MA 308

Exam #1 Review

February 10, 2011

1. Review the Ongoing Course Notes on the course website, `http://www.ms.uky.edu/~lee/ma308sp11/ma308sp11.html`.

2. Review all of the problems worked on in class and on homework. *Be sure you know how to explain the reasoning behind all of the solutions.*

3. Room Diagonal Problem. Know how to solve this problem and to explain your solution.

4. Be able to derive the distance formula from the Pythagorean Theorem, and also apply the distance formula to finding the distance between points.

5. Locker Problem and related problems. In particular, be able to explain clearly why perfect squares have an odd number of factors, and why numbers that are not perfect squares have an even number of factors. Be able to explain how to use a systematic method, such as decision trees, to systematically enumerate all of the factors of a number. Be able to explain how and why you can determine the number of factors of a number from its prime factorization. Be able to construct numbers with certain numbers of factors.

6. Be able to use diagrams and other representations to make sense of multiplication and division of fractions.

7. Crossing the River Problem and related problems. Be able to explain how to solve particular instances of the problem. Be able to explain what the general formula is for arbitrary numbers of adults and children, and where this formula comes from.

8. Coin Weighing Problem. Know how to solve this problem for any number of coins that is a power of 3, and why this method works.

9. Be able to determine the number of ways to write a positive integer as a sum of 1's and 2's, when order matters, and to justify your answer.

10. Be able to determine the number of ways to write a positive integer as a sum of positive integers, when order matters, and to justify your answer.

11. Be able to describe the three algebraic habits of thinking that we discussed, and illustrate them with examples. Be able to answer the related Three Problems with justification.

12. Be able to distinguish between and to write recursive formulas and explicit formulas.

13. Be able to explain how to obtain and how to use the formula to determine the sum of the positive integers from 1 to n.

14. Be able to derive and explain a formula for the minimum number of moves needed to solve the Towers of Hanoi problem for n disks.