

Math Warehouse - Completing the Square Calculator

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Original Equation
 $x^2 + 4x = -3$
Step 1) Apply Formula
 $x^2 + 2(2)x + 2^2 = -3 + 2^2$
Step 2) Simplify
 $x^2 + 4x + 4 = 1$
Step 3) Factor
 $(x+2)^2 = 1$
Step 4) Square Root
 $\sqrt{(x+2)^2} = \sqrt{1}$
Step 5) Simplify
 $x+2 = \pm 1$
Step 6) Solve
 $x = -3$ or $x = -1$

www.mathwarehouse.com/036947/calculators/completing-square-calculator.php

This application provides a calculator or program for solving quadratic functions by completing the square. Students are prompted to enter the coefficients for a particular problem to view how their solution would look in a step-by-step solution process. There is another button for students to save a screenshot of the problem and solution on their desktop, as well as a button that opens a new tab with square root calculator. This square root calculator does not act like a typical classroom calculator, but rather shows how to factorize for simplification.

Grade Level: Grades 9-12, Algebra and Algebra 2

PSSM Content Standard: Algebra

CCSSM Content Standard:

- [CCSS.Math.Content.HSA-REI.B.4](#) Solve quadratic equations in one variable.
 - [CCSS.Math.Content.HSA-REI.B.4a](#) Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
 - [CCSS.Math.Content.HSA-REI.B.4b](#) Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .

Math Content: solving quadratic functions (completing the square and square roots), factoring, simplifying radicals

Evaluation

What is being learned? What mathematics is the focus of the activity/technology? Is relational or instrumental understanding emphasized?

The primary mathematics being learned is how to use completing the square as a method for solving quadratic equations. The emphasized understanding is instrumental, as students are given a series of steps to follow alongside a specific example, with the coefficients of their choosing. A subsidiary focus would be the ability to simplify square-root expression. This understanding is also instrumental, as students can simply type the number they would like simplified, and are given, with necessary steps, the procedure to carry out to simplify the desired square root.

How does learning take place? What are the underlying assumptions (explicit or implicit) about the nature of learning?

The learning takes place as the student interprets the given original equation and reads the given steps for solving the quadratic using the method of completing the square. They are also given the opportunity to change the coefficients of the quadratic equation to see how the procedure would change. The student is expected to follow along with the procedure and work to understand the sequencing of steps with the hope they will be able to replicate it on their own when given similar problems.

It is possible that this application could be used for relearning or reviewing and ask students to substitute values that correspond to a previous night's homework. They could then be required to correct their work, using the provided steps to identify where their error first occurred

What role does technology play? What advantages or disadvantages does the technology hold for this role? What unique contribution does the technology make in facilitating learning?

This technology allows users to input in a variety of quadratic functions and view a step-by-step explanations of how to solve by completing the square. The speed, ability to input various coefficients, and a visual representation of the procedure are advantages of the technology. Unfortunately the major disadvantage is the lack of student accountability. I question whether students would think and reflect on the provided solutions, even if required to rewrite with pencil and paper. In this case, the technology might motivate students to try more problems, check their solutions, and allow individual students to compare their work to the calculator's procedure to enhance understanding on a variety of problems (differentiated instruction).
