

10/30/2023

Last time: binomial distribution

2 outcomes
- successes
- failures

- flipping coin 100x & counting # of H/T
- rolling dice 100x & counting # of
1, 2, 3 vs 4, 5, 6

each trial is evens vs odds
independent of each other

fix the total # of trials n

what is probability of getting exactly k successes

$$\text{Prob}(X = \underset{\text{succ}}{k}) = \binom{n}{k} \text{prob}(\text{succ})^k \text{prob}(\text{fail})^{n-k}$$

Geometric Distribution

- successes & failures

Question is what is prob that the first success is on the k^{th} trial?

Q: weighted coin T comes up 0.75 prob
H w/ 0.25 prob

What is prob that first H is on 100th flip??

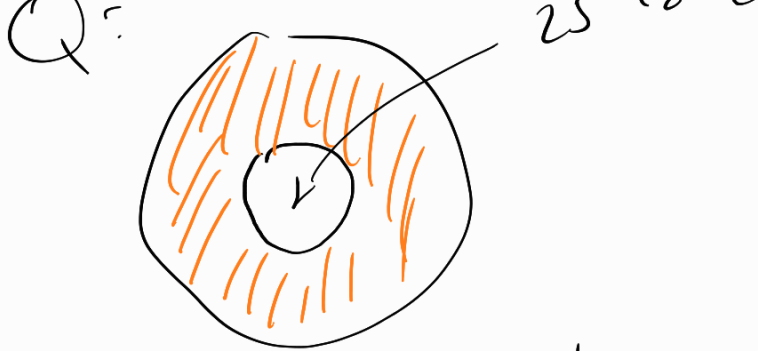
$$(0.75)^{99} \cdot 0.25$$

$$\text{Prob (first succ is on } k^{\text{th}} \text{ trial)} = \text{prob}(\text{fail})^{k-1} \cdot \text{prob}(\text{succ})$$

$$= q^{k-1} \cdot p = (1-p)^{k-1} \cdot p$$

$$q = \text{prob}(\text{fail}) \quad p = \text{prob}(\text{succ})$$

20% chance



$$\text{Prob (success on 4th toss)} = 0.75^3 \cdot 0.25$$

binomial

Formula

$$\binom{n}{k} p^k \cdot q^{n-k}$$

geometric

$$q^{k-1} \cdot p$$

μ

$$n \cdot p$$

$$1/p$$

Standard dev

$$\sqrt{n \cdot p \cdot q}$$

$$\frac{\sqrt{q}}{p}$$

$n = \# \text{ of trials}$

$p = \text{prob}(\text{succ})$

$q = \text{prob}(\text{fail})$

