**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.
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| 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.)
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| 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 | 10-25minStudents 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?
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