

Hands-On Activity

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Third Grade Lessons

1. **All Things Being Equal II** - The equals sign signifies that amounts on each side are the same. The students will use Unifix blocks and the corresponding equations to represent equalities between additive amounts.
2. **Comparing Heights I** - Students compare the heights of two children, measure, compare, and represent one's own height in relation to a peer's height, and focus on the differences between heights.
3. **Functioning Together** - Students work together to develop multiple representations of a function. The students split up into groups of three with each student having a separate responsibility. When all the input values have been used up, the students are asked to, together, make up a story that describes their function.
4. **Human Graph I** - Students plot themselves on a Cartesian plane. Each student will get a large card with a place for an ordered pair: (x, y), where x refers to hours worked, and y refers to amount earned. The students must name the coordinate pair for the point they themselves are standing on.
5. **Human Graph II** - Students graph the functions $k \times 2 \text{ \$/h}$ and $k \times 3 \text{ \$/h}$. The idea is to show that for each linear function the points fall onto a straight line.
6. **Number Line - Locations** - Students place themselves at points on the number line. Main contexts: stairs, age, money, temperature, and pure number.
7. **Number Line Shortcuts** - The students will use a number line to see how two addends or subtrahends are equivalent to one single change once combined.

Fourth Grade Lessons

1. **Comparing Strips of Unmeasured Lengths I** - The class is the first of a series that will focus directly upon the algebraic representation of measurements and their multiplicative relations. Children are asked to compare the lengths of strips, to describe the relationships between them in multiple ways, and to demonstrate that the relationships they represent are true.
2. **Comparing Strips of Unmeasured Lengths II** - The class is the second of the "Strips of Unmeasured Lengths" series that will focus directly upon the algebraic representation of measurements and their multiplicative relations. Children are asked to compare the lengths of strips, to use algebraic notation to describe the relationships between them, and to demonstrate that the relationships they represent are true.
3. **Comparing Strips of Unmeasured Lengths III** - This is the third lesson in the "Strips of Unmeasured Lengths" series that focuses directly upon the algebraic representation of measurements and their multiplicative relations. We will work with the relationship $B = 3S$, focusing on equations and their verbal descriptions and on true and false equations and statements.
4. **Multiplicative Candy Boxes I** - This class centers on the possible amounts of candies two children, Juan and Marcia, have. Juan has a box of candy and Marcia has twice as much candy. What are the possible amounts of candies they might have?

Fifth Grade Lessons

1. **Enacting and Solving Equations** - Students enact and discuss a situation where two children have amounts of candies. Some of the candies are visible, others are inside opaque tubes or boxes. After considering multiple possibilities they are told that the children have the same amount of candies. The situation corresponds to the equation $3x + y + 6 = x + y + 20$, where x is the amount of candies per tube and y is the amount of candies per box. Students will be asked to discuss and to represent the situation, to solve the equation that corresponds to the situation, and to solve other written equations with similar structure.

Middle School Lessons

1. **Box Extremum** - Students will start by finding average rates of change for a non-linear function over increments of the independent variable. The size of the increments will decrease to introduce the idea of using tangent lines to find instantaneous rates of change of linear and non-linear functions. Students will see what a tangent looks like at the extrema of a graph. Students will then create a box that maximizes the volume and see how determining the extrema of a graph can help to find the maximum volume.
2. **Candy Experiment** - Students will create their own data to construct a graph and equation of negative and fractional slope.
3. **Can We Predict Differences?** - Students will predict, produce, and compare linear and non-linear function graphs used to represent the number of punches on a balloon.