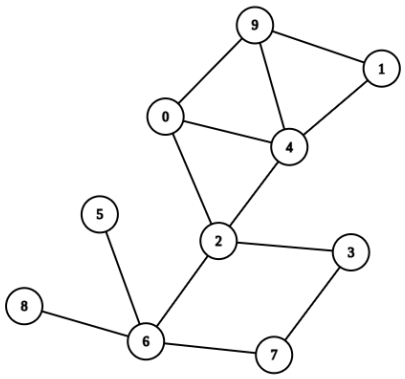
Exam 2 Practice C 25X

Problem 1



Give the order of nodes in each of the searches below, starting at the indicated node. When a method may select from among many next candidate nodes, prefer the node which has a larger value.

i Breadth First Search starting at node 2

ii Depth First Search starting at node 2

iii Breadth First Search starting at node 4

iv Depth First Search starting at node 4

Problem 2

Recall that $f(x) = O(g(x))$ means that:

$$\exists c, x_0 \in \mathbb{R} \text{ with } x_0 \leq x \Rightarrow 0 \leq f(x) \leq cg(x)$$

Using this definition, show each of the statements below is true or explain, in one sentence, why the statement is false. To show one of these statements is true, write out the conditional above with your values for c, x_0 plugged in.

i $20x + 100 = O(x)$

ii $40x^2 - 8x = O(x^2)$

Problem 3

How many ways can we line up 5 people for picture, of 8 total, if person 2 must be directly to the right of person 1 in every picture person 2 is included in?

Problem 4

A license plate reader is a system which identifies the text of a license plate given a camera's image of the back of a car (useful in parking enforcement). When its not raining, the system is able to identify 99% of the license plates correctly. Unfortunately, when it rains the system struggles to see clearly and only identifies 90% of the license plates correctly. In a particularly rainy parking lot, there is a $\frac{1}{4}$ chance of rain each day.

i What is the probability that its raining and a license isn't read correctly?

ii What is the probability that its not raining and a license isn't read correctly?

iii What is the probability that a license isn't read correctly?

iv Suppose that you receive a parking ticket for someone else's car because their license plate was incorrectly read as yours. What is the probability that it was raining when this other car's license plate was read incorrectly?

Problem 5

There are 2504 computer science students at a school. Of these, 1876 have taken a course in Java, 999 have taken a course in Linux, and 345 have taken a course in C. Further, 876 have taken courses in both Java and Linux, 231 have taken courses in both Linux and C, and 290 have taken courses in both Java and C. If 189 of these students have taken courses in Linux, Java, and C, how many of these 2504 students have not taken a course in any of these three programming languages?

Problem 6 Probability rolls

You don't need to simplify.

1. What is the probability of rolling a six on at least one die when rolling four six-sided dice?

2. What is the expected number of sixes when rolling four six-sided dice? (Hint: Use linearity of expectation.)

3. When rolling two six-sided dice, are rolling at least one six and rolling at least one four independent events? Show a calculation that supports your answer.

4. A board game player rolls two six-sided dice secretly and smiles. You estimate there is a 50% chance the player would smile if the sum of the dice is at least 10, and a 20% chance the player would smile with a roll of less than 10. Use Bayes' Theorem to calculate Pr[rolled at least 10 | smile].