Statistics

Spring 2023

Lecture 36

Feb 19-8:47 AM

Central - limit Theorem:

$\mu_{\bar{x}} = \mu$ $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$

SG 20 & SG 21

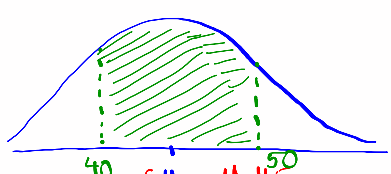
Consider a population with normal prob. dist. with $\mu = 45$ and $\sigma = 8$.

If we randomly select group of 4 ($n=4$) from this population, find the prob. that their mean ($\bar{x}$) is between 40 and 50.

$P(40 < \bar{x} < 50)$

$= \text{normalcdf}(40, 50, 45, 4)$

$= \boxed{.789} \approx 79\%$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 45 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{8}{\sqrt{4}} = \dfrac{8}{2} = 4 \end{cases}$

Apr 19-7:16 AM

Suppose salaries of nurses are normally dist. with $\mu = \$6200$/mo. with $\sigma = \$400$/mo.

$N(6200, 400)$

If we randomly select group of 25 nurses, $n=25$

find the prob. that their mean ($\bar{x}$) salary is $\boxed{\text{above } \$6150}$/mo.

$P(\bar{x} > 6150)$

$=$ normalcdf(6150, E99, 6200, 80)

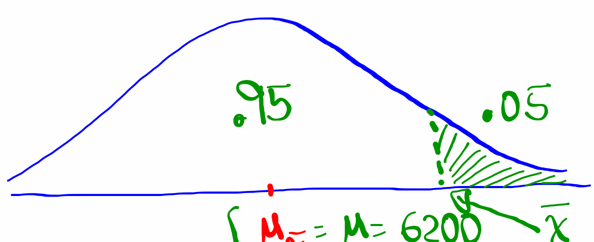
$= \boxed{.734} \approx 73\%$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6200 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{400}{\sqrt{25}} = 80 \end{cases}$

Apr 19-7:24 AM

Find $\boxed{\text{the mean}}$ ($\bar{x}$) for randomly selected group of $\boxed{\text{16 nurses}}$ ($n=16$) that separates the $\boxed{\text{top 5\%}}$ from the rest.

Right area



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6200 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{400}{\sqrt{16}} = 100 \end{cases}$

$\bar{x} =$ invNorm(.95, 6200, 100)

$= 6364.485$

Round-up $\rightarrow \boxed{\$6365}$

Apr 19-7:31 AM

Exam Scores are normally distributed with the mean of 86 and standard deviation of 10. $N(86, 10)$

If we randomly Select 5 exams ($n=5$), find the prob. that their mean ($\bar{x}$) Score is below 90. ($\bar{x}<90$)

$P(\bar{x}<90)$

$= \text{normalcdf}(-E99, 90, 86, 10/\sqrt{5})$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 86 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{5}} \end{cases}$

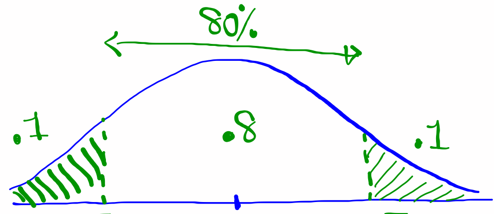
$= \boxed{.814}$

Apr 19-7:36 AM

Find two means ($\bar{x}_1$, $\bar{x}_2$), round up to whole numbers, that Separate the middle 80% from the rest for randomly Selected group of 5 exams. ($n=5$)

$1 - .8 = .2$

$.2 \div 2 = .1$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 86 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{5}} \end{cases}$

$\bar{x}_1 = \text{invNorm}(.1, 86, 10/\sqrt{5})$

$= 80.269 \approx \boxed{81}$

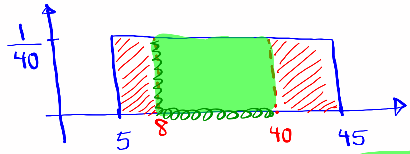
$\bar{x}_2 = \text{invNorm}(.9, 86, 10/\sqrt{5})$

$= 91.731 \approx \boxed{92}$

Apr 19-7:43 AM

Consider a uniform Prob. dist. for all values from 5 to 45.

1) Draw & clearly label.



2) $P(x=8)$
$=\boxed{0}$

3) $P(x<8$ or $x>40)$

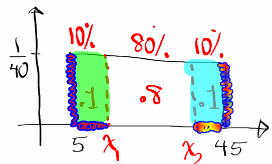
$P(x<8 \text{ OR } x>40) = 1 - P(8<x<40)$

↑ Total Area

$= 1 - (40-8)\cdot\frac{1}{40} = 1 - \frac{32}{40} = \frac{8}{40}$

$= \boxed{\frac{1}{5}} = \boxed{.2}$

Find two x-values that separate the middle 80% from the rest.



$(x_1 - 5)\cdot\frac{1}{40} = .1$

$x_1 - 5 = 40(.1)$

$\boxed{x_1 = 9}$

$(45 - x_2)\cdot\frac{1}{40} = .1$

$45 - x_2 = 40(.1)$ $\boxed{x_2 = 41}$

Apr 19-7:53 AM

Class QZ 10

Given $N(130, 15)$

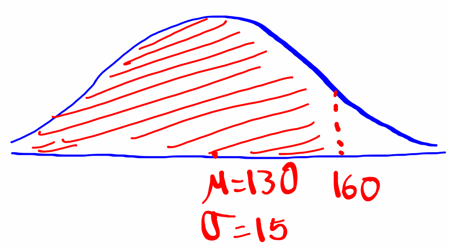
Drawing, labeling, shading, and TI command required.

Find

1) $P(x < 160)$

$= \text{normalcdf}(-E99, 160, 130, 15)$

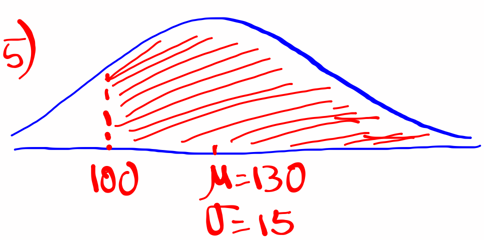
$= \boxed{.977}$



2) $P(x > 100)$

$= \text{normalcdf}(100, E99, 130, 15)$

$= \boxed{.977}$



Apr 19-8:04 AM