e. Probability Distribution: Add next to coins frequency chart a P(x) with 1/8, 3/8, 3/8, 1/8 values
f. Probability Function: Obey two properties of prob. (0 ≤ P(A) ≤ 1, ∑ (all outcomes) P(A) = 1.
g. Parameter: Unknown # describing population
h. Statistic: # computed from sample data

	Sample	Population
Mean	$\bar{x}$	μ - mu
Variance	s^2	σ^2
Standard deviation	s	σ - sigma

i. Base: $\bar{x} = \sum x / n$, $s^2 = \dfrac{\sum (x-\bar{x})^2}{(n-1)}$

	Frequency Dist	Probability Distribution
Mean	$\bar{x} = \sum xf / \sum f$	$\mu = \sum [xP(x)]$
Var	$s^2 = \dfrac{\sum (x-\bar{x})^2 f}{(\sum f - 1)}$	$\sigma^2 = \sum [(x-\mu)^2 P(x)]$
Std Dv	$s = \sqrt{s^2}$	$\sigma = \sqrt{\sigma^2}$

j. Probability acting as an $f / \sum f$. Lose the -1

9. Sampling Distribution

a. By law of large #'s, as n -> population, $\bar{x} \to \mu$
b. Given $\bar{x}$ as mean of SRS of size n, from pop with μ and σ. Mean of sampling distribution of $\bar{x}$ is μ and standard deviation is $\sigma / \sqrt{n}$
c. If individual observations have normal distribution N(μ,σ) – then $\bar{x}$ of n has N(μ, $\sigma / \sqrt{n}$)
d. Central Limit Theorem: Given SRS of b from a population with μ and σ. When n is large, the sample mean $\bar{x}$ is approx normal.

10. Binomial Distribution

a. Binomial Experiment. Emphasize Bi – two possible outcomes (success,failure). n repeated identical trials that have complementary P(success) + P(failure) = 1. binomial is count of successful trials where 0≤x≤n
b. p : probability of success of each observation
c. Binomial Coefficient: nCk = n!/(n – k)!k!
d. Binomial Prob: P(x = k) = $\binom{n}{k} p^k (1-p)^{n-k}$
e. Binomal μ = np
f. Binomal $\sigma = \sqrt{np(1-p)}$

11. Confidence Intervals

a. Statistical Inference: methods for inferring data about population from a sample
b. If $\bar{x}$ is unbiased, use to estimate μ
c. Confidence Interval: Estimate+/- error margin
d. Confidence Level C: probability interval captures true parameter value in repeated samples
e. Given SRS of n & normal population, C confidence interval for μ is: $\bar{x} \pm z^* \sigma / \sqrt{n}$
f. Sample size for desired margin of error – set +/- value above & solve for n.

12. Tests of significance

g. Assess evidence supporting a claim about popu.
h. Idea – outcome that would rarely happen if claim were true evidences claim is not true
i. Ho – Null hypothesis: test designed to assess evidence against Ho. Usually statement of no effect
j. Ha – alternative hypothesis about population parameter to null
k. Two sided: Ho: μ = 0, Ha: μ ≠ 0
l. P-value: probability, assuming Ho is true, that test statistic would be as or more extreme (smaller P-value is > evidence against Ho)
m. $z = \dfrac{\bar{x} - \mu}{\sigma / \sqrt{n}}$
n. Significance level α : If α = .05, then happens no more than 5% of time. "Results were significant (P < .01)"
o. Level α 2-sided test rejects Ho: $\mu = \mu_0$ when μ_0 falls outside a level 1 – α confidence int.
a. Complicating factors: not complete SRS from population, multistage & many factor designs, outliers, non-normal distribution, σ unknown.
b. Under coverage and nonresponse often more serious than the random sampling error accounted for by confidence interval
c. Type I error: reject Ho when it's true – α gives probability of this error
d. Type II error: accept Ho when Ha is true
e. Power is 1 – probability of Type II error