MATH 221 - STUDY GUIDE FOR THE FINAL EXAM

General Guidelines for Studying: The final exam will be 50 multiple choice questions, of which 25 will be based on the 75 questions you have had on the 3 tests. These 25 questions may not be identical to the test questions, but they will be very similar. If you understand not only what the answer was on a test problem but also why the answer was what it was, then you should have no problem on the corresponding final exam question. The remaining 25 questions on the final exam will be based on the class presentations available directly at:

`http://www.math.sc.edu/~filaseta/courses/Math221/the221password.html`

It would be wise to review the material, especially any questions posed, that appear in these presentations. This includes all of the homework problems that we went over in class.

Specific Items to Know (Astericks Indicate New Items):

- the main headings in the 4-step problem-solving process
- problems involving recognizing patterns
- arithmetic and geometric sequences
- the Fibonacci sequence
- set notation and terminology (set builder notation, proper subset, intersection, universal set, complement, $\emptyset$, $=$, $\cup$, $\cap$, $\in$, $\notin$, $\subset$, $\not\subset$, $\subseteq$, $\not\subseteq$, $\overline{A}$, $B - A$)
- Venn diagrams
- De Morgan's laws (i.e., $\overline{A \cup B} = \overline{A} \cap \overline{B}$ and $\overline{A \cap B} = \overline{A} \cup \overline{B}$)
- Addition and Multiplication models (line model for addition and subtraction; repeated addition, array, and area models for multiplication)
- Properties of Addition and Multiplication (eg., the commutative property of addition, the distributive property of multiplication over addition; also, review how we used models to describe these)
- The division algorithm, quotients and remainders
- the order of operations (PEMDAS)
- the expanded form of a number (in different bases)
- how to use blocks, flats, longs and units to describe numbers to different bases
- Understand the picture argument for determining $1 + 2 + 3 + \cdots + n$.
- Have some idea of how we approached the problems concerning WOW and CIRCLE.

$*$ the scale problem involving how many cubes are in a bag

$*$ the problem about 6 men and 2 boys crossing a river

$*$ the comparison between $\sqrt[10]{10}$ and $\sqrt[3]{2}$

$*$ the problem of getting 4 quarts of water from jugs

- base problems similar to Quiz 7 and homework from Section 3-2
- algorithms for addition (know them)
- lattice mulitplication
- repeated subtraction method for division
- compatible numbers for addition and multiplication
- estimating
- chip model for integer arithmetic (addition, subtraction and multiplication)
- number-line model for integer arithmetic (addition and subtraction)
- be able to recognize in black-and-white which way the witch is looking
- divisors (definition, properties and equivalent statements)

- divisibility tests (for 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, etc.)
- primes (definition and properties)
- The Fundamental Theorem of Arithmetic
- factor trees
- greatest common divisor
- least common multiple
- different methods for obtaining GCD's and LCM's

∗ mail-time model for addition and subtraction

∗ the sieve of Eratosthenes

∗ the Euclidean algorithm

- modulo problems like on the homework from Section 4-6 (and Quiz 12)
- models (there were lots of them) associated with fractions (representations for fractions, addition of rationals, multiplicaiton of rationals, division of rationals, representations for decimals)
- terminology (numerator, denominator, proper fraction, improper fraction, mixed fraction, equivalent fractions, equal fractions, simplest form, relatively prime, decimals and how to read them, terminating decimal)
- comparing rational numbers (recognize equal rational numbers and be able to tell if one rational number is greater than another, whether positive or negative)
- multiplication and "of"
- $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$ and $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$
- $a \div b$ is the number of b's it takes to get a
- word problems like the homework
- decimals in expanded form (going from one to the other)
- converting from decimals to fractions and from fractions to decimals
- comparing decimals (be able to tell if one is greater than another, whether positive or negative)
- operations on decimals (where does the decimal go for adding, multiplying and dividing?)
- know what rational numbers can be written as a terminating decimal
- know basic material covered on irrational numbers

∗ Denseness property of rationals

Specific Items You do NOT Need to Study:

- the problem involving diagonals of a regular polygon
- the Fibonacci type problem starting with 4 and ending with 67
- the problem about hand shakes at a party
- the problem involving placing numbers in 7 hexagons
- the public bus system problem from California
- terminology for mental arithmetic (other than "compatible")
- Fundamental Law of Fractions (know it but not its name)
- Venus and the number of days in a year
- lengths of periodic parts of decimal representations for $1/n$