

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

Equality Explorer

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

Equality Explorer

Variables Screen

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

VIEW simplified equation

$2x + 1 = -x - 2$

$x = -1$

CONTROL the variable value

LOCK the balance so that an operation occurs on both sides

Equality Explorer

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

$4x - 1 = 11$

$x = 3$

CONTROL the variable value

SHOW/HIDE the variable value for each snapshot

COMBINE like terms

Equality Explorer

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: one-step equations with negative coefficients

Level 3: two-step equations

Level 4: multi-step equations with fractions

Level 5: 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](#).