INCLUSION IN TEXAS

# Instructional Routines for Mathematics Intervention

The purpose of these mathematics instructional routines is to provide educators with materials to use when providing intervention to students who experience difficulty with mathematics. The routines address content included in the grades 2-8 Texas Essential Knowledge and Skills (TEKS). There are 23 modules that include routines and examples – each focused on different mathematical content. Each of the 23 modules include vocabulary cards and problem sets to use during instruction. These materials are intended to be implemented explicitly with the aim of improving mathematics outcomes for students.

TEA
Texas Education Agency

Instructional Routines for Mathematics Intervention

# MODULE 6

## Addition of Rational Numbers

# Module 6: Addition of Rational Numbers

## Mathematics Routines

## A. Important Vocabulary with Definitions

| Term | Definition |
|---|---|
| add/addition | To put amounts together to find the sum or to increase a set. |
| addend | Any numbers that are added together. |
| algorithm | A procedure or description of steps that can be used to solve a problem. |
| computation | The action used to solve a problem. |
| decimal | A number based on powers of ten. |
| denominator | The term in a fraction that tells the number of equal parts in a whole. |
| equal sign | The symbol that tells you that two sides of an equation are the same, balanced, or equal. |
| equivalent | Two numbers that have the same value. |
| fraction | A number representing part of a whole or set. |
| hundredths | The digit in representing $\frac{1}{100}$. |
| improper fraction | Any fraction in which the numerator is greater than or equal to the denominator. |
| join | To add to an existing set. |
| least common multiple | The common multiple with the least value. |
| mixed number | A whole number and a fraction combined. |
| multiple | The product of a number and any integer. |
| numerator | The term in a fraction that tells how many parts of a fraction. |
| ones | The digit representing 1. |
| plus sign | The symbol that tells you to add. |
| regroup/trade/exchange | The process of exchanging 10 ones for 1 ten, 10 tens for 1 hundred, 10 hundreds for 1 thousand, etc. |
| sum | The result of adding two or more numbers. |
| tenths | The digit in representing $\frac{1}{10}$. |
| together | To combine sets or numbers. |

## B. Background Information

In this module, we focus on addition with fractions and decimals. As you focus on computation of rational numbers, continue to emphasize addition as combining and addition as joining to a set because students will see these concepts within word problems.

For addition of fractions, we recommend using several models of fractions to help students understand concepts related to addition of fractions. We also recommend demonstrating several algorithms for addition of decimals. Every student should develop efficiency with strategies for addition of fractions and decimals. In the following sections, we provide examples of (1) addition of fractions – like denominators, (2) addition of fractions – unlike denominators, (3) addition of decimals with traditional algorithm, and (4) addition of decimals with partial sums algorithm.

## C. Routines and Examples

### (1) Addition of Fractions – Like Denominators

#### Routine

*Materials:*

- Module 6 Problem Sets
- Module 6 Vocabulary Cards
    - If necessary, review Vocabulary Cards before teaching
- A hands-on tool or manipulative like fraction tiles or two-color counters
    - Note that drawings can be used alongside or instead of manipulatives

**ROUTINE WITH MANIPULATIVES**

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with fraction tiles.** (Move fraction tiles to workspace.) |
| **Teacher** | **Our first addend is __. What's our first addend?** |
| Students | __. |
| **Teacher** | **Let's show this addend by showing the fraction.** (Show fraction part compared to whole.) |
| **Teacher** | **What fraction?** |

| | |
|---|---|
| Students | __. |
| **Teacher** | **Our second addend is __. What's our second addend?** |
| Students | __. |
| **Teacher** | **Let's show the second addend by showing the fraction.** (Show fraction part compared to whole.) |
| **Teacher** | **What fraction?** |
| Students | __. |
| **Teacher** | **So, we have __ plus __. Let's add by combining. What does combining mean?** |
| Students | To put together. |
| **Teacher** | **Yes. Let's combine, or put together, the parts of the fraction. The parts of the fraction represent the numerator. When adding fractions, first we want to determine whether the denominators are like or unlike. Are the denominators like or the same?** |
| Students | Yes. |
| **Teacher** | **The denominators are the same. Second, we want to add the parts or numerators of each fraction. That means we have to add __ one-__ parts and __ one-__ parts. What do we add?** |
| Students | We add the parts or numerator of the fraction. |
| **Teacher** | **Let's combine the parts together.** |
| Students | (Combine parts, compare to whole.) |
| **Teacher** | **So, we now have __, __, __, … one-__ parts. How many parts?** |
| Students | __. |
| **Teacher** | **When you have __ plus __, the sum is __. What's the sum?** |
| Students | __. |
| **Teacher** | **__ plus __ equals __. Let's say that together.** |
| Students | __ plus __ equals __. |
| **Teacher** | **So, if you have a set of __ and a set of __, when you combine (or put together) the sets, the sum is __. __ plus __ equals __. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What do you add when you add fractions?** |
| Students | The parts or numerator of each fraction. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | We started by showing each addend. Then, we added the parts or numerator together to determine the sum. |

## ROUTINE WITHOUT MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |

| | |
|---|---|
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point). **The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Our first addend is __. What's our first addend?** |
| Students | __. |
| **Teacher** | **Our second addend is __. What's our second addend?** |
| Students | __. |
| **Teacher** | **So, we have __ plus __. Let's add by combining. What does combining mean?** |
| Students | To put together. |
| **Teacher** | **Yes. Let's combine, or put together, the parts of the fraction. The parts of the fraction are the numerators. When adding fractions, first we want to determine whether the denominators are like or unlike. Are the denominators like or the same?** |
| Students | Yes. |
| **Teacher** | **The denominators are the same. The denominator, __, will not change when we add the fractions. Let's go ahead and write the denominator for our sum.** (Write denominator.) |
| **Teacher** | **Now, we want to add the parts or numerator of each fraction. That means we have to add __ one-__ parts and __ one-__ parts. What do we add?** |
| Students | We add the parts or numerators of the fraction. |
| **Teacher** | **Let's combine the parts together. What's __ plus __?** |
| Students | __. |
| **Teacher** | **Let's write the parts we added together.** (Write parts.) |
| **Teacher** | **When you have __ plus __, the sum is __. What's the sum?** |
| Students | __. |
| **Teacher** | **__ plus __ equals __. Let's say that together.** |
| Students | __ plus __ equals __. |
| **Teacher** | **So, if you have a set of __ and a set of __, when you combine (or put together) the sets, the sum is __. __ plus __ equals __. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What do you add when you add fractions?** |
| Students | The parts or numerator of each fraction. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | We determined the denominators of the fraction were the same. We added the parts of the fraction to determine the sum. |

## Example

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

### EXAMPLE WITH MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with fraction tiles.** (Move fraction tiles to workspace.) |
| **Teacher** | **Our first addend is $\frac{2}{8}$. What's our first addend?** |
| Students | $\frac{2}{8}$. |
| **Teacher** | **Let's show this addend by showing the fraction.** (Show 2 one-eighth parts compared to a whole.) |
| **Teacher** | **What fraction?** |
| Students | $\frac{2}{8}$. |
| **Teacher** | **Our second addend is $\frac{3}{8}$. What's our second addend?** |
| Students | $\frac{3}{8}$. |
| **Teacher** | **Let's show the second addend by showing the fraction.** (Show 3 one-eighth parts compared to a whole.) |
| **Teacher** | **What fraction?** |
| Students | $\frac{3}{8}$. |
| **Teacher** | **So, we have $\frac{2}{8}$ plus $\frac{3}{8}$. Let's add by combining. What does combining mean?** |
| Students | To put together. |
| **Teacher** | **Yes. Let's combine, or put together, the parts of the fraction. The parts of the fractions represent the numerators. When adding fractions, first we want to determine whether the denominators are like or unlike. Are the denominators like or the same?** |
| Students | Yes. |
| **Teacher** | **Both denominators are 8. The denominators are the same or like denominators. Second, we want to add the numerators, or parts, of each fraction. That means we have to add 2 one-eighth parts and 3 one-eighth parts. What do we add?** |
| Students | We add the parts or numerators of the fraction. |
| **Teacher** | **Let's combine the parts together. That means we're combining the numerators.** |

(Combine parts, compare to whole.)

**Teacher** **So, we now have 1, 2, 3, 4, 5 one-eighth parts. How many parts?**

Students 5 one-eighth parts.

**Teacher** **When you have $\frac{2}{8}$ plus $\frac{3}{8}$, the sum is $\frac{5}{8}$. What's the sum?**

Students $\frac{5}{8}$.

**Teacher** **$\frac{2}{8}$ plus $\frac{3}{8}$ equals $\frac{5}{8}$. Let's say that together.**

Students $\frac{2}{8}$ plus $\frac{3}{8}$ equals $\frac{5}{8}$.

**Teacher** **So, if you have a set of $\frac{2}{8}$ and a set of $\frac{3}{8}$, when you combine (or put together) the parts or numerators of each fraction, the sum is $\frac{5}{8}$. $\frac{2}{8}$ plus $\frac{3}{8}$ equals $\frac{5}{8}$. Let's review. What's an addend?**

Students One of the sets or numbers added together in an addition problem.

**Teacher** **What's a sum?**

Students The total number when you combine sets, or the result of adding two or more numbers together.

**Teacher** **What do you add when you add fractions?**

Students The parts or numerators of each fraction.

**Teacher** **How could you explain solving this problem to a friend?**

Students We started by showing each addend. We checked whether there were like denominators, then added the parts or numerators together to determine the sum.

## (2) Addition of Fractions – Unlike Denominators

### Routine

*Materials:*

- Module 6 Problem Sets
- Module 6 Vocabulary Cards
  - If necessary, review Vocabulary Cards before teaching
- A hands-on tool or manipulative like fraction tiles or two-color counters
  - Note that drawings can be used alongside or instead of manipulatives

#### ROUTINE WITH MANIPULATIVES

**Teacher** **Let's work on addition. What does it mean to add?**

Students To put together or to join to a set.

**Teacher** **Addition means to put together or to join to a set. Look at this problem.** (Show problem.)

**Teacher** **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?**

Students To add.

**Teacher** **Let's do this problem with two-color counters.**

(Move two-color counters to workspace.)

**Teacher** **Our first addend is __. What's our first addend?**

Students __.

**Teacher** **Let's show this addend by showing the fraction.**

(Show set compared to whole with white/yellow counters representing numerator and red counters representing denominator.)

**Teacher** **What fraction?**

Students __.

**Teacher** **Our second addend is __. What's our second addend?**

Students __.

**Teacher** **Let's show the second addend by showing the fraction.**

(Show set compared to whole with white/yellow counters representing numerator and red counters representing denominator.)

**Teacher** **What fraction?**

Students __.

**Teacher** **So, we have __ plus __. Let's add by combining. What does combining mean?**

Students To put together.

**Teacher** **Yes. Let's combine, or put together, the parts of the fraction. Remember, the parts of the fractions represent the numerators. When adding fractions, first we want to determine whether the denominators are like or unlike. You might also say common or uncommon denominators. Are the denominators the same or alike?**

Students No.

**Teacher** **The denominators are not the same. To add, we should add parts or numerators with the same denominator. When the denominators are unlike, the parts or numerators do not have the same value. So, we will work to make the fractions have like denominators. Why do we want to add fractions with like denominators?**

Students So, we can add the parts or numerators of the fraction.

**Teacher** **To do this, let's write the first five multiples of each denominator. The first addend has a denominator of __, so let's write the first five multiples of __.**

(Write multiples as __, __, __, __, __.)

**Teacher** **What are the multiples of __? Say them with me.**

Students __, __, __, __, __.

**Teacher** **The second addend has a denominator of __, so let's write the first five multiples of __.**

(Write multiples as __, __, __, __, __.)

**Teacher** **What are the multiples of __? Say them with me.**

Students __, __, __, __, __.

**Teacher** **Great. Let's determine the least common multiple of the two fractions. What is the multiple with the least value that you see on both lists of multiples?**

Students __.

**Teacher** **So, __ is the least common multiple. Say that with me.**

Students Least common multiple.

| | | |
|---|---|---|
| **Teacher** | **Sometimes we call the least common multiple the LCM. What do we call the least common multiple?** | |
| Students | LCM. | |
| **Teacher** | **The least common multiple, or LCM, helps us to determine the common denominator for the two fractions. What does the LCM help with?** | |
| Students | Finding a common denominator for the two fractions. | |
| **Teacher** | **The first addend has a denominator of __.** | |
| | ***OPTION 1:*** | **This is the original denominator. We don't have to do anything to this fraction.** |
| | ***OPTION 2:*** | **This is not the original denominator. We need to convert the fraction from a denominator of __ to a denominator of __.** |
| | **What do we need to do?** | |
| Students | *OPTION 1:* | We don't have to change the denominator. |
| | *OPTION 2:* | We need to convert the fraction to a denominator of __. |
| **Teacher** | ***OPTION 2:*** | **To convert the fraction to a denominator of __, I determine how many groups of __** (original denominator) **I need to make __** (common denominator)**. I see I need to make __, __, __ groups of __** (original denominator)**. How many groups?** |
| Students | | __. |
| **Teacher** | | **So, I make __ groups of __ with the two-color counters. That means I iterate or copy the original fraction __ times. What does it mean to iterate?** |
| Students | | To copy. |
| **Teacher** | | **Our new fraction is __. Is __** (original fraction) **equivalent to __** (fraction with common denominator)**?** |
| Students | | Yes. |
| **Teacher** | | **How do you know the fractions are equivalent?** |
| Students | | The fractions have the same value. They are equivalent. |
| **Teacher** | **So, we converted the first addend to a common denominator. Let's do the same with the second addend. What's the second addend?** | |
| | __. | |
| **Teacher** | **The second addend has a denominator of __.** | |
| | ***OPTION 1:*** | **This is the original denominator. We don't have to do anything to this fraction.** |
| | ***OPTION 2:*** | **This is not the original denominator. We need to convert the fraction from a denominator of __ to a denominator of __.** |
| | **What do we need to do?** | |
| Students | *OPTION 1:* | We don't have to change the denominator. |
| | *OPTION 2:* | We need to convert the fraction to a denominator of __. |
| **Teacher** | ***OPTION 2:*** | **To convert the fraction to a denominator of __, I determine how many groups of __** (original denominator) **I need to make __** (common denominator)**. I see I need to make __, __, __ groups of __** (original denominator)**. How many groups?** |
| Students | | __. |

| | |
|---|---|
| **Teacher** | **We make __ groups of __ with the two-color counters. That means I iterate or copy the original fraction __ times. How many times?** |
| Students | __. |
| **Teacher** | **Let's check our work. Is __** (original fraction) **equivalent to __** (fraction with common denominator)**?** |
| Students | Yes. |
| **Teacher** | **How do you know the fractions are equivalent?** |
| Students | The fractions have the same value. They are equivalent. |
| **Teacher** | **Now that we have common denominators, we want to add the parts or numerators of each fraction. That means we have to add __ one-__ parts and __ one-__ parts. What do we add?** |
| Students | We add the parts or numerators of the fraction. |
| **Teacher** | **Let's combine the numerators together. With the two-color counters, we add the red one-__ parts. Because our common denominator is __, we make groups of __** (common denominator)**. We make groups of what?** |
| Students | __. |
| **Teacher** | **We add the one-__ parts. We now have __, __, __, … one-__ parts. How many parts?** |
| Students | __. |
| **Teacher** | **When you have __ plus __, the sum is __. What's the sum?** |
| Students | __. |
| **Teacher** | **__ plus __ equals __. Let's say that together.** |
| Students | __ plus __ equals __. |
| **Teacher** | **So, if you have a set of __ and a set of __, when you combine (or put together) the sets, the sum is __. __ plus __ equals __. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What do you add when you add fractions?** |
| Students | The parts or numerators of each fraction. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | We started by showing each addend. We decided the denominators were not alike, so we determined a common denominator by using the least common multiples. Then, we added the parts together to determine the sum. |

## ROUTINE WITHOUT MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** |

(Show problem.)

**Teacher** **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?**

Students To add.

**Teacher** **Our first addend is __. What's our first addend?**

Students __.

**Teacher** **Our second addend is __. What's our second addend?**

Students __.

**Teacher** **So, we have __ plus __. Let's add by combining. What does combining mean?**

Students To put together.

**Teacher** **Yes. Let's combine, or put together, the parts of the fraction. Remember, the parts of a fraction represent the numerator. What do you add?**

Students The parts or numerators of the fractions.

**Teacher** **When adding fractions, first we want to determine whether the denominators are like or unlike. You might also say common or uncommon denominators. Are the denominators the same or alike?**

Students No.

**Teacher** **The denominators are not the same. To add, we should add parts or numerators with the same value. When the denominators are unlike, the parts or numerators do not represent the same value. So, we will work to make the fractions have like denominators. Why do we want to add fractions with like denominators?**

Students So, we can add the parts or numerators of the fractions.

**Teacher** **To do this, let's write the first five multiples of each denominator. The first addend has a denominator of __, so let's write the first five multiples of __.**

(Write multiples as __, __, __, __, __.)

**Teacher** **What are the multiples of __? Say them with me.**

Students __, __, __, __, __.

**Teacher** **The second addend has a denominator of __, so let's write the first five multiples of __.**

(Write multiples as __, __, __, __, __.)

**Teacher** **What are the multiples of __? Say them with me.**

Students __, __, __, __, __.

**Teacher** **Great. Let's determine the least common multiple of the two fractions. What is the multiple with the least value that you see on both lists of multiples?**

Students __.

**Teacher** **So, __ is the least common multiple. Say that with me.**

Students Least common multiple.

**Teacher** **Sometimes we call the least common multiple the LCM. What do we call the least common multiple?**

Students LCM.

**Teacher** **The least common multiple, or LCM, helps us determine the common denominator for the two fractions. What does the LCM help with?**

Students Finding a common denominator for the two fractions.

| | | |
|---|---|---|
| **Teacher** | **The first addend has a denominator of __.** | |
| | ***OPTION 1:*** | **This is the original denominator. We don't have to do anything to this fraction.** |
| | ***OPTION 2:*** | **This is not the original denominator. We need to convert the fraction from a denominator of __ to a denominator of __.** |
| | **What do we need to do?** | |
| Students | *OPTION 1:* | We don't have to change the denominator. |
| | *OPTION 2:* | We need to convert the fraction to a denominator of __. |
| **Teacher** | ***OPTION 2:*** | **To convert the fraction to a denominator of __, I determine how many groups of __** (original denominator) **I need to make __** (common denominator)**. I see I need to make __, __, __ groups of __** (original denominator)**. How many groups?** |
| Students | | __. |
| **Teacher** | | **So, I multiply the denominator times __ and the numerator times __. Let's multiply the denominator first. __** (original denominator) **times __ is what?** |
| Students | | __. |
| **Teacher** | | **That's right. __ times __ equals __. Our new denominator is __. What's our new denominator?** |
| Students | | __. |
| **Teacher** | | **Now, let's multiply the numerator times __. __** (original numerator) **times __ is what?** |
| Students | | __. |
| **Teacher** | | **Yes. __ times __ equals __. Our new numerator is __. What's the new numerator?** |
| Students | | __. |
| **Teacher** | | **Let's check our work. Is __** (original fraction) **equivalent to __** (fraction with common denominator)**? How do you know the fractions are equivalent?** |
| Students | | The fractions have the same value. They are equivalent. |
| **Teacher** | **So, we converted the first addend to a common denominator. Let's do the same with the second addend. What's the second addend?** | |
| | __. | |
| **Teacher** | **The second addend has a denominator of __.** | |
| | ***OPTION 1:*** | **This is the original denominator. We don't have to do anything to this fraction.** |
| | ***OPTION 2:*** | **This is not the original denominator. We need to convert the fraction from a denominator of __ to a denominator of __.** |
| | **What do we need to do?** | |
| Students | *OPTION 1:* | We don't have to change the denominator. |
| | *OPTION 2:* | We need to convert the fraction to a denominator of __. |
| **Teacher** | ***OPTION 2:*** | **To convert the fraction to a denominator of __, I determine how many groups of __** (original denominator) **I need to make __** |

| | |
|---|---|
| | (common denominator)**. I see I need to make __, __, __ groups of __** (original denominator)**. How many groups?** |
| Students | __. |
| **Teacher** | **So, I multiply the denominator times __ and the numerator times __. Let's multiply the denominator first. __** (original denominator) **times __ is what?** |
| Students | __. |
| **Teacher** | **That's right. __ times __ equals __. Our new denominator is __. What's our new denominator?** |
| Students | __. |
| **Teacher** | **Now, let's multiply the numerator times __. __** (original numerator) **times __ is what?** |
| Students | __. |
| **Teacher** | **Yes. __ times __ equals __. Our new numerator is __. What's the new numerator?** |
| Students | __. |
| **Teacher** | **Let's check our work. Is __** (original fraction) **equivalent to __** (fraction with common denominator)**?** |
| Students | Yes. |
| **Teacher** | **How do you know the fractions are equivalent?** |
| Students | The fractions have the same value. They are equivalent. |
| **Teacher** | **Now that we have common denominators, we want to add the parts or numerator of each fraction. That means we have to add __ one-__ parts and __ one-__ parts. What do we add?** |
| Students | We add the parts of the fraction. |
| **Teacher** | **Let's combine the parts or numerators together.** (Combine parts, compare to whole.) |
| **Teacher** | **So, we now have __, __, __, … one-__ parts. How many parts?** |
| Students | __. |
| **Teacher** | **When you have __ plus __, the sum is __. What's the sum?** |
| Students | __. |
| **Teacher** | **__ plus __ equals __. Let's say that together.** |
| Students | __ plus __ equals __. |
| **Teacher** | **So, if you have a set of __ and a set of __, when you combine (or put together) the sets, the sum is __. __ plus __ equals __. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What do you add when you add fractions?** |
| Students | The parts or numerator of each fraction. |
| **Teacher** | **How could you explain solving this problem to a friend?** |

| | |
|---|---|
| Students | We started by showing each addend. We used least common multiples to help determine common denominators. Then, we added the parts together to determine the sum. |

## Example

$$\frac{3}{4} + \frac{1}{3} = \frac{13}{12}$$

### EXAMPLE WITH MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with two-color counters.** (Move two-color counters to workspace.) |
| **Teacher** | **Our first addend is $\frac{3}{4}$. What's our first addend?** |
| Students | $\frac{3}{4}$. |
| **Teacher** | **Let's show this addend by showing the fraction. First, we have a denominator of 4, so let's show 4 yellow counters. How many?** |
| Students | 4. |
| **Teacher** | **Then, we need to show 3 of the 4 parts as red to show $\frac{3}{4}$. How many should we make red?** |
| Students | 3. |
| **Teacher** | **What fraction?** |
| Students | $\frac{3}{4}$. |
| **Teacher** | **Our second addend is $\frac{1}{3}$. What's our second addend?** |
| Students | $\frac{1}{3}$. |
| **Teacher** | **Let's show the second addend by showing the fraction. First, we have a denominator of 3, so let's show 3 yellow counters. How many?** |
| Students | 3. |
| **Teacher** | **Then, we need to show 1 of the 3 parts as red to show $\frac{1}{3}$. How many should we make red?** |
| Students | 1. |
| **Teacher** | **What fraction?** |
| Students | $\frac{1}{3}$. |

| | |
|---|---|
| **Teacher** | **So, we have $\frac{3}{4}$ plus $\frac{1}{3}$. Let's add by combining. What does combining mean?** |
| Students | To put together. |
| **Teacher** | **Yes. Let's combine, or put together, the parts of the fraction. When adding fractions, first we want to determine whether the denominators are like or unlike. You might also say common or uncommon denominators. Are the denominators the same or alike?** |
| Students | No. |
| **Teacher** | **How do you know the denominators are not alike?** |
| Students | We have a denominator of 4 and a denominator of 3. Those are not the same. |
| **Teacher** | **The denominators are not the same. To add, we should add parts or numerators with the same denominator. When the denominators are unlike, the parts or numerators do not represent the same value. So, we will work to make the fractions have like denominators. Why do we want to add fractions with like denominators?** |
| Students | So, we can add the parts or numerator of the fraction. |
| **Teacher** | **To do this, let's write the first five multiples of each denominator. The first addend has a denominator of 4, so let's write the first five multiples of 4.** (Write multiples as 4, 8, 12, 16, 20.) |
| **Teacher** | **What are the multiples of 4? Say them with me.** |
| Students | 4, 8, 12, 16, 20. |
| **Teacher** | **The second addend has a denominator of 3, so let's write the first five multiples of 3.** (Write multiples as 3, 6, 9, 12, 15.) |
| **Teacher** | **What are the multiples of 3? Say them with me.** |
| Students | 3, 6, 9, 12, 15. |
| **Teacher** | **Great. Let's determine the least common multiple of the two fractions. What is the multiple with the least value that you see on both lists of multiples?** |
| Students | 12. |
| **Teacher** | **So, 12 is the least common multiple. What is 12?** |
| Students | The least common multiple. |
| **Teacher** | **Sometimes we call the least common multiple the LCM. What do we call the least common multiple?** |
| Students | LCM. |
| **Teacher** | **The least common multiple, or LCM, helps us determine the common denominator for the two fractions. What does the LCM help with?** |
| Students | Finding a common denominator for the two fractions. |
| **Teacher** | **The first addend has a denominator of 4, which is not the original denominator. We need to convert the fraction from a denominator of 4 to a denominator of 12. What do we need to do?** |
| Students | Convert the fraction from a denominator of 4 to a denominator of 12. |
| **Teacher** | **To convert the fraction to a denominator of 12, I determine how many groups of 4 I need to make 12. I see I need to make 1, 2, 3 groups of 4.** (Point to the multiples of 4, 8, and 12.) **How many groups?** |

Students 3.

**Teacher** **Let's make 3 groups of the fraction $\frac{3}{4}$ with the two-color counters. We already have one group of $\frac{3}{4}$. Let's make a second group** (show 3 red counters and 1 yellow counter) **and a third group** (show 3 red counters and 1 yellow counter.) **Our new fraction is $\frac{9}{12}$. Is $\frac{9}{12}$ equivalent to $\frac{3}{4}$?**

Students Yes. The fractions are equivalent.

**Teacher** **So, we converted the first addend to a common denominator. Let's do the same with the second addend. What's the second addend?**

Students $\frac{1}{3}$.

**Teacher** **The second addend has a denominator of 3, which is not the original denominator. We need to convert the fraction from a denominator of 3 to a denominator of 12. What do we need to do?**

Students Convert the fraction from a denominator of 3 to a denominator of 12.

**Teacher** **To convert the fraction to a denominator of 12, I determine how many groups of 3 I need to make 12. I see I need to make 1, 2, 3, 4 groups of 3.** (Point to the multiples of 3, 6, 9, and 12.) **How many groups?**

Students 4.

**Teacher** **Let's make 4 groups of the fraction $\frac{1}{3}$ with the two-color counters. We already have one group of $\frac{1}{3}$. Let's make a second group** (show 1 red counter and 2 yellow counters), **a third group** (show 1 red counter and 2 yellow counters), **and a fourth group** (show 1 red counter and 2 yellow counters). **Our new fraction is $\frac{4}{12}$. Is $\frac{4}{12}$ equivalent to $\frac{1}{3}$?**

Students Yes. The fractions are equivalent.

**Teacher** **Now that we have common denominators, we want to add the parts or numerators of each fraction. That means we have to add 9 one-twelfth parts and 4 one- twelfth parts. What do we add?**

Students We add the parts or numerators of the fractions.

**Teacher** **Let's combine the parts or numerators together. With the two-color counters, we add the red one-twelfth parts. Because our common denominator is 12, we make groups of 12** (common denominator). **We make groups of what?**

Students 12.

**Teacher** **We add the one-twelfth parts. We now have 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 one-twelfth parts. How many parts?**

Students 13.

**Teacher** **When you have $\frac{9}{12}$ plus $\frac{4}{12}$, the sum is $\frac{13}{12}$. What's the sum?**

Students $\frac{13}{12}$.

**Teacher** **$\frac{9}{12}$ plus $\frac{4}{12}$ equals $\frac{13}{12}$. Let's say that together.**

Students $\frac{9}{12}$ plus $\frac{4}{12}$ equals $\frac{13}{12}$.

| | |
|---|---|
| | **$\frac{13}{12}$ is also equivalent to 1 $\frac{1}{12}$.** |
| **Teacher** | **If you have a set of $\frac{3}{4}$ and a set of $\frac{1}{3}$, when you combine (or put together) the sets, the sum is $\frac{13}{12}$. $\frac{9}{12}$ plus $\frac{4}{12}$ equals $\frac{13}{12}$. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What do you add when you add fractions?** |
| Students | The parts or numerator of each fraction. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | We started by showing each addend. We determined the denominators were not alike. So, we used least common multiples to find a common denominator. After converting both fractions to a common denominator, we added the parts or numerators together to determine the sum. |

## (3) Addition of Decimals with Traditional Algorithm

### Routine

*Materials:*

- Module 6 Problem Sets
- Module 6 Vocabulary Cards
    - If necessary, review Vocabulary Cards before teaching
- A hands-on tool or manipulative like Base-10 blocks or money
    - Note that drawings can be used alongside or instead of manipulatives

#### ROUTINE WITH MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with Base-10 blocks.** (Move Base-10 blocks to workspace.) |
| **Teacher** | **When we use the Base-10 blocks with decimals, we can shift the meaning of each type of block. Today, let's use the flats to represent ones. What do the flats represent?** |
| Students | Ones. |
| **Teacher** | **We'll use the rods to represent tenths. What do the rods represent?** |

| | |
|---|---|
| Students | Tenths. |
| **Teacher** | **How can we use the rods to represent tenths?** |
| Students | 1 rod equals 1 tenth. |
| **Teacher** | **What do you notice about the relationship between the rods and the flat?** |
| Students | There are 10 tenths in 1 in the same way there are 10 rods in 1 flat. |
| **Teacher** | **With our Base-10 blocks, the units represent hundredths. What do the units represent?** |
| Students | Hundredths. |
| **Teacher** | **What do you notice about the relationship between the units and the rods?** |
| Students | There are 10 hundredths in 1 tenth in the same way there are 10 units in 1 rod. |
| **Teacher** | **Our first addend is __. What's our first addend?** |
| Students | __. |
| **Teacher** | **Let's show this addend by showing __ ones, __ tenths, and __ hundredths.** (Show with Base-10 blocks.) |
| **Teacher** | **How many?** |
| Students | __. |
| **Teacher** | **Our second addend is __. What's our second addend?** |
| Students | __. |
| **Teacher** | **Let's show the second addend by showing __ ones, __ tenths, and __ hundredths.** (Show with Base-10 blocks. Place Base-10 blocks under the first addend.) |
| **Teacher** | **How many?** |
| Students | __. |
| **Teacher** | **So, we have __ plus __. Let's add by combining. What does combining mean?** |
| Students | To put together. |
| **Teacher** | **Yes. Let's combine or put together. First, let's combine the least place value. That means the place value with the least or smallest value. What's the least place value in this problem?** |
| Students | Hundredths. |
| **Teacher** | **Let's add the hundredths together.** (Move two sets of hundredths together.) |
| **Teacher** | **Let's count to learn the sum of the hundredths.** (Count hundredths.) |
| **Teacher** | **How many hundredths are there in total or altogether?** |
| Students | __. |
| **Teacher** | **Yes! There are __ hundredths. If we have more than 9 hundredths, we have to regroup. Do we have more than 9 hundredths?** |
| Students | Yes. |
| **Teacher** | **We have more than 9 hundredths. That means we have to regroup. To regroup, we count 10 hundredths and regroup/trade/exchange the 10 hundredths for 1 tenth. Let's do that together. Let's count out 10 hundredths.** (Count 10 hundredths.) |
| **Teacher** | **Let's regroup/trade/exchange the 10 hundredths for 1 tenth. See how 1 tenth is the same as 10 hundredths?** |

| | |
|---|---|
| Students | Yes. |
| **Teacher** | **We leave the remaining hundredths here. But we can't put this 1 tenth in the hundredths place. The hundredths place is only for hundredths. So, we place the 1 tenth in the tenths column. I like to place the 1 tenth above the other tenths.** |
| | (Place 1 tenth above tenths column.) |
| **Teacher** | **Now, let's combine the tenths. That means we put all the tenths together.** |
| | (Move sets of tenths together.) |
| **Teacher** | **How many tenths are there in total or altogether?** |
| Students | __. |
| **Teacher** | **There are __ tenths. If we have more than 9 tenths, we have to regroup. Do we have more than 9 tenths?** |
| Students | No. |
| **Teacher** | **Now, let's combine the ones. Let's put all the ones together.** |
| | (Move sets of ones together.) |
| **Teacher** | **How many ones are there in total or altogether?** |
| Students | __. |
| **Teacher** | **So, let's count the ones, tenths, and hundredths to learn the sum. Ready?** |
| | (Count the ones, then tenths, then hundredths.) |
| **Teacher** | **That means __ plus __ equals __. Let's say that together.** |
| Students | __ plus __ equals __. |
| **Teacher** | **Let's say it together again.** |
| Students | __ plus __ equals __. |
| **Teacher** | **So, if you have a set of __ and a set of __, when you combine (or put together) the sets, the sum is __. __ plus __ equals __. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What does it mean to regroup/trade/exchange?** |
| Students | You can regroup/trade/exchange 10 hundredths for 1 tenth. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | We started by showing each addend. Then, we combined the hundredths. We regrouped 10 hundredths for 1 tenth. Then, we combined the tenths. Then, we combined the ones. The sum was the total number of ones, tenths, and hundredths. |

## ROUTINE WITHOUT MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** |
| | (Show problem.) |

| | |
|---|---|
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with our pencil. First, when I see a problem like this that requires computation, I like to draw vertical lines to separate the different place value columns. Let's draw a vertical line between the ones column and the tenths column and another line between the tenths column and the hundredths column.**<br>(Draw vertical lines to separate place value columns.) |
| **Teacher** | **Now, we start by adding the hundredths. What should we add first?** |
| Students | The hundredths. |
| **Teacher** | **Which hundredths do we add?** |
| Students | __ plus __. |
| **Teacher** | **What's __ plus __?**<br>(If a student has difficulty with addition, say: **Start with the greater addend. Place that number in your fist, and let's count up __ more. Ready? __: __, __, __.** See Counting Up poster at the end of Module 4 for more information.) |
| **Teacher** | **How many hundredths are there in total or altogether?** |
| Students | __. |
| **Teacher** | **Yes! There are __ hundredths. If we have more than 9 hundredths, we have to regroup. Do we have more than 9 hundredths?** |
| Students | Yes. |
| **Teacher** | **We have more than 9 hundredths. That means we have to regroup. We think of our hundredths sum as 1 tenth and __ hundredths. We write the hundredths in the hundredths column under the equal line.**<br>(Write hundredths under equal line.) |
| **Teacher** | **We regroup the 1 tenth to the tenths column. We write the 1 tenth in the tenths column above the other tenths.**<br>(Write 1 above tenths column.) |
| **Teacher** | **Now, let's add the tenths. Which tens do we add?** |
| Students | __ plus __ plus __. |
| **Teacher** | **What's __ plus __ plus __?** |
| Students | __. |
| **Teacher** | **How many tenths are there in total or altogether?** |
| Students | __. |
| **Teacher** | **There are __ tenths. If we have more than 9 tenths, we have to regroup. Do we have more than 9 tenths?** |
| Students | No. |
| **Teacher** | **Now, let's add the ones. Which ones do we add?** |
| Students | __ plus __. |
| **Teacher** | **What's __ plus __?** |
| Students | __. |
| **Teacher** | **How many ones are there in total or altogether?** |
| Students | __. |

| | |
|---|---|
| **Teacher** | **So, let's look at the problem. What's __ plus __?** |
| Students | __. |
| **Teacher** | **That's right. __ plus __ equals __. Let's say that together.** |
| Students | __ plus __ equals __. |
| **Teacher** | **So, if you have a set of __ and a set of __, when you combine (or join) the sets, the sum is __. __ plus __ equals __. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What does it mean to regroup/trade/exchange?** |
| Students | You can regroup/trade/exchange 10 hundredths for 1 tenth. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | First, we combined the hundredths. We regrouped 10 hundredths for 1 tenth. Then, we combined the tenths. Then, we combined the ones. The sum was the total number of ones, tenths, and hundredths. |

## Example

$$\begin{array}{r} 2.16 \\ +\ 4.78 \\ \hline 6.94 \end{array}$$

### EXAMPLE WITH MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with Base-10 blocks.** (Move Base-10 blocks to workspace.) |
| **Teacher** | **When we use the Base-10 blocks with decimals, we can shift the meaning of each type of block. Today, let's use the flats to represent ones. What do the flats represent?** |
| Students | Ones. |
| **Teacher** | **We'll use the rods to represent tenths. What do the rods represent?** |
| Students | Tenths. |
| **Teacher** | **How can we use the rods to represent tenths? What do you notice about the relationship between the rods and the flat?** |
| Students | There are 10 tenths in 1 in the same way there are 10 rods in 1 flat. |

| | |
|---|---|
| **Teacher** | **With our Base-10 blocks, the units represent hundredths. What do the units represent?** |
| Students | Hundredths. |
| **Teacher** | **What do you notice about the relationship between the units and the rods?** |
| Students | There are 10 hundredths in 1 tenth in the same way there are 10 units in 1 rod. |
| **Teacher** | **Our first addend is 2 and 16 hundredths. What's our first addend?** |
| Students | 2 and 16 hundredths. |
| **Teacher** | **Let's show this addend by showing 2 ones, 1 tenth, and 6 hundredths.** (Show with Base-10 blocks.) |
| **Teacher** | **How many?** |
| Students | 2 and 16 hundredths. |
| **Teacher** | **Our second addend is 4 and 78 hundredths. What's our second addend?** |
| Students | 4 and 78 hundredths. |
| **Teacher** | **Let's show the second addend by showing 4 ones, 7 tenths, and 8 hundredths.** (Show with Base-10 blocks. Place Base-10 blocks under the first addend.) |
| **Teacher** | **How many?** |
| Students | 4 and 78 hundredths. |
| **Teacher** | **So, we have 2 and 16 hundredths plus 4 and 78 hundredths. Let's add by combining. What does combining mean?** |
| Students | To put together. |
| **Teacher** | **Yes. Let's combine or put together. First, let's combine the least place value. What's the least place value in this problem?** |
| Students | Hundredths. |
| **Teacher** | **Let's add the hundredths together. 6 hundredths plus 8 hundredths.** (Move two sets of hundredths together.) |
| **Teacher** | **Let's count to learn the sum of the hundredths.** (Count hundredths.) |
| **Teacher** | **How many hundredths are there in total or altogether?** |
| Students | 14. |
| **Teacher** | **Yes! There are 14 hundredths. If we have more than 9 hundredths, we have to regroup. Do we have more than 9 hundredths?** |
| Students | Yes. |
| **Teacher** | **We have more than 9 hundredths. That means we have to regroup. To regroup, we count 10 hundredths and regroup/trade/exchange the 10 hundredths for 1 tenth. Let's do that together. Let's count out 10 hundredths.** (Count 10 hundredths.) |
| **Teacher** | **Let's regroup/trade/exchange the 10 hundredths for 1 tenth. See how 1 tenth is the same as 10 hundredths?** |
| Students | Yes. |
| **Teacher** | **We leave the remaining hundredths here. But we can't put this 1 tenth in the hundredths place. The hundredths place is only for hundredths. So, we place the 1 tenth in the tenths column. I like to place the 1 tenth above the other tenths.** (Place 1 tenth above tenths column.) |

| | |
|---|---|
| **Teacher** | **Now, let's combine the tenths. That means we put all the tenths together.** (Move sets of tenths together.) |
| **Teacher** | **Let's add 1 tenth plus 1 tenth plus 7 tenths. How many tenths are there in total or altogether?** |
| Students | 9. |
| **Teacher** | **There are 9 tenths. If we have more than 9 tenths, we have to regroup. Do we have more than 9 tenths?** |
| Students | No. |
| **Teacher** | **Now, let's combine the ones. Let's put all the ones together.** (Move sets of ones together.) |
| **Teacher** | **How many ones are there in total or altogether?** |
| Students | 6. |
| **Teacher** | **So, let's count the ones, tenths, and hundredths to learn the sum. Ready?** (Count the ones, then tenths, then hundredths.) |
| **Teacher** | **That means 2 and 16 hundredths plus 4 and 78 hundredths equals 6 and 94 hundredths. Let's say that together.** |
| Students | 2 and 16 hundredths plus 4 and 78 hundredths equals 6 and 94 hundredths. |
| **Teacher** | **Let's say it together again.** |
| Students | 2 and 16 hundredths plus 4 and 78 hundredths equals 6 and 94 hundredths. |
| **Teacher** | **Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What does it mean to regroup/trade/exchange?** |
| Students | You can regroup/trade/exchange 10 hundredths for 1 tenth. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | We started by showing each addend. Then, we combined the hundredths. We regrouped 10 hundredths for 1 tenth. Then, we combined the tenths. Then, we combined the ones. The sum was the total number of ones, tenths, and hundredths. |

## (4) Addition of Decimals with Partial Sums Algorithm

### Routine

*Materials:*

- Module 6 Problem Sets
- Module 6 Vocabulary Cards
    - If necessary, review Vocabulary Cards before teaching
- A hands-on tool or manipulative like Base-10 blocks or money
    - Note that drawings can be used alongside or instead of manipulatives

## ROUTINE WITH MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with money.** (Move money to workspace.) |
| **Teacher** | **When we use the money, the dollar bills represent ones. What do the dollar bills represent?** |
| Students | Ones. |
| **Teacher** | **We'll use the dimes to represent tenths. What do the dimes represent?** |
| Students | Tenths. |
| **Teacher** | **How can we use the dimes to represent tenths?** |
| Students | 1 dime represents 1 tenth. |
| **Teacher** | **What do you notice about the relationship between the dimes and the dollar bill?** |
| Students | There are 10 dimes in 1 dollar. |
| **Teacher** | **With our money, the pennies represent hundredths. What do the pennies represent?** |
| Students | Hundredths. |
| **Teacher** | **What do you notice about the relationship between the pennies and the dimes?** |
| Students | There are 10 pennies in 1 dime. |
| **Teacher** | **Our first addend is __. What's our first addend?** |
| Students | __. |
| **Teacher** | **Let's show this addend by showing __ ones, __ tenths, and __ hundredths.** (Show with money.) |
| **Teacher** | **How many?** |
| Students | __. |
| **Teacher** | **Our second addend is __. What's our second addend?** |
| Students | __. |
| **Teacher** | **Let's show the second addend by showing __ ones, __ tenths, and __ hundredths.** (Show with money. Place under the first addend.) |
| **Teacher** | **How many?** |
| Students | __. |
| **Teacher** | **So, we have __ plus __. Let's add by combining. What does combining mean?** |
| Students | To put together. |

| | |
|---|---|
| **Teacher** | **Yes. Let's combine or put together. First, let's combine the ones. That means we combine the dollars. This will be our first partial sum. It's the sum for part of the problem. Adding the ones means we put all the ones together.** (Move two sets of ones together.) |
| **Teacher** | **Let's count to learn the sum of the ones.** (Count ones.) |
| **Teacher** | **How many ones are there in total or altogether?** |
| Students | __. |
| **Teacher** | **This __ is one of our partial sums. It's the sum of the ones. Now, let's combine the tenths. That means we put all the dimes together.** (Move dimes together.) |
| **Teacher** | **How many dimes are there in total or altogether?** |
| Students | __. |
| **Teacher** | **This __ is another of our partial sums. It's the sum of the tenths. What's a partial sum?** |
| Students | It's a sum of part of the problem. |
| **Teacher** | **Let's combine the hundredths or pennies. Let's put all the hundredths together to get the sum of the hundredths.** (Move pennies together.) |
| **Teacher** | **How many pennies are there in total or altogether?** |
| Students | __. |
| **Teacher** | **Now, we add the partial sums. Let's add the partial sums of the ones, tenths, and hundredths or the dollars, dimes, and pennies.** (Start with dollars, then add the dimes, then add the pennies.) |
| **Teacher** | **That means __ plus __ equals __. Let's say that together.** |
| Students | __ plus __ equals __. |
| **Teacher** | **Let's say it together again.** |
| Students | __ plus __ equals __. |
| **Teacher** | **So, if you have a set of __ and a set of __, when you combine (or put together) the sets, the sum is __. __ plus __ equals __. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | We started by showing each addend. Then, we combined the ones. Then, we combined the tenths. Then, we combined the hundredths. We added the partial sums of the ones, tenths, and hundredths by adding the dollars, dimes, and pennies. The sum was the total number of ones, tenths, and hundredths. |

## ROUTINE WITHOUT MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with our pencil. First, when I see a problem like this that requires computation, I like to draw vertical lines to separate the different place value columns. Let's draw a vertical line between the ones column and the tenths column and another line between the tenths column and the hundredths column.** (Draw vertical lines to separate place value columns.) |
| **Teacher** | **With the partial sums algorithm, we start by adding the greatest place value. What should we add first?** |
| Students | The ones. |
| **Teacher** | **Which ones do we add?** |
| Students | __ plus __. |
| **Teacher** | **What's __ plus __?** (If a student has difficulty with addition, say: **Start with the greater addend. Place that number in your fist, and let's count up __ more. Ready? __: __, __, __.** See Counting Up poster at the end of Module 4 for more information.) |
| **Teacher** | **How many ones are there in total or altogether?** |
| Students | __. |
| **Teacher** | **So, let's write __ under the equal line.** (Write ones.) |
| **Teacher** | **Now, let's add the tenths. Which tens do we add?** |
| Students | __ plus __. |
| **Teacher** | **What's __ plus __?** |
| Students | __. |
| **Teacher** | **Let's write __ under the equal line.** (Write tenths.) |
| **Teacher** | **Now, let's add the hundredths. Which hundredths do we add?** |
| Students | __ plus __. |
| **Teacher** | **What's __ plus __?** |
| Students | __. |
| **Teacher** | **Let's write __ under the equal line.** (Write hundredths.) |
| **Teacher** | **Now, let's add the partial sums. What's __ plus __ plus __?** |
| Students | __. |
| **Teacher** | **That's right. To review, __ plus __ equals __. Let's say that together.** |
| Students | __ plus __ equals __. |

| | |
|---|---|
| **Teacher** | **So, if you have a set of __ and a set of __, when you combine (or join) the sets, the sum is __. __ plus __ equals __. Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What's a partial sum?** |
| Students | The sum of just the ones or the tenths or the hundredths. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | First, we combined the ones. Then, we combined the tenths. Then, we combined the hundredths. The sum was the total number of ones, tenths, and hundredths. |

$$\begin{array}{r} 2.16 \\ +\ 4.78 \\ \hline 6.94 \end{array}$$

## Example

### EXAMPLE WITH MANIPULATIVES

| | |
|---|---|
| **Teacher** | **Let's work on addition. What does it mean to add?** |
| Students | To put together or to join to a set. |
| **Teacher** | **Addition means to put together or to join to a set. Look at this problem.** (Show problem.) |
| **Teacher** | **First, I see a plus sign** (point)**. The plus sign tells us to add. What does the plus sign mean?** |
| Students | To add. |
| **Teacher** | **Let's do this problem with Base-10 blocks.** (Move Base-10 blocks to workspace.) |
| **Teacher** | **When we use the Base-10 blocks with decimals, we can shift the meaning of each type of block. Today, let's use the flats to represent ones. What do the flats represent?** |
| Students | Ones. |
| **Teacher** | **We'll use the rods to represent tenths. What do the rods represent?** |
| Students | Tenths. |
| **Teacher** | **How can we use the rods to represent tenths?** |
| Students | 1 rod equals 1 tenth. |
| **Teacher** | **What do you notice about the relationship between the rods and the flat?** |
| Students | There are 10 tenths in 1 in the same way there are 10 rods in 1 flat. |
| **Teacher** | **With our Base-10 blocks, the units represent hundredths. What do the units represent?** |
| Students | Hundredths. |
| **Teacher** | **What do you notice about the relationship between the units and the rods?** |
| Students | There are 10 hundredths in 1 tenth in the same way there are 10 units in 1 rod. |
| **Teacher** | **Our first addend is 2 and 16 hundredths. What's our first addend?** |
| Students | 2 and 16 hundredths. |

| | |
|---|---|
| **Teacher** | **Let's show this addend by showing 2 ones, 1 tenth, and 6 hundredths.** (Show with Base-10 blocks.) |
| **Teacher** | **How many?** |
| Students | 2 and 16 hundredths. |
| **Teacher** | **Our second addend is 4 and 78 hundredths. What's our second addend?** |
| Students | 4 and 78 hundredths. |
| **Teacher** | **Let's show the second addend by showing 4 ones, 7 tenths, and 8 hundredths.** (Show with Base-10 blocks. Place Base-10 blocks under the first addend.) |
| **Teacher** | **How many?** |
| Students | 4 and 78 hundredths. |
| **Teacher** | **So, we have 2 and 16 hundredths plus 4 and 78 hundredths. Let's add by combining. What does combining mean?** |
| Students | To put together. |
| **Teacher** | **Yes. Let's combine or put together. We'll use the partial sums strategy. What strategy?** |
| Students | Partial sums. |
| **Teacher** | **With the partial sums strategy, we add the greatest place value first. What's the greatest place value in this problem?** |
| Students | Ones. |
| **Teacher** | **Let's add the ones together: 2 plus 4.** (Move 2 flats and 4 flats together.) |
| **Teacher** | **Let's count to learn the sum of the ones.** (Count ones.) |
| **Teacher** | **How many ones are there in total or altogether?** |
| Students | 6. |
| **Teacher** | **Yes! There are 6 ones. Now, let's combine the tenths. That means we put all the tenths together: 1 tenth and 7 tenths.** (Move 1 rod and 7 rods together.) |
| **Teacher** | **How many tenths are there in total or altogether?** |
| Students | 8. |
| **Teacher** | **There are 8 tenths. Now, let's combine the hundredths. Let's put all the hundredths together: 6 hundredths and 8 hundredths.** (Move 6 units and 8 units together.) |
| **Teacher** | **How many hundredths are there in total or altogether?** |
| Students | 14. |
| **Teacher** | **Notice that 14 hundredths is the same as what?** |
| Students | 1 tenth and 4 hundredths. |
| **Teacher** | **So, let's count the ones, tenths, and hundredths to learn the sum. Ready? 6 and 10, 20, 30, 40, 50, 60, 70, 80, 90, 91, 92, 93, 94 hundredths.** |
| **Teacher** | **That means 2 and 16 hundredths plus 4 and 78 hundredths equals 6 and 94 hundredths. Let's say that together.** |
| Students | 2 and 16 hundredths plus 4 and 78 hundredths equals 6 and 94 hundredths. |
| **Teacher** | **Let's say it together again.** |
| Students | 2 and 16 hundredths plus 4 and 78 hundredths equals 6 and 94 hundredths. |

| | |
|---|---|
| **Teacher** | **Let's review. What's an addend?** |
| Students | One of the sets or numbers added together in an addition problem. |
| **Teacher** | **What's a sum?** |
| Students | The total number when you combine sets, or the result of adding two or more numbers together. |
| **Teacher** | **What's a partial sum?** |
| Students | The sum of just the ones or the tenths or the hundredths. |
| **Teacher** | **How could you explain solving this problem to a friend?** |
| Students | We started by showing each addend. Then, we added the ones, then the tenths, and then the hundredths. The sum was the total number of ones, tenths, and hundredths. |

## D. Problems for Use During Instruction

See Module 6 Problem Sets.

## E. Vocabulary Cards for Use During Instruction

See Module 6 Vocabulary Cards.

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# Module 6:
# Addition of Rational Numbers

## Problem Sets

A. Proper fractions with like denominators and sums <1 (20)
B. Improper fractions with like denominators and sums >1 (10)
C. Mixed numbers with like denominators and sums >1 (10)
D. Proper fractions with unlike denominators and sums <1 (20)
E. Improper fractions with unlike denominators and sums >1 (10)
F. Mixed numbers with unlike denominators and sums >1 (10)

G. Decimals with tenths; no regrouping (20)
H. Decimals with tenths; regrouping (20)
I. Decimals with hundredths; no regrouping (20)
J. Decimals with hundredths; regrouping (20)
K. Decimals with tenths and hundredths; mix of regrouping (20)

A. $\frac{2}{5} + \frac{2}{5} =$

A.

$$\frac{4}{10} + \frac{3}{10} =$$

A. $\frac{3}{6} + \frac{1}{6} =$

A. $\frac{2}{4} + \frac{1}{4} =$

A. $\frac{1}{3} + \frac{1}{3} =$

A. $\frac{2}{6} + \frac{3}{6} =$

A.

$$\frac{3}{8} + \frac{4}{8} =$$

A.

$$\frac{4}{10} + \frac{1}{10} =$$

A. $\frac{2}{12} + \frac{4}{12} =$

A. $\frac{7}{12} + \frac{3}{12} =$

A.

$$\frac{5}{9} + \frac{2}{9} =$$

A.

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

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

A.

$$\frac{4}{7} + \frac{1}{7} =$$

A.

$$\frac{3}{9} + \frac{4}{9} =$$

A.

$$\frac{5}{10} + \frac{2}{10} =$$

A. $\frac{1}{4} + \frac{1}{4} =$

A. $\frac{1}{6} + \frac{1}{6} =$

A. $\frac{2}{7} + \frac{3}{7} =$

A.

$$\frac{1}{8} + \frac{2}{8} =$$

B.

$$\frac{6}{5} + \frac{7}{5} =$$

B. $\frac{12}{8} + \frac{3}{8} =$

B.

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

B.

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

B.

$$\frac{2}{3} + \frac{4}{3} =$$

B.

$$\frac{8}{6} + \frac{3}{6} =$$

B.

$$\frac{5}{8} + \frac{9}{8} =$$

B. $\frac{11}{10} + \frac{13}{10} =$

B.

$$\frac{13}{12} + \frac{4}{12} =$$

B. $\frac{10}{10} + \frac{5}{10} =$

c.

$$7\frac{7}{12} + 4\frac{3}{12} =$$

c. $\frac{3}{5} + 2\frac{3}{5} =$

c.

$$1\frac{2}{6} + 3\frac{5}{6} =$$

c. $\frac{8}{5} + 4\frac{1}{5} =$

c.

$$1\frac{4}{9} + 2\frac{6}{9} =$$

c.

$$1\frac{10}{12} + 3\frac{5}{12} =$$

c.

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

c.

$$7\frac{5}{6} + 2\frac{7}{6} =$$

c. $\frac{3}{4} + 2\frac{3}{4} =$

c.

$$1\frac{6}{8} + 3\frac{5}{8} =$$

D. $\frac{2}{4} + \frac{1}{3} =$

D.

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

D. $\frac{2}{12} + \frac{1}{4} =$

D. $\frac{3}{10} + \frac{1}{5} =$

D. $\frac{1}{6} + \frac{1}{3} =$

D. $\frac{2}{10} + \frac{2}{5} =$

D. $\frac{3}{8} + \frac{2}{4} =$

D. $\frac{3}{6} + \frac{1}{3} =$

D. $\frac{1}{3} + \frac{1}{2} =$

D. $\frac{2}{4} + \frac{3}{8} =$

D. $\frac{3}{10} + \frac{2}{5} =$

D. $\frac{2}{12} + \frac{5}{6} =$

D. $\frac{1}{3} + \frac{2}{5} =$

D. $\frac{1}{3} + \frac{1}{4} =$

D. $\frac{2}{5} + \frac{2}{4} =$

D. $\frac{1}{5} + \frac{1}{2} =$

D. $\frac{2}{12} + \frac{2}{4} =$

D. $\frac{5}{9} + \frac{1}{3} =$

D. $\frac{1}{4} + \frac{5}{8} =$

D. $\frac{2}{12} + \frac{2}{3} =$

E.

$$\frac{4}{2} + \frac{5}{3} =$$

E.

$$\frac{4}{5} + \frac{5}{4} =$$

E. $\frac{5}{2} + \frac{7}{4} =$

E. $\frac{6}{5} + \frac{5}{3} =$

E. $\frac{11}{4} + \frac{10}{8} =$

E. $\frac{8}{7} + \frac{9}{5} =$

E. $\frac{7}{4} + \frac{5}{8} =$

E. $\frac{11}{8} + \frac{3}{2} =$

E. $\frac{13}{5} + \frac{2}{4} =$

E. $\frac{12}{10} + \frac{10}{4} =$

F.

$$1\frac{1}{2} + 1\frac{7}{8} =$$

F. $\frac{2}{5} + 4\frac{1}{4} =$

F.

$$7\frac{1}{2} + 3\frac{1}{5} =$$

F.

$$1\frac{5}{6} + 1\frac{2}{4} =$$

F. $\frac{7}{8} + 2\frac{1}{2} =$

F.

$$1\frac{4}{10} + 1\frac{2}{5} =$$

F.

$$7\frac{3}{8} + 2\frac{5}{12} =$$

F.

$$\frac{2}{3} + 3\frac{1}{9} =$$

F.

$$\frac{1}{2} + 2\frac{5}{6} =$$

F.

$$1\frac{2}{6} + 4\frac{5}{12} =$$

G.

$$\begin{array}{r} 0.3 \\ +\ 0.1 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 1.5 \\ +\ 2.2 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 3.2 \\ +\ 0.3 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 2.5 \\ +\ 4.2 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 0.1 \\ +\ 4.1 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 3.3 \\ +\ 4.6 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 0.8 \\ +\ 2.1 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 1.6 \\ +\ 4.1 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 6.3 \\ +\ 2.1 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 3.1 \\ +\ 1.8 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 5.8 \\ +\ 4.1 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 9.2 \\ +\ 0.4 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 1.7 \\ +\ 6.2 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 0.7 \\ +\ 0.2 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 5.3 \\ +\ 4.4 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 6.1 \\ +\ 3.2 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 5.4 \\ +\ 0.4 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 0.3 \\ +\ 0.6 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 2.2 \\ +\ 7.0 \\ \hline \end{array}$$

G.

$$\begin{array}{r} 6.4 \\ +\ 3.3 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 4.2 \\ +\ 2.8 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 2.3 \\ +\ 6.7 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 1.5 \\ +\ 5.6 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 2.1 \\ +\ 3.9 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 4.8 \\ +\ 3.6 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 4.5 \\ +\ 3.9 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 2.9 \\ +\ 5.4 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 6.2 \\ +\ 2.9 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 1.1 \\ +\ 6.9 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 4.2 \\ +\ 3.9 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 1.8 \\ +\ 7.4 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 5.1 \\ +\ 2.9 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 3.5 \\ +\ 5.7 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 4.1 \\ +\ 4.9 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 5.6 \\ +\ 4.7 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 6.9 \\ +\ 3.2 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 8.8 \\ +\ 1.6 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 2.2 \\ +\ 7.8 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 3.5 \\ +\ 6.6 \\ \hline \end{array}$$

H.

$$\begin{array}{r} 1.2 \\ +\ 6.8 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 0.73 \\ +\ 0.21 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 1.46 \\ +\ 3.32 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 2.58 \\ +\ 6.11 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 9.82 \\ +\ 0.01 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 0.31 \\ +\ 8.22 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 1.50 \\ +\ 2.46 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 2.31 \\ +\ 1.60 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 7.31 \\ +\ 2.47 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 9.13 \\ +\ 0.60 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 12.46 \\ +\ 1.10 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 23.20 \\ +\ \ 6.04 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 1.71 \\ +\ 4.10 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 2.35 \\ +\ 4.22 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 0.88 \\ +\ 1.01 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 3.63 \\ +\ 1.21 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 10.13 \\ +\ 10.26 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 9.34 \\ +\ 2.44 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 5.60 \\ +\ 1.22 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 6.31 \\ +\ 3.08 \\ \hline \end{array}$$

I.

$$\begin{array}{r} 10.33 \\ +\ 0.55 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 2.56 \\ +\ 3.45 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 5.24 \\ +\ 1.37 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 5.45 \\ +\ 3.78 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 3.67 \\ +\ 5.25 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 6.14 \\ +\ 1.47 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 4.25 \\ +\ 2.25 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 4.71 \\ +\ 3.89 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 1.52 \\ +\ 3.77 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 2.84 \\ +\ 6.16 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 14.80 \\ +\ 6.96 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 7.83 \\ +\ 6.99 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 8.95 \\ +\ 9.80 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 12.80 \\ +\ 46.93 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 3.14 \\ +\ 1.99 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 7.21 \\ +\ 4.66 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 5.44 \\ +\ 2.08 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 9.66 \\ +\ 1.67 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 8.33 \\ +\ 1.92 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 42.12 \\ +\ 10.09 \\ \hline \end{array}$$

J.

$$\begin{array}{r} 6.87 \\ +\ 2.33 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 30.15 \\ +\ \ 2.6 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 1.5 \\ +\ 2.49 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 14.58 \\ +\ \ 1.4 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 10.2 \\ +\ 5.73 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 5.4 \\ +\ .54 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 8.3 \\ +\ .91 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 4.6 \\ +\ .64 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 9.38 \\ +\ .19 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 10.21 \\ +\ \ 5.6 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 1.9 \\ +\ 2.01 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 17.72 \\ +\ 12.58 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 42.1 \\ +\ 17.96 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 8.3 \\ +\ 9.31 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 9.0 \\ +\ 8.12 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 9.17 \\ +\ 2.7 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 3.46 \\ +\ 1.6 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 4.9 \\ +\ 9.23 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 15.5 \\ +\ 12.22 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 17.5 \\ +\ 8.83 \\ \hline \end{array}$$

K.

$$\begin{array}{r} 9.2 \\ +\ 6.75 \\ \hline \end{array}$$

# Module 6:

# Addition of Rational Numbers

## Vocabulary Cards

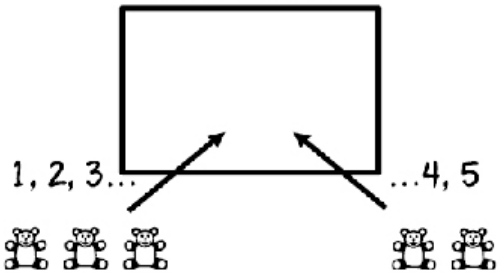
add/addition
addend
algorithm
computation
decimal
denominator
equal sign
equivalent
fraction
hundredths
improper fraction
join
least common multiple
mixed number
multiple
numerator
ones
plus sign
regroup/trade/exchange
sum
tenths
together

# add/addition

**To put amounts together to find the sum or to increase a set.**

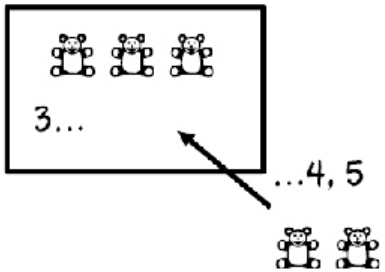
**To put amounts together**

**3 + 2 = 5**




**To increase a set**

**3 + 2 = 5**




---

# addend

**Any numbers that are added together.**

**6 + 2 = 8**

**6 and 2 are addends**

# algorithm

**A procedure or description of steps that can be used to solve a problem.**

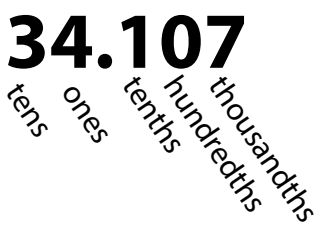
---

# computation

**The action used to solve a problem.**

# decimal

**A number based on powers of ten.**

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# denominator

**The term in a fraction that tells the number of equal parts in a whole.**

**2 / 3** $\frac{2}{3}$ **In these fractions, 3 is the denominator.**

# equal sign

**The symbol that tells you that two sides of an equation are the same, balanced, or equal.**

$$12 + 8 = 20$$

**= is the equal sign**

---

# equivalent

**Two numbers that have the same value.**

$$\frac{1}{4} = \frac{2}{8} \qquad \frac{2}{3} = \frac{8}{12}$$

# fraction

**A number representing part of a whole or set.**

$$\frac{3}{6} \qquad \frac{10}{12} \qquad \frac{8}{3}$$

---

# hundredths

**The digit in representing $\frac{1}{100}$ .**

**In the number 4.23, 3 is in the hundredths place.**

# improper fraction

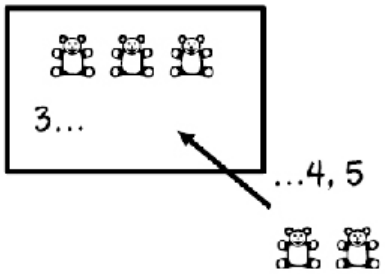
**Any fraction in which the numerator is greater than or equal to the denominator.**

$$\frac{9}{4} \qquad \frac{17}{12} \qquad \frac{10}{3}$$

---

# join

**To add to an existing set.**



# least common multiple

**The common multiple with the least value.**

6: 6, 12, 18, 24, 30
8: 8, 16, 24, 32, 40

**With multiples of 6 and 8, the least common multiple is 24.**

---

# mixed number

**A whole number and a fraction combined.**

$1\frac{1}{6}$ $4\frac{5}{12}$ $12\frac{4}{3}$

# multiple

**The product of a number and any integer.**

4: 4, 8, 12, 16, 20

---

# numerator

**The term in a fraction that tells how many parts in a fraction.**

**2 / 3** $\frac{2}{3}$ **In these fractions, 2 is the numerator.**

# ones

**The digit representing 1.**

**In the number 4.23, 4 is in the ones place.**

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# plus sign

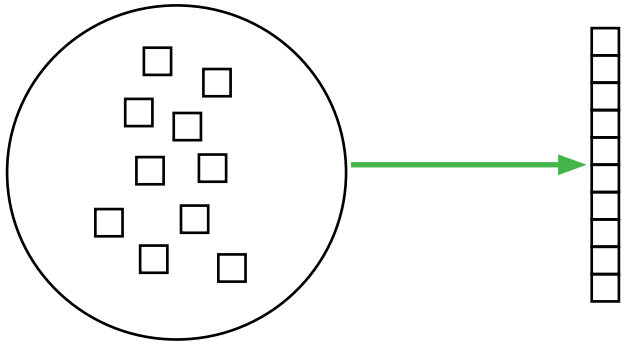
**The symbol that tells you to add.**

$$5 + 4 = 9$$

**+ is the plus sign**

# regroup/trade/exchange

**The process of exchanging 10 ones for 1 ten, 10 tens for 1 hundred, 10 hundreds for 1 thousand, etc.**



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# sum

**The result of adding two or more numbers.**

$$7 + 2 + 1 = 10$$

**10 is the sum**

# tenths

**The digit in representing $\frac{1}{10}$ .**

**In the number 4.23, 2 is in the tenths place.**

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# together

**To combine sets or numbers.**