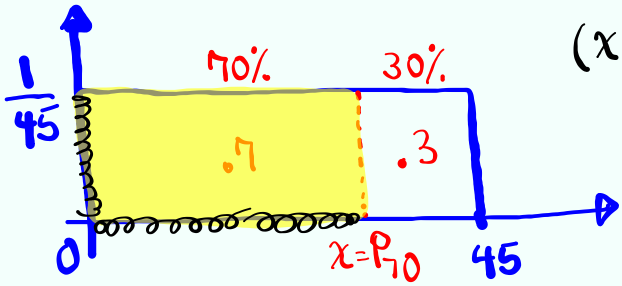
Statistics

Lecture 18

Feb 19-8:47 AM

Consider a uniform Prob. dist. for all values from 0 to 45. Find $x = P_{70}$.



$$(x-0)\cdot\frac{1}{45} = .7$$

$$x = 45(.7)$$

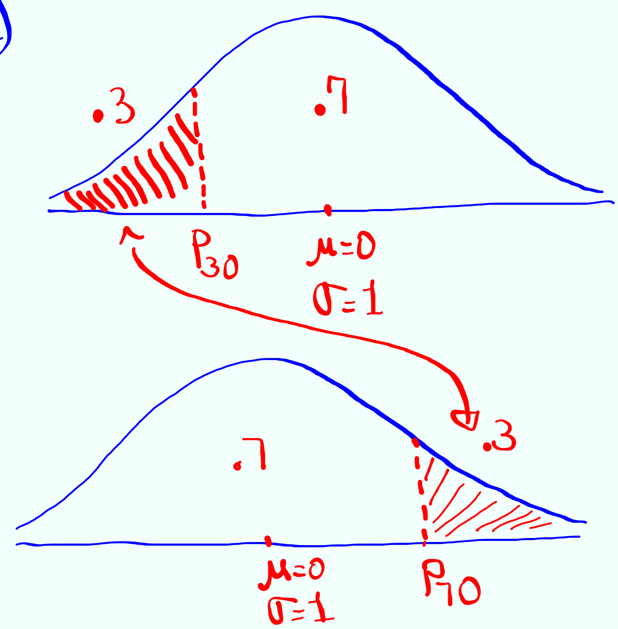
$$= \boxed{31.5} \approx 32$$

May 6-1:49 PM

Find $Z = P_{30}$. Round to 3-dec. Places.

$Z = \text{invNorm}(.3, 0, 1)$

$= \boxed{-.524}$



Find $Z = P_{70}$

By Symmetry

$= \boxed{.524}$

$Z = \text{invNorm}(.7, 0, 1)$

May 6-1:53 PM

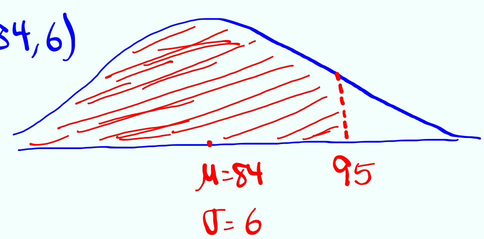
Given $N(84, 6)$ Normal prob. dist.

$\mu = 84$, $\sigma = 6$

Find $P(x < 95)$

$= \text{normalcdf}(-E99, 95, 84, 6)$

$= \boxed{.967} = 96.7\%$

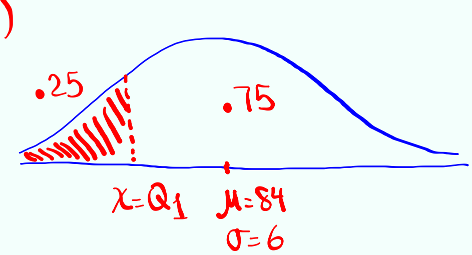


Find $x = Q_1$, round to a whole #

$x = \text{invNorm}(.25, 84, 6)$

$= 79.953$

$\approx \boxed{80}$



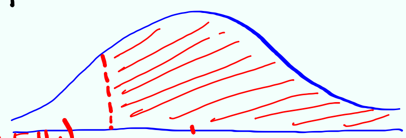
May 6-2:00 PM

Age of Students

$N(32.5, 8.2)$

Selected groups of 4

$P(\bar{x} > 28.5)$



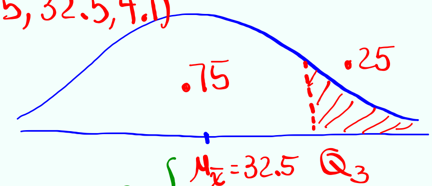
$= \text{normalcdf}(28.5, E99, 32.5, 4.1)$ 28.5

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32.5 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{8.2}{\sqrt{4}} = 4.1 \end{cases}$

$= \boxed{.835}$

Find $\bar{x} = Q_3$, round to 1-dec for groups of 4

$\bar{x} = Q_3 = \text{invNorm}(.75, 32.5, 4.1)$



$= 35.265$

$\approx \boxed{35.3}$

CLT $\begin{cases} \mu_{\bar{x}} = 32.5 \\ \sigma_{\bar{x}} = 4.1 \end{cases}$

May 6-2:06 PM

Given Conf. interval $.38 < p < .52$

Find

1) $E = \dfrac{.52 - .38}{2} = \dfrac{.14}{2} = \boxed{.07}$

2) $\hat{p} = \dfrac{.52 + .38}{2} = \dfrac{.9}{2} = \boxed{.45}$

May 6-2:25 PM

Given Conf. interval $78 < \mu < 94$

find

1) $E = \dfrac{94 - 78}{2} = \dfrac{16}{2} = 8$

2) $\bar{x} = \dfrac{94 + 78}{2} = \dfrac{172}{2} = 86$

May 6-2:27 PM

Given $n = 150$ $x = 32$ C-level $= 98\%$

find Conf. Interval for population Proportion

1 - Prop ZInt

$\boxed{.14 < p < .29}$

$E = \dfrac{.29 - .14}{2} = \dfrac{.15}{2} = \boxed{.075}$

$\hat{p} = \dfrac{.29 + .14}{2} = \dfrac{.43}{2} = .215 \approx \boxed{.22}$

May 6-2:30 PM

Given : $n = 35$ $\bar{x} = 83.5$ $\boxed{\sigma = 12}$

C-level : .9

Find Conf. interval for population mean

$\boxed{80.2 < \mu < 86.8}$

$\boxed{\sigma \text{ Known} \rightarrow Z \text{ Interval}}$

σ unknown $\rightarrow$ T Interval

Since $\bar{x}$ is 1-dec. we round to 1-dec.

$E = \frac{86.8 - 80.2}{2} = \boxed{3.3}$

$\bar{x} = \frac{86.8 + 80.2}{2} = \boxed{83.5}$

May 6-2:35 PM

Given : $\bar{x} = 125$, $S = 15$, $n = 12$ $df = n - 1 = \boxed{11}$

NO C-level $\rightarrow$ .95

Find Conf. interval for population mean.

$< \mu <$

σ Known $\rightarrow$ Z Interval

$\boxed{\sigma \text{ unknown} \rightarrow T \text{ Interval}}$

$\bar{x}$ is whole #, round to whole #

$\boxed{115 < \mu < 135}$

$E = \frac{135 - 115}{2} = 10$

$\bar{x} = \frac{135 + 115}{2} = 125$

May 6-2:41 PM

How to find minimum sample size:

1) for proportion

$E = z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}}$ → If we solve for n

$$\boxed{n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2}$$

if decimal → Always Round-up

If $\hat{p}$ & $\hat{q}$ are both unknown, use .5 for each

$$\boxed{n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2}$$

May 6-3:01 PM

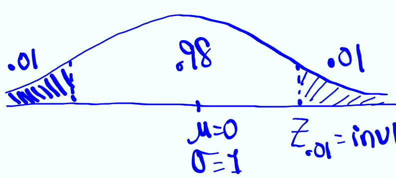
Find min. sample size needed to construct 98% Conf. interval for population proportion with error not to exceed 5% and

1) $\hat{p} = .4$

$\hat{q} = 1 - \hat{p} = .6$

$n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$

$= (.4)(.6)\left(\frac{2.326}{.05}\right)^2$



$z_{.01} = \text{invNorm}(.99, 0, 1)$

$= 519.386$

$n \approx 520$

2) $\hat{p}$ & $\hat{q}$ are unknown

$n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{2.326}{.05}\right)^2 = 541.0276$

$n \approx 542$

May 6-3:05 PM

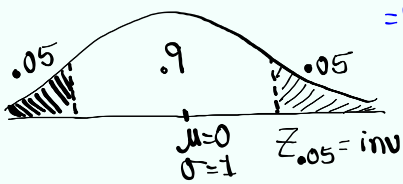
find min. Sample Size needed to Construct 90% Conf. interval for pop. proportion and error not to exceed 10% with

1) $\hat{p} = .3$

$$n = \hat{p}\,\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$

$$= (.3)(.7)\left(\frac{1.645}{.1}\right)^2 = 56.827$$

$n \approx 57$



$z_{.05} = \text{invNorm}(.95, 0, 1)$

2) Suppose $\hat{p}$ & $\hat{q}$ are unknown

$$n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{1.645}{.1}\right)^2 = 67.651$$

$n = 68$

May 6-3:14 PM

min. Sample Size for population mean

$$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

with Some algebra, we Solve for n.

$$\boxed{n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2}$$

If decimal, round-up

If σ is unknown, use S in its place.

$$\boxed{n = \left(\frac{z_{\alpha/2} \cdot S}{E}\right)^2}$$

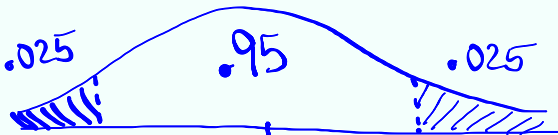
If decimal, round-up

May 6-3:22 PM

Find min. sample size needed to construct 95% conf. interval for population mean with $\sigma = 25$ and $E = 10$.

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{1.960 \cdot 25}{10}\right)^2 = 24.01$$

$n \approx 25$



$\mu = 0$
$\sigma = 1$

$z_{.025} = \text{invNorm}(.975, 0, 1)$

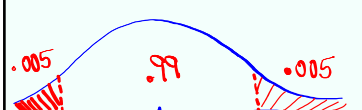
May 6-3:26 PM

Find min. sample size needed to construct 99% conf. interval for population mean with $S = 32$ and $E = 8$.

σ unknown $\rightarrow$ $n = \left(\frac{z_{\alpha/2} \cdot S}{E}\right)^2 = \left(\frac{2.576 \cdot 32}{8}\right)^2$

$= 106.172$

$n \approx 107$



$\mu = 0$
$\sigma = 1$

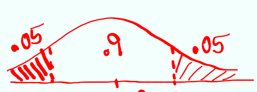
$z_{.005} = \text{invNorm}(.995, 0, 1)$

Redo with C-level 90% and $E = 10$

$$n = \left(\frac{1.645 \cdot 32}{10}\right)^2$$

$= 27.710$

$n \approx 28$



$\mu = 0$
$\sigma = 1$

$z_{.05} = \text{invNorm}(.95, 0, 1)$

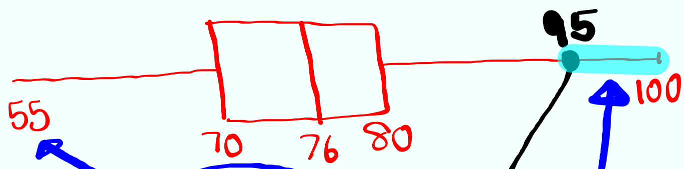
SG 21 & 22 ✓

May 6-3:32 PM

40 exams had the following 5-number Summary

55 70 76 80 100

1) Draw box plot



outliers

2) $IQR = Q_3 - Q_1 = 80 - 70 = \boxed{10}$

3) Upper & lower fences.

$Q_3 + 1.5(IQR) = 80 + 1.5(10) = 95$

$Q_1 - 1.5(IQR) = 70 - 1.5(10) = 55$

May 6-3:42 PM

40 Tkts Sold for \$10 each

one tkt drawn, winner gets a gift card worth \$100.

Find expected value per ticket Sold.

Net	P(Net)
10 − 100	1/40
10 − 0	39/40

Net → L1

P(Net) → L2

$E.V. = \mu = \bar{x} = \boxed{\$7.50}$

May 6-3:48 PM

$P(A) = .02$

1) $P(\bar{A}) = 1 - P(A) = .98$

2) odds in favor of event A.

$P(A) : P(\bar{A})$ $\quad .02 : .98$

$\boxed{1:49}$

3) odds against event A. $\boxed{49:1}$

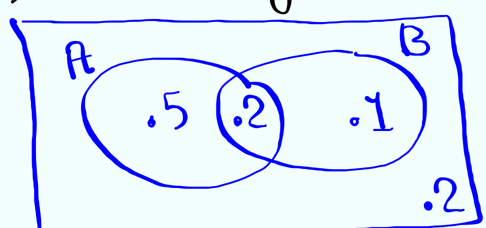
May 6-3:54 PM

$P(A) = .7$

$P(B) = .3$

$P(A \text{ and } B) = .2$

1) Venn Diagram



2) $P(B|A) = \dfrac{P(A \text{ and } B)}{P(A)}$

$= \dfrac{.2}{.7} = \boxed{\dfrac{2}{7}}$

$\approx .286$

May 6-3:58 PM