Chapter 2 More About Quadratic Equations

Suggested Approach

The method of solving a quadratic equation by factorisation may be revised. Students can then be given examples, such as $x^2 + 3x - 5 = 0$, that cannot be solved by the factorisation method. Hence, the graphical method, completing the square method and the quadratic formula can be introduced. After they become familiar with the different techniques of solving quadratic equations, teachers may ask them to reflect what they have learnt and how they would choose an effective method to solve a given quadratic equation.

Fractional equations that can be transformed into quadratic equations may be introduced by using practical examples. Students should be reminded to check whether the roots obtained from a quadratic equation satisfy the original fractional equation.

This chapter concludes with application problems requiring the solution of quadratic equations. Students may find it more interesting if they can relate the problems to their experience and daily life. Interdisciplinary examples can also be provided.

2.1 Factorisation Method

This section is a revision of solving a quadratic equation by factorisation learnt in Secondary 2. Students should be reminded to move all the terms to the left hand side before factorisation. They should be aware that applying factorisation in a smart way can yield a quicker solution.

2.2 Graphical Method

Students should understand that the roots of the quadratic equation $ax^2 + bx + c = 0$ are the x-intercepts of the graph of $y = ax^2 + bx + c$. Sufficient examples should be provided to illustrate that a quadratic equation may have two unequal real roots, two equal real roots or no real roots. In order to ease the job of the students, the interval of values of x for the graph of $y = ax^2 + bx + c$ is given.

2.3 Completing The Square Method

Students should be aware that, in general, the roots of a quadratic equation obtained from the graphical method are approximations only. The exact roots can be obtained by algebraic methods. They should understand the idea of completing the square. It is sufficient for them to attempt problems like $x^2 + 3x - 5 = 0$, where the coefficient of x^2 is unity.

Some common errors in completing the square of $x^2 + bx$ are: adding b^2 instead of $\left(\frac{b}{2}\right)^2$ and adding $-\left(\frac{b}{2}\right)^2$ when b is negative.

2.4 Quadratic Formula

Students should understand that the quadratic formula is derived from the completing the square method. In applying the formula, students should write down the values of a, b and c first before substituting them in the formula. They should recognise that when the value under the square root sign is negative, the formula yields no real roots.

When applying the quadratic formula, a common student error is to ignore the signs of the coefficients or mishandle them.