



What are Fraction Strips?

Fraction strips are rectangular pieces (electronic or copied on paper strips) to represent different parts of the same whole. They can be cut apart and manipulated to see how various parts can be added together to make the whole or compare different fractional amounts for equivalency. They can be various colours, and sizes. Some resources may call fraction strips **fraction towers** if they remain intact and pre-arranged.

How do Fraction Strips help students?

Fraction strips help students to visualize and explore fraction relationships. They allow students to develop a concrete understanding of fractions and mixed numbers, investigate equivalency, compare and order fractions and explore number operations with fractions. Fraction strips help students by allowing them to manipulate parts of the same whole. By their very nature they keep the whole consistent for students.

How many are recommended?

One set of fraction strips per student is recommended. Teachers can print the coloured versions from online templates or the black and white versions work as well; students can colour the strips themselves. Teachers might consider having students colour the pieces in a consistent manner for ease when referring to pieces during debriefing of the activities.

Sample Activities

1. Using non-labeled fraction strips, students cut out and arrange the pieces in relation to the whole. Students label each of the fraction amounts using proper fractional notation. Engage the class in a vocabulary discussion about numerators and denominators.
2. Students identify $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{8}$ and explain their reasoning.
3. Students compare various fraction strips and record their observations, and share their discoveries with the class. Encourage students to begin by counting the pieces of the whole to visualize how fractional notation relates the parts to the whole. Students explore fractions that are part of other fractions. (e.g., $\frac{1}{10}$ is $\frac{1}{2}$ of $\frac{1}{5}$)
4. Students show all the different ways they can represent $\frac{1}{2}$, and describe what they notice about the denominators they have chosen.
5. Students predict which fraction is larger: $\frac{2}{3}$ or $\frac{2}{6}$? Students use the strips to test their predictions and discuss what they notice?
6. Students order various fraction amounts from greatest to least, explaining what they notice about the denominators.
7. Each student in the class randomly receives a fraction strip ; they find partners so that the total of their strips is one whole.

Fraction Strips and Fraction Towers

8. Students solve and explain their thinking: Three siblings are helping to rake the leaves in the yard of their house. If Hannah rakes $\frac{1}{4}$ of the yard and Mya rakes $\frac{1}{3}$, how much of the yard is left for Fyona to rake? Who has raked the most leaves, and who has raked the least?
9. Students use the activity in GAP Closing Junior/Intermediate Module 2, page 14 http://www.edugains.ca/resources/LearningMaterials/GapClosing/Junior/Intermediate/GCU2_SB_ComparingFractions.pdf For this activity, the fraction strips are intact. Students use a ruler to measure $\frac{1}{3}$ and $\frac{2}{6}$ to verify that they both are the same length. Students test other fraction measures to look for equivalent fractions.
10. Students measure from one end of the whole fraction strip to the other end; then measure $\frac{1}{2}$ the fraction strip from one end, then $\frac{1}{4}$, and describe what they notice. If the strips are created with “friendly” numbers from end to end of the whole, (e.g., 40 cm long) it is easier for students to make connections. (e.g., $\frac{1}{2}$ is equal to 50% of the whole number measured, and $\frac{1}{4}$ is 25% of the whole number measured).
11. Model for students how fraction strips can show multiplication of fractions.
(e.g., $\frac{1}{3} \times \frac{3}{5}$ is really $\frac{1}{3}$ of $\frac{3}{5}$)

Start by showing $\frac{3}{5}$



Then consider $\frac{1}{3}$ of what is coloured



This shows the answer is $\frac{1}{5}$



Students practice with other fraction multiplication questions.

12. Model for students how fraction strips can show division of fractions

(e.g., $\frac{2}{3} \div \frac{3}{4}$ Use 12^{th} s to show the whole



$\frac{2}{3}$ would be



$\frac{3}{4}$ would be



Students write the answer as a fraction showing that 8 pieces out of 9 represents $\frac{2}{3} \div \frac{3}{4}$ Therefore $\frac{2}{3} \div \frac{3}{4} = \frac{8}{9}$

Students practice with other fraction division questions.

Note: Students can visualize that by first choosing the common denominator they can divide the numerators to determine their answer; this eliminates the need for the rule “invert the divisor and multiply”.



What are Fraction Towers?

Fraction towers consist of 51 interlocking blocks that are proportional to each other. There are 9 colours that represent fractions 1 whole, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{10}$, $\frac{1}{12}$. These colours help to draw the connections for students among the different fractional parts during their exploration. The colours represented for these fractions match the colours for equivalent decimals and percents if the towers are purchased.

Another option is to purchase fraction tower equivalency cubes which have one side of the cube labeled in fractional notation, the second side in decimal notation, the third in percent notation, and the last side is blank. It was noted above that some resources refer to fraction strips as fraction towers because they are prearranged and stacked beside each other to show relationships in a 2 dimensional form.



How do Fraction Towers help students?

Fraction towers help students to develop number sense for fractions and mixed numbers, order fractions, and explore number operations with fractions using concrete materials. The towers provide students with a visual and graphical representation because they can stack upwards to show the relationships. The predetermined colours help make these relationships more explicit for students. Fraction towers allow students to explore equivalency as well as the relationship between fractions, decimals and percents. They also help students to see the relationships between the parts and the whole.

How many are recommended?

Using fraction towers in pairs or small groups is recommended. One set per group of three or four students is ideal but a few sets for a room can be used effectively in conjunction with other manipulatives for representing fractions, decimals and percents. If fewer sets are available, they can be rotated throughout the class so that all students have a chance to explore with the towers and look for relationships; alternatively they can be used in a learning centre. A transparent overhead set or a document camera is effective for whole class demonstrations.

Sample Activities

1. Using the towers, students explore, look for relationships between the pieces, and share their discoveries with their peers.
2. Students explore fractions that are equal to $\frac{1}{4}$, showing how they know.
3. Working in partners, students put fraction pieces together in various lengths to determine fraction towers that are close to 0, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, justifying their answers.

Fraction Strips and Fraction Towers



4. Students work in pairs to determine which fraction is larger: $1/2$ or $5/8$, using multiple ways to show how they know.
5. Students determine the sum $2/8 + 4/8$, and show other fractions that also represent this answer.
6. Students compare and order $1/2$, $3/8$, $2/3$, $6/10$, explaining their reasoning.
7. Students find other fraction amounts equal to $4/12$, showing how they know they are equal and finding other fractions pairs that are equal.
8. Students solve: James, Gursh and Allan all get the same amount of money for their monthly allowance. If James spent 20%, Gursh spent $1/3$ and Allan spent 0.4 of his allowance who has the most money left over at the end of the month?
9. Students determine how many tenths are in $3/5$ and explain how it's the same as $3/5 \div 1/10$
10. Students explore: If you added two fractions and your answer is $8/10$ what could the two fractions added be, showing as many solutions as they can.
11. Students demonstrate $3 \times 1/8$ by joining fractional pieces, and then repeat for $3 \times 2/8$ and describe what they notice?

Recommended Websites

- <http://oame.on.ca/CLIPS/tools/> (electronic fraction strips)
- <http://oame.on.ca/clips/index.html?ePractice=T> (interactive fractions activities)
- http://www.eworkshop.on.ca/edu/pdf/Mod22_fraction_strips.pdf (printable fraction strips)
- <http://www.gradeamathhelp.com/free-fraction-strips.html> (downloadable fraction strips and activities)
- http://nlvm.usu.edu/en/nav/frames_asid_203_g_1_t_1.html?from=topic_t_1.html (electronic fraction strips where the whole can be manipulated)
- http://nlvm.usu.edu/en/nav/category_g_2_t_1.html (virtual manipulatives)
- <http://www.fractionmonkeys.co.uk/> (fraction game)
- <http://www.maths-games.org/fraction-games.html> (interactive fraction games)
- http://www.edugains.ca/resources/LearningMaterials/GapClosing/Junior/Intermediate/GCU2_SB_ComparingFractions.pdf (fraction towers activity)
- <http://www.learningresources.com/text/pdf/2564book.pdf> (shows how you can use fraction towers to change a mixed number into an equivalent fraction before subtraction)

Reference: Teaching Student-Centered Mathematics Grades 5-8, John Van de Walle, Pearson, Boston, 2006