Walsh **DISCRETE MATHEMATICS** **Fall 2012**

MWF 10:00-10:50 AM, King 227

Instructor: Jim Walsh, King 220C
775-8387 (office); 775-8380 (messages)
(syllabus, homework assignments, handouts on Blackboard)

Office Hours:

Monday	3:20-4:20 PM
Tuesday	3:00-4:30 PM
Friday	10:50-11:50 AM

(*also by appointment*)

Text: S. Epp, *Discrete Mathematics with Application*, 4th edition, Brooks/Cole (2011). This required text is available at the College Bookstore.

Expectations: You are expected to come to class, to arrive on time, and to participate in class discussions. In addition to attending class twice per week, you are expected to spend *roughly* six hours per week outside of class on discrete mathematics.

Homework: Homework problems will be collected on a regular basis during the course of the semester. You may work with other members of the class on all homework problems, but not to the extent you simply copy another's work. You can also ask me about any and all problems in this course. If you do every assigned problem, collected or otherwise, you will likely do well and learn a lot. Please note that **late assignments will not be accepted.** Your lowest homework score will be dropped when computing final homework averages.

Exams: There will be three midterm exams during the semester and a cumulative final exam. The midterm exam dates are 5 October, 9 November and 14 December. Please let me know immediately if there is a problem with any of these dates. The final exam will take place on 20 December from 2:00-4:00 PM.

Grading: Each of the three midterm exams counts 20% toward the final grade. The final exam and the homework contribute 25% and 15%, respectively, toward the final grade.

Honor System: You are urged to review the Oberlin College Honor System, available, for example, on the Blackboard site for this course. You will be expected to adhere to the Honor System with respect to all of your work in this class. One example: You should not use solutions to homework or exam questions found on the internet or from homework or exam solutions distributed for this course in the past.

Another example: You may not copy any portion of the work of another student and submit it as your own.

Goals: (*i*) To present a survey of non-calculus-based mathematics. (*ii*) To begin the process of learning how to communicate in the language of mathematics. The aim is to cover much of chapters 1-10 in Epp.

Discrete Mathematics

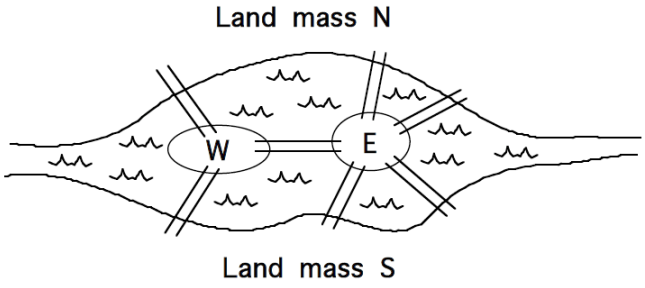
One interpretation of discrete mathematics is that of the science of patterns, arrangements and configurations. Thus, three questions arise again and again in its study:

(1) Does a particular type of arrangement exist? (**Existence**)

(2) How many such arrangements are there? (**Counting**)

(3) Which of the arrangements is best, according to some prespecified criterion? (**Optimization**)

Example 1. Konigsberg Bridge Problem (solved by L. Euler around 1740).



Is it possible to take a walk that starts at N, ends at N and crosses each bridge exactly once?

Example 2. The Traveling Salesperson Problem.

Suppose we must "tour" the dorms at Oberlin. Suppose we are to (a) start at King; (b) visit each dorm exactly once; and (c) return to King.

Questions: (1) Is there such a tour? (Existence)
(2) How many such tours are there? (Counting)
(3) In what order should we tour the dorms to minimize the total distance we walk? (Optimization)

Example 3. The Josephus Problem.

This problem is named for Flavius Josephus, a famous historian of the first century. Legend has it that Josephus was among a band of 41 rebels trapped in a cave by the Romans during the Jewish-Roman war. The rebels preferred suicide to capture, so formed a circle and, proceeding around it, eliminated every second remaining person until no one was left. But Josephus, wanting to save himself, quickly calculated where he should stand in order to be the last surviving member of the band.

Suppose there are n people numbered 1 to n around a circle, and we eliminate every second remaining person until only one survives. Determine J_n, the survivor's number.

Expect to try two or more approaches that fail before being able to solve a problem successfully. On challenging exercises allow yourself many hours of concentrated work, spread over several days, before getting help. **You will be amazed as you watch the problem solving process at work in your brain.**