
Statistics 251: Lab 2 Exercises – Probability and Random Variables

Important: Sit with the correct group. You will submit only one solution per group. However, each member should participate in completing the exercises. Keep track of time so that you will finish on time.

Exercise: Suppose there is a skytrain that travels at a variety of speeds depending on factors such as time of day, weather, etc. The speed at which the skytrain travels at can be modelled by the following random variable:

Speed (km/hr)	Probability
30	0.4
40	0.3
60	0.2
80	0.1

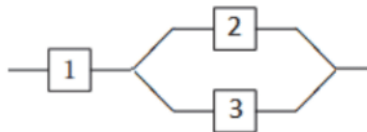
Part 1: The following problem will focus on simple probability rules (15 min)

- Suppose there are three such skytrains independently travelling at once. After one run of each skytrain, what is the probability that:
 - All three skytrains travelled at 40 km/hr?
 - All three skytrains travelled at 60 km/hr or less?
 - At least one skytrain travelled at 80 km/hr?
 - At least two skytrains travelled at 80 km/hr?

Hint: Remember addition, independence and complementary rules. For (c), consider finding the probability of the complement of the given event. For part (d), count the number of ways that at least two skytrains can travel at 80 km/hr, and then calculate the probability of each set of those events.

Part 2: Conditional probabilities (15 min)

- Suppose we take 3 skytrains and connect them in a chain as shown in the picture below:



The probability that each skytrain breaks down and stops is 0.1.

- Find the reliability of the whole skytrain chain.
- Given that the chain is broken, find the probability that skytrain 1 broke down.
- Suppose you know with 100% certainty that skytrain 3 will not break down. What is the updated reliability of the skytrain chain?