

The **Mean: Share and Balance** simulation allows students to explore four different conceptualizations of the mean, in four different contexts.

## Level Out Screen

In the Level Out screen, students can create and modify continuous data (cup water levels), predict the mean water level, then open the valves to see the water levels equalize.

**What is the average amount of water per container?**

Predict Mean  
 Tick Marks

**PREDICT** mean water level

**CONFIRM** mean prediction

**LEVEL OUT** water between all cups

**ADJUST** water levels for each cup

Number of Cups: ◀ 4 ▶

**CHOOSE** number of cups

Mean: Share and Balance | Level Out | Distribute | Fair Share | Balance Point | PhET

## Distribute Screen

In the Distribute screen, students can create and modify discrete data (number of candy bars), predict the mean number of candy bars per person, then distribute the bars to approximate or find the mean.

**What is the average number of candy bars per person?**

Total = 36 candy bars

Predict Mean  
 Total

↕ Sync

**PREDICT** mean number of candy bars

**DISTRIBUTE** candy bars into even piles

**ADJUST** number of candy bars per person

Number of People: ◀ 6 ▶

**SYNC** notepad view and table view

**CALCULATE** the arithmetic mean

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## Fair Share Screen

In the Fair Share screen, students can create and modify data (number of apples), collect the apples, then share them to find the mean.

The screenshot shows the 'Fair Share' interface with the question 'What is the average number of apples per person?'. A notepad at the top displays 'Total = 11 apples' and three stacks of three apples each. Below the notepad are 'Sync', 'Collect', and 'Share' buttons. A callout box on the left says 'COLLECT AND SHARE apples into even stacks'. Below the notepad, three people are shown with their respective apple counts: 2, 4, and 5. A callout box on the left says 'ADJUST number of apples per person'. On the right, a 'Number of People' control is set to 3, with a callout box saying 'CALCULATE the arithmetic mean'. The bottom navigation bar includes 'Mean: Share and Balance', 'Level Out', 'Distribute', 'Fair Share', and 'Balance Point'.

## Balance Point Screen

In the Balance Point screen, students can create and modify data (distances kicked) and move a fulcrum to predict and locate the balance point.

The screenshot shows the 'Balance Point' interface with the question 'What is the average kick distance?'. A notepad at the top displays a number line from 0 to 10 with three data points at 3, 4, and 8. A callout box on the left says 'PREDICT mean distance kicked'. Below the notepad is a 'Reset' button. On the right, there are controls for 'Tick Marks' (checked) and 'Total' (unchecked), with a callout box saying 'BALANCE beam'. Below the notepad, a person is shown kicking a ball, with a callout box saying 'KICK balls to create data set'. At the bottom, a 'Number of Balls' control is set to 4, with a callout box saying 'ADJUST distance kicked per person'. The bottom navigation bar includes 'Mean: Share and Balance', 'Level Out', 'Distribute', 'Fair Share', and 'Balance Point'.

## Insights into Student Use

- Students may desire to provide a numerical value for the mean. Tick marks may be helpful, but values are intentionally obscured in the sim to encourage a qualitative investigation into the value of the arithmetic mean.

## Customization Options

Query parameters allow for customization of the simulation, and can be added by appending a '?' to the sim URL, and separating each query parameter with an '&'. The general URL pattern is:

```
...html?queryParameter1&queryParameter2&queryParameter3
```

For example, in Collision Lab, if you only want to include the 1st and 2nd screens (`screens=1, 2`), with the 2nd screen open by default (`initialScreen=2`) use:

```
https://phet.colorado.edu/sims/html/collision-lab/latest/collision-lab_all.html?screens=1,2&initialScreen=2
```

To run this in Spanish (`locale=es`), the URL would become:

```
https://phet.colorado.edu/sims/html/collision-lab/latest/collision-lab_all.html?locale=es&screens=1,2&initialScreen=2
```

⚙️ Indicates this customization can be accessed from the Preferences menu within the simulation.

Query Parameter and Description	Examples
<code>screens</code> - specifies which screens are included in the sim and their order. Each screen should be separated by a comma. For more information, visit the <a href="#">Help Center</a> .	<code>screens=1</code> <code>screens=2, 1</code>
<code>initialScreen</code> - opens the sim directly to the specified screen, bypassing the home screen.	<code>initialScreen=1</code> <code>initialScreen=2</code>
⚙️ <code>locale</code> - specify the language of the simulation using <a href="#">ISO 639-1</a> codes. Available locales can be found on the simulation page on the <a href="#">Translations tab</a> . Note: this only works if the simulation URL ends in “_all.html”.	<code>locale=es</code> (Spanish) <code>locale=fr</code> (French)
⚙️ <code>regionAndCulture</code> - Select the portrayal of people, places, or objects in the sim. Images are not intended to represent the entire diversity of a region or culture. Possible values: <code>asia</code> , <code>africa</code> , <code>africaModest</code> , <code>latinAmerica</code> , <code>oceania</code> , <code>usa</code>	<code>latinAmerica</code>
<code>audio</code> - if muted, audio is muted by default. If disabled, all audio is permanently turned off.	<code>audio=muted</code> <code>audio=disabled</code>
<code>allowLinks</code> - when <code>false</code> , disables links that take students to an external URL. Default is <code>true</code> .	<code>allowLinks=false</code>
<code>supportsPanAndZoom</code> - when <code>true</code> , enables panning and zooming of the simulation using pinch-to-zoom or browser zoom controls.	<code>supportsPanAndZoom=false</code>

## Suggestions for Use

- Build a data set and predict the mean, then use the notepad view to find the mean in context.
- Explore the mean in different contexts by manipulating the original data (water levels, number of candy bars, number of apples, and distances kicked) and watching the mean value change.
- Explore the impact of outliers by manipulating a single data value and observing the effect on the value of the mean.

## Sample Challenge Prompts

- Explain why equalizing the water across all cups illustrates the mean water level.
- Explain why distributing candy bars evenly across all people illustrates the mean.
- Explain why collecting and dividing apples across all people illustrates the mean.
- Explain why the balance point of a beam illustrates the mean of a dot plot.
- Describe how the water, candy bar, and apple contexts all feel like “leveling out” to find the mean, and explain the differences between “leveling out” water, wrapped candy bars, and fruit.
- Build two different data sets with the same mean value. at least two ways to make a mean of  $1/2$  with \_\_\_\_ cups (fill in blank with a number from 2 to 7).
- Predict how the mean will change if you add a new cup or person whose data value is smaller than the mean, larger than the mean, and equal to the mean.
- Using the Balance Point screen, build four different data sets with a mean value of 5.
  - What is the easiest set to build?
  - Write a procedure for how to change the soccer ball locations and maintain a mean value of 5.
- Using the Balance Point screen, build a data set with a mean value of 5. Calculate the deviations (distance from each point to the mean), and compare with a partner. What statements can you make about the deviations?

See all published activities for Mean Share and Balance [here](#).

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