Math 124 C1 Homework #2 Solutions
Ch. 5.2 #5a, 10a, 12, 16, 18, 21, 28, 29
Ch. 5.3 #6, 10, 16

Ch. 5.2

#5.a.

The first "stage" is selection of the route, and there are 16 choices here. The second stage is selection of the class of service, of which there are 3. There are thus $3 * 16$ different types of ticket that must be printed.

#10.a.

The woman has 7 choices of city, 4 choices of job, and 3 choices of living arrangement. Thus she has $7 * 4 * 3$ different possibilities available to her.

#12.

Since there are two different sets of options for treatment on even days and on odd days, we must break down the possibilities depending on whether or not we are on an even or odd day.

If it is an odd day, we have 3 options for treatment, 16 options for tests, and 5 options for laboratory, so there are $3 * 16 * 5$ total possibilities.

If it is an even day, we have 4 options for treatment, 16 options for tests, and 5 options for laboratory, so there are $4 * 16 * 4$ total possibilities.

#16.a.

First, notice that there are 5 different objects contained in the basket. If we draw an ordered sample of 4 objects with replacement, there are then 5^4 different possible ordered samples.

#16.b.

If we draw the items without replacement, there are then $5 * 4 * 3 * 2$ different ordered samples that can be drawn.

#18

Since the man has 7 choices of city and 6 choices of car, there are $7{*}6$ total city-car combinations possible.

#21

The strategy should always be to list the 0-element subsets, then the 1-element subset, and so on.

There is only one 0-element subset, $\emptyset$.

There are three 1-element subsets, $\{x\}, \{y\}$, and $\{z\}$.

There are three 2-element subsets, $\{x, y\}, \{y, z\}$, and $\{z, x\}$.

There is one 3-element subset, $\{x, y, z\}$.

Since the set only has three elements, there can be no subsets with more elements.

#28

We want to draw a cast of 6 actors from a pool of 15 applicants. Since we cannot cast an actor in more than one role, and we will not allow replacement. Further, since it matters which actor is assigned to which role, the order matters.

Thus we are looking for how many ordered 6-tuples there are drawn from a set with 15 elements. This number is $P(15, 6) = \frac{15!}{9!} = 15 * 14 * 13 * 12 * 10 * 9$.

#29

We first note that there are 3! ways of arranging the three plates on one shelf, and 5! ways of arranging the five vases on the other shelf. Using the principle of counting, we see that there must then be $3! * 5!$ different ways of arranging all of the objects.

Ch. 5.3

#6

$$C(6,3) = \frac{6!}{3! * 3!} = \frac{6 * 5 * 4 * 3 * 2 * 1}{3 * 2 * 1 * 3 * 2 * 1}$$

$$= 5 * 4 = 20$$

#10

The collector wants to pick 4 stamps from a set of 14. Since he cannot pick the same stamp twice, there is no replacement allowed. Further, it does not matter which order he picks them in. The correct value to find is therefore $C(14, 4)$.

$$C(14,4) = \frac{14!}{4! * (14-4)!} = \frac{14!}{4! * 10!}$$

$$= \frac{14 * 13 * 12 * 11}{4!} = \frac{14 * 13 * 12 * 11}{4 * 3 * 2 * 1}$$

$$= \frac{14 * 13 * 12 * 11}{12 * 2} = 7 * 13 * 11$$

#16.

In selecting 5 bats from a set of 8, again, there is no replacement and order does not matter. The correct value is therefore $C(8, 5)$.

$$C(8,5) = \frac{8!}{5! * (8-5)!} = \frac{8!}{3! * 5!}$$

$$= \frac{8 * 7 * 6}{3!} = 8 * 7$$

In discarding 3 bats from 8, since there is no replacement and no order, the correct value to find is $C(8, 3)$.

$$C(8,3) = \frac{8!}{3! * (8-5)!} = \frac{8!}{3! * 5!} = 8 * 7$$