Math 210 - Dr. Miller - Topics List for Final Exam, Fall 2017

2:00 Class - THURSDAY, Dec. 14, 10:30-12:30.....3:30 Class - TUESDAY, Dec. 12, 1:00-3:00. You must take the final exam at the time scheduled for YOUR usual class.

The Final Exam is CUMULATIVE and is worth 150 points. Study this list in connection with your notes, in-class materials, reading, quizzes, graded AND ungraded homework, Exams #1-3, and your own study guides from those exams. Solutions to this semester's graded items are on the bulletin board near my office, old exams on my website.

Problem Solving: *Assessing this topic must involve new, unfamiliar situations; don't let that scare you.*

1. State Polya's Four Steps in order. Explain each step in detail. Spot the trouble step in a story.
2. Given a problem, name strategies that might/might NOT solve it. Tell why to choose, not how to use.
3. Fully solve a problem; explain your reasoning in terms of the math steps you chose, and why. Label.
4. Omitted on Exam #1 list: Solve work backwards problems, including involving fractions; explain.
5. Practice flexibility - use new "tricks" you've seen - but prepare for VARIABLES to be forbidden.

Sequences: *(Algebra/variables will not be permitted in sequence problems, except for a_n work.)*

1. Sequences may use decimals, fractions, or negative numbers in general, or as CDs and CRs.
2. Recognize given sequences that are arithmetic, geometric, Fibonacci-type, or no special type.
3. Find early terms when told about difference sequence, type (above), other terms, a_n notation/formula.
4. Find distant terms for arithmetic, geometric, or repeating sequences. Plan to explain briefly.
5. Find/explain how many terms of an arithmetic sequence are represented by a given ". . ." list.

Sets: *When asked, write exactly how to read set notation aloud; convert sentences to notation (notes, book).*

1. Use, read, understand listing/roster and set-builder notation for sets. Convert between these.
2. Know, understand, read, and use the notation n( ); understand the term "cardinality" of a set.
3. Create one-to-one correspondence(s) between given sets. Explain how they apply to more/less in real life.
4. Correctly use, read, understand $\in$, $\notin$, $\subseteq$, $\not\subseteq$ notation, including in true/false or fill-in-the-blank.
5. Know, read, use definitions and correct notation for natural numbers, whole numbers, empty set.
6. Predict how many subsets a given set has; list all; list some with certain properties or cardinality.
7. Use, find, read, understand notation: complement, intersection, union, difference, Cartesian product.
8. Know, use the word disjoint. Understand universal sets. Don't repeat elements when listing.
9. Make up sets whose $\cup$, $\cap$, $\setminus$, or $\times$ have certain qualities (as Act. #9). When not possible, explain.
10. Predict how many elements $A \times B$ should have. Be extra careful with Cartesian product notation.

W Arithmetic Scenarios, Terms, Definitions: *Memorize, spell terminology for parts of number sentences.*

1. Name the four operations; INFORMALLY describe their set-based definitions (as on the Summary).
2. Complete constructivist definitions; find Fact Families; use term "number sentence" and write some.
3. Know when division involving 0 is possible/not; use PRECISE definitions to explain.
4. Given a word problem, identify by (memorized) name its scenario, operation, use of objects/measurements.
5. Make up an original word problem requiring a given computation, scenario, use of objects/measurements.
6. Create number sentences having specified behavior for their parts; recognize when you cannot.

(over)

Numeration: *Understand terms: number, numeral, digit, place value, numeration system, Hindu-Arabic, base.*

1. Convert between forms for base ten numerals: standard, word, all three types of expanded.
2. Answer questions like those in HW #21. Find base ten numerals that satisfy a given set of clues.
3. Convert from other bases into base ten. Count in other bases (memorize base twelve and sixteen digits).
4. For *unfamiliar* bases beyond ten, I will give you necessary extra digits or the pattern for creating them.
5. List one or several numerals that precede or follow given numerals in a specific base.
6. Determine largest or smallest in a list of numerals, possibly in a mixture of bases. (See text HW.)

W Arithmetic Algorithms: *Prepare for ordinary base ten! Algorithms must have perfect scratchwork.*

1. Add entirely in a specific base using MY choice of the standard or Scratch Addition algorithms.
2. Subtract in a specific base using MY choice of the standard algorithm or Balancing Subtraction.
3. Show my choice of Lattice, Partial Products, or standard algorithm to multiply in a specific base.
4. Work in familiar or *unfamiliar* other bases (when I give you necessary extra digits or a rule).
5. Describe how to use base blocks to work a given addition or subtraction in a specific base.

Number Theory: *Understand, convert between: factor, divisor, multiple, divisible, divides, | notation.*

1. Use definition of "divides" in explanations, including for true/false statements about synonyms/notation.
2. List all whole or natural numbers that are factors or multiples of a given number.
3. Demonstrate the use of Divisibility-of-a-Sum/Difference/Product Theorems, as in QHW #12.
4. Recognize, use terms: prime, composite, unit. Prime factor a given number; don't stop too early!
5. Memorize, demonstrate, describe divisibility tests for 2 through 12. Use to find missing digits.
6. Apply the Prime Number Test to a given number, showing all steps. Use in tough factor trees.
7. Use prime factor mix-match to predict how many factors a number has or find certain ones (QHW #11).
8. Explain what GCDs, LCMs are without using any words these letters represent.
9. Demonstrate all methods to find GCDs, LCMs: listing, prime factors, Euclidean Algorithm.

Bring an approved calculator: not cell phone, no text-based memory.
If you forget, you may borrow mine - for a THREE point deduction.