Office Hours
Course Text
Prerequisites
Test Dates & Testing Policies
△ Check dates now!
Grading Policies
6 Come to class. Pay attention. Ask questions.
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- A question as vague as “I don’t get it” is perfectly acceptable.
- If you’re confused, *at least* 4 other people are, too.
1-3: How to Succeed

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2. Come by my office
   - I am very available to students.
1-4: How to Succeed

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- Start the homework assignments and projects early
  - Projects in this class are significantly harder than CS112
1-5: How to Succeed

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- Come by my office
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- Start the homework assignments and projects early
  - Projects in this class are significantly harder than CS112
- Read the textbook.
  - Ask Questions!
1-6: Words of Wisdom

6 “90% of life is showing up.” – Woody Allen
6 “Just keep swimming.” – Finding Nemo
6 “Never mistake activity for achievement.” – John Wooden
“90% of life is showing up.” – Woody Allen

“Just keep swimming.” – Finding Nemo

“Never mistake activity for achievement.” – John Wooden

“Do I contradict myself? Very well, then. I contradict myself. I am large; I contain multitudes.” - Walt Whitman
A problem is a well-defined description of a task to be performed. It provides a set of possible inputs and matching outputs for a given input. Should include resource constraints.

- “Given a list of numbers, sort them from smallest to largest without using additional memory.”
- “Given two floating-point numbers, compute their product.”
- “Given a list of tasks and deadlines, find the optimal schedule.”
  (but what does optimal mean?)
1-9: What is an algorithm?

- Each step must be well defined.
  - No ambiguity as to the order of operations
  - Each step must be concrete enough to be easily implemented.
- An algorithm must be correct.
- An algorithm must be composed of a finite number of steps (loops are OK).
- An algorithm must terminate.
1-10: What is an algorithm?

- An algorithm is like a recipe for solving a problem.
- Typically written in pseudocode.
- Algorithm $\neq$ Computer Program.
- A program is an *implementation* of an algorithm.
  - Note: not all programs are algorithms. (OS kernels don’t terminate, for example)
- Can have different implementations of the same algorithm
  - Different Languages
  - Different Coding Styles
**1-11: Example: Selection Sort**

- **Problem:** Given a list of n elements, sort them from smallest to largest without using additional space.
- **Input:** A list.
- **Output:** the same list, sorted in order.
Algorithm:

1. Examine all $n$ elements of a list, and find the smallest element
2. Move this element to the front of the list
3. Examine the remaining $(n - 1)$ elements, and find the smallest one
4. Move this element into the second position in the list
5. Examine the remaining $(n - 2)$ elements, and find the smallest one
6. Move this element into the third position in the list
7. Repeat until the list is sorted
1-13: Example: Selection Sort

Java Code:

```java
for (int i=0; i<A.length - 1; i++) {
    smallest = i;
    for (j=i+1; j<A.length; j++)
        if (A[j] < A[smallest])
            smallest = j;
    tmp = A[i];
    A[i] = A[smallest];
    A[smallest] = tmp;
}
```
Problem I: Bridge

Four people want to cross a bridge

- The bridge can only hold two people at the same time
- Each person requires a different amount of time to cross the bridge (1, 2, 5, and 10 minutes)
  - Some versions of this problem say that it’s the members of U2.
- It is pitch black, and they have only 1 flashlight which they need to shuttle back and forth across the bridge
- Can they do it in 17 minutes?
1-15: Purpose of the Problem

- Obvious solution is not always optimal
  - "Obviously" want fastest person to shuttle flashlight

- Optimal solution is often not obvious
  - Second-fastest person needs to do some of the shuttling
6 1 and 2 go over the bridge. (2 min total)
6 1 brings the flashlight back. (3 min. total)
6 5 and 10 go over the bridge (13 min. total)
6 2 brings the flashlight back. (15 min. total)
6 1 and 2 go over the bridge. (17 min. total)
Problem II: 8 Queens

- Standard 8x8 Chessboard
- Place 8 Queens on the board, so that no queen attacks another queen.
  - Queens can move in any compass direction any number of squares
1-18: 8-Queens Data Structures

- Two-dimensional array of characters.
- List of x-y coordinates of each queen.
- Array of integers:
  - Each element in this array represents a column.
  - Value stored in element $i$ represents the row in which the queen at column $i$ is located.
Different algorithms for solving this problem may perform differently.

Algorithm 1: Assign each queen a column. Place all queens at once. Check to see if there are conflicts.
- Worst case: 1,677,216 cases

Algorithm 2: Assign rows from left to right. If there’s a conflict, back up and undo the last row.
- Worst case: 40,320 cases
Read “Chapter 2 – Mathematical Preliminaries” in the required text, *A Practical Introduction to Data Structures in Java*.

- This material should be review from Discrete Mathematics.
- If you don’t ask questions about this material, I will expect that you know it. If you are not 100% clear on the material in chapter 2, ask questions in class or in my office!
- I’ll review it briefly on Wednesday; then we’ll start on Chapter 3.