# Fundamentals of Probability – Week 1

## Problem 1

### What is p?

hence

### What if you only tossed the coin once and got heads?

### Is it reasonable to give a single answer?

The answers will be more accurate if uncertainty is considered. The less data we have, the more unsure will we be about p.

## Problem 2

### What is the probability that a driver has smoked cannabis in the last 72 hours if they have tested positive?

We know that:

Hence, the probability that a driver has smoked cannabis in the past 72 hours is ***69.2%.***

### What is the probability that someone smoked cannabis in the last 72 hours if they have not tested positive?

We know that:

Hence the probability that someone smoked cannabis in the last 72 hours if they have not tested positive is ***0.4%.***

## Problem 3

### What is the probability that a vote for the winner was cast by a viewer from Dover?

The probability that a vote for the winner was cast by a viewer from Dover is ***0.117***.

## Problem 4

### What are the chances that George knows what a neural network is?

* 50% certain George studied AI
  + 80% who study AI know what a neural network is
* 20% certain George majored in CS
  + 40% of the those who study CS know what a neural network is
* ---
  + 10% of rest of population know what neural network is

1. He could know if he did AI
   * You are 50% sure he studied AI and 80% if AI students know what a neural network.
2. He could know if he did AI
   * You are 20% sure he studied CS and 40% if CS students know what a neural network.
3. He could know randomly
   * 50% do AI, 20% do CS which means 30% don do either of those and 10% of the people who don’t do AI or CS know what a neural network.

Hence

There is ***a 51%*** chance that George knows what a neural network is.

## Problem 5

### What is the probability that this is the biased one?

The probability that this coin is the biased one is ***0.506.***

## Problem 6

### What would you do?

* If I turn in
  + I get 3 years in jail if my friend turns in
  + I get 0 years in jail if my friend refuses to turn in
* If I don’t turn in
  + I get 6 years in jail if my friend turns in
  + I get 1 year in jail if my friend refuses to turn in
* At the end of the day it depends on trust, but if I trust my friend then there is a higher probability that I would not turn him in, hoping that he would not turn me in, and share the guilt and stay in prison for 1 year.
* I would probably not turn myself in, hoping that my friend would not.