

* HW: p. 405 #1, 2abcd, 5, 9

FOM 11

7.5 Solving Quadratic Equations by Factoring

We have learned how to solve a quadratic equation by graphing. Our next method of solving a quadratic equation is by factoring.

Example 1: Solve the following quadratic equations:

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

$$\frac{1x - 6 = -6}{1, -6 \quad -1, 6}$$

$$\frac{-2, 3 \quad 2, -3}{x^2 + 2x - 3x - 6 = 0}$$

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

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

$$\begin{matrix} x+2=0 & x-3=0 \\ \boxed{x=-2} & \boxed{x=3} \end{matrix}$$

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

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

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

$$\boxed{x=0} \quad \boxed{x=-3}$$

c. $6x^2 - 7x = 5$

$$\frac{6x - 5 = -30}{-10, 3}$$

$$6x^2 - 7x - 5 = 0$$

$$6x^2 + 3x - 10x - 5 = 0$$

$$3x(2x+1) - 5(2x+1) = 0$$

$$(2x+1)(3x-5) = 0$$

$$\begin{matrix} 2x+1=0 & 3x-5=0 \\ 2x=-1 & 3x=5 \\ x=-\frac{1}{2} & x=\frac{5}{3} \end{matrix}$$

d. $x(3x+1) - 2 = 0$

$$\frac{3x-2 = -6}{-2, 3}$$

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

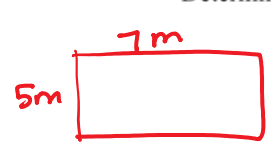
$$3x^2 + 3x - 2x - 2 = 0$$

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

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

$$\begin{matrix} x+1=0 & 3x-2=0 \\ \boxed{x=-1} & \boxed{x=\frac{2}{3}} \end{matrix}$$

Example 2: A rectangular garden has dimensions 5 m by 7 m. When both dimensions are increased by the same length, the area of the garden increases by 45 m². Determine the dimensions of the larger garden.



Area = $5 \times 7 = 35 \text{ m}^2$
Let x = increase in length

New Area = $(5+x)(7+x) = 35 + 45$

$$(5+x)(7+x) = 80$$

$$35 + 5x + 7x + x^2 = 80$$

$$35 + 5x + 7x + x^2 - 80 = 0$$

$$x^2 + 12x - 45 = 0$$

$$x^2 - 3x + 15x - 45 = 0$$

$$x(x-3) + 15(x-3) = 0$$

$$(x-3)(x+15) = 0$$

$$\begin{matrix} x-3=0 & x+15=0 \\ \boxed{x=3} & \cancel{x=-15} \\ & \text{reject} \end{matrix}$$

$5 + 3 = 8$
 $7 + 3 = 10$
New dimensions are 8m by 10m.

$$\frac{1x - 45 = -45}{-15, 3 \quad \boxed{-3, 15}}$$

$$\frac{1, -45 \quad -1, 45}{-5, 9 \quad -9, 5}$$

Example 3: A football is kicked vertically. The approximate height of the football, h metres, after t seconds is modeled by the formula: $h = 1 + 20t - 5t^2$.

a. Determine the height of the football after 2 s.

b. When is the football 16 m high?

When $b = 0$, the quadratic equation $ax^2 + bx + c = 0$ becomes $ax^2 + c = 0$. If this equation has a solution, it can be solved by using square roots.

Example 4: Solve each equation and verify the solution.

a. $3x^2 - 7 = 8$

b. $(x + 3)^2 = 20$

Example 5: Write an equation of a quadratic function with zeroes $\frac{2}{3}$ and $-\frac{1}{2}$. Is the equation you found the only equation possible?

Example 6: Matthew solved a quadratic equation as shown. Identify and correct any errors in his solution.

$$4x^2 = 9x$$

$$\frac{4x^2}{x} = \frac{9x}{x}$$

$$4x = 9$$

$$x = 2.25$$

Assignment: pg. 405 #1, 2, 5-11, 13, 14