

The **Equality Explorer** simulation allows students to explore the conditions that result in equality and inequality, the effect of applying operations to an equality or inequality, and solve simple equations.

## Basics Screen

In the Basics screen, students can discover equality relationships and create functional definitions of equality and inequality.

**OBSERVE** the statement reflecting what is on the balance

**ORGANIZE** objects on the balance

**BUILD** an equality by dragging objects on and off the balance

**SAVE** snapshots of the balance

**RELOAD** a snapshot

**EXPLORE** different sets of objects

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## Numbers Screen

In the Numbers screen, students can turn on the lock to perform the same operation to both sides of the balance and explore what happens to the state of equality.

**DISCOVER** the impact a positive or a negative number has on an equality or inequality

**COMBINE** zero pairs

**LOCK** the balance so that an operation occurs on both sides

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## Variables Screen

In the Variables screen, students explore how different values for a variable impact the state of equality.

**VIEW** simplified equation

**CONTROL** the variable value

**LOCK** the balance so that an operation occurs on both sides

## Operations Screen

In the Operations screen, students can build an inequality or equation and apply universal operations to explore what happens to each term, and discover how to undo an operation.

**APPLY** operations to both sides of the balance

**COMBINE** like terms

**CONTROL** the variable value

**SHOW/HIDE** the variable value for each snapshot

## Insights into Student Use

- Students naturally want to find balanced situations. Encourage them to find as many as possible.
- Students enjoy applying operations to create the largest or smallest numbers.
- Students might realize that an operation is “unproductive” or doesn’t do exactly what they want. Challenge them to find the operation that will “undo” their last one.

## Solve It! Screen

In the Game, students solve equations using the universal operation control to isolate the variable.

**Level 1:** one-step equations

**Level 2:** two-step equations

**Level 3:** multi-step equations with fractions

**Level 4:** multi-step equations with variables on both sides of the equation

**VIEW** original equation

**VIEW** current equation

**APPLY** operations to isolate  $x$ .

**COLLECT** stars for each completed challenge

**SAVE** snapshots of each step to show progress

## Suggestions for Use

- Explore proportional relationships on the Basics screen.
- Using the Variables screen, set up a balanced equation and minimize the variable value. Trade computers with a partner and figure out the value of  $x$ .

## Sample Challenge Prompts

- Find as many equations as possible using the objects on the Basics screen.
- What happens to an equation or inequality if you add 1 to both sides with the lock on? What happens if you add -1 to both sides with the lock on?
- Explain what happens to an equation if you try to remove 1 from both sides (with the lock on) and you don't have a 1 available. Why does this happen?

See all published activities for Equality Explorer [here](#).

For more tips on using PhET sims with your students, see [Tips for Using PhET](#).