

Lab 3

Addition and Subtraction of Whole & Decimal Numbers Emphasis on Borrowing & Carrying

Objectives:

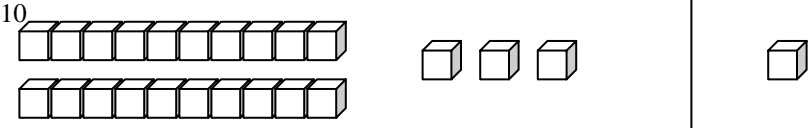
1. The teacher will understand how to model place value in base 10 using Multibase Blocks and Counting Frames for whole and decimal numbers.
2. The teacher will understand how to model large numbers with Multibase Blocks and Counting Frames.
3. The teacher will understand how to model addition of whole and decimal numbers, emphasizing larger numbers and carrying using Multibase Blocks and Counting Frames.
4. The teacher will understand how to model subtraction of whole and decimal numbers, emphasizing larger numbers and carrying using Multibase Blocks and Counting Frames.
5. The teacher will understand how to model decimal numbers with Decimal Squares.

TOPIC: MODELING WHOLE NUMBERS

➤ **Materials: BASE 10 MULTIBASE BLOCKS**

1. As a group use your set of multibase blocks to model each of the following whole numbers. For each number, draw a simple sketch (label each block type with its' value) to represent your model. For each problem, be sure to answer the question: *What's One?*

Example: 23


10
20
3
2 longs
3 small cubes
1 small cube = 1

a. 412

b. 1,312

c. 10,003

d. How many big cubes did you use for part c? _____ big cubes

Remember, you can rename extended sets of MBB by using the names of the basic set as quantifiers. [See your Place Value Options for Multibase Blocks Handout] That is:

Long – Block Name means 10 Block Name in a row

Flat - Block Name means a 10 x 10 Block Name set

Big Cube - Block Name means a 10 x 10 x 10 Block Name set

- If you have 10 big cubes in a row it is called a Long-Big Cube

TOPIC: MODELING DECIMAL NUMBERS

➤ ***Materials: BASE 10 MULTIBASE BLOCKS***

2. As a group use your set of multibase blocks to model each of the following decimal numbers. Draw a simple sketch (label each block type with their value) to represent your model. For each problem be sure to answer the question: *What's One?* You should have a different model for ONE for each part.

a. 2.3

b. 0.23

c. 341.2

d. 34.12

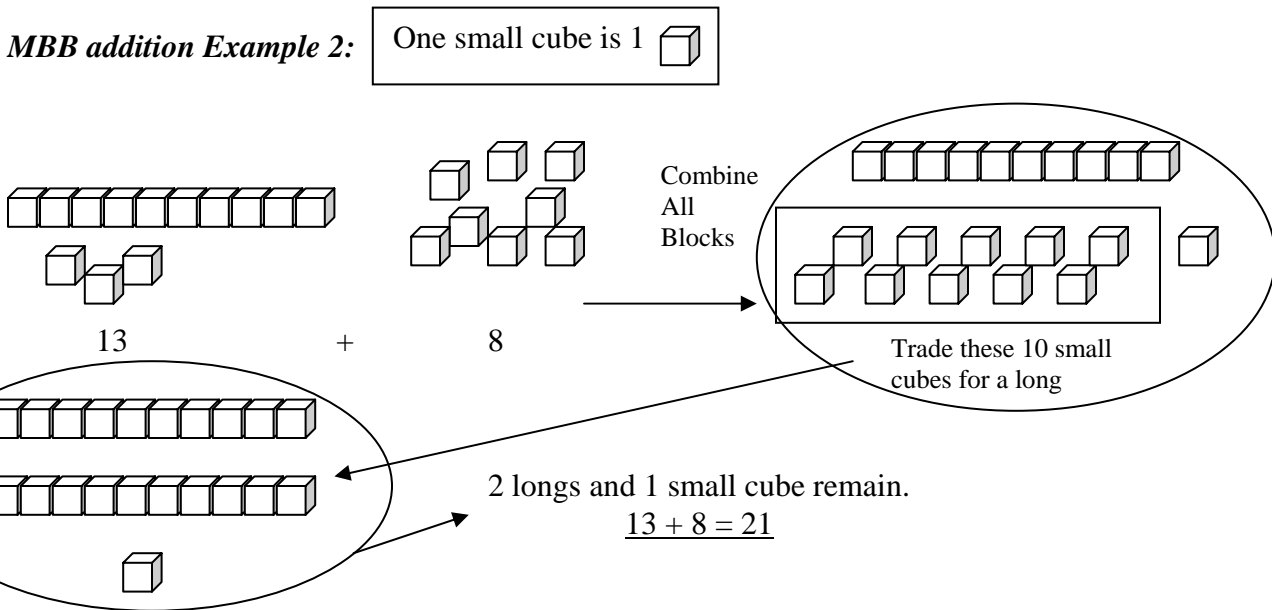
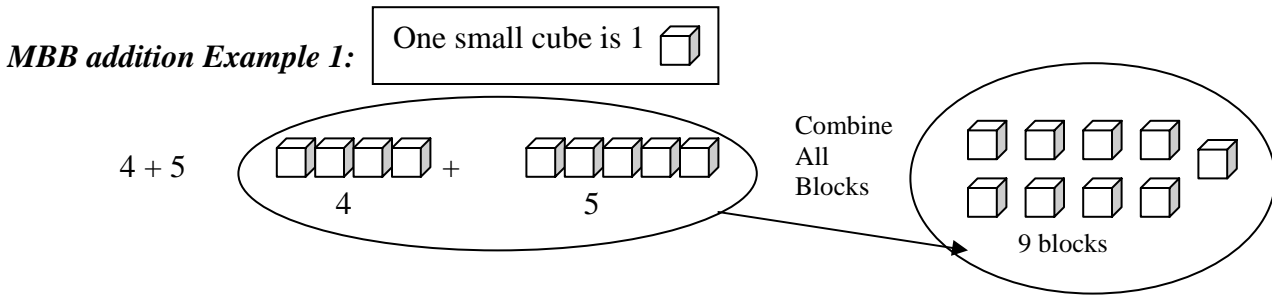
e. 3.412

f. 0.3412

e. Notice that the models for whole and decimal numbers are surprisingly similar. What is the one key difference in your models for problem 1 and problem 2?

TOPIC: ADDING AND SUBTRACTING WHOLE & DECIMAL NUMBERS

➤ **Materials: BASE 10 MULTIBASE BLOCKS**



Notice that Example 1 does not utilize any of the special features of MBB but that Example 2 does. Example 1 could have been accomplished using *any* counting object. This lab emphasizes utilizing the special “increasing by multiples of 10” feature of MBB to show addition & subtraction. MBB are not the only base 10 manipulatives. You may encounter other base 10 place value counting systems in your own classroom and you can use the same ideas developed here to work with those new manipulatives.

3. As a group use your set of multibase blocks to model each of the following sums. Draw a simple labeled sketch to represent your model. For these problems your final MBB set should be the most efficient set. For each problem be sure to answer the question: *What's One?*

<i>MBB ADDITION: Guide for your "first try"</i>			
<i>Make sure each step where the blocks change is very clear (sketch a new frame or comment)</i>			
i. Model 1 and each addend first.	ii. Mark/note combining the addend blocks together	iii. Trade, or _____ for the most efficient set in each place value	iv. Sketch the sum, the final set, give the final answer

a. $1,123 + 1,388 = ?$

Explain how the MBB work relates to the pencil and paper algorithm that you would use here:

$$\begin{array}{r} 123 \\ + 388 \\ \hline \end{array}$$

b. $2.5 + 3.6 = ?$

c. $12.5 + 3.62 = ?$

4. As a group use your set of multibase blocks to model each of the following differences. Draw a simple labeled sketch to represent your model. For these problems your final MBB set should be the most efficient set. For each problem be sure to answer the question: *What's One?*

<i>MBB SUBTRACTION: Guide for your "first try"</i>			
<i>Make sure each step where the blocks change is very clear (sketch a new frame or comment)</i>			
i. Model 1, the minuend and the subtrahend first.	ii. Mark/note if you cannot "take away" the subtrahend blocks from the minuend blocks. Note this by increasing place value as you proceed.	iii. Note if you must trade or _____. For example, you might trade a long for 10 sc. Check to see if you need to repeat this step for higher place values.	iv. Carry out the "take away"
			v. Sketch the difference, the final set, give the final answer

a. $123 - 39 = ?$

Explain how the MBB work relates to the pencil and paper algorithm that you would use here: $\begin{array}{r} 123 \\ - \underline{39} \end{array}$

b. $57 - 39 = ?$

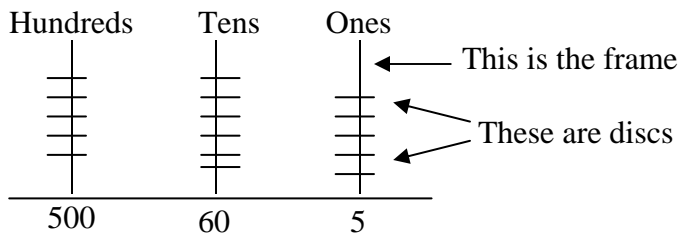
c. $5.7 - 3.9 = ?$

- d. What is the same about parts b and c? What is different about parts b and c?

TOPIC: ADDING AND SUBTRACTING WHOLE AND DECIMAL NUMBERS

➤ **Materials: COUNTING FRAMES**

This is an example of a Counting Frame with 565 shown



Each peg is used for the next place value up, you are only limited by the number of pegs.

5. As a group use Counting Frames to model each of the following sums. Draw a simple sketch; always label each peg with its place value and the value of the discs on the peg. For these problems your final counting frame view should be the most efficient set of discs. For each problem the question: *What's One?* will be answered by correctly labeling the counting frame place values.

<p>COUNTING FRAME ADDITION: Guide for your "first try" <i>Make sure each step where the # discs on a peg changes is very clear</i> <i>(sketch a new frame or comment)</i></p>			
<p>i. Model each addend first</p>	<p>ii. Sketch a new frame combining all the discs together</p>	<p>iii. Note if you must trade or _____. For example, you might trade 10 1s discs for 1 10s disc. Check to see if you need to repeat this step for higher place values.</p>	<p>iv. Sketch the sum, the final frame, give the final answer</p>

a. $3125 + 1786 = ?$

b. $6.44 + 2.97 = ?$

6. As a group use Counting Frames to model each of the following differences. Draw a simple sketch; always label each peg with its place value and the value of the discs on the peg. For these problems your final counting frame view should be the most efficient set of discs. For each problem the question: *What's One?* will be answered by correctly labeling the counting frame place values.

<i>COUNTING FRAME SUBTRACTION: Guide for your "first try"</i> <i>Make sure each step where the # discs on a peg changes is very clear</i> <i>(sketch a new frame or comment)</i>			
i. Model the minuend and the subtrahend first.	ii. Mark/note if you cannot "take away" the subtrahend discs from the minuend discs. Note this by increasing place value as you proceed.	iii. Note if you must trade or _____. For example, you might trade 1 10s disc for 10 1s discs. Check to see if you need to repeat this step for higher place values.	iv. Carry out the "take away"
			v. Sketch the difference, the final frame, give the final answer

a. $3125 - 1786 = ?$

b. $6.44 - 2.97 = ?$

c. $0.123 - 0.054 = ?$

TOPIC: MODELING DECIMAL NUMBERS

➤ *Materials: DECIMAL SQUARES¹*

7. As a group, look at the clear plastic box of Decimal Squares. Decimal Squares are a particularly effective for:
- Modeling Decimals
 - Comparing Decimals of Equal Value
 - Comparing Decimals And Fractions
 - Comparing different Decimal names for decimals of equal value

Take the decimal square cards out and match the cards in the first column with the correct place values in the second and third columns by drawing arrows between the first and second and the second and third columns.

Red Cards	1 place value	1/10 place value
Yellow Cards	0.01 place value	1 place value
Any whole card	0.001 place value	1/100 place value
Green Card	0.1 place value	1/1000 place value

8.
a. Which two decimal square cards show that $0.2 = 0.20$? What color are the cards and what part of each card is shaded? Fill out the following chart after you have found the cards.

<i>Decimal Square Card</i>	<i>Decimal Numeral</i>	<i>Decimal Words</i>	<i>Decimal Square Color</i>	<i># of items</i>	<i>Rows, Squares or Small Rectangles [shape on card]</i>
Example	0.650	Six hundred fifty thousandths	Yellow	650	Small Rectangles
One	0.2				
Two	0.20				

The words we say for 0.2 are: two-tenths

The words we say for 0.20 are: twenty-hundredths

It makes sense to say 0.20 this way, especially in context. We might write:

$0.2 + 0.35 = 0.20 + 0.35$ and then say

“What is the sum of twenty hundredths and thirty-five hundredths?”

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- b. As a group; pick three sets of two different decimal square cards that represent the same number. As a group make sure each person knows what decimal numbers these represent, what fractions these represent and what words to say:

Card Color	Decimal Numeral	Fraction Numeral	Decimal Words?

TOPIC: FUN WITH DECIMAL NUMBERS

➤ *Materials: DECIMAL SQUARES PLAYING CARDS².*

9. As a group; what kind of games do you think you could play with these cards?
- Make up and PLAY at least 2 games with your group.

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LAB THREE DISCUSSION QUESTIONS

As a group, discuss and fill in the blank arrows. Feel free to also discuss/talk with the other groups.

1. Name one other manipulative that could be used for ADDING AND SUBTRACTING WHOLE OR DECIMAL NUMBERS WITH CARRYING.
2. What mathematical knowledge would you want your students to KNOW prior to introducing ADDING AND SUBTRACTING WHOLE OR DECIMAL NUMBERS WITH CARRYING?
3. What mathematical knowledge would you want to EMPHASIZE while introducing ADDING AND SUBTRACTING WHOLE OR DECIMAL NUMBERS WITH CARRYING?
4. When you find the sum of 15, 17 and 29 and you “carry the 2,” what does that “2” represent?
5. When you subtract 22 from 41 and you “borrow” from the four, what you are really doing?
6. What manipulative do you think effectively teaches carrying? Can you see yourself using any manipulative to introduce carrying?
7. What manipulative do you think effectively teaches borrowing? Can you see yourself using any manipulative to introduce borrowing?