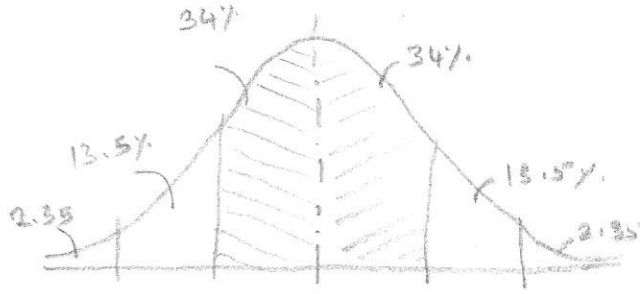
CONFIDENCE INTERVAL ASSIGNMENT

1. Find the average weight of the male.
Drawn a random sample of 1000 men.
Population of men is 1,000,000
Average weight in sample is 180 lbs
Std deviation is 30 lbs.



95% CONFIDENCE INTERVAL. $\sigma_{sample} = 30$ lbs

$\sigma_{SD} = \frac{\sigma_{sample}}{\sqrt{N}}$ | $\sigma_{SD} = \frac{\sigma_{pop}}{\sqrt{N}}$

$M_{SD} = 180$ lbs

$\sigma_{SD} = 30$ lbs

95% CI $= M \pm 2\sigma$

$= 180 + \frac{2.30}{\sqrt{1000}}, 180 - \frac{2.30}{\sqrt{1000}}$

$= 180 \pm 1.897$

$\sigma_{sample} \cong \sigma_{population}$

2. Assembly Plant - Need to estimate the mean amount of time a worker takes to assemble a new component

$\sigma_{pop} = 3.6$ mins

a) Sample of 120 workers $N = 120$; Average time to assembly is 16.2 minutes
Assumption 16.2 mins is Sample Distribution Mean $M_{SD} = 16.2$ min and not $\bar{x}$

Construct 92% confidence interval

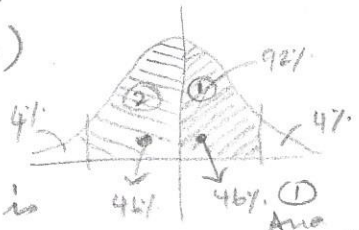
$M_{pop} \in [M_{SD} \pm Z \times SE]$

Standard Error SE = Sample distribution's Std deviation

$Z \times SE$ = Margin of error.

$SE = \sigma_{SD} = \frac{\sigma_{pop}}{\sqrt{N}} = \frac{3.6}{\sqrt{120}} = \frac{3.6}{\sqrt{120}} = 0.328$

Z value should be calculated from confidence interval required
(92% confidence interval is the 92% area under the curve)



So Z score for 92% area is = 1.75

So 92% confidence interval of sampling distribution mean is

$M_{pop} \in [M_{SD} \pm Z \times SE]$

$[16.2 \pm 1.75 \times 0.328]$

$\Rightarrow [16.2 \pm 0.574]$

b) How many workers needed to have assembly time estimated upto ±15 secs. with 92% conf

$M_{pop} \in (M \pm 2 \times SE)$ $Z \times SE = 15$ | Z score for 92% is 1.75

$1.41 \times SE = 15$

$1.41 \times \sigma_{SD} = 15$

$1.75 \times \frac{3.6}{\sqrt{N}} = 0.25$

$\frac{1.75 \times 3.6}{0.25} = \sqrt{N}$

$N = 635.04$

$N = 635$ workers

3. Consumer Advocacy groups conducted a survey to find proportion of customers who bought new gen MP3 players were happy with their purchase?

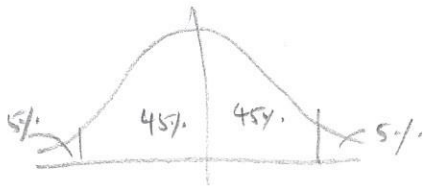
a) How many sample consumers need to estimate p with 2% margin of error and 90% confidence

Margin of error = $Z \times SE \Rightarrow Z \times \sigma_{SD} \Rightarrow Z_{90\%} \times \sigma_{SD} = 2$

$\Rightarrow 1.65 \times \sigma_{SD} = 0.02$

$\Rightarrow \sigma_{SD} = \frac{0.02}{1.65} = 0.012$

$\Rightarrow \frac{\sigma_{POP}}{\sqrt{N}} = 0.012$



b)

4. Standard weight of 1 gm. weighed 4 times [0.95, 1.02, 1.01, 0.98]

$\bar{X} = \Sigma \bar{x} / n = 3.96/4 = 0.99$ [Sample Mean]

$M_{pop} = 1$ gm [ASSUMPTION]

$$\sigma^2 = \frac{\Sigma (x - \bar{x})^2}{N}$$

$$\sigma^2 = \frac{(-0.04)^2 + (0.03)^2 + (0.02)^2 + (-0.01)^2}{4} = \frac{0.0016 + 0.0009 + 0.0004 + 0.0001}{4}$$

$$= \frac{0.0030}{4} = 0.00075$$

$\sigma^2 = 0.00075$

$\sigma_{sample} = 0.027$ in

$\sigma_{sample} \simeq \sigma_{population}$

95% confidence interval

$M_{pop} \in [M_{sample} \pm 2\sigma_{sample}]$

$[0.99 \pm 2(0.027)]$

$[0.99 \pm 0.054]$