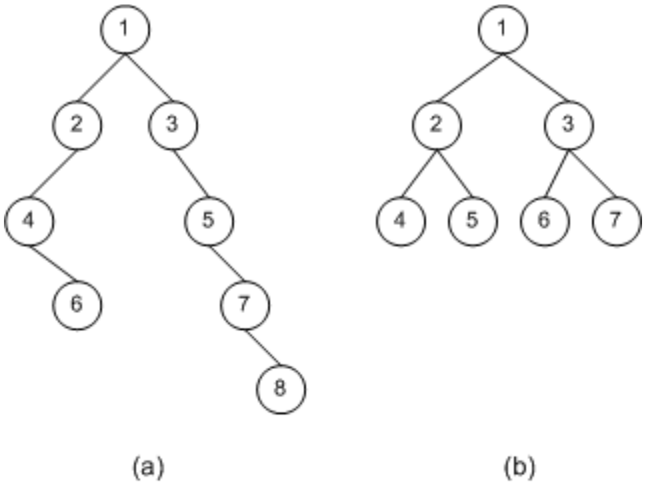
Q1



CSSE 230 Day 11

Size vs height in a Binary Tree

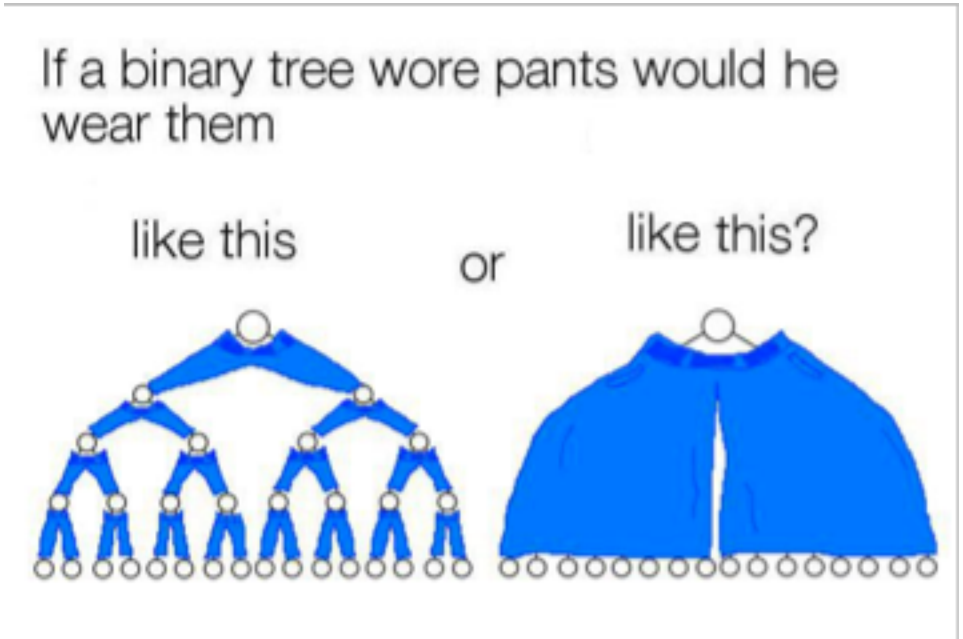
After today, you should be able to…
… use the relationship between the size and height of a tree to find the maximum and minimum number of nodes a binary tree can have
…understand the idea of mathematical induction as a proof technique

http://i.msdn.microsoft.com/dynimg/IC71494.gif

Team project starts Day 13

- Can voice preferences for partners for the term project (groups of 3)
  - EditorTrees partner preference survey on Moodle.
    - Preferences balanced with experience level + work ethic.
      - If course grades are close, I'll honor mutual prefs.
      - If no mutual pref, best to list several potential members.
      - If you don't want to work with someone, I'll honor that. But if your homework or exam average is low, I will put you with others in a similar position. Sorry if that's not your preference, but I can't burden someone who is doing well with someone who isn't.
    - Consider asking potential partners these things:
      - Are you aiming to get an A, or is less OK?
      - Do you like to get it done early or to procrastinate?
      - Do you prefer to work daytime, evening, late night?
      - How many late days do you have left?
      - Do you normally get a lot of help on the homework?
  - Survey is due Day 12; do it as soon as you can.

Some meme humor



http://www.smosh.com/smosh-pit/memes/internets-best-reactions-if-dog-wore-pants
http://knowyourmeme.com/photos/1272773-if-a-dog-wore-pants

Other announcements

- Today:
  - Size vs height of trees: patterns and proofs
- Wrapping up the BST assignment, and worktime.

Extreme Trees

- A tree with the maximum number of nodes for its height is a **full** tree.
- A tree with the minimum number of nodes for its height is essentially a ______ ______
- Height matters!
  - Recall that the algorithms for search, insertion, and deletion in a binary search tree are **O(h(T))**

Q5

Mathematical Induction

- To prove that p(n) is true for all $n \geq n_0$:
  - Prove that $p(n_0)$ is true (base case), and
  - Prove that **if p(k) is true** for any $k \geq n_0$, then p(k+1) is also true.

    [This part of the proof must work for all such k!]

To prove recursive properties (on trees), we use a technique called mathematical induction

- Actually, we use a variant called *strong induction* :

The former governor of California

Q6

Strong Induction

- To prove that p(n) is true for all $n \geq n_0$:
  - Prove that $p(n_0)$ is true (base case), and
  - For all $k > n_0$, prove that if we assume p(j) is true for $n_0 \leq j < k$, then p(k) is also true

- An analogy:
  - Regular induction uses the previous domino to knock down the next
  - Strong induction uses all the previous dominos to knock down the next!

- Warmup: prove the arithmetic series formula
- Actual: prove the formula for N(T)