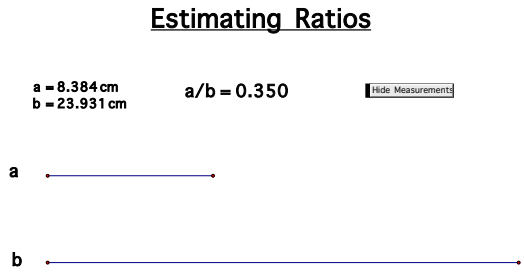
Estimating Ratios Activity

This is a simple game that can lead to a lot of valuable conversation about ratios and fractions. The game is easy to create using dynamic geometry software, and works especially well if it can be projected onto a board so that students can do it as a group.

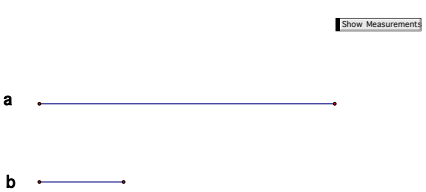
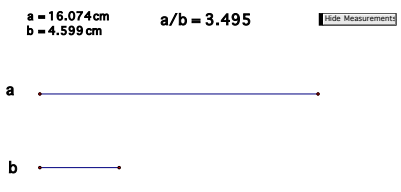


Setting up the game:

Create 2 line segments with the dynamic geometry program, and use the program to measure their lengths. Then, use the program to calculate the ratio of the two lengths. (Divide the length of the top line segment by the length bottom segment.) Use a "hide/show" button so that you can make the measurements appear or disappear from the screen. The segments can be made longer or shorter by dragging one of the ends, and as they change, the program will automatically recalculate.

Playing the game:

Students should each have a paper and pencil. The teacher displays two "new" line segments by dragging their ends and changing their lengths as in the illustration below. Students should be given a short amount of time (maybe 30 seconds) to estimate the ratio of lengths and write down a number. When students each have an estimate, the teacher can display the measurements, and students can see how close their estimates are.

Before:	After:
	

Variations:
This game can be played in different ways depending on the level of the students and what the teacher wants to emphasize. The teacher can encourage the students to think of a length that divides evenly into both (a common divisor or common measure) so that the ratio can be expressed as a ratio of integers. In the example above, students might be able to visualize it as a 3 : 1 ratio or even a 7 : 2 ratio. Another way to think of it is as a unit ratio (a ratio of some number

to the number 1). The teacher can encourage the students to think of the bottom length as the "unit" and ask themselves "How many of segment b fit into segment a?" If students think of it this way, they may get answers like 3.2 : 1. Another variation is to allow the students to use a calculator to convert a ratio into a unit ratio so that they can check their estimate. So, for example, if a student estimates a ratio to be 11 : 3.5, they can use a calculator to divide 11 by 3.5 to find the unit ratio (approximately 3.143). Allowing the kids to use the calculator makes the game move faster, and it encourages the kids to be inventive in finding a common divisor so they don't have to express their ratio in terms of easier numbers. It also helps students build an understanding of the relationship between ratios and division.

This game tends to lead to many interesting questions and conversations about ratios and fractions. Issues that arise include:

(a) Understanding a ratio as expressing a (visual?) relationship between two quantities
(b) Understanding the relationship between ratios and division (that one way to think about the ratio of a to b is "How many lengths of b fit into a?", or "How many times does b go into a?")
(c) Common divisors
(d) Ratios of integers vs. unit ratios
(e) Reciprocals (the relationship between a:b and b:a)
(f) Estimating and comparing magnitude of fractions
(g) Converting between decimals and fractions
(h) Estimating and calculating the difference of 2 decimals or fractions (when students check their answers)