**Phet Lesson, Equality Explorer, 6th Grade intro to solving and equality statements**

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| **Overview** | |
| This lesson is meant to have students explore the underlying principles of solving one-step equations.  Prerequisite Skills:   * Students can identify the additive inverse of an integer. * Use variables to represent values.   Learning Goals:   * I understand and can describe the equals sign as a balance that states each side of the equation is equal to the other. * I can use opposite operations (additive inverse) to make zero pairs. * I can use opposite operations to isolate (get by itself) the variable.   Common Core Standards:   * 6.EE.B.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. * 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or , depending on the purpose at hand, any number in a specified set. * 6.EE.B.7 Solve real-world and mathematical problems by writing and solving equation of the form x+p=1 and pxq for cases in which p, q and x are all nonnegative rational numbers.   Mathematical Practices:   * Reason abstractly and quantitatively. * Construct viable arguments and critique the reasoning of others. * Look for and make use of structure. | |
| Materials   * One-to-one or one-to-two device setup. * Projector for warm up. * Class set of activity sheets. * Ideally some manner by which to share a web link with students (Google Classroom, etc.) | |
| Estimated Time: approximately 50min | |
| Equality Explorer | |
| Warm Up | 7min |
| Project the below image from <https://im.openupresources.org/6/students/6/3.html>. Have students think quietly for 2min, then discuss with a partner for 2min. Have a few students share out an idea they discussed with their partner.    Adapted from Open Up Resources/Illustrative Mathematics. Download the original lesson for free at [openupresources.org](https://openupresources.org/) | |
| Simulation Introduction | 7-10min |
| Teacher will... | Students will... |
| * Make sure each student has a pencil. * Hand out an activity sheet to each student. * Help students get to the correct link / sim. * Tell students that the interactive screen is called a simulator or sim. * Show students what the Basics screen looks like on the projector. * Ask students to play around with the sim and discover what it can do. * Tell them they will have a chance to share out. | Follow along with instructions and then play with the sim. |
| * Ask students to share out. * Make sure that the following items are covered   + The balance arrow is green when the two sides are of equal weight   + Snapshots   + 4 different modules   + Reset button   + Eraser and Restack button | Share out to the class |
| Investigation: Problems 2-7 | 10-25min  Students work in pairs. |
| * Point out to students that there is a checkpoint after question 7. * Ask students to begin working through problems 2 through 7, checking in with their partner for each question to share and discuss answers. * For the checkpoint, push students to explain what an equals sign says about a relationship.   + Each side of the balance must be the same value. | Students should be discussing each problem. If necessary, the teacher should add talking accountability structures. |
| Investigation: Problems 8-13 | 25-40min  Students work in pairs. |
| * When all or almost all pairs have continued on to the Numbers part of the sim (past #8), pause the class. * Ask for students to share out what is new or different about this sim?   + Make sure to cover:     - The lock button     - Making zero pairs on one side of the scale     - Taking away something that isn’t there (in lock mode) | Students pause and follow teacher led discussion. |
| Closure   * Tell students that one of our most important takeaways is being able to explain the meaning of an equals sign. Have them move ahead to #13 and discuss if they have not yet. | Skip to #13 and discuss with their partners. |
| Exit Ticket (formative assessment) | Last 6min of class |
| Provide the below exit ticket problems on a half or third of a sheet. Have students work independently and show and explain their thinking.  Exit Ticket:   1. Explain the meaning of an equal sign. 2. How can you change an equation and keep it balanced? | |