Completing the square – Teacher notes

Activity description

In this activity students match cards to practise completing the square and relating the competed square form to the graph of the function.

Suitability

Level 3 (Advanced)

Time

Up to 1 hour

Resources

Student information sheet, copies of cards

For each student or group of students you will need to copy, laminate and cut out the cards you select. If you use the Word version of this activity you can delete the cards you do not wish to use before printing and copying.

Optional: slideshow

Equipment

Copies of cards, one set per group of students.
Optional: Paper for sketching graphs

Key mathematical language

Quadratic, function, coefficient, minimum, maximum, graph, intercept, line of symmetry, roots

Notes on the activity

The slideshow can be used to introduce the activity and to demonstrate how to complete the square. It includes a range of examples and shows how this form of a quadratic function can be used to sketch its graph. The student information sheets include the same examples.

See notes about the cards under Resources above.

There are 24 sets of cards, where each set contains a quadratic graph, the corresponding quadratic function, and its completed square form. These are of varying difficulty so that you can choose to make the activity more or less challenging. You can also choose to use all three cards in each set or just two of them. Alternatively, students could try to sketch the graph from one of the two forms of the function, and the sketch could be compared with the graph card.

During the activity

Students can work individually or in pairs or groups to match the cards.

Points for discussion

Here are some questions that can be used in class discussion.

- What shape is a quadratic graph?

- How do you know whether a quadratic function has a minimum or a maximum?

- Where is the line of symmetry of the graph?
  Is there always a line of symmetry?

- How does completing the square help you to sketch the graph of the function?

- Do you notice anything about the coefficients in the original expression and in the bracket of the completed square form?

- Can you describe the completed square form of a quadratic in terms of transformations of the graph of $y = x^2$?

- Does completing the square tell you anything about the roots of the corresponding quadratic equation?

- Why do you think the technique is called 'completing the square'?

Extension

Students can try to find the roots of the corresponding quadratic equations, recording anything they notice about the completed square forms of those quadratics that have no real roots.