

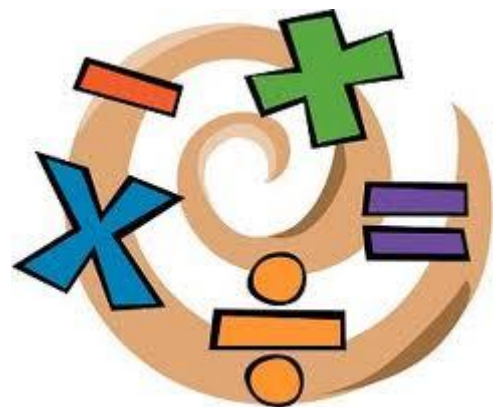
Star Art Education Company

F.4 Mathematics

Teaching Notes and Examples:

Key Topics in Algebra (Book 1)

- Quadratic Equations I (Roots, Sum/Product of Roots and Discriminants)
- Quadratic Equations II (Min/Max vertex and graph)
- Straight Line Equations
- Functions



Chapter 1 - Quadratic Equation

Objective:

1. Find out the roots of the equation
2. Determine the number and nature of roots
3. Find out the Sum of roots, Product of roots and Difference of roots

General form of a quadratic equation:

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

E.g. $4x^2 - 5x + 8 = 0$

$$a = 4, \quad b = -5, \quad c = 8$$

Objective 1. Find out the roots of the equation:

Method 1: Factor method:

$$x^2 - 4x - 5 = 0 \quad (\text{with the help of calculator, find out the value of } x \text{ first})$$
$$(x - 5)(x + 1) = 0$$

$$\therefore (x - 5) = 0 \quad \text{or} \quad (x + 1) = 0$$

$$X = 5 \quad \text{or} \quad X = -1$$

Example 1:

Solve $(x-6)(x-3) = -2$

Sometimes the question will give you one of the roots, and then ask you to find the unknown variable in the equation. In this case, **Simple Substitution** is the key

Example 2:

Given that -1 is one of the roots of the equation $-x^2 + 2x + k = 0$, find the value of k and hence find another root.

Method 2: Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For example:

$$2x^2 - 5x - 3 = 0$$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-3)}}{2(2)}$$

$$= \frac{5 \pm \sqrt{25 + 24}}{4}$$

$$= \frac{5 \pm \sqrt{49}}{4}$$

$$= \frac{5+7}{4} \text{ or } \frac{5-7}{4}$$

$$= 3 \text{ or } -0.5$$

Points to note:

1. If the question asks you to leave the answer in surd form, MUST use quadratic formula
2. If the question gives you the roots, ask you to write the formula, you could do it reversely

Example 3:

Solve each of the following equations and express the answers in surd form if necessary

a. $x^2 + 8x + 15 = 0$

b. $16x(x + 2) = 8x - 9$

Example 4:

Find out the quadratic equation with root = 6 and -3