

# Math 2100 – Spring 2018

## Lab 1

Names: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Cuisenaire Rods

First, color in the picture to match the two summands. Then find the one rod that matches and color this in. Finally, write the actual numerical sentence this represents.

Here is a list of abbreviations you may use: W = White; R = Red; LG = Light Green; L = Lavender;

Y = Yellow; DG = Dark Green; BK = Black; BR = Brown; BL = Blue; O = Orange

1) a. Light Green + Red =

**Number Sentence**


\_\_\_\_\_

b. Dark Green + Lavender =


\_\_\_\_\_

c. Yellow + White =


\_\_\_\_\_

d. Brown + Red =


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e. Try to do the same as before for the following example. Do you run into any difficulties? If so, explain them but also explain what this could help represent.

Blue + Light Green = ???


2) Now find the following sums (in colors) using your rods.

a. White + Brown =

b. Brown + White =

c. Yellow + Red =

d. Red + Yellow =

e. Light Green + Dark Green =

f. Dark Green + Light Green =

What relationship do you notice?

- 3) a. Fill in the following chart (in colors) above the diagonal lines.

+	W	R	LG	L	Y
W					
R					
LG					
L					
Y					

- b. Use your discovery from #2 to fill in the rest of the chart below the diagonal lines.
- c. Write an equation in general for the property of addition that helps you complete the chart. This is called the **commutative property of addition**.

- 4) a. Next find the sum (in colors) **White + Red**. To this result, add **Yellow**. We write this as **(White + Red) + Yellow**, where the parentheses tell you which numbers to add first.

b. Now consider **White + (Red + Yellow)**. Which sum do you add first? \_\_\_\_\_ What is the final answer? \_\_\_\_\_ How does this result compare with part (a)? \_\_\_\_\_

c. Write a general statement or equation that summarizes your previous two findings in (4a) and (4b). This is called the **associative property of addition**.

5) The “missing summand” approach to subtraction is useful as it shows how addition and subtraction are related (namely inversely). For example, to help with solving the equation **Blue – Dark Green**, we can phrase it “what must be added to **Dark Green** to obtain **Blue**?”

a. What must be added to Dark Green to obtain Blue? \_\_\_\_\_

b. Use your Cuisenaire rods to solve the following:

Yellow + \_\_\_\_\_ = Orange; Black + \_\_\_\_\_ = Orange + Red

Dark Green + \_\_\_\_\_ = Orange + Lavender

c. Rewrite each addition statement above as an equivalent subtraction statement.

d. Rewrite each of the following subtraction problems in its “missing summand” equivalent and find the solution.

Brown – Red = \_\_\_\_\_

Black – Dark Green = \_\_\_\_\_

(Orange + White) – Yellow = \_\_\_\_\_

6) Explain how you could use Cuisenaire rods to model and teach  $9 - 2 = 7$ .

## Macaroni bases

7) Count out 6 piles of 8 pieces of macaroni each. These will be your “stock” of macaroni.

- a. Form as many groups of 10 pieces of macaroni as your stock will allow (placing each group of 10 in a cup) and record your result.

<b>Tens</b>	<b>Ones</b>

What is the base-ten numeral representing the number of macaroni pieces in your stock?

- b. Empty the cups and form groups of 4 now (each cup now contains 4 pieces). Suppose you could only count to 4. Can you record the result in the table below? If not, why not?

<b>Fours</b>	<b>Ones</b>

From the groups of 4, form “supergroups” each containing groups of 4 cups. Record your result.

<b>Four fours</b>	<b>Fours</b>	<b>Ones</b>

What is the base-four numeral for the number of pieces in your stock?

8) Carry out the same procedure as in (7a) and (7b), now grouping into groups of five. What is the base-five numeral for the number of pieces in your stock?

9) From your stock, select a subset of pieces containing  $221_{\text{three}}$  pieces and draw a picture. Do not convert  $221_{\text{three}}$  to a base-ten numeral and count. Pretend that you could only count to three.

10) Write each of the following in expanded notation to help you convert back to base 10.

a.  $472_{\text{eight}}$

b.  $324_{\text{five}}$

11) Using division, convert each number in base ten to the indicated base.

a. 224 to base 6

b. 356 to base 2