

For Friday

- Submit your rough draft to Blackboard
- Bring two hard copies of the rough draft to class
- Remember that these rough drafts are to be complete – grade for the rough draft will be based purely on how complete the paper is, rather than its quality
- **BE ON TIME!**

For Monday

- Read chapter 12, section 2
- Chapter 10, exercise 31

Research Paper

- Any questions?

Program 5

- Any questions?

Random Numbers

- Are they really random?
- What makes a good sequence of numbers for the purposes of randomized algorithms?

Linear Congruential Generators

- Basic concept:
 - $x_{i+1} = Ax_i \bmod M$
- First x must be given: cannot be 0.
- Quality of the generator depends on the selection of A and M.
- If M is prime, x_i is never 0.
- Need to handle arithmetic overflow.
- PS: Standard rand() is not this good.

Skip Lists

Problem Solving as Search

- Many problems have a solution space that can easily be thought of as a directed graph or a tree
- We can solve problems of this type by searching for the optimal solution in the space of possible solutions (the **solution space**)

Implicit Trees/Graphs

- Note that we do NOT have to construct the graph of the entire solution space
- We only need a procedure for finding the next set of nodes

Backtracking

- Essentially, depth-first search in a solution space which can be represented as a directed graph
- When we discover that the current node does not produce the solution we want, we backtrack to a node where we can make an alternate decision and proceed from there

Backtracking Method Steps

- Define the solution space
- Organize the space appropriately to search in
- Search depth-first using bounding functions to avoid searching uninteresting parts of the space

Backtracking Approach

- We're going to load the first ship with containers that match its capacity as closely as possible
- If the second ship has capacity greater than the remaining boxes, we have a feasible solution

Bounding Functions

- We need to recognize infeasible solutions
- We need to recognize bad solutions

N-Queens

- Placing a set of N queens on an $N \times N$ board such that no two queens are attacking each other.