Broken Calculators

Topics: Addition, Subtraction, Multiplication, Division, Problem Solving
Materials: Scratch paper and pencil, or white boards
Common Core: Variable, but especially 3.OA, 4.OA, 5.OA, MP1, MP3, MP6, MP7

How many ways can you reach the target number, even when the calculator is broken?

Why We Love Broken Calculators

This warmup is a simple and dynamic extension of Target Number, with an extra obstruction that provides greater interest and rigor.

The Launch

The teacher puts up a target number on the board. She tells students that they can come up with any way to make this number that they want on an (imaginary) calculator that has some broken buttons. They should come up with as many ways as they can, but any using the broken button won't count. The teacher gives the students a minute or two to think up and write down solutions, then calls on students to share their answers with the class.

Example problem. The target number is 21. The broken keys are 0, 1, and 2. That means students can use the keys 3, 4, 5, 6, 7, 8, 9, +, -, x, ÷ to make 21. How will they do it?

Selected solutions.
(9 - 6) x 7 = 21 98 - 77 = 21 33 - 7 - 5 = 21
An example like 16 + 5 = 21 is a faulty solution, since you entered the key "1" to make 16.

The teacher can make up examples, or even roll dice to create the target and the restrictions.

Tips for the Classroom

1. Keep it short. A 5-10 minute game is plenty for a warmup, and will keep students from getting burned out on the game.
2. Make operations like addition and subtraction the broken keys to force multiplication and division.
3. Avoid writing "equations" that treats the equals sign as the "compute" button on a calculator, i.e., 5 x 6 = 30 - 5 = 25. Better is to write a single equation using parentheses if necessary, or rewrite what you've done so far on a new line.

(5 x 6) - 5 = 25 or 5 x 6 = 30
30 - 5 = 25.