1. Quadratic Equations

- A **quadratic equation** in x is an equation that can be written in the **standard form**
- $ax^2 + bx + c = 0$
- where a, b, and c are real numbers with a *not equal to* 0. A quadratic equation in x is also called a **second-degree polynomial equation** in x.

Find the zeros of the function by factoring.

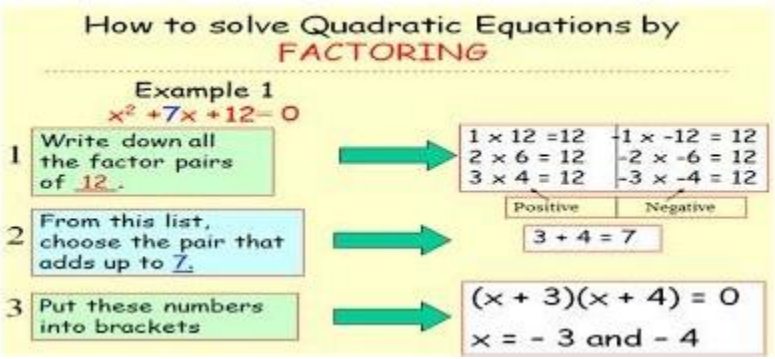
$f(x) = x^2 - 5x - 6$

$x^2 - 5x - 6 = 0$ — *Set the function equal to 0.*

$(x + 1)(x - 6) = 0$ — *Factor: Find factors of –6 that add to –5.*

$x + 1 = 0$ or $x - 6 = 0$ — *Apply the Zero Product Property.*

$x = -1$ or $x = 6$ — *Solve each equation.*



- Solving a quadratic equation;
  - Write the equation in standard form
  - Factorize the trinomial
  - Make each factor equal to zero
  - Solve individually

Example: Solve for x: $x^2 + 2x - 3 = 0$

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

$$x + 3 = 0 \; or \; x - 1 = 0$$

$$\therefore x = -3 \; or \; x = 1$$

Practice Exercise

Solve the following quadratic equations for x

a. $x^2 + 7x + 10 = 0$
b. $x^2 + 12x + 36 = 0$
c. $x^2 + 7x = 44$
d. $x^2 = 5x - 4$
e. $2x^2 - 13x + 15 = 0$
f. $3x^2 - 5x + 2 = 0$
g. $5x^2 - 42x = 27$
h. $3x^2 = 16 - 8x$
i. $(x - 3)(x - 15) = 20$
j. $x(x + 7) = -4(2x + 11)$
k. $(x - 7(x + 7) = 3(5 - 4x)$
l. $x^2 - 16 = 0$
m. $2x^2 - 8 = 0$

2. Simultaneous Equations (In two Unknowns)

To solve pairs of simultaneous equations you need to:

1. Use the elimination method to get rid of one of the variables
2. Find the value of one variable
3. Find the value of the remaining variables via substitution
4. Clearly state the final answer/s
5. Check your answer by substituting both values into either of the original equation

Example: Solve for x and y

$x + y = 6 \quad (1)$

$2x + 4y = 20 \quad (2)$

From (1) $x = 6 - y$

Substitute for x in (2) and solve for y

$2(6 - y) + 4y = 20$

$12 - 2y + 4y = 20$

$2y = 8$

$\therefore y = 4$

Substituting y in (1), $x + 4 = 6$

$$\therefore x = 6 - 4 = 2$$

Practice Exercise

Solve the following simultaneous equations for $x \; and \; y$

a. $y = 2x - 3 \; and \; 2y = 5x - 8$
b. $3y = -4x + 1 \; and \; 2y = x - 4$
c. $3y = x \; and \; y = 2x + 5$
d. $y + x = 1 \; and \; 5y = -x + 3$
e. $-2y = 5x + 6 \; and \; y = 4x - 5$
f. $6y - x = 0 \; and \; y = -5 + \frac{1}{3}x$
g. $y = 2x - 4 \; and \; x - 8y = 27$
h. $5y = 2x + 8 \; and \; 2y = x + 4$