Math4010 Spring 2014
Both Midterms

1. Convert these numbers as indicated.
   (a) (5 points) 571 to base 8.

   (b) (5 points) 839 to Mayan Number System.

   (c) (5 points) 21450_6 to base 10.

2. Rewrite the following expressions using a single exponent.

   (a) (5 points) $6^4(6^3)^6(3^0)$ = _____

   (b) (5 points) $7^6 \cdot 28^2 \cdot 4^6$ = _____

3. (25 points) Answer whether or not each statement is true or false by circling the appropriate response. If a statement is false, then give an example which shows why it's false OR correct the statement to make it true (just negating the false statement is not allowed).

(a) $\overline{A} \cup \overline{B} = \overline{A \cap B}$. T or F

_____

(b) The additive identity is 1. T or F

_____

(c) MXXIV = MXIXV in the Roman Number System. T or F

_____

(d) If $A \subseteq B$, then $A \subset B$. T or F

_____

(e) For all whole numbers a , $a^0 = 1$. T or F

_____

(f) $\{1,2,c,d,e\} - \{1,3,c,g,h\} = \{2,d,e,3,g,h\}$ T or F

_____

(g) For a base 4 number system, you'd need the digits 0, 1, 2, 3, and 4. T or F

_____

(h) This set is closed under multiplication. {0, 1, 2, 4, 8, 16, 32, …. }. T or F

_____

(i) When counting in base 12, 3TE_{12} is followed by 310_{12} . T or F

_____

(j) This set is closed under addition. {0, 1, 3, 9, 27, 81, 243, …. }. T or F

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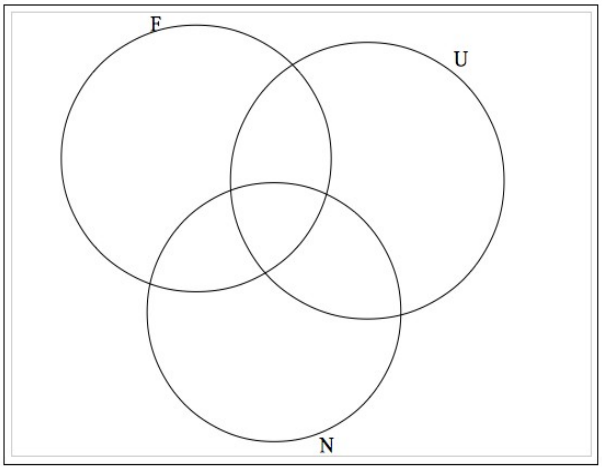
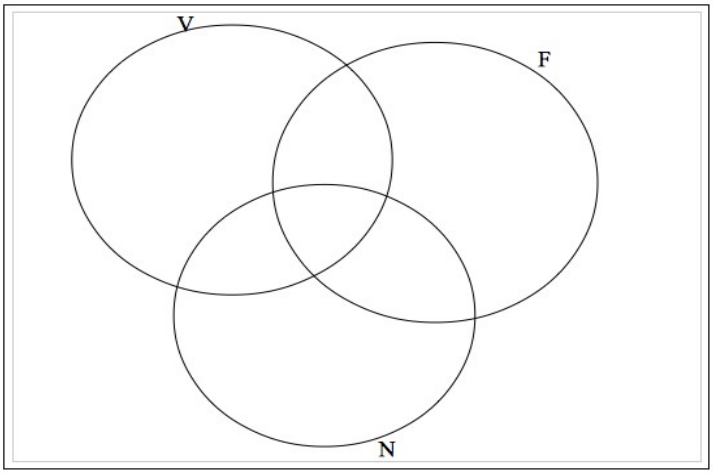
4. (10 points)
In this Venn Diagram, shade in $(U \cap F) - \overline{N}$.



5. (15 points) A survey was taken of 260 people at Fashion Place mall. It showed that 173 people came to the mall for Valentine's gifts, 112 people came for both the food court and to get Valentine's gifts, 125 people did not go to Nordstrom's, 72 people came for all three purposes, 88 people did not go to the food court, 51 people did not go to the food court nor go to Nordstrom's, and 20 people came to the mall for none of those three purposes.

(a) Fill in this Venn Diagram to represent this data.



(b) How many people only went to get Valentine's gifts?

(c) How many people went to Nordstrom's and the food court?

(d) How many people went to the mall for at least two of the three purposes?

6. (15 points) Do these computations, or **explain** why they cannot be done.

(a) 0÷ 6

(b) 2÷0

(c) 0÷0

7. (10 points) Use mental math strategies to simplify. **Show your work!** (I'm not a mind-reader. :))

(a) 49(34) + 66(49) = _____

(b) 20 (8179 *x* 5) = _____

8. (30 points) Perform the following arithmetic operations in the specified bases. **For each problem, use two different methods to show your work and label which methods you are using.** (For example, you can use the chip abacus, base pieces, number line, etc.) You may NOT use standard algorithm.

(a) $203_4 \div 3_4$ (Do one partitive method and one measurement method.)

(b) $2003_5 - 444_5$

(c) $3205_7 \, x \, 34_7$

9. (10 points each) **Choose 3 out of the following 6 questions to do.** Indicate clearly which three questions you want graded by circling "Yes" next to each problem (because I really will only grade three)!!!

A. ***Grade: Yes or No*** A special rubber ball is dropped from the top of a wall that is 256 meters high. Each time the ball bounces, it rises half as high as the distance it fell. The ball is caught when it bounces ½ meter high. How many times did the ball bounce?

B. ***Grade: Yes or No*** Two 2-digit numbers satisfy the following conditions:
The sum of the digits in each number is 10.
All four digits are different.
The sum of the numbers is 119.
Determine the two numbers.

C. ***Grade: Yes or No*** If there are 25 people at a party and everyone shakes hands once with everyone else, how many handshakes will there be in total?

D. ***Grade: Yes or No*** If you add the square of Mary's age to the age of Jim, the sum is 51. If you add the square of Jim's age to the age of Mary, the sum is 231. How old is Jim?

E. ***Grade: Yes or No*** A set of 26 encyclopedias (one for each letter) is placed on a bookshelf in alphabetical order from left to right. Each encyclopedia is 1½ inches thick, including the front and back covers. Each cover (front or back) is $\frac{1}{8}$ inch thick. A bookworm eats straight through the encyclopedias, beginning inside the front cover of volume A and ending after eating through the back cover of volume Z. How many inches of book did the bookworm eat?

F. ***Grade: Yes or No*** Determine whether the following $$ operation on the elements {?, %, ~, @} illustrated by the following table has the properties listed. Justify your answers.

$$	?	%	~	@
?	%	?	%	@
%	?	?	~	@
~	~	%	~	~
@	@	@	%	?

(a) Closure T or F (circle one)

Because _____

_____

_____

(b) Identity element T or F (circle one)

Because _____

_____

If true, then the identity element is _____ .

(c) Commutativity T or F (circle one)

Because _____

_____

_____

1. *(10 pts each)* **For each of these, create a word problem** that requires the given division calculation and yields the answer given. **Note: You cannot use food for your word problems!**

(a) $28 \div 3 = 10$

(b) $4 \div \frac{3}{4} = 5\frac{1}{3}$

2. *(15 pts)* Find the GCF(1680, 1960) and LCM(1680, 504), **using two different methods**. Show all

3. *(20 pts)* Convert these numbers as directed. **Make sure your answers are totally simplified.**

(a) $\frac{3}{11}$ to a decimal

(b) 0.005125 to a fraction

4. *(15 pts)* If the statement is true, write true in the blank. If it's false, give an example which shows that the statement is not true OR correct the statement (just negating the statement is not allowed!).

(a) $2^4 \cdot 3^4 \cdot 7$ has a total of 9 factors. T or F (circle one)

_____

(b) All fractions can be converted into decimals. T or F (circle one)

_____

(c) Exponents distribute through addition. T or F (circle one)

_____

(d) The smaller the denominator, the smaller the fraction. T or F (circle one)

_____

(e) 2 : 11 = 2.6 : 14.3 is a valid proportion. T or F (circle one)

_____

(f) $\frac{2}{9} \div \frac{3}{5} = \frac{9}{2} \cdot \frac{3}{5}$. T or F (circle one)

_____

(g) Each composite whole number has a unique prime factorization. T or F (circle one)

_____

5. *(30 pts)* **<u>Draw some sort of picture</u>** to clearly illustrate your calculation and answer to each of the following questions.

(a) -3 + 7 - (-(-5))

(b) Find $\frac{3}{4} - \frac{2}{3}$

(c) Find $\frac{2}{5}$ *of* $\frac{3}{8}$

6. *(10 pts each)* **Simplify the following expressions**. Show all work.

(a) $\left(3\frac{3}{5} - 1\frac{5}{6}\right)\left(\frac{-9}{\frac{1}{3} + \frac{1}{6}}\right) \div \frac{3}{4}$ = _____

(b) $(2007.83-1999.73)(-0.4)\div(0.3)^4$ = _____

(c) (i) $(-2)^6$ = _____ (iii) $(-2)^{-6}$ = _____

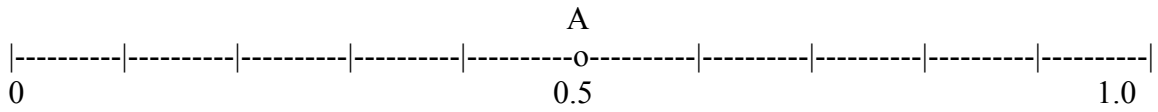
(ii) -2^6 = _____ (iv) -2^0 = _____

7. *(15 pts)* Order these numbers and plot them (as points) on the number line below. Identify each point by placing the corresponding letter above the point, as indicated in the example that's already placed on the number line below..

A = 0.5 B = $\frac{3}{12}$ C = $\frac{3}{5}$ D = 0.425

E = $0.2222\ldots$ F = $\frac{0}{7}$ G = $\frac{1}{3}$ H = 0.3

I = $0.\overline{9}$ J = $\frac{7}{9}$



8. You go to Costco and buy a large container of M&Ms, holding 55 cups of the candy. In order to maintain the health of your family, you decide to eat only $1\frac{2}{7}$ cups per day between you and your family members. How many days will the container of M&Ms last your family? And, how many cups (or what fraction of a cup) of M&Ms are leftover?

9. One fourth of the world's population is Chinese and one fifth of the rest is Indian. What fraction of the world's population is Indian?

10. A family uses 7 gallons of milk every 5 weeks. At that rate, how many gallons of milk will they need to purchase in a year's time?

11. At a mathematics seminar, one-third of the people there are students, two-fifths are professors, and one-sixth are industry representatives. The rest are employees of the convention center. If there are 130 employees working there, how many total people are at the convention?