Central limit thm:

Political view	Population
1	5%
2	10%
3	15%
4	20%
5	20%
6	10%
7	10%
8	5%
9	3%
10	2%
	100%

any distribution

true mean $= 1(0.05) + 2(0.01) + \dots + 10(0.02)$

$= 4.67$

Sample 1000 times, 100 people each

$[\mu_1, \mu_2 \dots \mu_{1000}]$ → normally dist around mean of 4.67

law of large numbers

Political view	Population
1	5%
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	100%

true mean $= 1(0.05) + 2(0.01) + \dots + 10(0.02)$

$= 4.67$

Sample 10 people, mean $\neq 4.67$

Sample 100 people, mean $\rightarrow 4.67$

Sample 1000 people mean $\simeq 4.67$

Sample entire people mean $= 4.67$

$$\text{Sample size } n = \left(\frac{z\,\sigma}{E}\right)^2$$

$z \rightarrow z$ score of confidence level
1.96 for 95%

$\sigma \rightarrow$ sd of population

$E \rightarrow$ margin of error desired

Measures of Central tendency

Mean(x) $\mu = E[X] = \int_{-\infty}^{\infty} x f(x)\, dx$

Var(x) $\text{var}(x) = E(x-\mu)^2 = E(x-E[x])^2 = E(x^2) - (Ex)^2$

$\sigma = \sqrt{\text{var}(x)}$

$E(X/x=y) = \int_{-\infty}^{\infty} x f_{x/y}(x/y)\, dx$

$\text{cov}(x,y) = E((x-Ex)(y-Ey)) = E(xy) - (Ex)(Ey)$

$\rho(x,y) = \frac{\text{cov}(x,y)}{\sigma_x \sigma_y}$

Distributions

Normal (Gaussian)
Uniform
Binomial
Poisson
Exponential
chi-sq
t-dist
F-dist

Normal

Histogram, QQ plot
Shapiro-Wilk test
Kolmogorov-Smirnov test

pdf

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$$

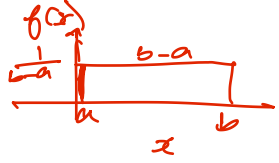
Symmetric, mean = median = mode

Binomial

Uniform

$$f(x) = \frac{1}{b-a}$$

Uniform Dist



$$f(x) = \frac{1}{b-a}$$

$$E[x] = \int_a^b x\, f(x)\, dx$$

$$= \int_a^b x \cdot \frac{1}{b-a}\, dx = \frac{1}{b-a} \cdot \frac{x^2}{2}\Big|_a^b = \frac{b^2-a^2}{2(b-a)}$$

$$= \frac{b+a}{2}$$