Grade Level/Course: 5th/ 6th

Lesson/Unit Plan Name: Division of Fractions, from the Abstract to the Concrete

Rationale/Lesson Abstract: Students will be able to understand and divide fractions using different methods.

Timeframe: 2 – 3 days (depending on your class)

Common Core Standard(s):

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

5.NF.7a Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.

5.NF.7b Interpret division of a whole by a unit fraction, and compute such quotients.

6.NS Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

CCEE (Common Core Essential Elements) Alternate Achievement Descriptors (SPED):

***Standards can be scaffold back to meet student's present levels.**

EE5.NF.1. Differentiate between halves, fourths, and eighths.

Level IV AA Students will:

EE5.NF.1. Differentiate fractional parts less than 1/4.

Ex. With fraction bars labeled 1/4, compare the 1/4 to fraction bars to those less than 1/4 and identify the fraction using numerals.

Ex. Using squares, fold it in 1/4, and then 1/8, and tell which is more and which is less.

Ex. Divide a square into 1/4 and then 1/8 and tell which is more.

Ex. Divide a circle into the correct fractions when shown the numerical representation of 1/2, 1/4, or 1/8.

Level III AA Students will:

EE5.NF.1. Differentiate between halves, fourths, and eighths.

Ex. With pictures cut into halves, pictures cut into fourths, and pictures cut in eighths, sort the pictures.

Ex. Using fraction bars, identify the bar that is 1/2, 1/4, or 1/8 of the whole using a template.

Ex. Given a partitioned shape, shade it to show 1/2, 1/4, or 1/8 when asked.

Ex. Using an analog clock, shade the clock to show the quarter hour.

Level II AA Students will:

EE5.NF.1. Differentiate between whole and a part.

Ex. Given a whole sandwich, cut the sandwich in half (e.g., cut horizontally, vertically, and diagonally), indicate which is half and which is whole.

Ex. Draw a square on a dry erase board; then draw a line to cut the square in half.

Ex. When playing a game in which the class is divided into two teams, indicate that only half the class is on each team.

Level I AA Students will:

EE5.NF.1. Recognize that fractions are part of a whole.

Ex. Assemble a simple puzzle to demonstrate pieces of a whole.

Ex. Using a self-sticking non-adhesive shape, take apart and put together fractional parts of a whole.

EE6.NS.1. Compare the relationships between two unit fractions.

Level IV AA Students will:

EE6.NS.1. Compare the relationships between the three unit fractions (1/2, 1/4, 1/8).

Ex. Given three measuring cups filled to 1/2, 1/4, and 1/8 with water, compare fractional amounts to determine which is greater.

Ex. Given pictorial representations of shaded pictures and/or fraction bars, compare fractions to determine which is a smaller or a lesser amount.

Ex. Using circle shaped fraction puzzles, compare a 1/2, 1/4, and 1/8 to determine which is greater.

Level III AA Students will:

EE6.NS.1. Compare the relationships between two unit fractions.

Ex. Given two measuring cups of 1/2 and 1/4 full of sand, compare the amounts in each of the measuring cups to a whole cup. Which is more?

Ex. Given two measuring cups of 1/4 and 1/8 full of water, compare the amounts in each of the measuring cups to a whole cup. Which is more?

Ex. When given a group of even-numbered objects that represents 1/2 and 1/4, determine which set is more or less.

Ex. Split an even-numbered group of objects into two equal groups to show one half of the group; then split each group again to show fourths of the whole; and split each group again to show eighths of the whole.

Level II AA Students will:

EE6.NS.1. Demonstrate an amount of 1/2.

Ex. Fold one piece of paper in half to show two halves in every one whole.

Ex. Shade a shape to show 1/2.

Ex. Given a whole and a half, identify the half (e.g., a whole or half sandwich).

Ex. Shown a glass that is full and a glass that is 1/2 (half) full, select the half-full glass.

Level I AA Students will:

EE6.NS.1. Distinguish between more or less.

Ex. Given two groups of objects with significantly different amounts (three vs. 10), determine which group has more or less.

Ex. Given a picture of a familiar symmetrical object cut in half, combine both halves to make a whole.

Instructional Resources/Materials: Fraction Bars, paper, and pencils. If you do not have fraction you can print them off from the math website under math resources, and have the kids cut them out.

Activity/Lesson:

The first part of the lesson is to use fraction bars to get the kids to understand what division of fractions mean. Use the fraction bars to demonstrate how to divide $2 \div \frac{1}{4}$. Ask the kids what does this mean? They should reply, or you may need to explain, that it means how many $\frac{1}{4}$ are in 2?

The students should be able to see that there are 8 $\frac{1}{4}$ in 2.

1				1			
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

Put several problems on the board and have the kids work in teams to solve them.

1) $3 \div \frac{1}{6}$ 2) $2 \div \frac{1}{2}$ 3) $4 \div \frac{4}{5}$

4) $\frac{3}{4} \div \frac{1}{8}$ 5) $\frac{2}{5} \div \frac{1}{10}$ 6) $\frac{3}{5} \div \frac{2}{10}$

Bonus: $2 \div \frac{3}{4}$

You may want to model division of a fraction by a fraction.

For example $\frac{3}{5} \div \frac{2}{10}$

$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$					
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$				

The students should be able to see that there are 3 $\frac{2}{10}$ in $\frac{3}{5}$.

You should also show how to model the bonus problem.

$2 \div \frac{3}{4}$

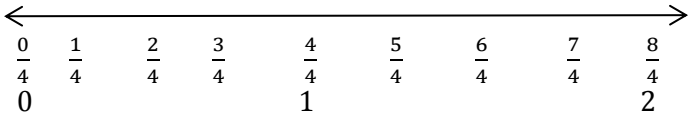
1				1			
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

1	1	$\frac{2}{3}$

We need to explain to the kids that you have 2 entire sets of $\frac{3}{4}$ and then 2 out of 3 or $\frac{2}{3}$ of the final set to get a quotient of $2\frac{2}{3}$.

Ask the kids what are the common mistakes that kids will make? Why was the bonus question harder than the other questions? What are some strategies we can do to help the students who are struggling understand the concept, especially when the problems have a quotient of a mixed number?

We can also solve these division problems by using a number line. For the problem $2 \div \frac{1}{4}$, we can draw a number line and the kids can actually count how many $\frac{1}{4}$ are in 2



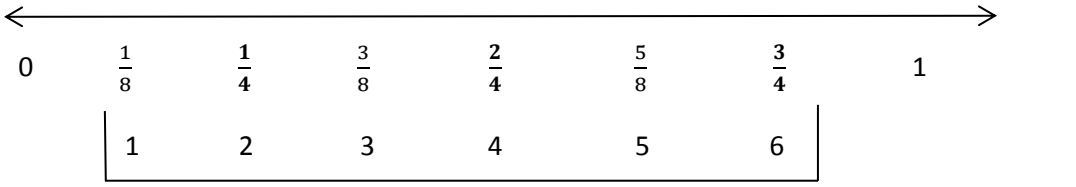
Have the students solve the problems below by drawing a number line.

1) $3 \div \frac{1}{6}$ 2) $2 \div \frac{1}{2}$ 3) $4 \div \frac{4}{5}$

4) $\frac{3}{4} \div \frac{1}{8}$ 5) $\frac{2}{5} \div \frac{1}{10}$ 6) $\frac{3}{5} \div \frac{2}{10}$

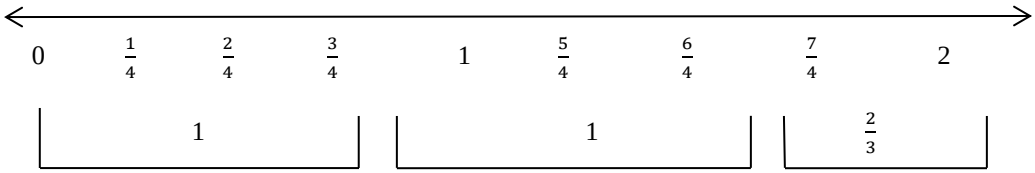
Bonus: $2 \div \frac{3}{4}$

We may want to model how to divide a fraction by a fraction using the number line. $\frac{3}{4} \div \frac{1}{8}$



The students should be able to see that there are 6 $\frac{1}{8}$ in $\frac{3}{4}$

Where it can get tricky is when the quotient is a mixed number. $2 \div \frac{3}{4}$



Again, ask the students what they think the common mistakes will be, and what strategies we can use to help students who are struggling, especially when the quotient involves a mixed number. You may also want to ask the students which method they preferred and why, it is easier is not an appropriate answer. They need to explain why it is easier.

Answers for the fraction bar and number line problems.

1) $3 \div \frac{1}{6} = 18$

2) $2 \div \frac{1}{2} = 4$

3) $4 \div \frac{4}{5} = 5$

4) $\frac{3}{4} \div \frac{1}{8} = 6$

5) $\frac{2}{5} \div \frac{1}{10} = 4$

6) $\frac{3}{5} \div \frac{2}{10} = 3$

Bonus: $2 \div \frac{3}{4} = 2\frac{2}{3}$

Activity/Lesson continued:

Once the kids understand the concept of dividing fractions then they should be able to divide using three different ways. Remember the main reason for learning multiple methods is not for the kids to solve each problem 3 ways, but for them to look at each problem and see which method work for a particular problem.

Multiply by the Reciprocal	Divide Across	Common Denominator
$\frac{2}{3} \div \frac{4}{5}$ $= \frac{2}{3} \times \frac{5}{4}$ $= \frac{10}{12}$ $= \frac{5}{6}$	$\frac{\frac{2}{3}}{\frac{4}{5}}$ $= \frac{\frac{2}{3}}{\frac{4}{5}}$ $= \frac{\frac{2}{3}}{\frac{4}{5}}\left(\frac{\frac{5}{4}}{\frac{5}{4}}\right)$ $= \frac{10}{12}$ $= \frac{5}{6}$	$\frac{2}{3} \div \frac{4}{5}$ $= \frac{2}{3}\left(\frac{5}{5}\right) \div \frac{4}{5}\left(\frac{3}{3}\right)$ $= \frac{10}{15} \div \frac{12}{15}$ $= \frac{10}{12}$ $= \frac{5}{6}$

Ask the students which method was more efficient? Which had fewer steps? What are the common mistakes that kids will make?

Try a couple more problems and have the same discussion.

Multiply by the Reciprocal	Divide Across	Common Denominator
$\frac{15}{16} \div \frac{7}{8}$ $= \frac{15}{16} \times \frac{8}{7}$ $= \frac{120}{112}$ $= \frac{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 7}$ $= \frac{15}{14}$	$\frac{15}{16} \div \frac{7}{8}$ $= \frac{\frac{15}{16}}{\frac{7}{8}}$ $= \frac{\frac{15}{16}}{\frac{7}{8}}\left(\frac{\frac{8}{7}}{\frac{8}{7}}\right)$ $= \frac{120}{112}$ $= \frac{15}{14}$	$\frac{15}{16} \div \frac{7}{8}$ $= \frac{15}{16} \div \frac{7}{8}\left(\frac{2}{2}\right)$ $= \frac{15}{16} \div \frac{14}{16}$ $= \frac{15}{14}$

Multiply by the Reciprocal	Divide Across	Common Denominator
$\frac{66}{28} \div \frac{3}{4}$ $= \frac{66}{28} \times \frac{4}{3}$ $= \frac{264}{84}$ $= \frac{2 \cdot 2 \cdot 2 \cdot 3 \cdot 11}{2 \cdot 2 \cdot 3 \cdot 7}$ $= \frac{22}{7}$	$\frac{66}{28} \div \frac{3}{4}$ $= \frac{22}{7}$	$\frac{66}{28} \div \frac{3}{4}$ $= \frac{66}{28} \div \frac{3}{4}\left(\frac{7}{7}\right)$ $= \frac{66}{28} \div \frac{21}{28}$ $= \frac{66}{21}$ $= \frac{2 \cdot 3 \cdot 11}{3 \cdot 7}$ $= \frac{22}{7}$

- *Please note that $\frac{22}{7}$ is an approximation for pi*

In the third problem, which method is more efficient, has fewer steps? It is important to have the discussion with the kids that they need to look at the problem to see what the most efficient way to solve it is; sometimes the traditional method isn't always the best method.

Assessment:

Exit Ticket:

Use a visual model (either fraction tiles or a number line) to solve $6 \div \frac{4}{8}$

Exit Ticket:

Solve $\frac{8}{9} \div \frac{2}{3}$ three different ways, and explain which method would be more efficient and why.

$\frac{4}{5} \cdot \frac{10}{12}$

$\frac{3}{4} + \frac{1}{5}$

$\frac{2}{3} \cdot \frac{4}{5}$

Which methods show how to solve $6 - 2.45$?

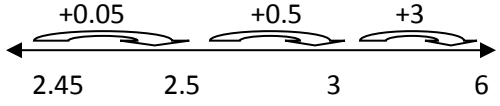
Select all that apply.

$A)$ 6.00
$\underline{-\ 2.45}$
4.45

$B)$ $5.99 + .01$
$\underline{-2.45}$
$3.54 + .01$
$= 3.55$

$C)$ 6.00
$\underline{-\ 2.45}$
3.55

$D)$



$= 0.05 + 0.5 + 3$
$= \ 3.55$

$$\frac{4}{5} \cdot \frac{10}{12}$$

$= \frac{4 \cdot 10}{5 \cdot 12}$

$= \frac{40 \div 20}{60 \div 20}$

$= \frac{2}{3}$

or

$= \frac{2 \cdot 2 \cdot 2 \cdot 5}{2 \cdot 2 \cdot 3 \cdot 5}$

$= \frac{2}{3}$

$$\frac{3}{4} + \frac{1}{5}$$

$= \frac{3}{4}\left(\frac{5}{5}\right) + \frac{1}{5}\left(\frac{4}{4}\right)$

$= \frac{15}{20} + \frac{4}{20}$

$= \frac{19}{20}$

$$\frac{2}{3} \cdot \frac{4}{5}$$

$= \frac{2.4}{3.5}$

$= \frac{8}{15}$

Which methods show how to solve $6 - 2.45$?

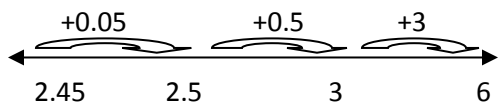
Select all that apply.

$A)$ 6.00
$\underline{-\ 2.45}$
4.45

$B)$ $5.99 + .01$
$\underline{-2.45}$
$3.54 + .01$
$= 3.55$

$C)$ 6.00
$\underline{-\ 2.45}$
3.55

$D)$

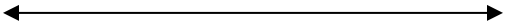


$= 0.05 + 0.5 + 3$
$= 3.55$

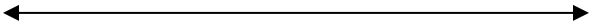
Correct Answers B, C, & D

Extra Practice Day 1

1) $4 \div \frac{1}{4}$



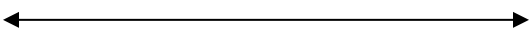
2) $6 \div \frac{2}{3}$



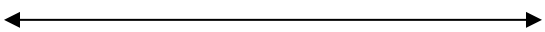
3) $2 \div \frac{1}{2}$

4) $2 \div \frac{2}{5}$

5) $\frac{3}{4} \div \frac{2}{8}$

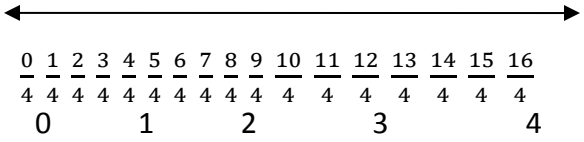


6) $\frac{2}{3} \div \frac{1}{6}$

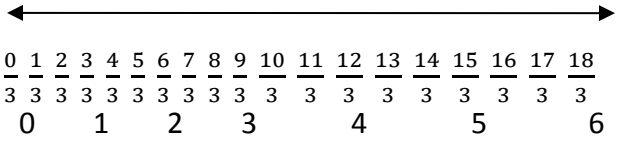


Extra Practice Day 1

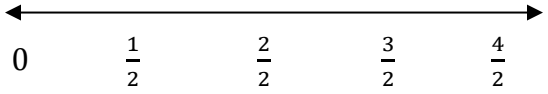
1) $4 \div \frac{1}{4} = 16$



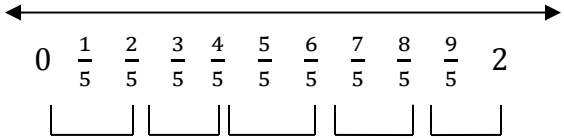
2) $6 \div \frac{2}{3} = 9$



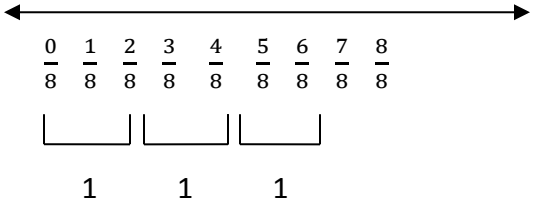
3) $2 \div \frac{1}{2} = 4$



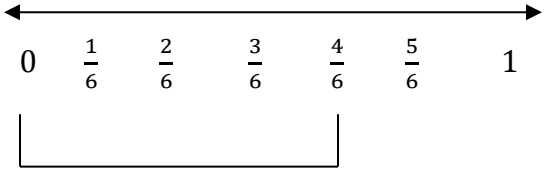
4) $2 \div \frac{2}{5} = 5$



5) $\frac{3}{4} \div \frac{2}{8} = 3$



6) $\frac{2}{3} \div \frac{1}{6} = 4$



$\frac{7}{10} \cdot \frac{4}{5}$

$\frac{7}{8} + \frac{2}{3}$

$3 \div \frac{1}{4}$

Mark said that $3 \div \frac{2}{3}$ *is* $4\frac{1}{3}$ *, and Marcy said it is* $4\frac{1}{2}$ *. Who is correct, explain how you know. Use a visual model to help explain your thinking.*

$\frac{7}{10} \cdot \frac{4}{5}$

$= \frac{2 \cdot 2 \cdot 7}{2 \cdot 5 \cdot 5}$

$= \frac{14}{25}$

$\frac{7}{8} + \frac{2}{3}$

$= \frac{7}{8}\left(\frac{3}{3}\right) + \frac{2}{3}\left(\frac{8}{8}\right)$

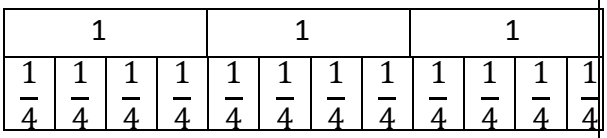
$= \frac{21}{24} + \frac{16}{24}$

$= \frac{37}{24}$

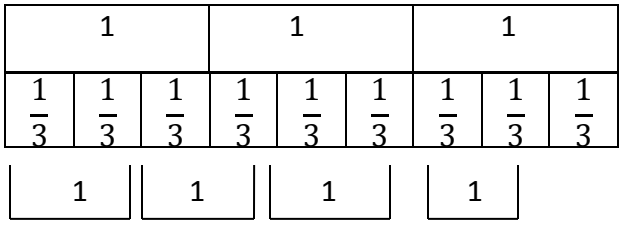
$= \frac{24}{24} + \frac{13}{24}$

$= 1\frac{13}{24}$

$3 \div \frac{1}{4} = 12$



Mark said that $3 \div \frac{2}{3}$ *is* $4\frac{1}{3}$ *, and Marcy said it is* $4\frac{1}{2}$ *. Who is correct, explain how you know. Use a visual model to help explain your thinking.*



Marcy is correct, because there are $4 \frac{2}{3}$ with 1 out of 2 left over, therefore

$3 \div \frac{2}{3} = 4\frac{1}{2}$

Extra Practice Day 2

Solve each problem three different ways. For each problem explain which method is more efficient and why?

1) $\frac{3}{4} \div \frac{1}{2}$

2) $\frac{7}{8} \div \frac{4}{5}$

3) $\frac{11}{12} \div \frac{4}{6}$

Extra Practice Day 2

Solve each problem three different ways. For each problem explain which method is more efficient and why?

1) $\frac{3}{4} \div \frac{1}{2}$ 2) $\frac{7}{8} \div \frac{4}{5}$ 3) $\frac{11}{12} \div \frac{4}{6}$

Multiply by Reciprocal	Divide Across	Common Denominator
$\frac{3}{4} \div \frac{1}{2}$ $= \frac{3}{4} \cdot \frac{2}{1}$ $= \frac{3 \cdot 2}{2 \cdot 2}$ $= \frac{3}{2}$	$\frac{3}{4} \div \frac{1}{2}$ $= \frac{3 \div 1}{4 \div 2}$ $= \frac{3}{2}$ This method should be listed as the most efficient, because it uses fewer steps.	$\frac{3}{4} \div \frac{1}{2}$ $= \frac{3}{4} \div \frac{1}{2}\left(\frac{2}{2}\right)$ $= \frac{3}{4} \div \frac{2}{4}$ $= \frac{3}{2}$
$\frac{7}{8} \div \frac{4}{5}$ $= \frac{7}{8} \cdot \frac{5}{4}$ $= \frac{35}{32}$ This method should be listed as the most efficient, because the numbers are reasonable and it uses fewer steps.	$\frac{7}{8} \div \frac{4}{5}$ $= \frac{\frac{7}{8}}{\frac{4}{5}}$ $= \frac{\frac{7}{8}}{\frac{4}{5}}\left(\frac{\frac{5}{4}}{\frac{5}{4}}\right)$ $= \frac{35}{32}$	$\frac{7}{8} \div \frac{4}{5}$ $= \frac{7}{8}\left(\frac{5}{5}\right) \div \frac{4}{5}\left(\frac{8}{8}\right)$ $= \frac{35}{40} \div \frac{32}{40}$ $= \frac{35}{32}$

Multiply by Reciprocal	Divide Across	Common Denominator
$\frac{11}{12} \div \frac{4}{6}$ $= \frac{11}{12} \cdot \frac{6}{4}$ $= \frac{66}{48}$ $= \frac{2 \cdot 3 \cdot 11}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}$ $= \frac{11}{8}$	$\frac{11}{12} \div \frac{4}{6}$ $= \frac{\frac{11}{12}}{\frac{4}{6}}$ $= \frac{\frac{11}{12}}{\frac{4}{6}} \left(\frac{\frac{6}{4}}{\frac{6}{4}}\right)$ $= \frac{66}{48} \div \left(\frac{6}{6}\right)$ $= \frac{11}{8}$	$\frac{11}{12} \div \frac{4}{6}$ $= \frac{11}{12} \div \frac{4}{6} \left(\frac{2}{2}\right)$ $= \frac{11}{12} \div \frac{8}{12}$ $= \frac{11}{8}$ This method should be listed as the most efficient, because there are fewer steps.