Exam 2 Practice A 25X

Problem 1

A course has 4 sections. Each contains 239, 243, 87 and 49 students respectively.

i If six students from the smallest section form a study group, how many different groups could there be?

ii How many different study groups can be formed from one student from each section? (Four total students in the group).

iii How many ways can a particular student, Sally, from the second section form a study group with two students from the first section (239 students)?

iv Sally is now willing to form a group with two students from either the first *or* third sections (potentially one from each), how many different groups can she form?

v Sally realizes that the two sections have different styles, so she now wishes to select the two students from either the first or third section, but not both, how many different groups can she form?

Problem 2

How many different numbers can be made by rearranging the digits in the number 7302833? (e.g. 0233378)

Problem 3

An internet service provider's call center receives calls which are each one of the following types:

Call Type	Time of Call (min)	Probability
General Inquiry	2	0.20
Technical Support	4	0.25
Billing Questions	3	0.15
Service Activation	7	0.10
Device Troubleshooting	5	0.30

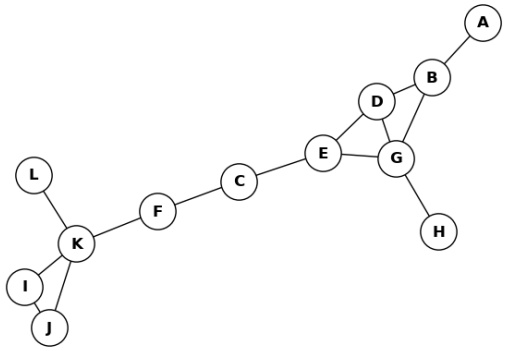
Table 1: Probability of Response Time for Call Center (Sum to 1)

i Compute the expected time it takes to handle a single call

ii Compute the variance in time it takes to handle a single call

iii An employee working at the center is able to handle 15 calls in an hour (this employee's calls follow the same distribution as above). Is this employee typically faster or slower than others in the group? Explain

Problem 4



Wherever possible below, select the node which is earlier in the alphabet first (e.g. prefer visiting node A first over node B, when the search allows you to visit either).

i Starting at L, find the Breadth-First-Search (BFS) ordering of nodes in the graph above.

ii Starting at A, find the Breadth-First-Search (BFS) ordering of nodes in the graph above.

iii Starting at D, find the Breadth-First-Search (BFS) ordering of nodes in the graph above.

iv Starting at L, find the Depth-First-Search (DFS) ordering of nodes in the graph above.

v Starting at A, find the Depth-First-Search (DFS) ordering of nodes in the graph above.

vi Starting at D, find the Depth-First-Search (DFS) ordering of nodes in the graph above.

Problem 5

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 $x = O(2^x)$

ii $100x + 5 = O(x)$

iii $x! = O(\log_2 x)$

iv $999x = O(.001x^2)$

Problem 6 ★ Car Models onto Dealerships

A car factory has 74 engines which are compatible with 3 models of cars (model-A, model-B and model-C). How many different deliveries can they make to their 11 dealerships?

For example, the factory might deliver

- 70A, 0B, 0C cars to dealership 1
- 1A, 1B, 1C cars to dealership 2
- 1A, 0B, 0C cars to dealership 3
- no cars to all remaining dealerships because the 74 engines have already been used in the 74 cars above