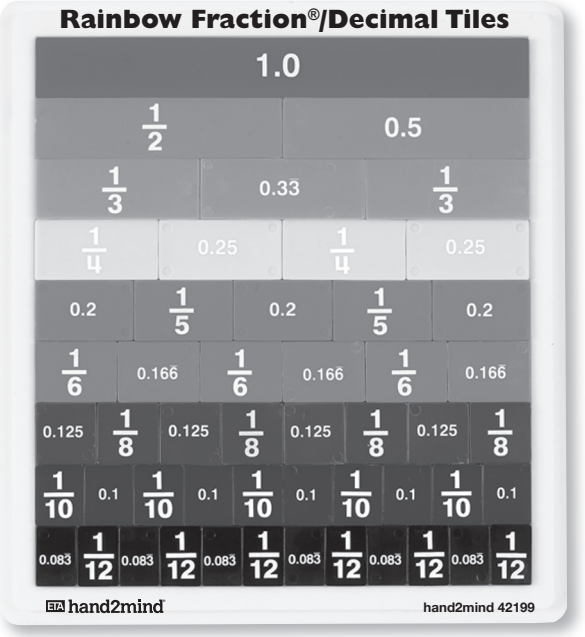
Learning About...®

Rainbow Fraction®/Decimal Tiles

A Guide to Teaching Strategies, Activities, and Ideas



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INTRODUCTION

This ***Learning About…® Rainbow Fraction®/Decimal Tiles Activity Guide*** is a resource providing hands-on activities and ideas that allow you, the teacher, to lead students in an active exploration of the world of fractions and decimals. The activities presented involve students in the process of exploring abstract concepts through the use of a variety of fraction/decimal tiles. Students are encouraged to think critically, plan strategies, and share conclusions.

The ***Learning About…® Rainbow Fraction®/Decimal Tiles Activity Guide*** emphasizes:

- communication
- exploration
- problem solving
- analysis

The Rainbow Fraction®/Decimal Tiles Activity Set contains 51 double-sided tiles. The longest is labeled "1" and "1.0", two are labeled "$\frac{1}{2}$" and "0.5", three are labeled "$\frac{1}{3}$" and "$0.3\overline{3}$", four are labeled "$\frac{1}{4}$" and "0.25", five are labeled "$\frac{1}{5}$" and "0.2", six are labeled "$\frac{1}{6}$" and "$0.16\overline{6}$", eight are labeled "$\frac{1}{8}$" and "0.125", ten are labeled "$\frac{1}{10}$" and "0.1", and twelve are labeled "$\frac{1}{12}$" and "$0.08\overline{3}$". Each tile is scaled to represent the appropriate sized fraction and decimal of the unit tile.

Each Rainbow Fraction®/Decimal Tiles Activity Set can be used to:

- name fractions and decimals
- relate fractions and decimals to a whole unit
- show equivalent fractions and decimals
- model different operations involving fractions and decimals

Exploring with Rainbow Fraction®/Decimal Tiles Activity Set

Students should be allowed time to freely explore and experiment with their **Rainbow Fraction®/Decimal Tiles Activity Sets** before guided activities begin. Students should be given the opportunity to become comfortable and familiar with the tiles by creatively manipulating them. Encourage students to use the tiles to create patterns and designs. Challenge students to talk about the tiles and how they relate to one another.

INTRODUCTION TO FRACTIONS

Purpose: Exploring and naming the number of fractions needed to create one unit tile

Group Size: Cooperative Groups

Procedure: Provide one complete set of **Rainbow Fraction®/Decimal Tiles** for each group of students. Tell students to turn all tiles over so that only the decimal sides are showing. Create the following chart on the board leaving the entries in brackets [ ] for students to fill in:

Fraction Name	Number of Pieces Equal to 1 Red Unit Tile
[one-half]	[two]
[one-third]	[three]
[one-fourth]	[four]
[one-fifth]	[five]

Fraction Name	Number of Pieces Equal to 1 Red Unit Tile
[one-sixth]	[six]
[one-eighth]	[eight]
[one-tenth]	[ten]
[one-twelfth]	[twelve]

Have students work in groups. They should take turns showing and counting how many of each color of tile are needed to equal one red unit tile.

Ask students to copy the chart from the board and record their findings on their charts.

Hold up one of the two pink tiles and ask the following questions:

- *How many of these pieces do I need to create a red unit tile?* [2]
- *What fraction name do we give to this piece?* [one-half]

Fill in the corresponding blanks on the chart. Repeat the questions for thirds, fourths, fifths, sixths, eighths, tenths, and twelfths.

Ask students to compare the now-completed charts on the board with the charts they created. Ask for and answer any questions they may have. Be sure that they correct any errors in their charts.

Invite students to identify common objects that are cut into the number of pieces that they have studied today. Elicit from them the fact that the use of fraction names is very common in everyday activities.

You may wish to ask students to role-play scenarios in which fractions are used. For example, a person may order the “Half-Sandwich-and-Cup-of-Soup” special from a restaurant’s menu.

NAMING FRACTIONS

Purpose: To acquaint students with how fractions are named and with the terms numerator and denominator

Group Size: Cooperative Groups

Procedure: Give each group a complete set of **Rainbow Fraction®/Decimal Tiles.**

Have students pick up the red tile and inform them that it represents one whole unit.

Using a pink tile, have students determine how many pink tiles are needed to create a whole tile. [2] Have students verify this by placing 2 pink tiles together to completely cover the red tile.

Using an orange tile, have students determine how many orange tiles are needed to create a red tile. [3] Again, have students verify this by placing 3 orange tiles together to completely cover the red tile.

Have students complete this up to twelfths, having them verify their results using the **Rainbow Fraction®/Decimal Tiles**.

Tell students that a fraction is represented as a number above and a number below a line segment or slanted segment. The top number is called the *numerator* and the bottom number is called the *denominator*.

Tell students that the numerator tells how many equal parts of a whole you have, while the denominator tells how many of these equal parts are needed to create a whole.

Copy the chart below onto the board and ask students to copy and complete it, using the **Rainbow Fraction®/Decimal Tiles** to assist them. Those entries in brackets [ ] should be left blank for students to fill in.

Number of Equal Pieces	Number of Equal Pieces in a Whole	Numerator	Denominator	Fraction	Fraction's Common Name
1	5	[1]	[5]	[$\frac{1}{5}$]	[one-fifth]
3	8	[3]	[8]	[$\frac{3}{8}$]	[three-eighths]
[2]	[3]	2	3	[$\frac{2}{3}$]	[two-thirds]
[3]	[4]	[3]	[4]	$\frac{3}{4}$	[three-fourths]
[1]	[2]	[1]	[2]	[$\frac{1}{2}$]	one-half
[7]	[8]	[7]	[8]	[$\frac{7}{8}$]	seven-eighths
[1]	[4]	1	4	[$\frac{1}{4}$]	[one-fourth]
[5]	[8]	[5]	[8]	$\frac{5}{8}$	[five-eighths]
5	12	[5]	[12]	[$\frac{5}{12}$]	[five-twelfths]
7	10	[7]	[10]	[$\frac{7}{10}$]	[seven-tenths]
[5]	[6]	[5]	[6]	[$\frac{5}{6}$]	five-sixths

Verify/model some of the entries using the **Rainbow Fraction®/Decimal Tiles**.

Ask students which columns contain the same numbers and ask them to explain why. [The first and third columns both indicate how many equal pieces there are; the second and fourth columns give how many equal pieces are needed to add to one unit.]

COMPARING AND ORDERING FRACTIONS

Purpose: To compare and order fractions

Group Size: Pairs or Cooperative Groups

Procedure: Give each group a complete set of **Rainbow Fraction®/Decimal Tiles**.

Remind students and write on the board that > means "greater than" and < means "less than". You may also write "5 > 2 and 3 < 7."

Have students count the number of each color of tile needed to equal the unit-length red tile. Write the chart below on the board, have students copy it, and use their data to fill what part of the unit red tile each smaller tile represents.

Color	Fraction Name
red	[$\frac{1}{1}$]
pink	[$\frac{1}{2}$]
orange	[$\frac{1}{3}$]
yellow	[$\frac{1}{4}$]
green	[$\frac{1}{5}$]

Color	Fraction Name
teal	[$\frac{1}{6}$]
blue	[$\frac{1}{8}$]
purple	[$\frac{1}{10}$]
black	[$\frac{1}{12}$]

Ask students about similarities they see in the chart. [All numerators are 1.] Ask how the size of the denominator compares to the relative size of the tile. [The larger the denominator, the shorter the piece.]

Ask students to use their **Rainbow Fraction®/Decimal Tiles** to help them insert the correct inequality symbol or equal sign between each pair of fractions. Summarize their results on the board. Write the fraction pairs listed below onto the board.

a) $\frac{1}{4}$ [>] $\frac{1}{8}$ b) $\frac{1}{5}$ [<] $\frac{1}{3}$ c) $\frac{1}{12}$ [>] $\frac{1}{20}$ d) $\frac{1}{4}$ [<] $\frac{1}{2}$

Working in groups, have students take turns combining tiles, writing the fractions they represent, and using the fractions to write correct inequalities that compare the pairs of fractions created. Also ask students to write all fractions in simplest form.

Write the following fraction pairs on the board. Ask students to use their **Rainbow Fraction®/Decimal Tiles** to help them insert the correct inequality symbol or equal sign between each pair of fractions. Summarize their results on the board.

a) $\frac{2}{3}$ [<] $\frac{3}{4}$ b) $\frac{5}{8}$ [<] $\frac{3}{4}$ c) $\frac{2}{8}$ [=] $\frac{1}{4}$ d) $\frac{7}{8}$ [>] $\frac{3}{4}$

Ask students to order from smallest to largest the fractions $\frac{2}{3}$, $\frac{1}{2}$, $\frac{3}{8}$, $\frac{1}{3}$, $\frac{7}{8}$, $\frac{1}{8}$, $\frac{3}{4}$, and $\frac{1}{4}$. Verify their answers using the **Rainbow Fraction®/Decimal Tiles**.

[$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{7}{8}$]

REDUCING FRACTIONS TO LOWEST TERMS OR SIMPLIFIED FORM

Purpose: Reduce (simplify) fractions to lowest terms

Group Size: Pairs of students or Cooperative Groups

Procedure: Give each group a complete set of **Rainbow Fraction®/Decimal Tiles**.

Tell students that they can use their **Rainbow Fraction®/Decimal Tiles** to reduce a fraction to lowest terms or simplest form by finding the largest fraction tile whose pieces can exactly cover the fraction they want to reduce.

Have students create the fraction $\frac{6}{12}$ by putting six of their black tiles in a row. Next, ask them to experiment which tiles (of the same color) will exactly cover their representation of $\frac{6}{12}$. Ask students which pieces cover $\frac{6}{12}$ with the "simplest" (fewest) number of tiles. Discuss with students the simplest way to cover $\frac{6}{12}$ exactly is with one pink "$\frac{1}{2}$" tile, the fraction $\frac{6}{12}$ written in lowest terms or simplest form is $\frac{1}{2}$. [Sample results: three teal tiles ($\frac{3}{6}$) or two yellow tiles ($\frac{2}{4}$) or one pink tile ($\frac{1}{2}$)]

Repeat above using 8 black tiles to represent $\frac{8}{12}$. [Cover with four teal tiles ($\frac{4}{6}$) or with two orange tiles ($\frac{2}{3}$); $\frac{8}{12}$ in lowest terms or simplest form is $\frac{2}{3}$.]

Have students use their **Rainbow Fraction®/Decimal Tiles** to help them reduce each given fraction to lowest terms or simplified form.

a) $\frac{6}{8}$ [$\frac{3}{4}$] b) $\frac{4}{12}$ [$\frac{2}{6} = \frac{1}{3}$] c) $\frac{4}{6}$ [$\frac{2}{3}$]

d) $\frac{4}{8}$ [$\frac{2}{4} = \frac{1}{2}$] e) $\frac{3}{12}$ [$\frac{1}{4}$] f) $\frac{6}{10}$ [$\frac{3}{5}$]

Challenge students to find fractions (not unit fractions) that are already in lowest terms or simplest form.

EQUIVALENT FRACTIONS

Purpose: Recognize and create equivalent fractions

Group Size: Pairs or Cooperative Groups

Procedure: Give each group a complete set of **Rainbow Fraction®/Decimal Tiles.** Create the following chart on the board leaving the entries in brackets [ ] for students to fill in:

Fraction	Equivalent Fraction
$\frac{1}{5}$	[$\frac{2}{10}$] [sample answers]
$\frac{1}{4}$	[$\frac{2}{8}, \frac{3}{12}$]
$\frac{1}{3}$	[$\frac{2}{6}, \frac{4}{12}$]
$\frac{2}{5}$	[$\frac{4}{10}$]
$\frac{1}{2}$	[$\frac{6}{12}, \frac{5}{10}, \frac{4}{8}, \frac{3}{6}, \frac{2}{4}$]

Fraction	Equivalent Fraction
$\frac{3}{5}$	[$\frac{6}{10}$]
$\frac{2}{3}$	[$\frac{4}{6}, \frac{8}{12}$]
$\frac{3}{4}$	[$\frac{6}{8}, \frac{9}{12}$]
$\frac{4}{5}$	[$\frac{6}{10}$]
$\frac{1}{1}$	[$\frac{2}{2}, \frac{3}{3}, \frac{4}{4}, \frac{5}{5}, \frac{6}{6}, \frac{8}{8}, \frac{10}{10}, \frac{12}{12}$]

Ask students to copy this chart.

Have students use their **Rainbow Fraction®/Decimal Tiles** to create as many fractions as they can that are equivalent to the fraction beginning each row in the chart.

Have students record each of these fractions in the appropriate row.

Combine the class to record on the board the various answers that students were able to formulate. Have answers verified using the **Rainbow Fraction®/Decimal Tiles.**

Have students describe their thinking as they did this activity. Ask them to explain why the fractions in each row are equivalent to each other. [All represent the same part of the whole or the pieces fit on top of one another equally.]

Ask students why we need to be able to express a fraction in more than one way. [Sample answer: When adding or subtracting fractions, all must be expressed in terms of a common denominator.]

Have students model each problem with **Rainbow Fraction®/Decimal Tiles** and show how they use the chart to add or subtract the fractions and then rewrite each sum in lowest terms or simplest form.

a) $\frac{1}{8} + \frac{3}{8} = [\frac{4}{8} = \frac{1}{2}]$

b) $\frac{1}{4} + \frac{3}{4} = [\frac{4}{4} = \frac{1}{1} = 1]$

c) $\frac{3}{8} + \frac{1}{4} + \frac{1}{8} = [\frac{3}{8} + \frac{2}{8} + \frac{1}{8} = \frac{6}{8} = \frac{3}{4}]$

d) $\frac{3}{4} - \frac{1}{8} + \frac{1}{4} - \frac{3}{8} = [\frac{6}{8} - \frac{1}{8} + \frac{2}{8} - \frac{3}{8} = \frac{4}{8} = \frac{1}{2}]$

IMPROPER FRACTIONS AND MIXED NUMBERS

Purpose: Explore improper fractions and mixed numbers

Group Size: Cooperative Groups

Procedure: Provide each student group with two complete sets of **Rainbow Fraction®/Decimal Tiles.**

Define for students the term "*improper fraction*" as any fraction whose numerator is larger than or equal to its denominator.

Have students use their sets of **Rainbow Fraction®/Decimal Tiles** to create improper fractions. List some of these on the board.

Define for students the term "*mixed number*" as a number that is composed of a whole number and a fraction. Write some examples on the board.

Tell students that a mixed number may be written as the sum of a whole number and a fraction. For example, the mixed number $1\frac{1}{2}$ may be written as $1 + \frac{1}{2}$.

Show students that the improper fraction $\frac{3}{2}$ may be written as $1 + \frac{1}{2}$ or $1\frac{1}{2}$ by using the red unit tile to replace two of the pink tiles, leaving one red and one pink tile.

Show students that the improper fraction $\frac{7}{4}$ may be written as $1 + \frac{3}{4}$ or $1\frac{3}{4}$ by replacing four of the yellow tiles with one red tile, leaving one red and three yellow tiles.

Inform students that if the sum of two or more fractions is an improper fraction, then this sum should be rewritten as a mixed number and then, if possible, reduced to lowest terms or simplest form.

Have students use their **Rainbow Fraction®/Decimal Tiles** to create improper fractions, rewrite them as mixed numbers, and then reduce their answers to lowest terms or simplest form. Ask each group to share three of their improper fractions along with their mixed number forms. Remind them that fractions that are being added must first be renamed so that they share a common denominator.

Instruct students to use their **Rainbow Fraction®/Decimal Tiles** to calculate each sum and then, if appropriate, write it as a mixed number. Also ask students to reduce the fractions in their answers to lowest terms or simplest form.

a) $\frac{5}{8} + \frac{7}{8} = [\frac{12}{8} = 1\frac{4}{8} = 1\frac{1}{2}]$

b) $\frac{3}{5} + \frac{2}{5} = [\frac{5}{5} = 1]$

c) $\frac{7}{8} + \frac{3}{4} = [\frac{7}{8} + \frac{6}{8} = \frac{13}{8} = 1\frac{5}{8}]$

d) $\frac{2}{3} + \frac{5}{12} = [\frac{8}{12} + \frac{5}{12} = \frac{13}{12} = 1\frac{1}{12}]$

e) $\frac{2}{3} + \frac{5}{6} = [\frac{4}{6} + \frac{5}{6} = \frac{9}{6} = 1\frac{3}{6} = 1\frac{1}{2}]$

f) $\frac{7}{10} + \frac{3}{5} = [\frac{7}{10} + \frac{6}{10} = \frac{13}{10} = 1\frac{3}{10}]$

f) $\frac{5}{6} + \frac{5}{12} = [\frac{10}{12} + \frac{5}{12} = \frac{15}{12} = 1\frac{3}{12} = 1\frac{1}{4}]$

h) $\frac{7}{10} + \frac{2}{5} = [\frac{7}{10} + \frac{4}{10} = \frac{11}{10} = 1\frac{1}{10}]$

i) $\frac{7}{12} + \frac{7}{12} = [\frac{14}{12} = 1\frac{2}{12} = 1\frac{1}{6}]$

j) $\frac{2}{3} + \frac{3}{4} = [\frac{8}{12} + \frac{9}{12} = \frac{17}{12} = 1\frac{5}{12}]$

THE NUMBER LINE AND DECIMALS

Purpose: To be able to order decimals, between 0 and 1, from smallest to largest

Group Size: Cooperative Groups

Procedure: Give each group a complete set of **Rainbow Fraction®/ Decimal Tiles** and a sheet of 8.5- by 11-inch paper.

Have students use their red "unit" tile to draw a line segment the length of their red tile across the length of their sheet of paper.

Instruct students to use a yellow tile to divide their line segment into 4 equal parts.

Have students label the left-most end of their segment with a zero and label the remaining divisions on their number line 0.25, 0.5, 0.75, and 1.0.

Have students use their purple tiles to label 10 equal parts from 0.1 to 1.0.

Challenge students to use their number line and **Rainbow Fraction®/ Decimal Tiles** to help them insert the correct inequality symbol between each pair of decimals. Write the answers on the board.

a) 0.1 [<] 0.125

b) 0.2 [>] 0.125

c) 0.2 [<] 0.25

d) 0.3 [>] 0.25

e) 0.4 [>] $0.3\overline{3}$

f) 0.5 [<] 0.6

g) 0.75 [<] 0.8

h) 0.9 [>] 0.8

i) $0.08\overline{3}$ [<] 0.1

j) $0.16\overline{6}$ [>] 0.1

k) $0.3\overline{3}$ [>] 0.25

l) 0 [<] $0.08\overline{3}$

EQUIVALENT DECIMALS

Purpose: To determine a decimal equivalent for a given fraction

Group Size: Pairs or Cooperative Groups

Procedure: Give each group a complete set of **Rainbow Fraction®/ Decimal Tiles**. Create the following chart on the board leaving the entries in brackets [ ] for students to fill in:

Decimal Equivalent	Fraction
[0.5]	$\frac{2}{4}$
[0.6$\overline{6}$]	$\frac{2}{3}$
[0.75]	$\frac{3}{4}$
[0.6]	$\frac{3}{5}$
[0.6$\overline{6}$]	$\frac{4}{6}$
[0.625]	$\frac{5}{8}$
[0.875]	$\frac{7}{8}$
[0.7]	$\frac{7}{10}$
[0.25]	$\frac{3}{12}$
[0.75]	$\frac{9}{12}$

Ask students to copy this chart into their notebooks.

Using their set of **Rainbow Fraction®/Decimal Tiles**, have students determine the equivalent decimal representation for the given fraction.

Instruct students to build the fraction with their tiles first. Then have them flip the tiles over and add the decimals together to find an equivalent.

Have students describe their thinking as they did this activity. Elicit from them the need to reduce a fraction to lowest terms before finding the decimal equivalent.

DECIMAL DIVISION

Purpose: Explore decimal division by finding $\frac{1}{2}$ of a given decimal

Group Size: Pairs or Cooperative Groups

Procedure: Give each group a complete set of **Rainbow Fraction®/Decimal Tiles**.

Decimal ÷ 2	Decimal
[0.5]	1.0
[0.4]	0.8
[0.3$\overline{3}$]	0.6$\overline{6}$
[0.3]	0.6
[0.25]	0.5
[0.2]	0.4
[0.16$\overline{6}$]	0.3$\overline{3}$
[0.125]	0.25
[0.1]	0.2
[0.08$\overline{3}$]	0.16$\overline{6}$

Ask students to copy this chart into their notebooks.

Using their set of **Rainbow Fraction®/Decimal Tiles,** have students find $\frac{1}{2}$ of the given decimal.

Instruct students to build the decimal with the tiles first. Then have them find tiles that match exactly half of the decimal.

Challenge students to find several ways to represent half of a decimal with their tiles, when possible. For example, 1.0 ÷ 2 = 1 pink tile, 2 yellow tiles, 3 teal tiles, 4 blue tiles, 5 purple tiles, or 6 black tiles.

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