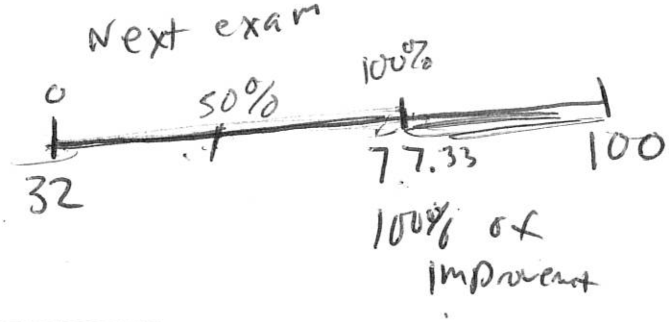
Stat 381 4/3/2015

1st exam score 32



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improve by 25% 37.5%

$X = $ ~~0~~ length time until next birth

$$P(X \leq 1) = \int_0^1 \frac{1}{6} e^{-x/6}\, dx = 1 - e^{-1/6}$$

Let $Y = $ # babies in 1 hour

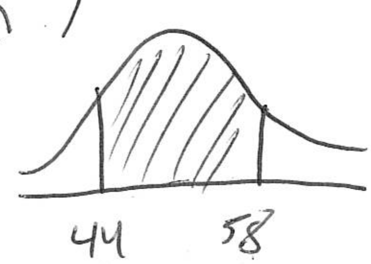
$Y \sim \text{Poisson}\left(\frac{1}{6}\right)$ $\quad P(Y \geq 1) = 1 - P(Y=0)$

$1 - e^{-1/6}$

$$\bar{X} \sim N\left(\mu = 50, \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}\right)$$

$$\bar{X} \sim N(50, \sigma_{\bar{x}} = 5)$$

normalcdf(44, 58, 50, 5)



$T \sim \text{Poisson}(200)$ $\quad H = \frac{T}{40}$ $\quad 40H = T$

$$P(H > 5.5) = P\left(\frac{T}{40} > 5.5\right) = P(T > 5.5 \cdot 40)$$

$P(T > 220)$

$= 1 - P(T \leq 220)$

1 − poissoncdf(200, 220)

~~T has $\mu = 5$~~ X # in 1 hour

$\mu_X = 5 \quad \sigma_X^2 = 5$

$\to \sigma_X = \sqrt{5}$

$H = \overline{X}$ has $\mu_{\overline{X}} = 5$

$\sigma_{\overline{X}} = \frac{\sqrt{5}}{\sqrt{40}}$

Chapter 9 - Statistical Inference

use sample data to infer properties of the population.

1) estimation (intervals)
2) Hypothesis testing / Decision Making

Estimation

def **point estimate** of population parameter θ is a single value $\hat{\theta}$ (thetahat) of $\hat{\Theta}$

$\uparrow$ the statistic.

ex) $\bar{x}$ is a value of $\bar{X}$ estimating μ

$\hat{p}$ is a value of $\hat{P}$ estimating p

def a ~~point estimate θ~~ statistic $\hat{\Theta}$ is an **unbiased estimator** of θ if $E(\hat{\Theta}) = \theta$.

to estimate μ $\quad X_1, \ldots, X_n \overset{iid}{\sim}$ population

- $X_1 \quad E(X_1) = \mu$
- $\frac{X_1 + X_n}{2} \quad E\left(\frac{X_1+X_n}{2}\right) = \frac{1}{2}\left(E(X_1) + E(X_n)\right) = \frac{1}{2}(\mu + \mu) = \mu$
- $\bar{X} \quad E(\bar{X}) = \mu$

biased $\max(X_1, \ldots, X_n)$

Given $\hat{\Theta}_1$ and $\hat{\Theta}_2$ unbiased for θ,
the "better" statistic is the one with the smaller variance. ("Efficiency")

<u>def</u> If we consider all possible unbiased estimators of θ, the one with the least variance is called the <u>best</u>, or <u>most efficient</u> estimator of θ.

$$\sigma_{\bar{X}}^2 = \frac{\sigma^2}{n}$$

is it possible to have B
$E(B) = \mu$
<u>and</u> $\sigma_B^2 = \dfrac{\sigma^2}{n+1}$

<u>def</u> If as sample size increases (to infinity) if the estimator converges (in some sense) to θ, we say $\hat{\Theta}$ is <u>consistent</u>.