University of British Columbia
Okanagan

Introduction to Statistics
Stat 230

Lab 2
Counting and Probability

Instructions:

- Define your events before you begin.
- Have your probability equations handy.
- Use diagrams if necessary.

1. Suppose that I want to purchase a tablet computer. I can choose either a
   - large or a small screen;
   - a 64GB, 128GB, or 256GB storage capacity,
   - a black or white cover.

   How many different options do I have?

2. An urn contains 10 different coloured balls.
   (a) How many ways can you choose 5 balls from the urn.
   (b) How many distinct ways are there to arrange all the balls if they're all out of the urn?
   (c) Suppose there are now 3 red balls, 3 blue, 2 green and 2 purple. How many distinct ways are there to arrange all the balls if they're all out of the urn?
   (d) What is the probability of choosing a red ball, followed by two green balls and then a purple ball (**without replacement**)?
   (e) Suppose there are now 3 red balls, 3 blue, 2 green and 2 purple. You choose 5 balls (**with replacement**) from the urn. What is the probability of getting exactly 1 red ball?

3. You toss a fair coin three times.
   (a) What is the probability of three heads, HHH?
   (b) What is the probability that you observe exactly one heads?
   (c) Given that you have observed at least one heads, what is the probability that you observe at least two heads?

4. In Kelowna, it's rainy one third of the days.

   - Given that it is rainy, there will be heavy traffic with probability $\frac{1}{2}$.
   - Given that it is not rainy, there will be heavy traffic with probability $\frac{1}{4}$.
   - If it's rainy and there is heavy traffic, I arrive late for work with probability $\frac{1}{2}$.
   - On the other hand, the probability of being late is reduced to $\frac{1}{2}$ if it is not rainy and there is no heavy traffic.
   - In other situations (rainy and no traffic, not rainy and traffic) the probability of being late is $\frac{1}{4}$.

   You pick a random day.

   (a) What is the probability that it's not raining and there is heavy traffic and I am not late?

   (b) What is the probability that I am late?

   Hint: Draw a tree diagram.

5. Suppose we have the following information:

   - There is a 60 percent chance that it will rain today.
   - There is a 50 percent chance that it will rain tomorrow.
   - There is a 30 percent chance that it does not rain either day.

   Find the following probabilities:

   (a) The probability that it will rain today or tomorrow.

   (b) The probability that it will rain today and tomorrow.

   (c) The probability that it will rain today but not tomorrow.