

4.1 Skill Builder: Extending Algebra Skills: Completing the Square

Specific Expectations

The following expectation is common to both the Functions and Relations and Functions courses.

- OC1.03 determine the maximum or minimum value of a quadratic function whose equation is given in the form $y = ax^2 + bx + c$, using the algebraic method of completing the square

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Time Required Functions and Relations or Functions: 75 min

Materials and Equipment

- graphing calculator (but not essential for this lesson)

Overview

- Build on prior learning about completing the square.
- Complete the square for an expression with a rational factor.

Completing the Square

Encourage students to recognize the merits of various forms of a quadratic relation and to select the appropriate form for the task at hand.

Completing the square can become a familiar routine if students generalize the steps.

Sometimes a device for remembering is helpful, for example, here is a singsong version of the second step, “half it, square it; add it, subtract it.”

Management Options

Groups – Allow students to practise their skills using games. For example, create cards for a game of “concentration.” Write the same equation in different forms on different cards, referring to examples in this section. Use several equations. Players accumulate pairs of matching equations, and the player with the most pairs wins the game.

Teacher Demonstration – Emphasize the steps for completing the square by projecting them on a screen, while working through several examples on the board. This will help students remember the steps for completing the square. Ask students to name the next step and then ask another student to do the algebra as you develop examples.

Then ask students to “fill in the blanks” in a solution or to try a single example and check their work against an overhead solution.

ASSESSMENT SUGGESTION

Knowledge and Understanding, Application

Students should re-express a given function by completing the square and extract useful information about the graph of the function. Provide frequent opportunities for students to respond to a single example rather than to a “test” with multiple examples of the same type of questions.

Practise, Apply, Solve 4.1

Questions with a Functions and Relations Focus:

1–3, 6, 8–11, 13, 14

Questions with a Functions Focus:

1–8, 10, 11, 14