

1 More Review/Random Variable Intro

We are going to spend the day doing more probability questions (and so more counting questions) but with some added notation we will use later.

Example: Suppose we flip a coin 6 times. Let X be the number of heads that occurs. Find the probability we get exactly 2 heads. We can use the notation $P(X = 2)$. Similarly, find $P(X = 3)$. Now make a table showing all the possible values of X and the corresponding probabilities.

This type of notation is what we will call a Random variable. It is a convenience that we will use for experiments with some sort of numerical outcome. One of the best uses is that we can treat X algebraically. So we will ask questions like $P(X \geq 1)$ or $P((X - 3) = 0)$ both of which we can answer.

Example: A basketball player shoots freethrows with a percentage of 80%. They shoot until they miss or make 5. Let X be the number of shots they made. Find $P(X = 2)$. Find $P(X = 5)$. Make a table showing all possible values of X and $P(X = k)$ for each one of them.

The data in this table is called a probability distribution. It encapsulates all outcomes of an experiment and their probabilities. Then finding the probability of more complicated outcomes is just adding table values. For example $P(X \geq 3) = P(X = 3) + P(X = 4) + P(X = 5)$.

Here is another situation where this idea can be very convenient to use.

Example: Suppose we roll 2 fair 6 sided dice. Let X be the outcome of the first and Y be the outcome of the second. Find

- $P(X = 4)$
- $P(X > Y)$
- $P(X + Y = 5)$
- $P(X = Y)$

And describe each of these in words.

Answer more review questions if we have time.