Example I am a contestant on Fear Factor. A jar in front of me contains 3 snakes (with venom), 5 spiders, and 4 bees. Magically, they do not attack each other but patiently wait for me to put my hand in the jar. I am crazy enough to do it. After 1 minute I take it out and see that it has 3 bites; what is the chance that all the bites are from the bees and I will get to see the episode aired?

Example

Suppose that in Toronto there are only two chains who handle all the selling of coffee in the city (oh, how horrendous!): Second Cup and Starbucks. We know that 60% of the people purchase coffee from Second Cup, 70% buy coffee from Starbucks, and 20% do not drink coffee (and don't buy it either). However, by saying that a person purchases coffee from one coffee shop we don't mean to say that it necessarily buys *only* from that shop.

1) What is the chance that a person picked at random in Toronto gets coffee at both Starbucks and Second Cup?

2) What is the percentage of people in Toronto who get their coffee only at Starbucks?

Example

Suppose that a town has three local newspapers (A, B and C).

Suppose that

- 10% read newspaper A
- 20% read newspaper B
- 5% read newspaper C
- 8% read A and B
- 2% read A and C
- 4% read B and C
- 1% read A, B and C

1) What is the percentage of people reading only one newspaper?

2) What is the percentage of people reading exctly two newspapers?

3) What is the percentage of people reading A or B?

Example An innocent tourist comes to Toronto in May to enjoy our great city. He gets hurt in a car-racing contest on a dark street. He gets in a nice hospital room with an abundance of mosquitoes located next to the SARS ward.

We know that:

- there is a 20% chance to contract the West Nile virus from one of those mosquitoes.

- there is 10% chance to contract SARS

- there is a 30% chance to leave the bed without scars from the accident

- there is a 3% chance to get SARS and WNV

- there is a 10% to get the scars and the SARS

- there is a 5% to get the scars and the WNV

- there is 1% chance that all three bad things happen to him (poor thing!)

What is the chance that we will **NOT** leave the city the same way he came (and therefore not be able to wear one of those T-shirts with "I survived Toronto")?

Example

Mr. Jones has 10 books he wants to arrange on a shelf. Of these books, 3 are mathematics books, 4 are chemistry books and 3 are physics books.

a) [5 points] How many arrangements of the 10 books on the shelf are possible if Mr. Jones want to indulge a small mania and wants the 3 mathematics books to be next to each other?

b) [5 points] How many arrangements are possible if the mania is serious and she needs to have all the books dealing with the same subject together (next to one another) on the shelf?

Example 1

A tourist (maybe the same one from one of the previous problems) wanders on Bloor street and does not know where he is going. At each intersection he decides at random to go either east or west. Suppose that each time he chooses by flipping a coin.

a) After walking a length equal to four blocks what is the probability that he is back at the starting point, say Yonge & Bloor.

b) What is the probability that he is one block away from the starting point.

Example 2

1) How many four digit numbers can be formed by using only digits 2,4,6,8, and 9?

2) How many of the above have some digit repeated?

Example 3

The elevator of a four-floor building leaves the first floor with six passengers and stops at all of the remaining three floors. If it is equally likely that a passenger gets of at any of these floors what is the probability that at each stop at least one passenger departs?

Example 4

Professor X is somewhat familiar with 6 languages.

1) To translate texts from one language into another directly how many two-way dictionaries does he need?

2) To translate texts from one language into another directly how many one-way dictionaries does he need?

Example 5

At various yard sales a woman has acquired five forks, four knives, and seven spoons of which no two are alike. In how many different ways can she arrange a three place settings? (assume the place at the table is not important).

Example 6

A box contains five blue and and eight red balls. Jim and Jack start drawing balls from the box, one at a time, at random and without replacement until a blue ball is drawn. Given that Jim starts first what is the probability that Jack draws the blue ball?