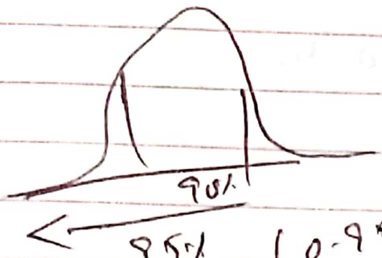
confidence interval - doll problem

$n = 44$ mean $= 10.455$

$\sigma_{pop} = 7.7$

$\mu_{pop} \in [\mu_s \pm 2SE]$

$= [10.455 + 2 \frac{\sigma_{pop}}{\sqrt{n}}]$



$z(0.95)$

$= 10.455 + 2 \times \frac{7.7}{\sqrt{44}} = 95\%$

for 90% confidence interval

$\mu_s \pm 1.65\ SE$

Confidence Interval Assignment

2) $\sigma = 3.6$ monthly

$n = 120$

1) $n_s = 1000$

$n_{pop} = 1{,}000{,}000$

$\mu = 180$

$\sigma = 30$

$\mu_s \pm 2\sigma$

$180 \pm 2(30)$

180 ± 60

$95\% = (120, 240)$

$\mu_s \pm 2\frac{\sigma}{\sqrt{n}}$

$180 \pm 2\frac{30}{\sqrt{1000}}$

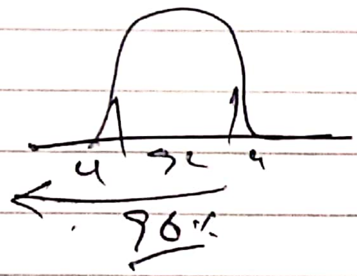
$180 \pm 2 \cdot \frac{30}{10\sqrt{10}}$

$180 \pm \frac{6}{\sqrt{10}}$

2) $\sigma_{\mu_p} = 3.6\,m$

a) $n = 120$ $\mu = 16.2$

$\mu_s \pm 2\sigma$



$16.2 \pm 2 \cdot \frac{\sigma}{\sqrt{n}}$

$16.2 \pm 2 \cdot \frac{3.6}{\sqrt{120}}$

$\pm 2\ \frac{36}{10.95}$

16.2 ± 6.575

9.625, 22.7775

$z \times SE$

$(1.76) \cdot \frac{3.6}{\sqrt{120}}$

$92\% = 16.2 \pm$ 1.25

16.2 ± 5.786

(10.414, 21.986)

b) ± 15 sec (margin of Error)

margin of error $= \pm 15$ sec

$$\pm 15 = \pm Z \times SE$$

$$= \pm 1.75 \times \frac{\sigma_{pop}}{\sqrt{n}}$$

$$\pm 15 = \pm 1.75 \times \frac{36}{\sqrt{n}}$$

$$\sqrt{n} = \frac{1.75 \times 36}{15} =$$

$$n = \left(\frac{1.75 \times 36}{15}\right)^2$$

$n = 635$

proportion Given instead of frequency

$$Z = \frac{\hat{p} + \frac{0.5}{n} - P_0}{\sqrt{P_0\left(\frac{1-P_0}{n}\right)}}$$

SE of Sample proportion $\sqrt{\frac{PQ}{n}}$

$$SE = \sqrt{\frac{P_0(1-Q_0)}{n}}$$

$$SE = \sqrt{\frac{P_0 Q_0}{n}}$$

Sample = 930

predicted : 49% = P_1 Q_1 = 95%

margin of Error = Z * SE = 1%

ME = 1% = Z * SE

$$0.01 = 1.96 * \sqrt{\frac{P_0 Q_0}{n}}$$

$$= 1.96 * \sqrt{\frac{0.49 \times 0.51}{n}}$$

$$\frac{n}{0.49 \times 0.51} = \left(\frac{1.96}{0.01}\right)^2$$

$$n = \left(\frac{1.96}{0.01}\right)^2 \times 0.49 \times 0.51$$

n = 9600

What happens to Confidence Interval as Confidence level changes

$CI = \mu_s \pm Z * SE$

$CL = 99\% = 3$
$95\% = 2$
$68\% = 1$

Confidence level increase

Sample
(30 - 120) 99% (80 - 85) → 80%

Happen Confidence interval of Sample size changes

$CI = \mu_s \pm Z * \sqrt{\frac{pq}{n}}$ ↑ ↓ decreases

range decreases

more accurate
when CI decreases

Sample size increases
decreases then CI increases
less accurate

Shortcuts for calculating Confidence intervals

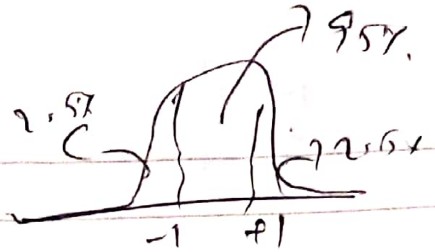
normal
You know σ^2
n is large or small
$\bar{x}$ is the sample mean

$CI: \bar{x} - Z\frac{\sigma}{\sqrt{n}}, \bar{x} + Z\frac{\sigma}{\sqrt{n}}$

non-normal
You know σ^2
n is large (> 30)
$\bar{x}$ is the sample mean

$\bar{x} - Z\frac{\sigma}{\sqrt{n}}, \bar{x} + Z\frac{\sigma}{\sqrt{n}}$

3a) $p = 0.5$



~~0.8413~~

$$\begin{array}{r} 0.8413 \\ 0.1587 \\ \hline 0.6826 \end{array}$$

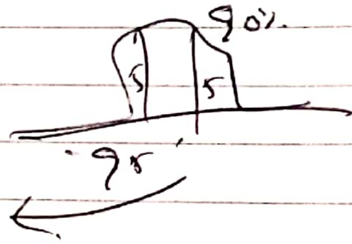
97.5%

1.96

import
scipy.stats
of stats
stats.norm.cdf(1.96)
stats.norm.ppf(97.5)
= 1.96

$Z = 90\%$

$ME = Z * SE$



$= ppf(0.95)$

$$0.02 = 1.65 * \sqrt{\frac{0.5 \times 0.5}{n}}$$

$$0.02 = 1.65 \sqrt{\frac{0.25}{n}}$$

$$\frac{0.25}{n} = \left(\frac{0.02}{1.65}\right)^2$$

$$\frac{n}{0.25} = \left(\frac{1.65}{0.02}\right)^2$$

$$n = \left(\frac{1.65}{0.02}\right)^2 * 0.25$$

$$p_s \pm Z \sqrt{\frac{p_s q_s}{n}}$$

$$= 0.5 \pm 1.96 \sqrt{\frac{0.4 * 0.6}{1000}}$$