Math 210 - Dr. Miller - UPDATED Topics List for Exam #3, Fall 2018 - Tuesday, Dec. 4, 2018

Carefully study this list with reference to your notes, activities, readings, quizzes, and practice problems.

Arithmetic Algorithms: Algorithms must display PERFECT markings, suited to a teacher, not a child.

1. Questions can be in any base from three up; you'll have to work ENTIRELY in the given base.
2. Memorize the extra digits for base twelve, sixteen. For other bases over ten, I'll tell you the digits.
3. Tell what the terms algorithm and manipulative mean in the elementary mathematics classroom.
4. Add and subtract using the Standard Algorithms; also know and use Scratch Addition.
5. In subtraction regrouping, use correct notation at the top of a column. Stay in the given base!
6. Add/subtract mixed measurements such as inches-feet-yards, time, etc., as in text HW.
7. Fill in the blanks in partway-done algorithms; create largest/smallest answers, as in text HW.
8. Find missing addends or subtrahends in other bases, as in text homework.
9. Multiply in other bases using Lattice Multiplication or the Partial Products Algorithm.
10. Clearly and thoroughly explain each step in using base blocks, abacus, or place value card to add or subtract a given example. (See HW solutions on the web for clear examples and expectations.)

Number Theory:

1. Carefully state the formal (box-number sentence) definition of "divides," use it in explanations.
2. Understand and convert between these synonyms: factor, divisor, multiple, divisible, and divides.
3. Know, use, and understand the notation $x|y$ for "divides" and $x \nmid y$ for "doesn't divide."
4. Do NOT confuse the | symbol or the word "divides" with a fraction bar, ÷ symbol, or division.
5. Identify true/false statements, create your own sentences using the synonyms or the | or $\nmid$ symbols.
6. Especially know how the synonyms pertain to the numbers zero and one.
7. List all natural numbers that are factors or multiples of a given number.
8. List factors or multiples meeting extra conditions: even, odd, prime, composite, certain size, etc.
9. Know that all natural numbers can be classified as prime, composite, or unit; sort examples.
10. Memorize the primes up to 50; be able to test/recognize higher numbers as prime vs composite.
11. State precisely: definition of prime, defn of composite, Fundamental Theorem of Arithmetic.
12. Explain clearly what a prime factorization is. Recognize/explain a wrong one (as in text).
13. Prime factor a given number, possibly using my choice of a Factor Tree vs. Division Tower.
14. Be careful not to stop a tree/tower too early; check that unusual-looking final factors *are* prime
15. Predict how many factors a given number has; show work by listing "# of ways..." as in class.
16. Apply the Prime Number Test to a given number, showing all steps. Be sure to draw a conclusion!
17. Correctly spell "Sieve of Eratosthenes." Know that it's used to find all primes up to a given limit.
18. State what circled versus crossed-out numbers in a Sieve represent.
19. Explain why after we circle a number in the Sieve, we know that we CAN cross out all its multiples.
20. Find and explain the stage at which a given Sieve will be complete.
21. Identify other items in a Sieve: last number crossed out, largest number crossed/not crossed, etc.
22. Memorize and demonstrate the tests for divisibility by 2 through 12. Be sure to draw a conclusion!
23. Remember that tests are repeatable (especially 7) if the first outcome isn't easy to decide about.
24. Find missing digits or make up entire numbers satisfying tests from 2 through 12.
25. ~~Apply Divisibility of a Sum (Difference) and Product Theorems to given numbers; explain briefly.~~

Bring an approved calculator for use on the exam; if you forget, there's a deduction.