M358K: Sept 4^{th}, 2020.

More on discrete random variables.

Look into Chapter #3 to review probability.

<u>Example</u>. The simplest discrete random variable is the Bernoulli random variable, or a Bernoulli trial:

$$X \sim \begin{cases} 0 & \text{w/ probab. } 1-p \; (=: q) \\ 1 & \text{w/ probab. } p \end{cases} \quad p \in [0,1]$$

Its probab. mass function?

$$p_X(0) = \mathbb{P}[X=0] = 1-p$$

$$p_X(1) = \mathbb{P}[X=1] = p$$

x	0	1
$p_X(x)$	$1-p$	p

Note: This is a named dist'n w/ a single parameter interpreted as a probability of "success" in a particular trial.

Q: Write in the chat an example of when the Bernoulli(p) would be a appropriate model for some phenomenon!

Example. What happens if you repeat a number n = size of independent, Bernoulli(p) trials?

Let X_i, $i = 1..n$, be independent Bernoulli(p). We're interested in the total # of successes; our S will be

$$S = X_1 + X_2 + \cdots + X_n.$$

We get Binomial (n = # of trials, p = probab. of success in a single trial)

Q: What's the support of S?

$\{0, 1, \dots, n\}$

Q: What's its pmf?

For $k = 0, 1, \dots, n$:

$$p_S(k) = \binom{n}{k} \cdot p^k \cdot (1-p)^{n-k}.$$