

PORTFOLIO PROBLEMS

- This document is available on your class web page.
- You may cut and paste the problem statements
- PLEASE LOOK AT YOUR LABS, ACTIVITIES & GUIDES WHILE YOU WORK ON THESE PORTFOLIO PROBLEMS
- BE SURE to read the PROBLEM SPECIFIC DIRECTIONS when you do these problems. These notes do not need to be included with the problem statement

BE SURE to double check the

- PORTFOLIO DIRECTIONS
 - PORTFOLIO CHECKLIST
 - PORTFOLIO ASSESSMENT GUIDE
- when you write up your Portfolio Problems
-

**YOUR PORTFOLIO SHOULD BE:
A SERIES OF
CAREFUL, WELL EXPLAINED
AND
FULLY LABELED PICTURES**

LAB 1

- *Use only 1 cover sheet and 1 set up (problem / manipulative description) for this problem.*
- *Use only 1 "set" of modeling for parts a and b. After you have modeled and explained the correct block placement you may give the solutions for a and b.*

Portfolio Problem 1.1 (Set Models)

Given the following three sets:

- Set A = All big blocks
 - Set B = All blue blocks
 - Set C = All triangular blocks
- Describe how to model the union of these three sets
What is $A \cup B \cup C$?
 - Describe how to model the intersection of these three sets
What is $A \cap B \cap C$?

SPECIFIC PROBLEM DIRECTIONS for 1.1 a & b:

General Manipulative Description (before you start modeling)

1. See your lab for the four characteristics of attribute blocks, use these in your general description.

Modeling

1. For set problems the attribute blocks do not have a value. There are no specific manipulative numerical values for this problem.
2. You should include a clear discussion for DRAWING/CREATING the Venn Diagram.
3. Your work should include a clear discussion on how to handle blocks that go in all of the various components/regions of your Venn Diagrams.
 - Be sure to EXPLAIN how to place the various blocks (blue, blue circles, etc.) in the various components of the Venn Diagram.
 - Explain WHY the blocks go in the various regions of the Venn Diagram as well.
4. Explain how to fill in the Venn Diagram (step by step) just ONE time. Then, use this model to give the solution for part a. and for part b.

Visual / Pictures (embedded in the modeling)

1. Your Venn Diagram should include clear, well-labeled, pictures or simple sketches of some of the various blocks (you do not have to draw in every block).
2. Be sure that your picture is accurate as well. For example, there should be no blue blocks pictured in Set A that are not also in Set B.
3. Label the Venn Diagram with words (big, blue, etc.), not just Set A, Set B, Set C.

Solution (at the end of the modeling)

1. Give the answers to: What is $A \cup B \cup C$? and What is $A \cap B \cap C$? These solutions should be described in complete sentences using appropriate terminology, don't just list all of the elements in the sets $A \cup B \cup C$.

↓ MORE LAB 1 PORTFOLIO 1.2 ↓

LAB 1

Portfolio Problem 1.2 (Greatest Common Factors)

Describe how to model determining the $GCF(12, 18)$ by

- Finding all of the factors of 12 and all of the factors of 18 (use color tiles)
 - Using a Venn Diagram to show the COMMON factors of 12 and 18
 - Explaining how to find the $GCF(12, 18)$ using a Venn Diagram.
-

SPECIFIC PROBLEM DIRECTIONS for 1.2 a, b & c:

General Manipulative

- For this problem, simply describe the color tiles.

Modeling

- Declare each tile to be 1×1 at the start of the modeling, there are no other units for this problem.
- Be sure to explain how the tile arrays are connected to the idea of *factors*.
- Explain all of your steps and all of the connections as you proceed from part a through part c. Remember you are explaining to the reader *how to use the tiles to model the problem*—you may assume they can multiply, but they don't already know how to determine all of the factors, your task is to explain *how to do that with tile arrays*

Visual / Pictures (embedded in the modeling)

- Be sure to show all of the tile arrays for part a.
- Label all components of your model including the tile arrays, their edges and the Venn Diagrams.
- Be sure that your picture is accurate as well.

Solution (at the end of the modeling)

- Your solutions for a and b are embedded in your work. Your response for part c. is your final solution for this problem. Don't repeat parts a and b at the end of the modeling (for the solution), you have already done it in the modeling.
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LAB 2

Portfolio Problem 2.1 (Numeration Systems)

- You have been transported to the *Land Of Five*.
- In the *Land of Five* there are only the following coins and bills:
Pennies (1-cent coins), 5-cent coins, 25-cent coins, 125-cent bills and **625-cent bills**.

You have 17 pennies, 8 5-cent coins, 9 25-cent coins and 7 125-cent bills.

- a. Explain **WHY** there are these particular coins and bills in the *Land Of Five*
In particular you should mention the relationship between the numbers 1, 5, 25, 125, 625 in the *Land Of Five*
- b. Explain which digits can be used in the *Land Of Five*
- c. Show/MODEL **HOW TO** trade this set of coins for the most efficient set of coins in the *Land Of Five*.

SPECIFIC PROBLEM DIRECTIONS for 2.1 a, b & c:

General Manipulative Description (before you start modeling)

1. Describe what you are using for coins and bills when you present your general manipulative description.
2. IN THIS CASE, your coins and bills (like all money) have their own value. Label your coins & bills with the appropriate values in the general manipulative description.

Modeling

1. Be sure to clearly set up, explain and display (illustrate) ALL steps when you trade for the most efficient set.
2. Show each "trade up" and explain what you are doing and why you are doing it.
3. Do this in a **series** of pictures (not one big picture).

Visual / Pictures (embedded in the modeling)

1. You do not have to worry about elaborately drawn pictures; you can use LABELED circles and rectangles with numbers in them to denote the coins and bills. Regardless of your choice of pictures, each of your coins and bills must be labeled with their numerical value.
2. Show each trade up and each new set. Circle and label. Don't X out coins or bills that you are trading up (messy and unclear).
3. Label every picture carefully.

Solution (at the end of the modeling)

1. Your solutions for a and b may be embedded in your work. Your solution for c should include the final picture of the coins and bills in the most efficient set.

LAB 2

Portfolio Problem 2.2 (Place Value, Addition of Whole Numbers)

Model $45 + 38$ using Bean Sticks.

SPECIFIC PROBLEM DIRECTIONS for 2.2

General Manipulative Description (before you start modeling)

1. Simply describe the beans, bean sticks **and** a bean raft without values, but with the relationship between them (i.e., 10 beans = 1 bean stick).

Modeling

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling).
2. Use the terms Addends and Sum. Model both addends **before** you start combining your beans and bean sticks.
3. Be explicit about **why** you are doing each step.
4. Show each "trade up" and explain what you are doing.

Visual / Pictures (embedded in the modeling)

1. The bean sticks should look like sticks with beans (dots). Don't use x's.
2. Carefully show when you "trade up;" beans for bean sticks. Circle and label, don't X out the beans (messy and unclear).
3. Label every picture carefully.
4. Do this in a **series** of pictures (not one big picture) and explanations.

Solution (at the end of the modeling)

1. Show the final (clean) picture and give the solution.

LAB 3

Portfolio Problem 3.1 (Whole Number Addition)

Model $188 + 1456$ using Multibase Blocks

SPECIFIC PROBLEM DIRECTIONS for 3.1:

General Manipulative Description (before you start modeling)

1. Simply describe the four types of Multibase Blocks without values, but with the relationship between them (i.e., 10 small cubes = 1 long).

Modeling

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling). For this portfolio, you should **ALSO** declare the values of each of basic blocks at the beginning of your model.
2. Use the terms Addends and Sum. Model both addends **before** you start combining your Multibase blocks.
3. Be explicit about *why* you are doing each step.
4. Show your trading in a series of pictures and explanations, not just one big picture showing all the trades that occur at once.

Visual / Pictures (embedded in the modeling)

1. Clearly label your blocks and each picture to show numerical values.
2. Typing or drawing: You do not need to draw in the "hatch" marks on the blocks. In particular, for hand drawing, this is messy and overly time-consuming.
3. For adding, one nice model is to circle two addends, write "combine into" and then show the new pieces (e.g. 7sc + 3sc combine into 1 long). Label everything.
4. Carefully show & explain trading blocks up to the next place value. Circle or mark the blocks to trade, don't X them out (messy and unclear).

Solution (at the end of the modeling)

1. Show the final (clean) picture and give the solution.
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↓ MORE LAB 3 PORTFOLIO 3.2 ↓

LAB 3

Portfolio Problem 3.2 (Decimal Number Subtraction)

Model 10.4 - 7.8 using Counting Frames

SPECIFIC PROBLEM DIRECTIONS for 3.2:

General Manipulative Description (before you start modeling)

1. Simply describe a Counting Frame, its pegs and discs.

Modeling

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling) by describing the place values that you are using on the Counting Frame.
2. Use the terms Subtrahend, Minuend and Difference.
3. Clearly explain borrowing.
4. Clearly explain taking away discs.

Visual / Pictures (embedded in the modeling)

1. Labeling each component of each of your pictures is critical. Clearly label your Counting Frames PLACE VALUES & DIGITS for every peg in every picture.
2. Model both the subtrahend and the minuend before you start borrowing or taking away.
3. Carefully show & explain trading discs up to the next place value. Circle or mark the discs to trade, don't X them out (messy and unclear).
4. Show the whole frame and all discs for each step.
5. Clearly show borrowing.
6. Clearly show taking away discs.

Solution (at the end of the modeling)

1. Show the final (clean) picture and give the solution.
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LAB 4

Portfolio Problem 4.1 (Whole Number Multiplication)

Model 5×14 with Cuisenaire Rods

SPECIFIC PROBLEM DIRECTIONS for 4.1:

General Manipulative Description (before you start modeling)

1. Describe the Cuisenaire Rods in reference to the white rod (see lab and the portfolio example). Note: Orange \neq 10, Blue \neq 9, ... White \neq 1. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).

Modeling

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling).
2. Use the terms Factors and Product.
3. Be sure to clearly set up, explain and display (illustrate) all steps and carefully explain what you are doing and *why* you are doing each step.

Visual / Pictures (embedded in the modeling)

1. Label each rod with its color and value. Don't just color in the rods.
2. Label each train with what it is (e.g., 5×14) or the value of the train. Of course, until the end of the model, you don't "know" the value of 5×14 yet.

Solution (at the end of the modeling)

1. To model your solution you must use a comparison place value train to show the most efficient set of Cuisenaire Rods (the most Orange Rods). Remember, you don't already know your answer! Show the final (clean) picture and give the solution.
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↓ MORE LAB 4 PORTFOLIO 4.2 ↓

LAB 4

- *Use only 1 cover sheet and 1 set up (problem / manipulative description) for this problem*

Portfolio Problem 4.2 (Whole Number Division, Division Settings)

a. For the division setting: Number Of Equivalent Subsets

- i. Write a question in terms of colored Cuisenaire Rods that result in the division sentence $36 \div 9 = \underline{\quad}$? Model your question with colored rods.
- ii. Rephrase your question in terms of white Cuisenaire rods to show your understanding of the division setting. Model your question with white rods.

b. For the division setting: Number Of Elements

- i. Write a question in terms of colored Cuisenaire Rods that result in the division sentence $36 \div 9 = \underline{\quad}$? Model your question with colored rods.
- ii. Rephrase your question in terms of white Cuisenaire rods to show your understanding of the division setting. Model your question with white rods.

SPECIFIC PROBLEM DIRECTIONS for 4.2 a & b:

General Manipulative Description (before you start modeling)

1. Describe the Cuisenaire Rods as describe in Portfolio 4.1.

Modeling & Solution

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling) for all four parts.

Next: EACH PART (ai, aii, bi, bii) should have the following categories:

2. A brief explanation of the rods you are using.
3. Your question that addresses the "write a question" part of the problems.
4. A model of your question and a brief explanation of how/why your model works. These models are not very complicated but they still need to be explained.
5. The final answer/solution in a sentence that incorporates the idea of elements or subsets. For example, from lab in the subset setting, " $20 \div 4 = 5$ since the purple rod (4) goes into the orange-orange train (20) 5 times. There are 5 subsets of size 4 in this model for 20. Your answers should include words like subset (group) or elements.

Visual / Pictures (embedded in the modeling)

1. Label each rod with its color and value. Don't just color in the rods. You can label whole groups of white rods, but you don't have label each white rod.
2. Label each train with the value of the train.

Solutions

1. Your four solutions should be at the end of each part as described above

LAB 5

Portfolio Problem 5.2 (Decimal Number Division with measurement units)

Model $6.4 \text{ u}^2 \div 4 \text{ u} = ?$ using Linear and Area pieces

SPECIFIC PROBLEM DIRECTIONS for 5.2:

General Manipulative Description (before you start modeling)

1. In the general description generally describe the pieces—see your linear/area piece guide. Remember; the pieces have no numerical values at this stage, but just like MBB they have a relationship between the pieces (10 small linear pieces = 1 linear strip, etc.)

Modeling

1. At the beginning of the modeling, be SURE to declare the linear and area unit values for each linear and area piece. this is a problem specific manipulative requirement and will help you to make sense of the rest of the problem.
2. Use the terms Dividend, Divisor and Quotient whenever appropriate and show your dividend and divisor before you start the actual model of the division.
3. Model your quotient (as an edge) with blue linear pieces and EXPLAIN how this gives you your solution.
4. Be sure to explain HOW you build your picture. Don't just say "fill in." Your goal, for 5.2, is to explain HOW to use the pieces to determine the quotient.

Visual / Pictures (embedded in the modeling)

1. Labeling your pictures is critical--be sure to label linear and area units with EVERY NUMBER.
2. Model your dividend and divisor before you start the actual model of the division.
3. Be sure to include the model of your quotient (as an edge) with blue linear pieces.
4. Don't label each piece in your picture. This is messy and confusing.

Solution (at the end of the modeling)

1. Don't forget units throughout your final solution sentence. Show the final (clean) picture and give the solution.

LAB 6: LOOK AT YOUR FRACTION IDEAS HANDOUT

Portfolio Problem 6.1 (Modeling Fractional Numbers)

Use a Geoboard to model the equivalence of the given fractions.

$$\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16}$$

See the reference section of your course pack and the class web page for Geoboard templates.

SPECIFIC PROBLEM DIRECTIONS for 6.1

General Manipulative Description (before you start modeling)

1. Geoboards come in a variety of sizes, describe them in general in the general manipulative description.

Modeling

1. When you declare the size of your Geoboard, you can use $\frac{1}{2}$ squares or ANY SIZE Geoboard to create more regions. Be sure to say which region (number of squares of $\frac{1}{2}$ squares) you are using for your model for 1 (specific manipulative in modeling). Include a discussion of how you determine what to use for 1 when you declare what region on the Geoboard you are using for 1. You may do this mathematically (without modeling).
2. DO NOT CONVERT the fractions to a common denominator to do the whole problem, you may note the conversion, but keep the original fraction as well.
3. **BE SURE** to use the same model for 1 for each fraction, if you do not, the problem is entirely incorrect.
4. Model each fraction separately and as the APPROPRIATE PARTS OF A WHOLE. (E.g. $\frac{1}{2}$ would be 1 of 2 regions, both regions must show, 1 region must be marked). Explain what you are doing.

Visual / Pictures (embedded in the modeling)

1. Label 1 and the fraction on EVERY fraction picture.
2. Be sure to use the Geoboard correctly (bands stretched on pegs to create regions of squares or triangles).
3. Don't use whole numbers to label any of the components of the fractional pictures (e.g., while counting regions), it is very confusing.

Solution (at the end of the modeling)

1. In this problem, the final picture (all the boards compared together at the end) is the solution.

MORE LAB 6 PORTFOLIO 6.2



LAB 6: LOOK AT YOUR FRACTION IDEAS HANDOUT

Portfolio Problem 6.2 (Modeling Fractional Numbers)

Use Cuisenaire Rods to model the equivalence of the given fractions.

$$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12}$$

SPECIFIC PROBLEM DIRECTIONS for 6.2:

General Manipulative Description (before you start modeling)

1. Describe the Cuisenaire Rods in reference to the white rod (see lab and the portfolio example). Note: Orange \neq 10, Blue \neq 9, ... White \neq 1. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).

Modeling

1. Explain and declare *What's One?* at the start of the modeling (specific manipulative in modeling). Your explanation may be modeled, but you may use LCM without modeling if you like.
2. DO NOT CONVERT the fractions to a common denominator to do the whole problem, you may note the conversion, but keep the original fraction as well
3. **BE SURE** to use the same model for 1 for each fraction, if you do not, the problem is entirely incorrect.
4. Model each fraction separately and as the **APPROPRIATE PARTS OF A WHOLE**. (E.g. $\frac{1}{2}$ would be 1 of 2 rods, both rods must show, 1 rod must be marked). Explain what you are doing.

Visual / Pictures (embedded in the modeling)

1. Label the rods with colors; don't just color in the rods.
2. Label 1 and the fraction on every fraction picture / every train.
3. Note: Orange \neq 10, Blue \neq 9, ... White \neq 1 now that we are modeling fractions. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).
4. Don't use whole numbers to label any of the components of the fractional pictures (e.g., while counting rods), it is very confusing.
5. Don't use WHITE ROD trains in your model. At this point, you should be using the length of the Cuisenaire Rods in your explanations.

Solution (at the end of the modeling)

1. In this problem, the final picture (all the trains compared) is the solution.
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LAB 7: LOOK AT YOUR FRACTION IDEAS HANDOUT

- *Use only 1 cover sheet and 1 set up (problem / manipulative description) for this problem*

Portfolio Problem 7.1 (LCM & Addition of Fractional Numbers)

- Model finding the LCM (12, 8) using Cuisenaire Rods.
 - Model $(5/12) + (7/8)$ using Cuisenaire Rods.
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SPECIFIC PROBLEM DIRECTIONS for 7.1 a & b:

General Manipulative Description (before you start modeling)

- Describe the Cuisenaire Rods in reference to the white rod (see lab and the portfolio example). Note: Orange \neq 10, Blue \neq 9, ... White \neq 1. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).

Modeling

- Declare *What's One?* at the start of the modeling (specific manipulative in modeling) for 7.1a.
- Declare the NEW *What's One?* at the start of the modeling (specific manipulative in modeling) for 7.1b. Include a brief discussion of how you determine what to use for 1 at the beginning of the model for 7.1b, of course, you should be referring to 7.1a.
- DO NOT CONVERT the fractions to a common denominator to do the whole problem, you may note the conversion, but keep the original fraction as well
- For 7.1 b: Use the terms Addends and Sum.
- For 7.1 b: Model each fraction separately and as the **APPROPRIATE PARTS OF A WHOLE**. (E.g. $1/2$ would be 1 of 2 rods, both rods must show, 1 rod must be marked). Explain what you are doing.
- For 7.1 b: **BE SURE** to use the same model for 1 for each fraction, if you do not, the problem is entirely incorrect.

Visual / Pictures (embedded in the modeling)

- Label the rods with colors; don't just color in the rods.
- For both 7.1a and 7.1b; label each train with its' correct value.
- For 7.1b, label 1 and the fraction on every fraction picture.
- Note, for 7.1 b: Orange \neq 10, Blue \neq 9, ... White \neq 1 now that we are modeling fractions. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).
- Note, for 7.1 b: Don't use whole numbers to label any of the components of the fractional pictures, it is very confusing.
- Don't use WHITE ROD trains in your model. At this point, you should be using the length of the Cuisenaire Rods in your explanations.

Solutions (at the end of the modeling)

- For 7.1a list your answer, for 7.1b, give your EXPLAINED answer after your final solution train.
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MORE LAB 7 PORTFOLIO 7.2



LAB 7: LOOK AT YOUR FRACTION IDEAS HANDOUT

Portfolio Problem 7.2 (Subtraction of Fractional Numbers)

Model $(5/4) - (2/3)$ using Wooden Cubes.

SPECIFIC PROBLEM DIRECTIONS for 7.2:

General Manipulative Description (before you start modeling)

1. Simply describe the wooden blocks.

Modeling

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling). Include a discussion of how you determine what to use for 1. You may do this mathematically (without modeling).
2. DO NOT CONVERT the fractions to a common denominator to do the whole problem, you may note the conversion, but keep the original fraction as well
3. **BE SURE** to use the same model for 1 for each fraction, if you do not, the problem is entirely incorrect.
4. Use the terms Subtrahend, Minuend and Difference in your modeling.
5. Model each fraction separately and as the **APPROPRIATE PARTS OF A WHOLE**. (E.g. $1/2$ would be 1 of 2 sets of blocks, both blocks sets must show, 1 block set must be marked). Explain what you are doing.
6. $5/4$ is greater than 1. You will need two copies of the model for 1 (next to each other) to model $5/4$.

Visual / Pictures (embedded in the modeling)

1. Label 1 and the fraction on every fraction picture.
2. Don't use whole numbers to label any of the components of the fractional pictures, it is very confusing.

Solution (at the end of the modeling)

1. Show the FINAL (clean) picture and give your EXPLAINED answer
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LAB 8: LOOK AT YOUR FRACTION IDEAS HANDOUT

- *Use only 1 cover sheet and 1 set up (problem / manipulative description) for this problem*

Portfolio Problem 8.1 (Multiplication of Fractional Numbers}

- Model $(\frac{3}{4})$ of 18 using Wooden Cubes
 - Model 18 is $(\frac{3}{4})$ of what number? using Wooden Cubes.
-

SPECIFIC PROBLEM DIRECTIONS for 8.1 a & b:

General Manipulative Description (before you start modeling)

- Simply describe the wooden blocks.

Modeling

- Declare *What's One?* at the start of the modeling (specific manipulative in modeling) for 8.1a. NOTE: Multiplication DOES NOT USE common denominators or LCM, this is not a valid argument for choosing your model for 1 and, in fact, will NOT yield the most efficient model for one. Give the MOST EFFICIENT model for one.
- Declare *What's One?* at the start of the modeling (specific manipulative in modeling) for 8.1b.
- Be sure to use your Multiplication guides from Lab 8 when you write up these problems. You do not have to reproduce a copy of the guide in your portfolio write-ups.

Visual / Pictures (embedded in the modeling)

- For 8.1 a you NEVER use the fraction $\frac{3}{4}$, only $\frac{3}{4}$ of 18? Be sure to always label $\frac{3}{4}$ of 18. There should be NO " $\frac{3}{4}$ " labels.
- For 8.1 b you NEVER use the fraction $\frac{3}{4}$, only $\frac{3}{4}$ of ____? Be sure to always label $\frac{3}{4}$ of ? or $\frac{3}{4}$ of the mystery number. There should be NO " $\frac{3}{4}$ " labels.
- Label all of the numbers on every fraction picture.

Solutions (at the end of the modeling)

- For both parts, show the FINAL (clean) pictures, EXPLAIN and give the solution.
 - For 8.1a, give both the mixed number and improper fraction solution.
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↓ MORE LAB 8 PORTFOLIO 8.2 ↓

LAB 8: LOOK AT YOUR FRACTION IDEAS HANDOUT

Portfolio Problem 8.2 (Multiplication of Fractional Numbers)

Model $(5/6)$ of $(3/4)$ using Cuisenaire Rods

SPECIFIC PROBLEM DIRECTIONS for 8.2:

General Manipulative Description (before you start modeling)

1. Describe the Cuisenaire Rods in reference to the white rod (see lab and the portfolio example). Note: Orange \neq 10, Blue \neq 9, ... White \neq 1. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).

Modeling

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling). Explain, in detail, how you determine what to use for 1. NOTE: Multiplication DOES NOT USE common denominators or LCM, this is not a valid argument for choosing your model for 1. The argument for TRAINS will be different than the argument for CLUSTERS. This explanation will be a big part of you modeling.
2. Be sure to use your Multiplication guides from Lab 8 when you write up these problems. You do not have to reproduce a copy of the guide in your portfolio write-ups.

IF YOU USE A TRAIN

3. Model each fraction separately and as the APPROPRIATE PARTS OF A WHOLE. (E.g. $1/2$ would be 1 of 2 rods, both rods must show, 1 rod must be marked). Explain what you are doing.

IF YOU USE A CLUSTER

4. You may wish to use Cuisenaire Rod CLUSTERS instead of trains. If you use clusters: You do not have to show 1 of 2 parts etc.

Visual / Pictures (embedded in the modeling)

1. Label the rods with colors; don't just color in the rods.
2. Label each train with its' value.
3. For 8.2 you NEVER use the fraction $7/8$, only $7/8$ of $2/5$. Be sure to always label $7/8$ of $2/5$ or perhaps $1/8$ of $2/5$. There should be NO " $7/8$ " labels.
4. Note: Orange \neq 10, Blue \neq 9, ... White \neq 1 now that we are modeling fractions. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).
5. Don't use whole numbers to label any of the components of the fractional pictures, it is very confusing.
6. Don't use WHITE ROD trains in your model. At this point, you should be using the length of the Cuisenaire Rods in your explanations.

Solution (at the end of the modeling)

1. Show the final (clean) picture and give your EXPLAINED solution.
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LAB 9: LOOK AT YOUR FRACTION IDEAS HANDOUT

Portfolio Problem 9.1 (Division of a Whole number by a Fraction)

Model $2 \div \frac{3}{8}$ with Wooden Cubes

SPECIFIC PROBLEM DIRECTIONS for 9.1:

General Manipulative Description (before you start modeling)

1. Simply describe the wooden blocks.

Modeling

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling). Include a discussion of how you determine what to use for 1.
2. **REMEMBER** the model for 1 is not important once you move to answering the question: How many times does _____ go into _____?
3. Use the terms Dividend, Divisor and Quotient in your modeling.
4. Be sure to use your Division guides from Lab 9 when you write up these problems. You do not have to reproduce a copy of the guide in your portfolio write-ups.

Visual / Pictures (embedded in the modeling)

1. Show $\frac{3}{8}$ as the **APPROPRIATE PARTS OF A WHOLE**.
2. Label all of the numbers on every picture.

Solution (at the end of the modeling)

1. Show the final (clean) picture and give your EXPLAINED solution.
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↓ MORE LAB 9 PORTFOLIO 9.2 ↓

LAB 9: LOOK AT YOUR FRACTION IDEAS HANDOUT

Portfolio Problem 9.2 (Division of a Fraction by a Fraction)

Model $5/9 \div 5/6$ with Cuisenaire Rods

SPECIFIC PROBLEM DIRECTIONS for 9.2:

General Manipulative Description (before you start modeling)

1. Describe the Cuisenaire Rods in reference to the white rod (see lab and the portfolio example). Note: Orange \neq 10, Blue \neq 9, ... White \neq 1. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).

Modeling

1. Declare *What's One?* at the start of the modeling (specific manipulative in modeling). Include a discussion of how you determine what to use for 1 (LCD is valid here and you may describe this mathematically without modeling).
2. At the start, **BE SURE** to use the same model for 1 for each fraction, if you do not, the problem is entirely incorrect.
3. Use the terms Dividend, Divisor and Quotient in your modeling.
4. At the start, model each fraction separately and as the **APPROPRIATE PARTS OF A WHOLE**. (E.g. $1/2$ would be 1 of 2 rods, both rods must show, 1 rod must be marked).
5. **REMEMBER** the model for 1 is not important once you move to answering the question: How many times does _____ go into _____?
6. Be sure to use your Division guides from Lab 9 when you write up these problems. You do not have to reproduce a copy of the guide in your portfolio write-ups.
7. **DO NOT CONVERT** the fractions to a common denominator to do the whole problem, you may note the conversion, but keep the original fraction as well

Visual / Pictures (embedded in the modeling)

1. Label the rods with colors; don't just color in the rods.
2. Label each train with its' value.
3. Note: Orange / 10, Blue \neq 9, ... White \neq 1 now that we are modeling fractions. DON'T label your rods with whole numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 or 10).
4. Don't use whole numbers to label any of the components of the fractional pictures, it is very confusing.

Solution (at the end of the modeling)

1. Show the final (clean) picture and give your EXPLAINED solution.
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THAT'S IT! THIS IS THE END OF THE MATH 391 PORTFOLIOS!