Practice Problems 8 Solutions

Be sure to provide an answer for each question. You may work with other students, as well as use your notes, the book, and the internet. Do make sure you understand how to solve the problems and answer the questions, as similar ones may appear on the exams.

1. You are the owner of a computer component manufacturing company. Your manufacturing plant has 10 different machines that can be tooled to make a variety of chips and boards. Specifically you can make memory chips that are 2GB, 4GB, 8GB, and 16GB, or motherboards that are 12”x12”, 15”x15”, and 21”x21”. Each machine can only make one type of chip or one type of board at a time, and retooling a machine takes a full day to accomplish. How many different ways can you configure the machines to produce computer component on any given day, assuming all of the machines have been completely setup for that day?

   10 machines and 7 assignments

   7^10 = 282475249 different possible combinations

2. One of the key features of any good manufacturing process is quality assurance testing. It is important to test a percentage of every batch of products to ensure that they contain the smallest number of defective parts. In this case, you need to select five components out of every batch of twenty to test. If two of your five components are defective, you can immediately stop testing and mark the entire batch as faulty. Given this process, and the fact that each component has a unique manufacture ID, how many different ways can you select five components to test from a batch of twenty?

   Select 5 chips from 20, order matters.

   20!/(20-5)! = 1860480 different ways to select the five chips

3. Because you make your own hardware, you have found that it is advantageous to write an operating system specifically for that hardware. Our new operating system has a very special scheduling algorithm for scheduling ready processes. It determines the optimal schedule by examining all possible permutations, and finding the permutation that has the lowest average run time. Assuming you have eight processes that are all in the ready queue (i.e. need to be scheduled), how many different schedules will your OS need to examine in order to make the optimal decision?

   Eight processes to choose from
   8! = 40320

4. How many strings made up of five characters, using only the characters 0, 1, or 2, contain exactly one 1?

   The 1 can be in 5 different spots, and the other slots must be either 0 or 2. So that gives us 5x2x2x2x2 or 80

5. How many strings made up of five characters, using only the characters 0, 1, or 2, contain no ones?

   You can only use the numbers 0 and 2. So we can assign our two choices to each position which gives us 2^5 different assignments or 32

6. A family has four children. Their home has three bedrooms for the children. Two of the bedrooms are only big enough for one child. The other bedroom will have two children. How many ways are there to assign the children to bedrooms?

   There are four ways to select the child who will get the first single room. Then there are three ways to select the child who will get the second single room. The two remaining children are placed in the double room. Therefore the number of ways to assign children to rooms is P(4,2) or 4·3 = 12.

7. An employee of a grocery store is placing an order for soda. There are 8 varieties of soda and they are sold in cases. Each case contains all the same variety of soda. The store will order 50 cases total. How many unique orders can the store place?

   The number of ways to select 50 cases from 8 varieties is (50+8-1) choose (8-1), or 57 choose 7, which is 264385836 possible ways.