

Exercises Lecture 2: Probability - Part II

1. You want to buy a new desktop computer which you can customize yourself. In particular, on DELL's webpage you see that there are 2 choices for a processor, 3 different operating systems, 4 levels of memory, 4 hard drives of differing sizes, and 10 choices for a monitor. How many possible types of desktop computers can you build?

Solution:

There are $2 \times 3 \times 4 \times 4 \times 10$ possible configurations.

2. In how many different ways can a student club at a large university with 500 members choose its president and vice president?

Solution:

This is an example of permutation without replacement: 500×499 .

3. How many ways are there to arrange 6 books on a shelf?

Solution:

This is an example of permutation without replacement: $6!$.

4. We rent five movies to watch over the span of two nights. We wish to watch 3 movies on the first night. How many distinct sequences (i.e., ordered arrangements) of 3 movies could we possibly watch (assuming that we do not want to watch the same movie again)?

Solution:

This is an example of permutation without replacement: $\frac{5!}{2!}$.

5. Selecting a Committee:

- Suppose that a committee composed of eight people is to be selected from a group of 20 people. What is the number of different groups of people that might be on the committee?
- Suppose now that the eight people in the committee each get a different job to perform. What is the number of different groups of people that might be on the committee?

Solution:

- $\binom{20}{8}$
- $\frac{20!}{12!}$

6. Suppose in a Chinese restaurant there are four different meat dishes, three different fish dishes and six different vegetable dishes.

- (a) How many combinations of three dishes can you make when you only want to select one from each type. Assume that the order in which the meat, fish and vegetable dishes are served is not important.
- (b) How many combinations of three dishes can you make when you do not take the type of dish into account (but there should be three different dishes).

Solution:

- (a) The menu consists of a meat dish (M) a fish dish (F) and a vegetable dish (V). If we don't care about the order in which the dishes are served, MFV or FMV or MVV then the answer is easy : There are 4 possibilities for M, 3 for F and 6 for V. In total we are going to serve (based on the multiplication rule) $4 \cdot 3 \cdot 6 = 72$ different dishes.
- (b) We don't care about the type of dish any more, thus we can serve $4+3+6=13$ dishes. $n=13$ choices and we want $r=3$ of them (Combinations without Replacement) thus possible number of combinations:

$$\binom{13}{3} = \frac{13!}{(13-3)!3!} = 286.$$