Microbit Activity with Expressions and Solving Equations

Grade Band: 3-5, 6-8

Subject Area: Math, Computer Science

Domain: Computing Systems, Algorithms and Programming

Computer Science Standards Connections: Collaborating Around Computing, Recognizing and Defining Computational Problems, Creating Computational Artifacts, Testing and Refining Computational Artifacts

Other Standards:
5.OA.A.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
6.EE.E.1 Write and evaluate numerical expressions involving whole-number exponents.
6.EE.E.2.C Use Order of Operations to evaluate algebraic expressions using positive rational numbers and whole-number exponents. Include expressions that arise from formulas in real-world problems.
6.EE.E.3 Apply the properties of operations to generate equivalent expressions.
6.EE.E.4 Identify when two expressions are equivalent.
6.EE.F.5 Understand a solution to an equation or an inequality makes the equation or inequality true. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
6.EE.F.7 Write and solve real-world and mathematical problems in the form of one-step, linear equations involving non-negative rational numbers.

Required Technology: Computer, microbit

Brief Description: Students will incorporate the use of microbits to help them understand how to utilize parentheses. This will help reinforce the idea that order matters when solving equations or generating equivalent equations. The microbits can be used at multiple times throughout the year to help students understand the importance of sequencing involved in coding and math.

Objectives:
- Students will be able to evaluate numerical expressions and prove their answers using microbits.
- Students will be able to generate equivalent expressions using the microbits and apply two different sets of code to achieve the same answer.
- Students will be able to determine a solution or solve a one-step equation and successfully check their solution using the microbits.

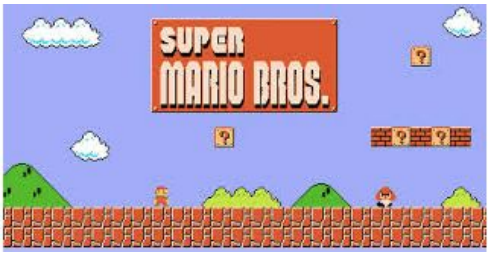
Pre-Test Questions:

- Does order matter when evaluating or solving equations?
- Can you write different expressions and, when evaluated, get the same result?

Post-Test Questions:

- Which operations produced the same result?
- How does the idea of order in math relate to coding?
- What were some of the obstacles you faced when trying to recreate/prove your answer or solution with the microbits?
- Right now we are solving simple expressions or equations. What would happen if you did not pay attention to the order or sequence when writing code?

Catch/Hook: Video Games - What's your favorite game? How does it work?
After asking your students about their favorite video game and coming up with ideas on how the video game works, discuss what would happen if there was a mistake in the coding. What if when you tried to jump, the code was accidentally written to duck down? How would this affect the game? Do you think the programmer double-checked his/her work?



Lesson/Activity Description:

This is an activity that I would use multiple times throughout the school year. The first time would be to address evaluating expressions and checking work. The second time I would use this activity would be creating equivalent expressions or identifying whether two expressions are equivalent. The third time this activity would be used would be to

substitute a solution to determine if it makes a true statement or not and by checking work when solving equations.

As students work through evaluating expressions and solving equations, point out the importance of order and the sequence of how math problems are solved. The other big idea when teaching these math standards is the idea of checking your work.

Throughout these activities, I would have students work with partners.

Part 1: After students have evaluated an expression, have them double check their work by applying the correct code into the microbit. If they do not come up with the same answer, have them double check their work or their code and revise their work. Make sure to use real-world examples.

Part 2: Have students create two different expressions that generate the same value. Give them an answer and they develop two equivalent expressions. Use this to create two different codes that produce the same result. Make sure to use real-world examples.

Part 3: A) First have students mentally determine solutions to equations. Check these solutions by substituting them in and have them double check by correctly using the microbits. B) Have students use inverse operations to solve one-step equations. Students will double check their work by correctly substituting in their answer and entering in the expression into the microbit. Make sure to use real-world examples.

What to Know Before Starting: Some students struggle with the idea of order when evaluating math expressions. Coding requires specific sequencing and the use of parentheses can be seen with ovals around certain steps. It is important for students to communicate their thinking by showing their work. Make sure students are writing down their steps and showing their work before moving on to the microbit activity part.

Computer Science Standards: 5.CS.HS.01, 5.AP.A.01, 5.AP.C.01, 8.AP.A.01