MA/CSSE 473 Day 04 Summary

Main ideas from today:

1. When we add three 1-digit integers, how many digits can be in the answer?

   Is this independent of the base (i.e, the same for decimal, binary, hexadecimal, etc.).

2. How does the previous question apply to the analysis of the addition of two k-bit non-negative integers?

3. What is the running time of the "standard" algorithm for multiplying two n-digit numbers?

4. What is the running time of the "European" algorithm for multiplying multiple-digit numbers?

5. What is the recurrence for the first Divide and Conquer multiplication algorithm?

   What is its solution?

6. (1) Gauss's algorithm for multiplying two complex numbers replaces _____ integer multiplications by _____.

7. (1) What is the recurrence relation for the Gaussian Divide and Conquer multiplication algorithm?

   What is its solution?

8. State in your own words the (Ordinary) Principle of Mathematical induction:

   To prove that property p(n) is true for all integers $n \geq n_0$, (you fill in the rest)

   (a)

   (b)

9. Prove: For all N≥0, $$\sum_{i=1}^{N} i \cdot 2^i = 2^{N+1}(N-1)+2$$

10. Prove that any amount of postage that is 24 cents or more can be obtained using only 5-cent stamps and 7-cent stamps

11. An Extended Binary Tree with n internal nodes has _______ external nodes.

12. Prove the statement from the previous question using (strong) induction, based on the definition of EBT.

13. A space for notes on Trominoes (most details are in the slides).