writing a Quadratic Equation in Standard Form
means writing it like this :

$$ax^2 + bx + c = 0$$

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Example 1

Solve $3x^2 = 6x$ for x.

$$3x^2 = 6x$$
$$3x^2 - 6x = 0$$
$$3x(x - 2) = 0$$
$$3x = 0, \quad x - 2 = 0$$
$$\boxed{x = 0, \quad x = 2}$$

Example 2

Solve algebraically $x^2 = 3x + 10$.

$$x^2 = 3x + 10$$

$$x^2 - 3x - 10 = 0$$

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

$$x - 5 = 0, \ x + 2 = 0$$

$$\boxed{x = 5, \ x = -2}$$

<u>Example 3</u>

Find the roots of $x(x-4)=2x-5$.

$$x(x-4)=2x-5$$

$$x^2-4x=2x-5$$

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

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

$$x-5=0, \quad x-1=0$$

$$\boxed{x=5, \quad x=1}$$

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<u>Example 4</u>

Solve $x = \dfrac{15}{x + 2}$ algebraically.

$$x = \dfrac{15}{x + 2}$$

$$x(x + 2) = 15$$

$$x^2 + 2x = 15$$

$$x^2 + 2x - 15 = 0$$

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

$$x + 5 = 0, \quad x - 3 = 0$$

$$\boxed{x = -5, \quad x = 3}$$

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Questions

1 Solve the following equations algebraically.

a $4x^2 = 8x$ **b** $4x^2 = 9$ **c** $x^2 = 3x - 2$

d $2x^2 = 3 - 5x$ **e** $6x = x^2 + 9$ **f** $x^2 + 2x = 18 - 5x$

g $3x^2 + 5x = 4x$ **h** $x^2 + 5x = 2x + 10$ **i** $3x = 10 - x^2$

j $18x^2 = 50$ **k** $2x^2 + 5x + 10 = x^2 - 4x - 10$ **l** $x^2 - 5x - 24 = 9x - 2x^2$

2 Find the roots of the following quadratic equations.

a $4x(x - 2) = 2x$ **b** $x(x - 6) + 8 = 0$

c $2x(x + 4) - 5 = x(x + 4)$ **d** $(x - 2)^2 = 16$

e $(x + 4)(x + 2) = 15$ **f** $(x + 3)^2 = 2x + 9$

g $2x(x + 2) = 4x - 2x^2 + 25$ **h** $(x - 3)(x - 5) = 4x - 17$

i $(x + 2)^2 + (x + 1)^2 = 25$ **j** $169 - (x - 2)^2 = (x + 5)^2$

3 Solve algebraically.

a $x = \dfrac{10}{x + 3}$ **b** $x - 3 = \dfrac{28}{x}$ **c** $\dfrac{x + 2}{3} = \dfrac{5}{x}$

d $x + 8 - \dfrac{20}{x} = 0$ **e** $\dfrac{x + 2}{x} = x$ **f** $\dfrac{x}{2} = \dfrac{3x - 4}{x}$

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Answers

1

a $4x(x - 2) = 0$
$x = 0$ or $x = 2$

b $(2x + 3)(2x - 3) = 0$
$x = -\frac{3}{2}$ or $x = \frac{3}{2}$

c $(x - 1)(x - 2) = 0$
$x = 1$ or $x = 2$

d $(2x - 1)(x + 3) = 0$
$x = \frac{1}{2}$ or $x = -3$

e $(x - 3)(x - 3) = 0$
$x = 3$

f $(x + 9)(x - 2) = 0$
$x = -9$ or $x = 2$

g $x(3x + 1) = 0$
$x = 0$ or $x = -\frac{1}{3}$

h $(x + 5)(x - 2) = 0$
$x = -5$ or $x = 2$

i $(x + 5)(x - 2) = 0$
$x = -5$ or $x = 2$

j $2(3x + 5)(3x - 5) = 0$
$x = -\frac{5}{3}$ or $x = \frac{5}{3}$

k $(x + 4)(x + 5) = 0$
$x = -4$ or $x = -5$

l $(x - 6)(3x + 4) = 0$
$x = 6$ or $x = -\frac{4}{3}$

2

a $2x(2x - 5) = 0$
$x = 0$ or $x = \frac{5}{2}$

b $(x - 4)(x - 2) = 0$
$x = 4$ or $x = 2$

c $(x + 5)(x - 1) = 0$
$x = -5$ or $x = 1$

d $(x - 6)(x + 2) = 0$
$x = 6$ or $x = -2$

e $(x + 7)(x - 1) = 0$
$x = -7$ or $x = 1$

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

g $(2x + 5)(2x - 5) = 0$
$x = -\frac{5}{2}$ or $x = \frac{5}{2}$

h $(x - 8)(x - 4) = 0$
$x = 8$ or $x = 4$

i $2(x + 5)(x - 2) = 0$
$x = -5$ or $x = 2$

j $(x + 10)(x - 7) = 0$
$x = -10$ or $x = 7$

3

a $(x + 5)(x - 2) = 0$
$x = -5$ or $x = 2$

b $(x - 7)(x + 4) = 0$
$x = 7$ or $x = -4$

c $(x + 5)(x - 3) = 0$
$x = -5$ or $x = 3$

d $(x + 10)(x - 2) = 0$
$x = -10$ or $x = 2$

e $(x - 2)(x + 1) = 0$
$x = 2$ or $x = -1$

f $(x - 4)(x - 2) = 0$
$x = 4$ or $x = 2$

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