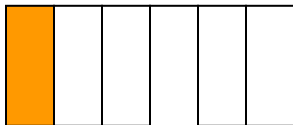


Lesson 5.2_(F-09)

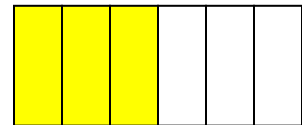
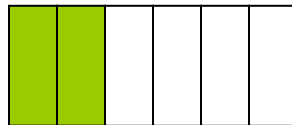
- OBJECTIVES:
1. To add and subtract fractions.
 2. To learn the properties of addition and subtraction.
 3. To estimate with rational numbers.

ADDITION

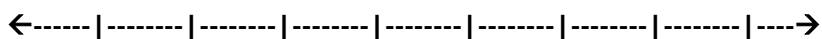
1. Region Model-



$$\frac{1}{6} + \frac{2}{6} =$$



2. Number Line Model-



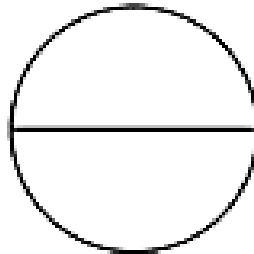
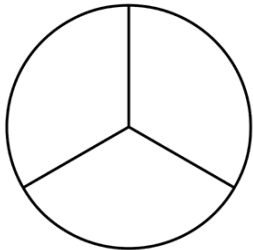
Definition of Rational Number Addition

If $\frac{a}{b}$ and $\frac{c}{b}$ are rational numbers, then $\frac{a}{b} + \frac{c}{b} = \frac{a+c}{b}$.

What if the denominators are different?

Use the area model to add:

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



But, how do we accomplish this? We need to find a way to combine the two drawings to find the sum. We need each circle to have the same number of pieces.

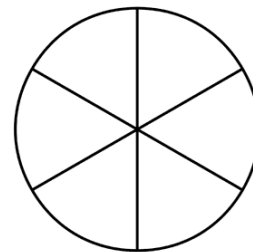
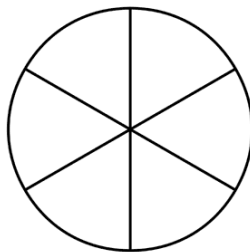
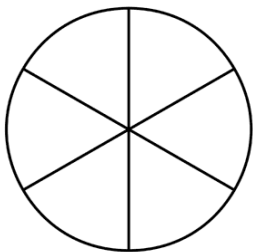
Let's "build-up" each fraction:

$$\frac{1}{3} = \frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

$$\frac{1}{2} = \frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

What is the common denominator? _____

Now let's divide our circles into this many pieces and shade each circle.



+

=

TRY THESE

Model each of the following with an area or region model.

1. $\frac{1}{3} + \frac{1}{3}$ 2. $\frac{1}{3} + \frac{1}{6}$

Property: If $\frac{a}{b}$ and $\frac{c}{d}$ are any two rational numbers, then

$$\frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd}.$$

Examples—Add each of the following using the LCD

1. $\frac{5}{9} + \frac{3}{4}$

2. $\frac{7}{15} + \frac{5}{12}$

3. $\frac{4}{9} + \frac{1}{-3}$

4. $\frac{3}{x} + \frac{2}{y}$

Mixed Number- Numbers that are made up of an integer and a fractional part of an integer. $a\frac{b}{c} = a + \frac{b}{c}$

Example: $3\frac{1}{3} = 3 + \frac{1}{3}$

$-4\frac{3}{4} = -(4 + \frac{3}{4})$

“In a NAEP test, students were given the following problem:

$5\frac{1}{4}$ is the same as: a. $5 + \frac{1}{4}$ b. $5 - \frac{1}{4}$ c. $5 \times \frac{1}{4}$ or d. $5 \div \frac{1}{4}$

Only 47% of the seventh graders answered correctly.

Change each mixed number to an improper fraction.

1. Using the Conventional Algorithm

$$6\frac{1}{2} = \frac{6 \cdot 2 + 1}{2} = \frac{13}{2}$$

Change with Meaning

$$6 + \frac{1}{2} = \frac{12}{2} + \frac{1}{2} = \frac{13}{2}$$

Using the Conventional Algorithm

2. $2\frac{4}{9} =$

Change with Meaning (You do this one)

Using the Conventional Algorithm

3. $-4\frac{1}{5}$

Change with Meaning (You do this one)

Example:

Change each improper fraction to a mixed number.

Using the Conventional Algorithm

1. $\frac{37}{10} =$

Change with Meaning

$$\frac{37}{10} = \frac{10}{10} + \frac{10}{10} + \frac{10}{10} + \frac{7}{10} = 3\frac{7}{10}$$

Try These.

1. $\frac{37}{8}$

2. $\frac{29}{5}$

Calculator

1. Add: $3\frac{11}{15} + 5\frac{5}{21}$
2. Change to an improper fraction: $156\frac{99}{102}$
3. Change to a mixed number: $\frac{2347}{124}$

Properties of Addition for Rational Numbers (Q)

Additive inverse property of rational numbers. For any rational number $\frac{a}{b}$, there exists a unique number $-\frac{a}{b}$, the additive inverse of $\frac{a}{b}$, such that $\frac{a}{b} + (-\frac{a}{b}) = 0 = (-\frac{a}{b}) + \frac{a}{b}$.

Find the additive inverse of each fraction.

1. $\frac{4}{9}$
2. $\frac{-3}{10}$
3. $\frac{x+y}{z}$
4. $-4\frac{1}{3}$

Addition property of equality. If $\frac{a}{b}$ and $\frac{c}{d}$ are any rational numbers such that $\frac{a}{b} = \frac{c}{d}$ and if $\frac{e}{f}$ is any rational number then, $\frac{a}{b} + \frac{e}{f} = \frac{c}{d} + \frac{e}{f}$.

SOLVE: $x - \frac{1}{4} = \frac{3}{8}$

PROPERTIES OF ADDITION FOR RATIONAL NUMBERS

Given any three rational numbers $\frac{a}{b}$, $\frac{c}{d}$ and $\frac{e}{f}$ where, b, d and f are non-zero integers:

1. Closure
2. Commutative
3. Associative
4. Additive Identity

ADDITION OF MIXED NUMBERS

(Know how to add using the given mixed numbers)

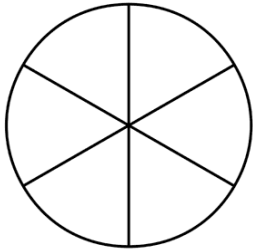
$$2\frac{3}{8} + 5\frac{5}{6}$$

$$\begin{array}{r} 2\frac{3}{8} \\ + 5\frac{5}{6} \\ \hline \end{array}$$

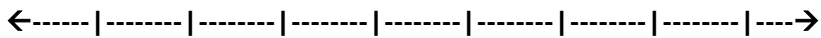
$$82\frac{9}{25} + 17\frac{33}{50}$$

SUBTRACTION

1. Take away model: $\frac{5}{6} - \frac{3}{6}$



2. Number line model: $\frac{5}{6} - \frac{3}{6}$



3. Missing addend model: $\frac{5}{6} - \frac{3}{6}$ means $\frac{3}{6} + \underline{\quad} = \frac{5}{6}$.

Definition of Subtraction of Rational Numbers.

If $\frac{a}{b}$ and $\frac{c}{d}$ are any rational numbers, then $\frac{a}{b} - \frac{c}{d} = x$ if, and only if, $\frac{c}{d} + x = \frac{a}{b}$.

Theorem 5.4

If $\frac{a}{b}$ and $\frac{c}{d}$ are any rational numbers, then $\frac{a}{b} - \frac{c}{d} = \frac{a}{b} + \left(\frac{-c}{d}\right)$.

Find each difference.

1. $\frac{4}{5} - \frac{2}{3}$

2. $5\frac{1}{3} - 2\frac{3}{4}$ Use 2 methods

I

$$\begin{array}{r} 5\frac{1}{3} \\ - 2\frac{3}{4} \\ \hline \end{array}$$

II

$$\begin{array}{r} 5\frac{1}{3} - 2\frac{3}{4} \\ \frac{16}{3} - \frac{11}{4} \end{array}$$

TRY THESE

Use Method I to subtract. (Know how to subtract using the given mixed numbers)

1. $15\frac{1}{2} - 10\frac{7}{8}$

2. $9\frac{1}{6} - 2\frac{2}{3}$

3. $147\frac{1}{5} - 40\frac{1}{2}$

Estimation with rational numbers

Many times when estimating with fractions, it is helpful to round to a convenient fraction – for instance

$$0, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{2}{3}, \frac{3}{4}, \text{ or } 1.$$

For example, if you got 59 out of 80 questions correct on your test, this is about $\frac{60}{80}$ or $\frac{6}{8}$ or $\frac{3}{4}$

Then we can conclude that $\frac{3}{4}$ is a HIGH ESTIMATE.

(You actually got less than $\frac{3}{4}$ of the test correct, since $59 < 60$, then $\frac{59}{80} < \frac{60}{80} = \frac{3}{4}$).

Estimate: 1. $\frac{12}{13} + \frac{7}{8}$ 24% 13yr olds

2. $15\frac{1}{4} + 7\frac{3}{5}$

3. $\frac{217}{413} + \frac{698}{703}$

4. $6\frac{7}{8} - \frac{7}{12}$

TRY THESE

1. Round each rational number to the nearest whole number.

$$\frac{2}{5}$$

$$4\frac{3}{7}$$

$$\frac{8}{3}$$

$$7\frac{3}{6}$$

2. Replace each rational number by a close approximation that is in simpler form.

Use $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{3}$, $\frac{3}{4}$

$$4\frac{17}{30}$$

$$12\frac{5}{26}$$

$$\frac{4}{13}$$

$$\frac{19}{80}$$

Class work

Home work Math XL section 5.2 and page 325 #5, 6, 7, 10, 12, 20, 21, 22, 23, 27, 28