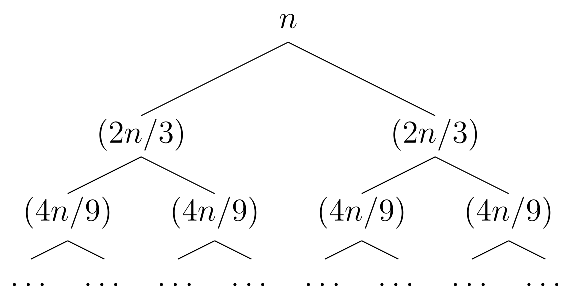
COMP 550
Algorithms and Analysis
Spring 2020
Pop Quiz 2

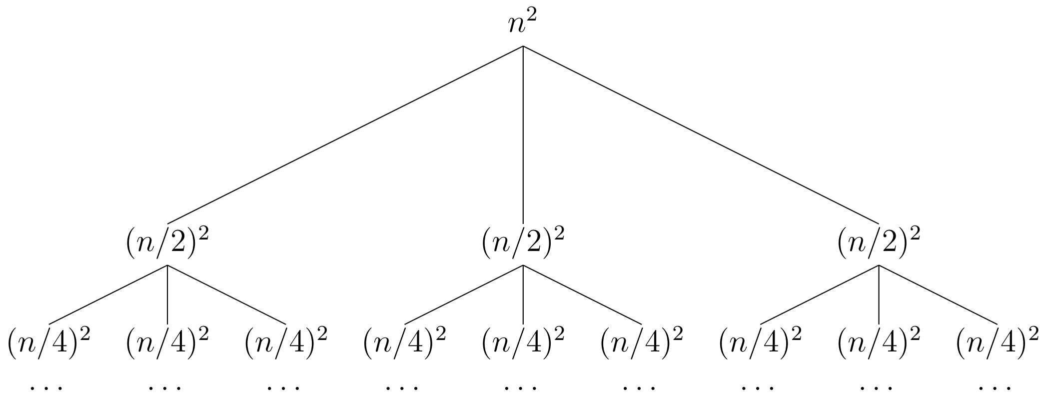
This quiz continues on the back.

Consider a recursion tree that looks like this:



1. Suppose this tree is generated by the recurrence relation $T(n) = aT(n/b) + n^k$.
   a) Give a non-negative integer or rational number for a. _____
   b) Give a non-negative integer or rational number for b. _____
   c) Give a non-negative integer or rational number for k. _____
2. Roughly how many levels would there be in this tree, as a function of n? Pick the best answer.
   a) n^2
   b) $2n$
   c) n
   d) $log_{(3/2)}(n)$
3. How many leaves would there be in this tree, as a function of n? Pick the best answer.
   a) $n^{3/2}$
   b) n
   c) $n^{log_{3/2}2}$
   d) $log_{3/2}n$
4. Solve the recurrence to obtain an asymptotic expression for $T(n)$ as a function of n. Pick the best answer.
   a) $T(n)$ is about $(3/2)^n$ for large n.
   b) $T(n)$ is about $n^{log_{3/2}2}$ for large n.
   c) $T(n)$ is about n^2 for large n
   d) $T(n)$ is about $log_{3/2}n$ for large n.

Now consider a recursion tree that looks like this:



5. Suppose this tree is generated by the recurrence relation $T(n) = aT(n/b) + n^k$.
   a) Give a non-negative integer or rational number for a. _____
   b) Give a non-negative integer or rational number for b. _____
   c) Give a non-negative integer or rational number for k. _____

6. Roughly (to within +/-1) how many levels would there be in this tree, as a function of n? Pick the best answer.
   a) n^2
   b) $2n$
   c) n
   d) $log_2(n)$

7. How many leaves would there be in this tree, as a function of n? Pick the best answer.
   a) n^2
   b) n
   c) $n^{log_2 3}$
   d) $log_2 n$

8. Solve the recurrence to obtain an asymptotic expression for $T(n)$ as a function of n. Pick the best answer.
   a) $T(n)$ is about 2^n for large n.
   b) $T(n)$ is about $4n^2$ for large n.
   c) $T(n)$ is about n^2 for large n
   d) $T(n)$ is about $log_2 n$ for large n.