

In **Ratio and Proportion**, students explore the concepts of ratios and proportional reasoning by changing hand positions to find challenge ratios and maintaining ratios through movement.

## Discover Screen

Move the hands to find the three challenge ratios and try keeping the ratio by moving the hands together.

**MOVE** each hand to find the challenge ratio

**VIEW** tick marks to help position the hands

**CHANGE** the challenge ratio after exploring and finding a ratio

**ACCESS** sim features (sound on/off, keyboard shortcuts)

## Create Screen

Set the challenge ratio and challenge yourself or others to find the and maintain the ratio.

**CHANGE** the antecedent (left hand) and consequent (right hand) for the challenge ratio

**CHANGE** the range of the tick mark scale (if tick marks enabled)

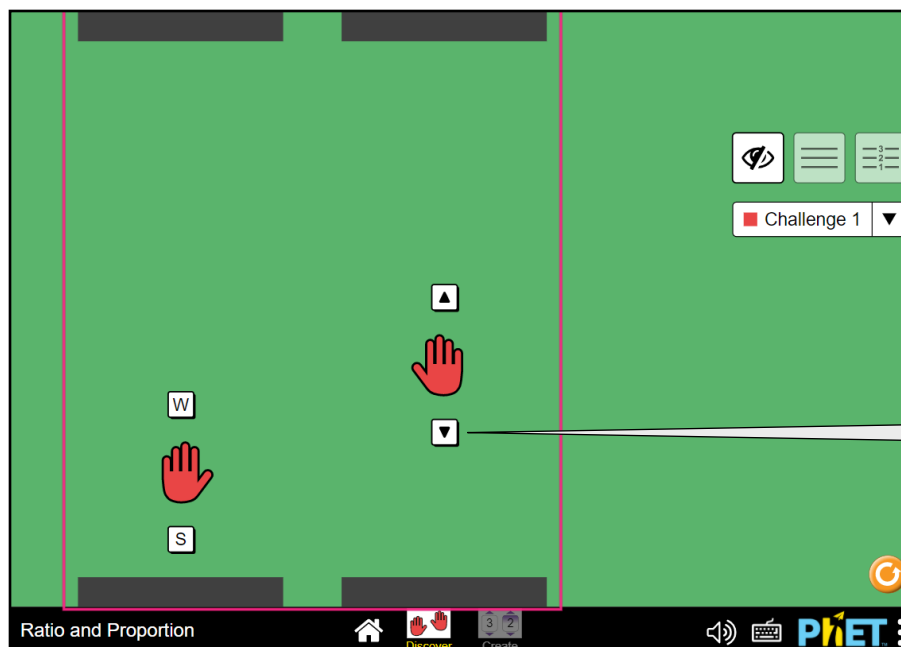
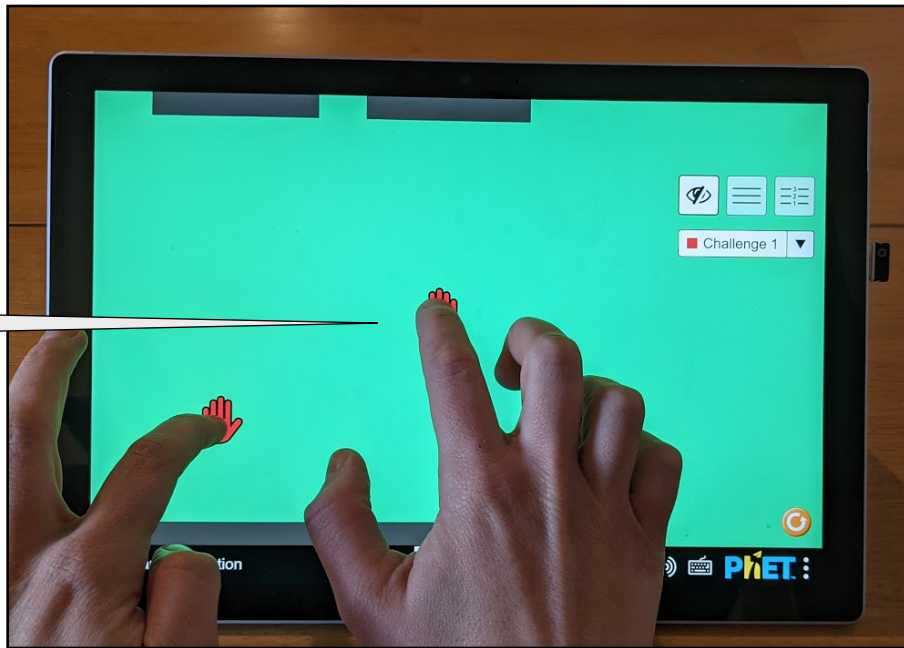
**HIDE** the set challenge ratio

**LOCK** the hands when at the challenge ratio

## Device and Input Features

- This simulation supports independent movement of each hand using a touchscreen device and is the ideal input for exploring the continuous nature of the ratio through proportional reasoning.
- If a touchscreen is not available, the continuous nature of the ratio can be explored using a cursor or keyboard by enabling the Lock Ratio checkbox on the Create screen when at the challenge ratio.
- If using a keyboard, you can tab to the entire play area (shown below with a pink box highlight) and use the W/S keys to control the left hand and the Up/Down arrow keys to control the right hand for independent, simultaneous exploration.

**MOVE** each hand simultaneously to find the challenge ratio and move both hands using a touchscreen device



**CONTROL** each hand independently & simultaneously using W/S and Up/Down arrow keys

## Model Simplifications

- When either hand is placed at 0, it is not possible to get success feedback. You can discuss with your students what it means for zero to be in the numerator or denominator of a ratio.
- When the tick marks are enabled (with or without numbers), the hands will snap to the lines when released near them. This allows students to get exact placement of the hands when using the tick marks to find challenge ratios.

## Additional Features

- A plucking sound indicates how close the hands are to the challenge ratio. If the plucking sound is playing, keep moving until a happy chime plays to indicate success in finding the challenge ratio.
- A rewarding sound will play when you move the hands together in a way that keeps the challenge ratio. This sound will also play when moving the hands on the Create screen with the Lock Ratio checkbox enabled.
- The simulation can play a sound as you move a hand past a tick mark by enabling the Enhanced Sound in the PhET menu.
- See the [Sound Features Video](#) for more useful tips on how concepts and sound are integrated in this sim. See the published [Sound Design Documentation](#) for more details on all sounds in this simulation.
- The hands can be moved independently using the keyboard. See the Keyboard Shortcuts dialog in the simulation for more information.

## Suggestions for Use

### Sample Challenge Prompts

- Predict different hand positions where you will get success for each challenge ratio, then test each position and see if you right. Come up with a rule for finding new successful hand positions.
- Come up with a strategy for how you might move the hands up and down the play area to keep the challenge ratio and try to do it (best with a touchscreen)!

See all published activities for Ratio and Proportion [here](#).

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