Statistics

Fall 2022

Lecture 22

Class QZ 15

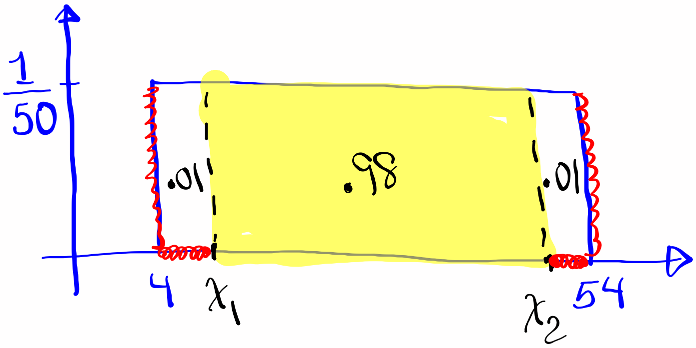
Consider a binomial Prob. dist. with $n = 60$ and $p = .4$

1) Find $P(x = 25) = \text{binompdf}(\overset{n}{60}, \overset{p}{.4}, \overset{x}{25}) = \boxed{.100}$ ✓

2) Find $P(x \le 30) = \text{binomcdf}(\overset{n}{60}, \overset{p}{.4}, \overset{x}{30}) = \boxed{.956}$ ✓

Consider a uniform Prob. dist. for $4 \le x \le 54$,

1) Draw & clearly label.



2) Find two x-Values that Separate the middle 98% from the rest.

$1 - .98 = .02$

$.02 \div 2 = .01$

$(x_1 - 4) \cdot \frac{1}{50} = .01$

$x_1 - 4 = 50(.01)$

$x_1 = 4 + .5 = \boxed{4.5}$

$(54 - x_2) \cdot \frac{1}{50} = .01$

$54 - x_2 = 50(.01)$

$54 - x_2 = .5$

$\boxed{x_2 = 53.5}$

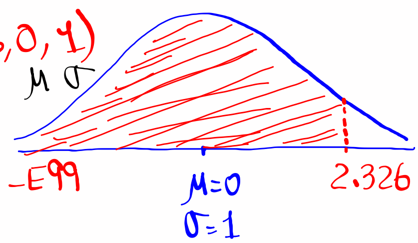
Find $P(Z < 2.326)$

$= \text{normalcdf}(-E99, 2.326, 0, 1)$

L U μ σ

(−) 2nd ,

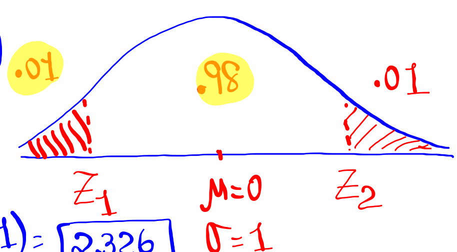
$= \boxed{.990}$



Find two Z-Values, Round to 3-decimals, that Separate the middle 98% from the rest.

$Z_1 = \text{invNorm}(.01, 0, 1)$

$= \boxed{-2.326}$



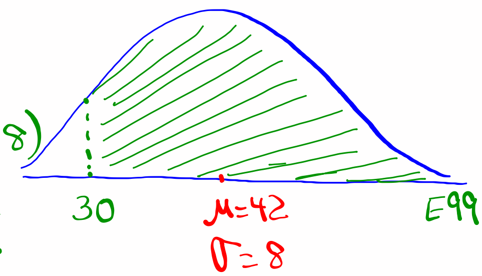
$Z_2 = \text{invNorm}(.99, 0, 1) = \boxed{2.326}$

Consider a normal prob. dist. with $\mu = 42$ and $\sigma = 8$.

1) find $P(x > 30)$

$= \text{normalcdf}(30, E99, 42, 8)$

$= \boxed{.933} \approx 93\%$

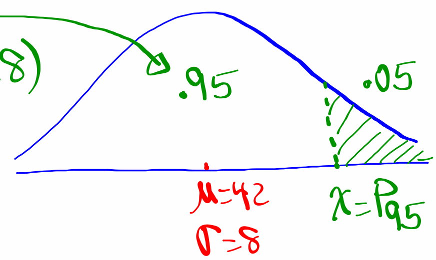


2) find $x = P_{95}$, Round to a $\boxed{\text{whole \#}}$

$x = P_{95} = \text{invNorm}(.95, 42, 8)$

$= 55.159$

$\approx \boxed{55}$



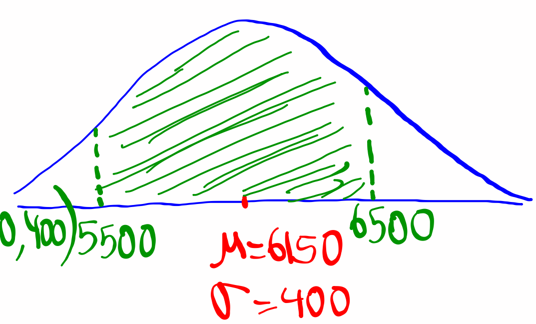
Salaries of nurses have a normal dist. with the mean of \$6150/mo. and Standard dev. of \$400/mo. $N(6150, 400)$

If we randomly Select one nurse, find the Prob. that his/her Salary is between \$5500 & \$6500.

$P(5500 < x < 6500)$

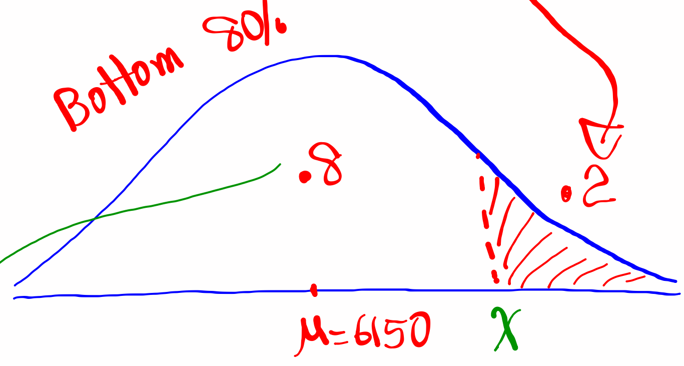
$= \text{normalcdf}(5500, 6500, 6150, 400)$

$= \boxed{.757} \approx 76\%$



Find a Salary that Separates the $\boxed{\text{top } 20\%}$ from the rest.

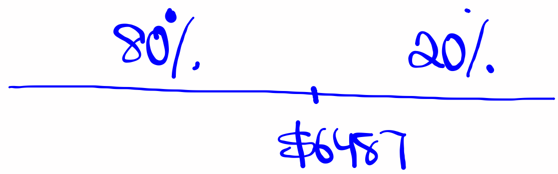
Round to whole #.



$x = \text{invNorm}(.8, 6150, 400)$

$= 6486.648$

≈ 6487



Clear all lists.

Reset all lists.

Store 5, 9, 13 in L1

Use $\boxed{\text{1-Var Stats}}$ with L1 to find

$\mu = 9$ $\quad\sigma = 3.266\quad$ $\sigma^2(\text{exact}) = \frac{32}{3}$

Now take all Samples with $\boxed{\text{Size } 2}$ with replacement from this list.

$n = 2$

5,5	5,9	5,13
9,5	9,9	9,13
13,5	13,9	13,13

Find $\bar{x}$ of each Sample!

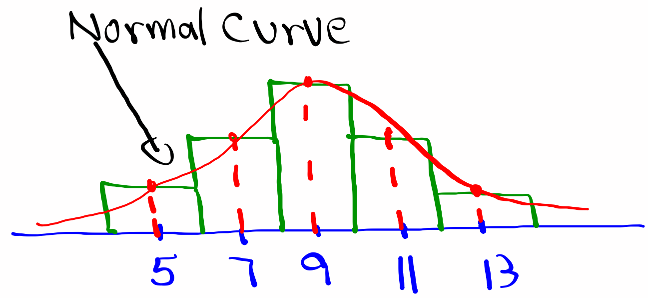
5	7	9
7	9	11
9	11	13

9 Means

$\bar{x}$	$P(\bar{x})$
5	1/9
7	2/9
9	3/9
11	2/9
13	1/9

$\bar{x}$	$P(\bar{x})$
5	1/9
7	2/9
9	3/9
11	2/9
13	1/9

Draw Prob. dist. Histogram



$\bar{x} \to L2$, $P(\bar{x}) \to L3$

Use $\boxed{\text{1-Var Stats}}$ with L2 & L3 to find

$\mu = 9$ $\qquad \sigma = 2.309$ $\qquad \sigma^2 (\text{exact}) = \frac{16}{3}$

Using L1 with original data

$\mu = 9$ $\qquad \sigma^2 = \frac{32}{3}$

Using L2 & L3 with $\bar{x}$ & $P(\bar{x})$

Sample Size

$\mu = 9$ $\qquad \sigma^2 = \frac{16}{3}$

$\mu_{\bar{x}} = 9$ $\qquad \sigma^2_{\bar{x}} = \frac{16}{3} = \frac{\frac{32}{3}}{2}$

Central - Limit Theorem

$\boxed{\mu_{\bar{x}} = \mu}$ $\qquad \boxed{\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}}$ $\qquad \boxed{\sigma^2_{\bar{x}} = \frac{\sigma^2}{n}}$

Consider a normal prob. dist with

$\mu = 375$ & $\sigma = 40$

If we randomly select samples of size 25,

find **by** $\boxed{\text{CLT}}$

$$\mu_{\bar{x}} = \mu = \boxed{375}$$

$$\sigma^2_{\bar{x}} = \frac{\sigma^2}{n} = \frac{40^2}{25} = \boxed{64} \leftarrow 8^2$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{40}{\sqrt{25}} = \frac{40}{5} = \boxed{8}$$

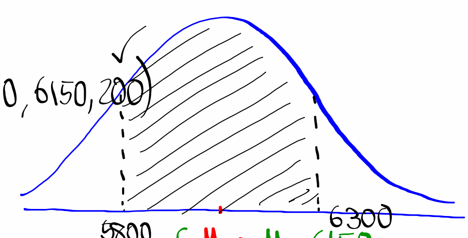
Salaries of nurses are normally dist. with the mean of \$6150/mo. and standard deviation of \$400/mo.

If we randomly select samples of $\boxed{\text{size 4}}$ nurses, find the prob. that $\boxed{\text{their mean}}$ salary falls between \$5800 and \$6300.

$$P(5800 < \bar{x} < 6300)$$

$$= \text{normalcdf}(5800, 6300, 6150, 200)$$

$$= \boxed{.733}$$



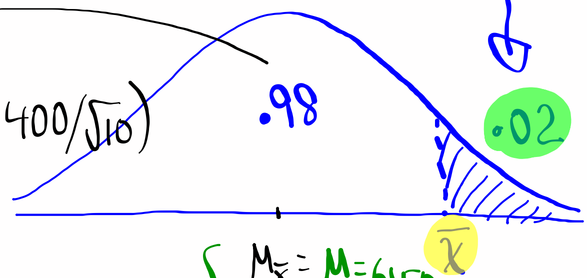
$$\text{CLT} \begin{cases} \mu_{\bar{x}} = \mu = 6150 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{400}{\sqrt{4}} = 200 \end{cases}$$

Find the mean salary for randomly selected samples of size 10 that separates the top 2% from the rest.

$\bar{x} = \text{invNorm}(.98, 6150, 400/\sqrt{10})$

$= 6409.781$

$\approx \boxed{6410}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6150 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{400}{\sqrt{10}} \end{cases}$

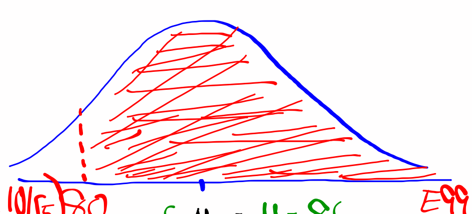
Exam results have a normal prob. dist. with the mean of 86 and stand. dev. of 10. $N(86, 10)$

If we randomly select samples of size 5, find the prob. that their mean score is above 80.

$P(\bar{x} > 80)$

$= \text{normalcdf}(80, E99, 86, 10/\sqrt{5})$

$= \boxed{.910} \approx 91\%$

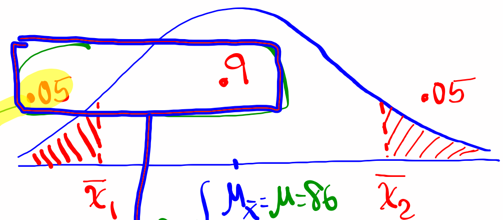


CLT $\begin{cases} \mu_{\bar{x}} = \mu = 86 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{10}{\sqrt{5}} \end{cases}$

Find two means for randomly selected samples of $\boxed{\text{size } 4}$ that separate the $\boxed{\text{middle } 90\%}$ from the rest. Round to whole #.

$1 - .9 = .1$

$.1 \div 2 = .05$



$$\text{CLT}\begin{cases} \mu_{\bar{x}} = \mu = 86 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{10}{\sqrt{4}} = 5 \end{cases}$$

$x_1 = \text{invNorm}(.05, 86, 5)$

$= 77.776$

$\approx \boxed{78}$

$x_2 = \text{invNorm}(.95, 86, 5)$

$= 94.224$

$\approx \boxed{94}$

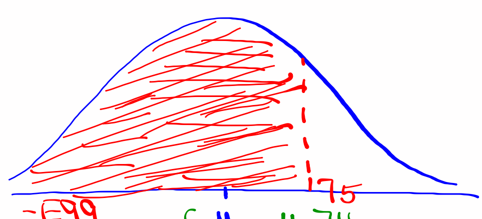
5% | 90% | 5%

78   94

Speed of cars on certain FWY are normally dist. with the mean of 74 mph and stand. dev. of 6 mph. $N(74, 6)$

If we randomly select samples of 3 cars, find the prob. that their mean speed is below 75 mph.

$P(\bar{x} < 75)$

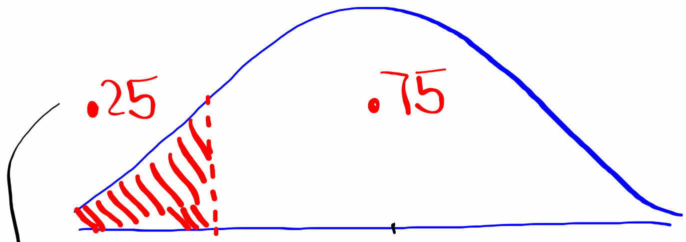


$= \text{normalcdf}(-E99, 75, 74, 6/\sqrt{3})$

$$\text{CLT}\begin{cases} \mu_{\bar{x}} = \mu = 74 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{6}{\sqrt{3}} \end{cases}$$

$= \boxed{.614}$

Find $\bar{x} = Q_1$ for randomly selected samples of 4 cars.



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 74 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{6}{\sqrt{4}} = 3 \end{cases}$

$\bar{x} = Q_1 = \text{invNorm}(.25, 74, 3)$

$= 71.977 \approx \boxed{72}$

SG 18, 19, 20, and 21 ✓

Class Qz 16

1) Consider a geometric Prob. dist. with $p = .3$,

Find $P(x \leq 3) = \text{geometcdf}(.3, 3) = \boxed{.657}$

2) Consider a Poisson Prob. dist. with $\mu = 5$,

Find $P(x \geq 8) = 1 - P(x \leq 7) = 1 - \text{Poissoncdf}(5, 7)$

$= \boxed{.133}$