#### www.cs.cmu.edu/~15251

Check this Website OFTEN!

## **Course Staff**

#### Instructors

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# Weekly Homework

Homework will go out every Tuesday and is due the Tuesday after

Ten points per day late penalty

No homework will be accepted more than three days late

### Assignment 1: The Great 251 Hunt!

You will work in randomly chosen groups of 4

The actual Puzzle Hunt will start at 8pm tonight

You will need at least one digital camera per group

Can buy a digital camera for \$8 nowadays!

### **Collaboration + Cheating**

You may NOT share written work

You may NOT use Google, or solutions to previous years' homework

You MUST sign the class honor code

# Textbook

There is NO textbook for this class We have class notes in wiki format You too can edit the wiki!!!







The chefs at our place are sloppy: when they prepare pancakes, they come out all different sizes

When the waiter delivers them to a customer, he rearranges them (so that smallest is on top, and so on, down to the largest at the bottom)

He does this by grabbing several from the top and flipping them over, repeating this (varying the number he flips) as many times as necessary

























# Initial Values of P<sub>n</sub>

n	0	1	2	3
P <sub>n</sub>	0	0	1	3

# P<sub>3</sub> = 3

 $\begin{array}{c|c} 1 \\ 3 \\ 2 \end{array} | requires 3 Flips, hence P_3 \ge 3$ 

ANY stack of 3 can be done by getting the big one to the bottom ( $\leq 2$  flips), and then using  $\leq 1$  flips to handle the top two













? ≤ P<sub>n</sub> ≤ 2n-3













#### ANY Stack S to ANY stack T in $\leq \boldsymbol{P}_n$

S: 4,3,5,1,2 T: 5,2,4,3,1 1,2,3,4,5 "new T"

Rename the pancakes in S to be 1,2,3,..,n

Rewrite T using the new naming scheme that you used for S

The sequence of flips that brings the sorted stack to the "new T" will bring S to T

The Known Pancake Numbers				
n	P <sub>n</sub>			
1	0			
2	1			
3	3			
4	4			
5	5			
6	7			
7	8			
8	9			
9	10			
10	11			
11	13			
12	14			
13	15			









How many different stacks of n pancakes are there?

n! = 1 x 2 x 3 x ... x n

## Pancake Network: Definition For n! Nodes

For each node, assign it the name of one of the n! stacks of n pancakes

Put a wire between two nodes if they are one flip apart





## Pancake Network: Reliability

If up to n-2 nodes get hit by lightning, the network remains connected, even though each node is connected to only n-1 others

The Pancake Network is optimally reliable for its number of edges and nodes





# **High Level Point**

Computer Science is not merely about computers and programming, it is about mathematically modeling our world, and about finding better and better ways to solve problems

Today's lecture is a microcosm of this exercise



