COMP 550
Algorithms and Analysis
Spring 2020
Pop Quiz 8
Thursday, April 9, 2020
Don't forget to write your name on the quiz sheet. This quiz continues on the back.

1. What is an asymptotic bound for the time taken by the dynamic programming longest common subsequence algorithm on sequences of length $m$ and $n$? Choose the best answer.
   a)$\Theta(2^{m*n})$
   b)$\Theta(2^{m+n})$
   c)$\boxed{\Theta(m*n)}$
   d)$\Theta(m+n)$

2. What is an asymptotic bound on the time taken to find the longest common subsequence of two sequences $X$ and $Y$ of length $m$ and $n$ by exhaustively considering all subsequences of $X$ and checking which of them are subsequences of $Y$? Choose the best answer.
   a)$\Theta(2^m * n)$
   b)$\boxed{\Theta(2^m + n)}$
   c)$\Theta(m*n)$
   d)$\Theta(m+n)$

Consider a binary search tree where the probabilities of searching for each key are as indicated:

```
            .25
          /     \
       .10       .15
      /    \
   .20     .30
```
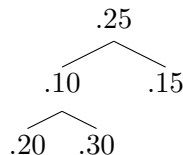
3. What is the expected number of nodes visited in a random successful search operation on this tree? _____2.25_____

4. Is this an optimal binary search tree? _____No_____

5. Suppose $A_1$, $A_2$, $A_3$, and $A_4$ are four matrices of dimensions $3 \times 5$, $5 \times 7$, $7 \times 2$, and $2 \times 10$, respectively. (a) How many multiplications does it take to perform the matrix multiplication $((A_1A_2)A_3)A_4$? _____207_____ (b) Is this an optimal way to multiply these matrices? _No_

Consider the following table:

|   |   | a | b | a | c | b |
|---|---|---|---|---|---|---|
|   |   |   |   |   |   |   |
| c |   |   |   |   |   |   |
| b |   |   |   |   |   |   |
| a |   |   |   | A | B | C |
| b |   |   |   | D | E | F |
| a |   |   |   | G | H | I |

6. Fill in the blanks $A$ through $I$ with the numbers $c[i,j]$ used in the longest common subsequence algorithm for those squares. A __2__ B __2__ C __2__ D __2__ E __2__ F __3__ G __3__ H __3__ I __3__ Show a longest common subsequence. _____bab_____