

Math4010 Problem Set 1

Due date: _____

Please attach the appropriate cover sheet to your assignment when you turn it in. Remember that it must be stapled and also that you cannot turn this in late! **To get full credit, you must have neat work, show all your work and circle or box all answers!**

Referring to the Math4010 Class Info sheet, complete the following problems.

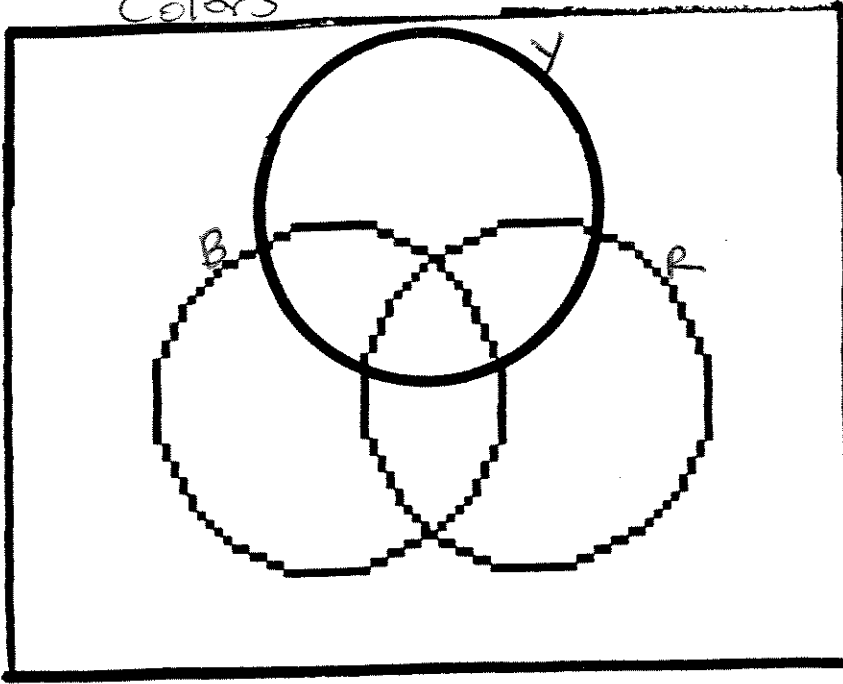
- (1) (5 points each) For each of the data categories (e.g. Colors, Flavors, etc.), draw a Venn Diagram that represents all of the information. (In each section of the Venn Diagram, just enter the number of students in that category.)
- (2) (10 points) For the Colors set, list the set of people who like all colors.
- (3) (10 points) For the Flavors set, let V = set of people who like vanilla, C = set of people who like chocolate and S = set of people who like strawberry. Shade in $V - (S \cup C)$ and tell how many people are in this set.
- (4) (10 points) For the Drinks category, let C = the set of people who drink coffee and M = set of people who drink milk. Shade in $\overline{C} \cap \overline{M}$ and tell how many people are in this set.
- (5) (10 points) For the Subjects category, let E = the set of people who like English, M = the set of people who like Math, and S = the set of people who like Science. Shade in $S \cap (E \cup M)$ and tell how many people are in this set.
- (6) (10 points) For the Activities category, list the set of people who don't like playing games nor working out.
- (7) (10 points) For the Transportation category, let T = the set of people who use Trax, B = the set of people who use the bus, D = the set of people who drive their own car, and C = the set of people who carpool. Shade in $(T \cup B) \cap (D - C)$ and tell how many people are in this set.

From the book: (10 points each)

- 1.1 B #1, 7, 14 pg 20 #1
- 1.2 B #8, 15, 19
pg 42 #12, 16
- 2.1 B #10, 11, 14, 17, 19, 29

①

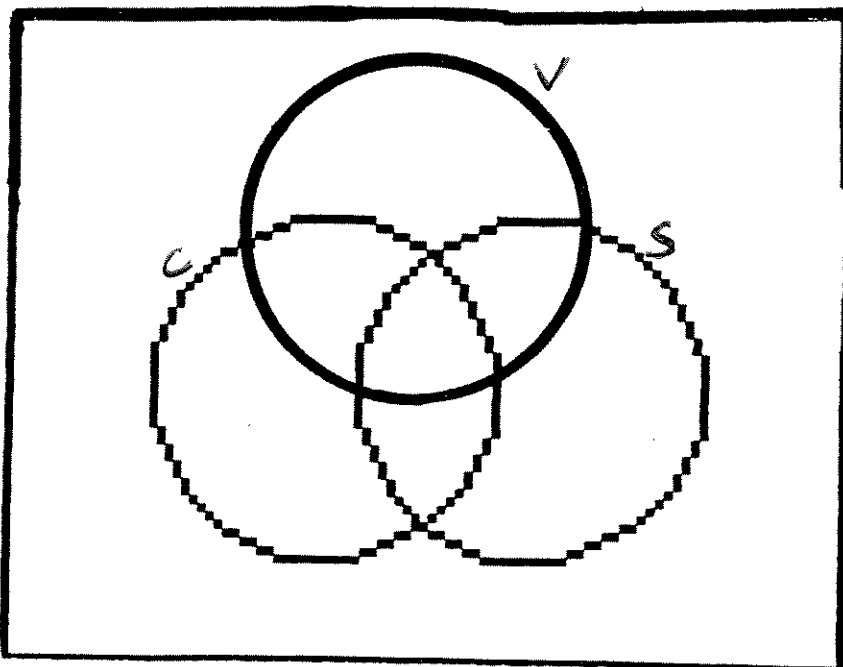
Colors



Math 4010

PS1

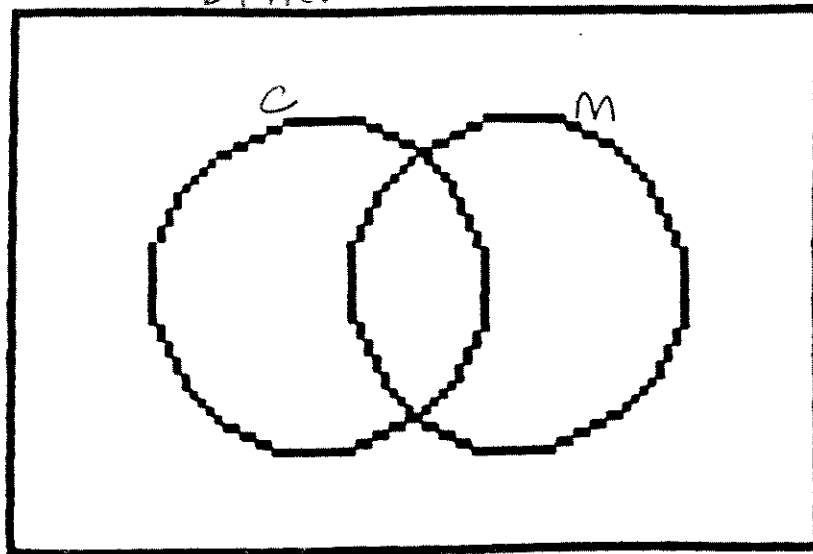
Flavors



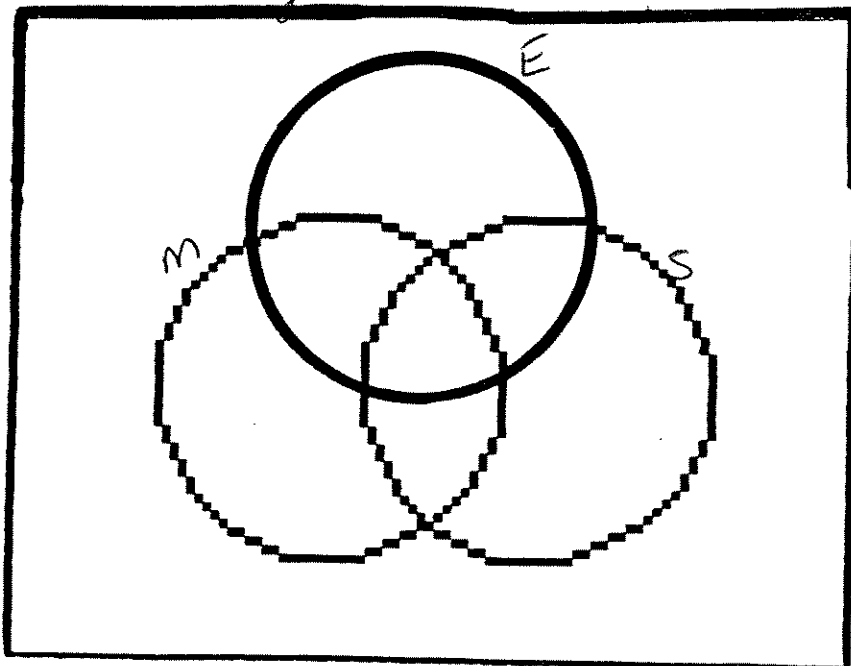
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Math 4010
PS1

Drinks

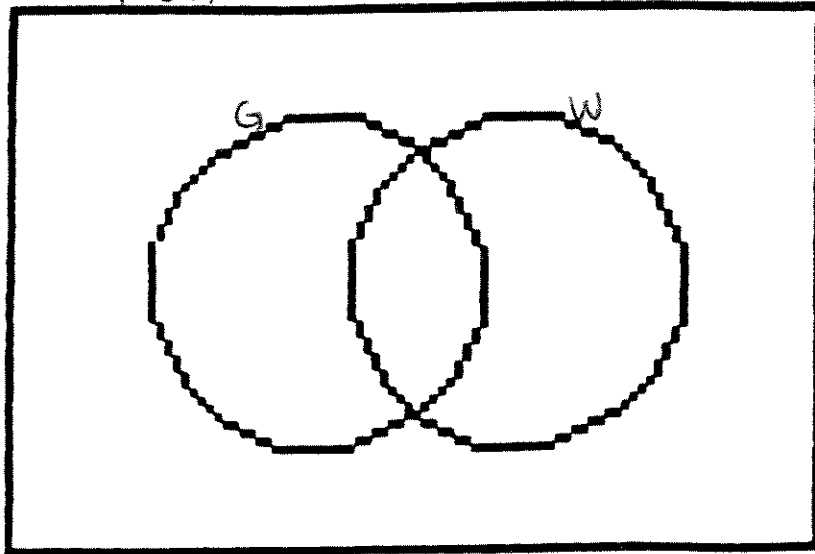


Subjects



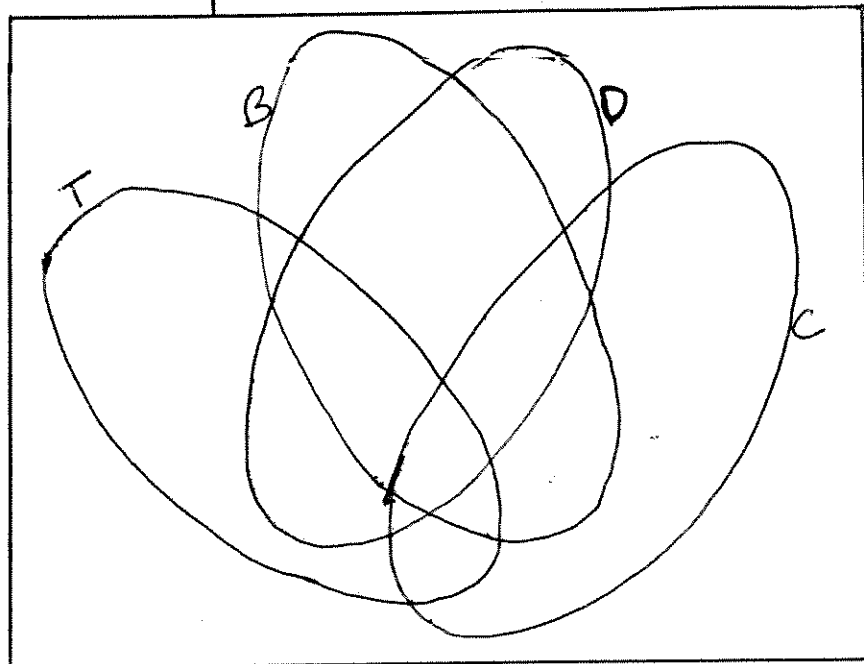
Activities

①



Math 4010
PS1

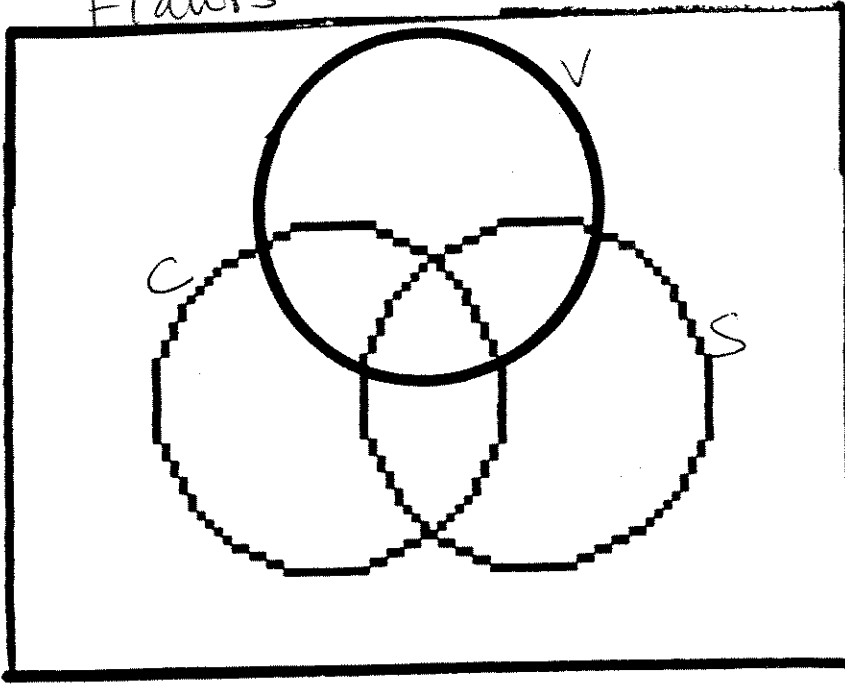
Transportation



T = use Trax D = ^{drive} own car
B = use Bus C = carpool

③

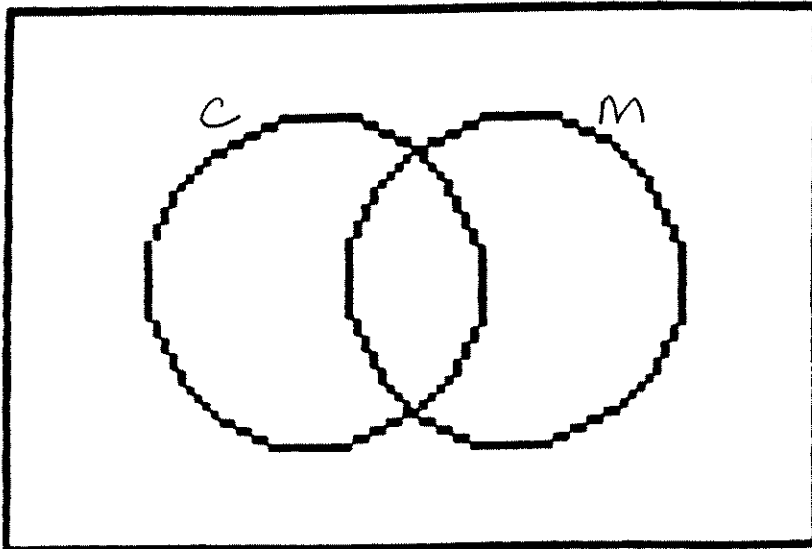
Flavors



Math 4010
PS1

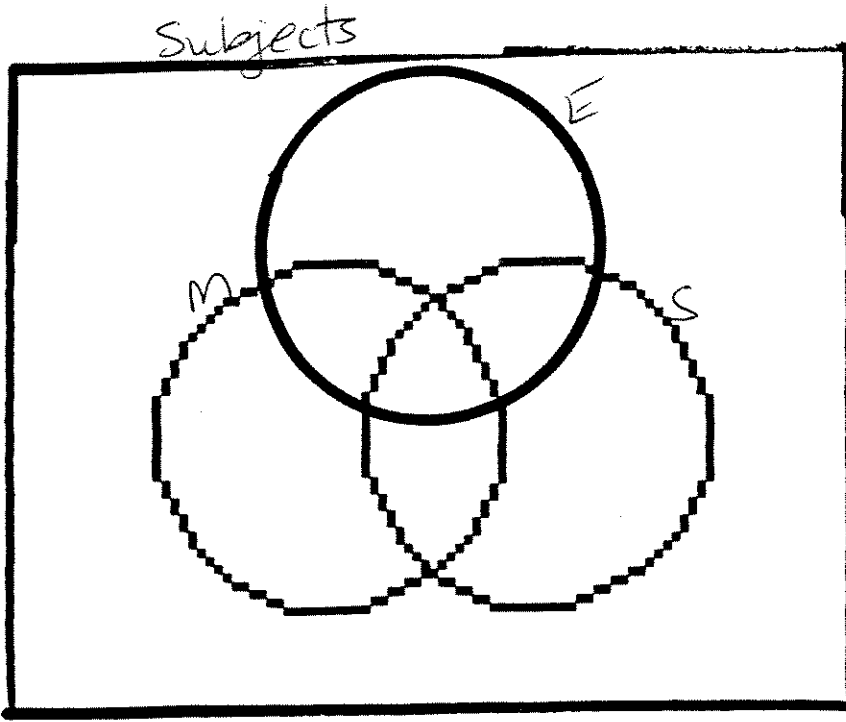
④

Drinks

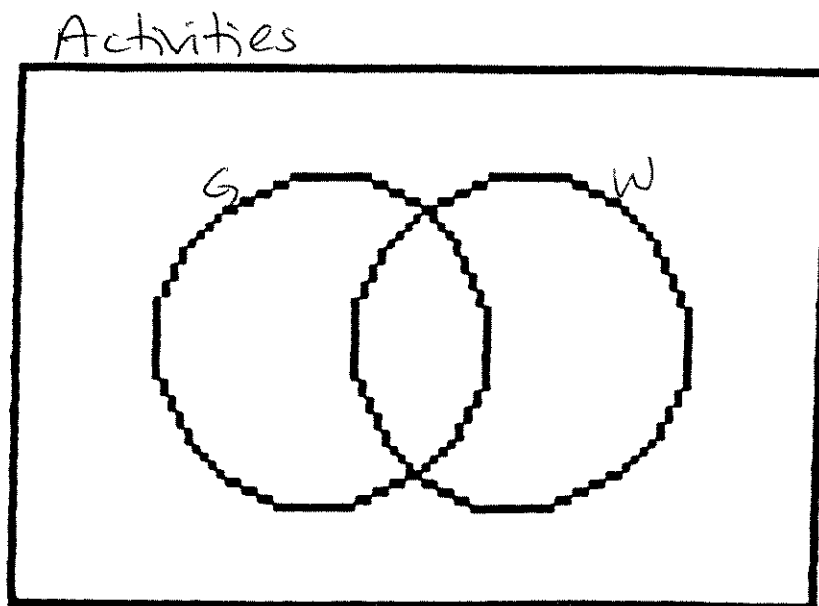


② list:

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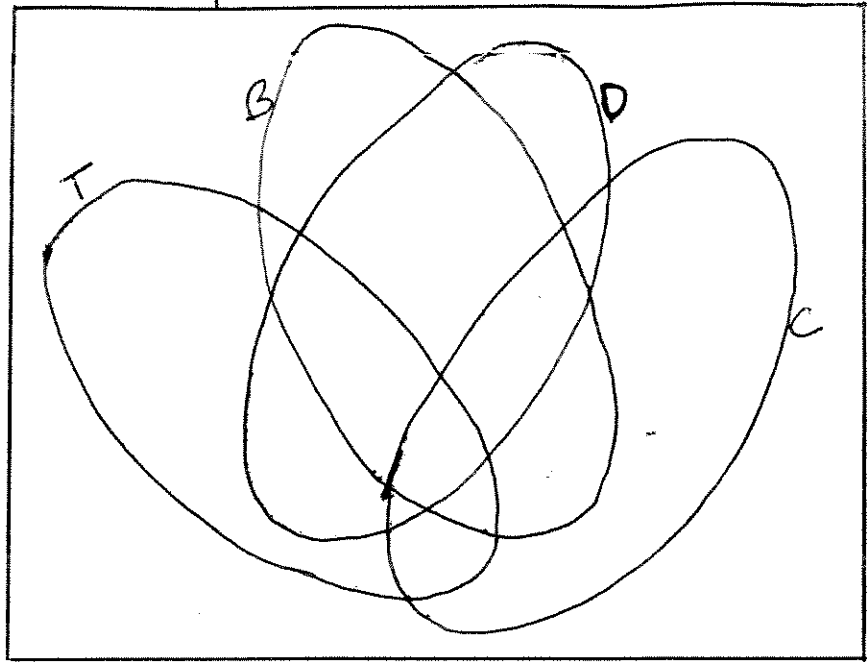


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7

Transportation



T = use Trax D = own ^{drive} car
B = use Bus C = carpool

Math4010 Problem Set 2

Due date: _____

Please attach the appropriate cover sheet to your assignment when you turn it in. Remember that it must be stapled and also that you cannot turn this in late! **To get full credit, you must have neat work, show all work, and circle or box all handwritten answers!!**

This assignment has two parts. Part A is a list of problems, which you need to write up individually. Part B is a group assignment. We will discuss this in class as well as choose groups. For Part B, please turn in your write-up with this assignment (answering questions 1 – 8).

Part A:

(1) From the book (10 pts each):

2.3 B #7, 13, 14

3.2 B #5, 7, 11

3.3 B #8, 15

pg 120 #2, 3

pg 135 #1

Chapter 3 Test (pg 148-149) #2, 6, 8, 10

(2) Discussion of Zero. (**Must be typed and in your own words!**) (20 pts) Zero is quite a special number with some unique qualities, so we need to give it some attention. Please answer these questions with complete sentences.

(a) What is zero?

(b) Why do we need zero?

(c) Discuss how zero behaves

(i) With addition.

(ii) With subtraction.

(iii) With multiplication.

(iv) With division.

(v) As an exponent.

Be sure to illustrate with examples and explain clearly what problems are associated with zero.

(3) Reflection Question: (**Must be Typed**) (10 pts) How can studying other number systems help us better understand our own number system? How will it help you teach children?

Part B: (80 pts)

Your group will create a new number system using only these four symbols:



Develop a system that lets you represent any amount.

In your group, discuss different alternatives and come up with one you all agree on. Answer these questions when deciding on the best system.

- Does this system make sense?
- How can you explain it to others?
- How is it better than other alternatives?
- What characteristics would provide for simplicity, yet make your system powerful enough to do computations needed by your group?

On a separate sheet of paper, write a description of your system and answer the following questions using your new number system.

- 1 The name of your new system (feel free to be creative here).
- 2 A table showing your symbols for the numbers, along with some explanation necessary to understand your system.
- 3 Which properties or characteristics does this new system have (e.g. additive, multiplicative, place holders, place value, zero, subtractive, etc.)?
- 4 What are the advantages and disadvantages to your system?
- 5 Express the numbers 2761 and 305 in your number system.
- 6 Count to 20 with your number system.
- 7 Add $217 + 358$ using your number system (and show your work).
- 8 Subtract $541 - 106$ using your number system (and show your work).

Math4010 Problem Set 3

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(1) (6 points) Create a base 6 multiplication table and base 6 number line.

(a) (8 points) Use blocks to model and solve these problems.

$$4_6 \times 25_6 \quad (\text{repeated addition})$$

$$231_6 \div 3_6 \quad (\text{partitive and measurement})$$

(b) (8 points) Use a number line to model and solve these problems.

$$5_6 \times 2_6$$

$$43_6 \div 2_6 \quad (\text{repeated subtraction})$$

(c) (8 points) Use a chip abacus to model and solve these problems.

$$3_6 \times 135_6$$

$$224_6 \div 4_6$$

(2) (10 points each) For each of these problems, use three different models to find the answer. (You can look through the exercises in Chapter 4 to give you more ideas, if necessary.) Demonstrate your work clearly and indicate which algorithm you're using. Put each problem on a separate sheet of paper.

(a)
$$\begin{array}{r} 346 \\ + 97 \\ \hline \end{array}$$

(b)
$$\begin{array}{r} 261 \\ \times 43 \\ \hline \end{array}$$

(c)
$$7 \overline{)689}$$

(3) (10 points) Find GCF(420, 234) using Euclid's algorithm and LCM(420, 234) using the "Layer Cake" algorithm.

(4) (10 points) Find the GCF(924, 840) and LCM(924, 840) using a Venn Diagram.

(5) (10 points) Find the GCF(425, 510) using the area model. Then, find the LCM using the fact that LCM times GCF = product of the two numbers.

(6) From the book: (10 points each)

4.1 B #14, 16

4.2 B #23, 31

4.3 B #15

Problems for Writing & Discussion (page 194) #1, 2

5.1 B #28, 30, 31

pg 167 #1, 3

pg 191 #1 (Problems for Writing & Discussion)

pg 212 #2

(7) (10 points) Reflection Question: **(Must be Typed)** As you look back on the class work with whole numbers and arithmetic operations, reflect on what you have learned. Briefly describe one important mathematical morsel you have learned about working in a number system that has been a new idea for you. For instance, you can focus on one or more of these questions:

- Did you learn more about what an operation means?
- Do you better understand how an algorithm works? What is clearer for you?
- What connections between operations do you better understand now and why?
- What do you understand about place value that you didn't quite get before this?

(8) (10 points) Practicum Observation Report: **Type** a one or two page report describing your insights from your practicum observations.

Math4010 Problem Set 4

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- (1) (10 points) If it takes Betty 5 hours to walk 9 miles, how far will she have walked in 3 hours? (Assume that she walks at a constant rate.)
- (2) (10 points) Mary was making a skirt. She had $3\frac{2}{5}$ yards of material. She used $\frac{3}{4}$ of the material for the main part of the skirt, and then she used $\frac{2}{3}$ of what was left for a stylish belt. How much material was left?
- (3) (10 points) John's teacher gave him a large sheet of red construction paper to make paper toys. If John used $\frac{2}{7}$ of the sheet for a cart and $\frac{3}{5}$ of the sheet for a tent, what fraction of the sheet of paper was left?
- (4) (10 points) Three-sevenths of a class is girls. If there are 20 boys in the class, how many girls are in the class?
- (5) (10 points) If $\frac{5}{8}$ of a pound of apples cost \$2.35, how much would $1\frac{1}{2}$ pounds of these apples cost?
- (6) (10 points) Five rectangular cakes are to be divided into portions with each portion being $\frac{3}{5}$ of a cake. How many portions are possible?
- (7) (10 points) If the ratio of girls to boys in a class is 4 to 5 and there are 25 boys, girls form what fraction of the class?
- (8) (10 points) Katie can mow $\frac{3}{5}$ of the lawn in $\frac{1}{4}$ of an hour. How long will it take Katie to mow the whole lawn?
- (9) (10 points) It takes Bill 2 hours to correct the essays that his students wrote in class. The substitute teacher, Dave, takes 3 hours to do the same job. If they both work together until all the essays are corrected, how long will it take to do this job?
- (10) (10 points) A teacher uses $\frac{2}{3}$ of her yearly supply of construction paper during the first quarter. She then uses $\frac{5}{7}$ of what's left during the second quarter. During the third quarter, she uses $\frac{3}{4}$ of what she has left (from the end of the second quarter). How much construction paper does the teacher have left for the fourth quarter of the school year?
- (11) (10 points) I am a four-digit number divisible by 5. My first three digits are divisible by 4. The sum of my digits is 11. There is a 3 in my hundreds place. Who am I?

Math4010 Portfolio In-Depth Problem

Due: _____

Your write-up and solutions to these problems must be placed in your portfolio. Your Math Methods teacher will expect you to have these there and will talk further about these problems in that class. This will be worth a total of 4 percentage points extra credit on your final exam.

As you work problem #1 and 2, keep a record of the questions you ask yourself and/or the problems you run into in your work. Attach your list to the assignment.

1. Consider the division calculation, $17 \div 5 = 3 \text{ R} 2$
 - a. Use this problem to illustrate briefly how division is related to the other three arithmetic operations.
 - b. Give word problems for which the best answer in the context of the word problem would be
 - (i) $3 \text{ R} 2$
 - (ii) $3\frac{2}{5}$
 - (iii) 3
 - (iv) 4 .(Solve each problem explaining what the R 2 and $\frac{2}{5}$ mean in the context of the problem.)
 - c. Give two different word problems that would result in the above calculation and which would show the two models of division we have discussed in class: partitive and measurement.
2. Respond to each question below: **Type and title it** “*Concepts of Division.*”
 - a. Why might it be useful to have more than one concept of the operation of division, i.e. partitive and measurement?
 - b. One can use different algorithms to carry out a division calculation. Are different “concepts” related to different “algorithms?” If so, explain why.
 - c. Using your word problems illustrate what is meant when one says, “division and multiplication are inverse operations.”
 - d. Which method of division is more readily accessible to children who know how to add and subtract? What are the implications of your answer for developing an understanding of division?

Math4010 Problem Set 5

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(1) (5 points each) Express each number as directed. (Show all your work by hand—don't use a calculator for these problems.)

- (a) $3\frac{5}{8}$ as a decimal
- (b) $12\frac{7}{11}$ as a decimal
- (c) $8\frac{37}{64}$ as a decimal
- (d) 7.2364 as a fraction
- (e) 7.236464646464... as a fraction
- (f) $3.\overline{85}$ as a fraction

(2) (10 points) Prove that $0.\overline{9}=1$.

(3) (10 points) Will $\frac{3^3 \times 5 \times 7}{2^{12} \times 3 \times 5^{23}}$ terminate or repeat when expressed as a decimal?

Justify your answer.

(4) (10 points) Simplify this expression (show all your steps).

$$\frac{3(7-4) - (24 \div 3 \times 2) \div 4 + 2}{18 - 2(7-4)}$$

(5) (10 points) A sale advertises that you can either take "70% off the original price" or "50% off the original price with an additional 25% off the sale price." Which is a better deal? Use a \$100 item to illustrate your reasoning.

(6) (10 points) At the end, would you be better off if you got (a) a 10% raise in salary and then a 10% cut in salary, or (b) a 10% cut in salary and then a 10% raise in salary? Use a salary of \$100,000 to illustrate your reasoning.

(7) From the book: (10 points each)

- 7.2 B #27, 28
- 7.3 B #26, 28, 33
- 7.4 B #24, 29, 36
- Chapter 7 Test (pg 331) #23

Problems for Writing/Discussion

- pg 290 #1
- pg 301 #3
- pg 327 #3

(8) (10 points) Reflection Question: **(Must be typed)** On the first day of class, you answered these two questions. Answer these questions again at this point in time.

- (a) Write 4-6 adjectives that characterize your experience with math.
- (b) Describe your attitude toward math.

Has there been any change for you? If so, describe what has changed and why. If not, describe why and what would make a difference for you.

Math4010 Problem Set 6

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(1) (10 points) Without evaluating it, how can you tell if the following expression is positive or negative? (State clearly whether you think this is positive or negative.)

$$\frac{(1)(2)(3)\cdots(49)(50)}{(-2)(-4)(-6)\cdots(-34)}$$

(2) (10 points) Simplify this expression (show all your steps).

$$\frac{-3(2-5) - (-18 \div 3 \times 4) \div 2 + 1 - 6}{8 - (7 - 9) + 1}$$

(3) (10 points) Evaluate this expression when $x = -5$, $y = 2$ and $z = \frac{-1}{4}$.

$$\frac{4y^3 - x^2}{25z^{-2}}$$

(4) (5 points each) Use two different methods to show these calculations.

- (a) $(-24) \div 8$
- (b) $-5 + -2$
- (c) $4 \cdot (-3)$
- (d) $-7 - (-2)$

(5) (10 points) Use a number line to explain and calculate this expression.

$$-5 - (-(-2)) + 1 - 3 + (-4)$$

(6) From the book: (10 points each)

8.1 B #6, 21

8.2 B #15, 20

9.1 B #10, 15

9.2 B #15, 29, 30

pg 364 #3

pg 367 (Problems for Writing/Discussion) #3, 6

pg 390 #2

pg 408 #1