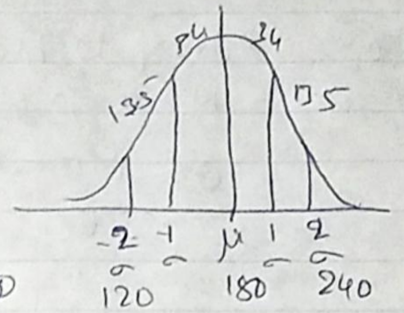
$E = \mu + SE \quad SE = \frac{\sigma}{\sqrt{N}} \quad ME = Z \times SE$

$\alpha = 1 - \left(\frac{CL}{100}\right) \quad$ Critical $P() = P^{*} = 1 - (\alpha/2)$

(1) $N_s = 1000 \quad N_p = 1000000$

$\mu_s = 180 \quad \sigma_{SD} = 30.$

95% CI $\Rightarrow \mu \pm SE$



~~$E = (180 \pm 2 \times 30) = 180 - 60 / 180 + 60$~~

~~$= 120 / 240$~~

$E = (\mu \pm SE)$

$SE = \frac{\sigma}{\sqrt{N}} = \frac{30}{\sqrt{1000}} = \frac{30}{31.62} = 0.95$

$E = 180 \pm 2(0.95) =$

ME = Z-Score × S.E

$\alpha = 1 - (C.L/100) = 1 - (95/100) = 0.05$

$P = 1 - \alpha/2 = 1 - \frac{0.05}{2} = 0.975 \Rightarrow$ Z-score $= 1.96$

ME = Z-Score × SE = $1.96 \times 0.05 = 1.86$

$E = \mu \pm SE \Rightarrow 180 \pm (1.86)$

(2) Op Mngr prod plant estimate μ of worker to assemble component.

$\sigma = 3.6$ min

(a) $N = 120 \quad \mu = 16.2$. Construct a 92% CI for mean assembly

$\alpha = 1 - \frac{C.L}{100} = 1 - \frac{92}{100} = 0.08$

$P = 1 - \alpha/2 = 1 - \frac{0.08}{2} = 1 - 0.04 = 0.96 \Rightarrow 1.75$

$E = \left(\mu \pm Z \frac{\sigma}{\sqrt{N}}\right) = 16.2 \pm (1.75)\frac{3.6}{\sqrt{120}} = 16.2 \pm 0.575 \Rightarrow [15.6, 16.8]$

Mean assembly for a worker is estimated to be b/n 15.6–16.8 with 92%

(b) What is N to have mean estimated to ±15sec with 92% confidence

$\pm 15 = 1.75 \times \frac{3.6}{\sqrt{N}} \Rightarrow \sqrt{N} = \frac{1.75 \times 3.6}{0.25} = 635.04 = \underline{636}$

15 sec = 0.25 min

(3) Survey to find proportion of P consumers

(a) N=? to estimate P with 2% margin of error & 90% confidence

$ME = Z \times SE = Z \times \frac{\sigma}{\sqrt{N}}$

$\alpha = 1 - \frac{CL}{100} = 1 - \frac{90}{100} = 0.1$

$P = 1 - \frac{\alpha}{2} = 1 - \frac{0.1}{2} = 1 - 0.05 = 0.95 \Rightarrow 1.645$

$ME = 2\% = 0.02$

assuming proportion of P consumer $= 0.5$

$ME = Z \cdot \sqrt{\frac{P(1-P)}{N}} \Rightarrow 0.02 = 1.645 \sqrt{\frac{(0.5)(0.5)}{N}}$

$(0.02)^2 = (1.645)^2 \times \frac{0.25}{N} \Rightarrow N = \frac{(1.645)^2 (0.25)}{(0.02)^2} = \frac{0.6765}{0.0004}$

$N = 1691.25 \approx 1692$

(b) N=1000 & 400 are happy. Find 95% CI for P.

Z-score for 95% = 1.96. $\quad N = \frac{400}{1000} = 0.4 \quad P = 0.4$
$1-P = 0.6$

$p^{\wedge} = 0.4 \pm z\sqrt{\frac{P(1-P)}{N}} \Rightarrow 0.4 \pm 1.96 \sqrt{\frac{(0.4)(0.6)}{1000}}$

$= 0.4 \pm 1.96(0.015) = 0.4 \pm 0.0305 \Rightarrow (0.3694, 0.4306)$

(4)

(6) Install of HW $\sigma = 5\,min$

$N = 64 \quad \mu = 42$ Compute 95% of CI. $z(95\%) = 1.96$

$$\epsilon = \cancel{\mu} \pm z\frac{\sigma}{\sqrt{N}}$$

$$= 42 \pm 1.96(5/\sqrt{64}) = 42 \pm 1.96(5/8) = 42 \pm 1.225$$

$$= \{40.8, 43.2\}$$

Mean install time is b/n 40.8 & 43.2 min with 95% confidence.

(8) Sample size reqd to provide 95% of CI for μ. interval be longer than 1 cm. popul is normal with $\sigma^2 = 9\,cm^2$ $(\sigma = 3)$

$M = Z \times SE$

$= Z \cdot \frac{\sigma}{\sqrt{N}}$

$Z(95\%\text{-}CI) = 1.96$

$$ME = z\frac{\sigma}{\sqrt{N}} \Rightarrow \sqrt{N} = z \cdot \sigma / e$$

$$N = \left(\frac{Z \cdot \sigma}{ME}\right)^2 = \left(\frac{1.96 \times 3}{1}\right)^2 = 34.57 = 35$$

(10) Alchohol Abuse $N = 17096$ Binge 3314 Students

$$P = 3314/17096 = 0.194$$

$CI = 90\% \Rightarrow Z(\text{score } 90\%\ CI) = 1.64$

$$p^1 = P \pm Z \times \sqrt{\frac{P(1-P)}{N}} \Rightarrow 0.194 \pm 1.64\sqrt{\frac{0.194(1-0.194)}{17096}}$$

$$= 0.194 \pm 1.64\sqrt{\frac{0.194 \times 0.806}{17096}} = 0.194 \pm 1.64(0.012)$$

$$= 0.194 \pm 0.019 = (0.174, 0.213)$$

Can be stated that

20% (19.4%) are binge drinker with 90% confidence.

with 2% (0.02) ~~err~~ margin of error