Lesson 2: SOLVING QUADRATIC EQUATIONS
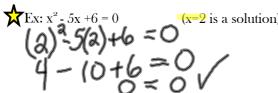
By the end of this lesson you should be able to:

- Find the ROOTS or SOLUTIONS of an equation

zeros or X-intercepts.

⭐ Terms

ROOTS of an equation: These are the solutions to the equation. They are the numbers that make the equation TRUE.

⭐ Ex: $x^2 - 5x + 6 = 0$ ($x=2$ is a solution)

$$(2)^2 - 5(2) + 6 = 0$$
$$4 - 10 + 6 = 0 \checkmark$$
$$0 = 0$$

We still use the same methods to factor quadratic equations. We can solve by:

Factoring and then setting our factors to zero or by graphing and then finding out zeros (x-intercepts)

⭐ ROOTS and SOLUTIONS mean the same thing.

Example 1:

Solve the following by factoring. Find the roots of $6x^2 - 11x - 10$

$$M : (a)(c) = -60$$
$$A : -11$$
$$N : -15, +4$$

We will use MAN to factor this because it is factorable

$$-60$$
$$-60 \times 1$$
$$-30 + 2$$
$$-15 \times 4$$

$$= \underline{6x^2 + 4x} , \underline{-15x - 10}$$

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

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

Solutions:

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

$$2x - 5 = 0$$
$$\frac{2x}{2} = \frac{5}{2}$$
$$\boxed{x = \frac{5}{2}}$$

EXAMPLE 2: *through*

Stacey maintains the gardens in the city parks. In the summer she plans to build a walkway ~~thought~~ the rose garden. The area of the walkway (A) in square metres is given by: A = 4x² +160x, where x is the width of the walkway in metres. If the area of the walkway must be 900 m², what is the width? x

Solution:

x = the width, so we have to find x

A = 900 m², so we need to plug that into our equation

A = 4x² + 160x

$$A = 4x^2 + 160x$$

$$900 = 4x^2 + 160x - 900$$

$$0 = 4x^2 + 160x - 900$$

$$0 = 4(x^2 + 40x - 225)$$

M: -225   -225
A: 40   -5 × 45
N: -5, 45

$$0 = 4(x-5)(x+45)$$

Solutions:

$$x - 5 = 0 \qquad x + 45 = 0$$

$$\boxed{x = 5} \qquad \boxed{x = -45}$$

$$\boxed{5m} \qquad -45m \leftarrow \text{not a solution!}$$

∴ The width is 5m

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Complete #10 on page 321 and we'll take it up together in 10 minutes

SOLUTION:

a) what is the profit (P) if he breaks even going to be?

$P = 0$

$$P = -5x^2 + 200x - 1500$$
$$= -5(x^2 - 40x + 300)$$
$$= -5(x - 10)(x - 30)$$

M: +300
A: -40
N: -10, -30

$$X - 10 = 0 \qquad X - 30 = 0$$
$$X = \$10 \qquad X = \$30$$

When Conor charges $10 or $30, he breaks even.

b) profit (P) is 500 dollars

$$500 = -5x^2 + 200x - 1500$$
$$0 = -5x^2 + 200x - 2000$$

M 400
A -40
N -20; -20

$$0 = -5(x^2 - 40x + 400)$$
$$0 = -5(x - 20)(x - 20)$$

$$X - 20 = 0$$
$$\boxed{X = 20}$$

∴ He has to charge $20.