Stat 202-2015XD-W2 – Thurs

A discrete random variable X is one with a finite number of possible values,

The probability distribution of X (discrete R.V.) lists all the possible values of X and their probabilities

Table. { Value of X: x_1 x_2 x_3 ... x_k
Probability: p_1 p_2 p_3 ... p_k

Probability histogram

In the coin toss example there were 8 possible outcomes, each equally likely, for the random phenomenon, eg

TTH, HTH, etc

There were only 4 possible values for the random variable,

Value of X	0	1	2	3
Probability	1/8	3/8	3/8	1/8

Here's another example

Lets say that every point on the earth is equally likely to be struck by a meteor (I don't know if this is true)

Then the probability of an area being struck next is equal to

$$\frac{\text{its area}}{\text{area of earth's whole surface}}$$

Let (x, y) be the lattitude and longitude of the next meteor strike,

These are the outcomes.

The random variable is going to be a function that assigns a number to each (x, y).

My random variable is going to assign

1 if Northern Hemisphere
0 if equator
-1 if Southern hemisphere.

Is this a discrete random variable?

Yes! Finite number of values
even though sample space is infinite
(assuming infinite precision in measurement
of latitude / longitude.

What is distribution

Value of X	-1	0	1
Probability	1/2	0	1/2

Equator has zero probability (zero area)
(even though it isn't impossible to land there)
↳ kind of like a coin landing on edge.

For a discrete random variable

1. Every probability p_i is a number between 0 and 1

2. $p_1 + p_2 + p_3 + \cdots + p_k = 1$

If the sample space is discrete you can find each p_i by adding the probabilities of the events that give x_i

Continuous Random variable

A continuous random variable X takes all values in an interval of numbers. (latitude of meteor strike)

The probability distribution of X is described by a density curve

The probability of any event is the area under the density curve and above the values of X that make up the event.

All continuous probability distributions assign probability 0 to every individual outcome (every latitude probability 0 like equator)

Only intervals of values have positive probability

Binomial Random variable

Concerns a sequence of observations,

(Think: Coin tosses)

1. There must be a fixed number of observations n (in other words the number of observations can't depend on the results

2. The results fall into two categories for convenience called "success" and "failure"
   (Must decide if heads is success or heads is failure, tails is whatever heads isn't)

3. Results of each observation is Independent (knowing results of some doesn't affect probabilities of the others)

4. For each observation, the probability of success is p.

The Binomial Random variable is the count of number of successes.

Pg 69

If (1) - (4) Hold can use Binomial calculator to get probabilities for number of successes } Easy way to do problems,

This is easy way to do problems 1–3 on Homework #10 (ie 4.34, 4.35, 4.36)

There is a hard way without StatCrunch A challenge is to figure it out, (Answers on back).

Show Statcrunch Binomial Calculator

Example of a random variable

TTT → 0
HTT → 1
HHT → 2
THT → 1
⋮ etc

} number of heads in 3 tosses of a coin.

Binomial Random Variable Calculator

n = ____ p = ____

$P(X \geq 3) =$ ____

X is number of successes in n observations where each has probability p of success.

X is a random variable.
(a function that assigns a number to each outcome

SSFSS FFFS → 5 (successes)