Geometric Random Variables

geometric: count the # of trials UNTIL the 1st success.

X = # of trials it takes to get a success

ex: how many flips until I get a Heads?

ex: how many free throws until one is made?

ex: how many die rolls until I get a 6?

4 Conditions:

1. Binary (Success/Failure)
2. Independent
3. Trials? (count how many until 1st success)
4. Success (probability p must be the same each time)

Geometric Probability

p = probability of a success

k = trial # the 1st success occurs on

$$P(X=k) = p(1-p)^{k-1}$$

$$P(X>k) = (1-p)^{k}$$

ex: rolling a die. Success = rolling a 3 $p=\frac{1}{6}$

X = # of rolls it takes to get a 3

Let's find the probability that $X=8$ (k)

$P(X=8) = \frac{1}{6}\left(1-\frac{1}{6}\right)^{8-1} = \frac{1}{6}\left(\frac{5}{6}\right)^{7} = .047$

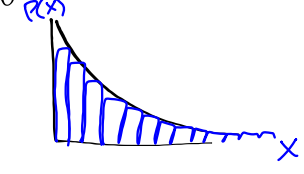
Prob. of it taking 8 or less rolls:

$1-P(X>8) = 1-(1-p)^{k} = 1-\left(\frac{5}{6}\right)^{8} = 0.767$

on calc: geometpdf(p,k) gives P(X=K)

geometcdf(p,k) gives P(X≤K)

What do geometric distributions look like?



Mean (Expected Value) of a geometric random variable:

$$\mu_X = \frac{1}{p}$$