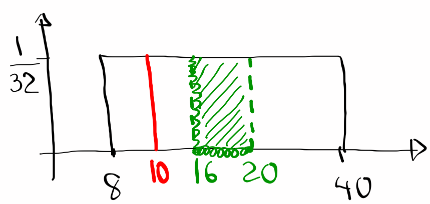
Statistics

Fall 2022

Lecture 21

Consider a uniform Prob. dist. for all values from 8 to 40

1) Draw & label clearly



2) Find $P(x=10)$

$= \boxed{0}$

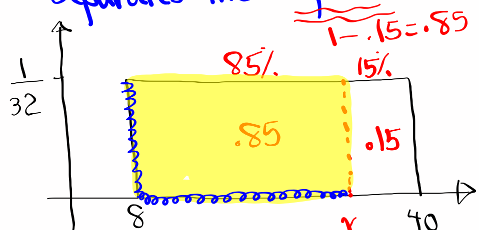
3) Find $P(16 < x < 20)$

$= (20-16) \cdot \frac{1}{32}$

$= \frac{4}{32} = \boxed{\frac{1}{8}} = \boxed{.125}$

4) Find the x-value that separates the top 15% from the rest.

$1 - .15 = .85$



$x = P_{85}$

$(x-8) \cdot \frac{1}{32} = .85$

$x - 8 = 32(.85)$

$x = 8 + 32(.85)$

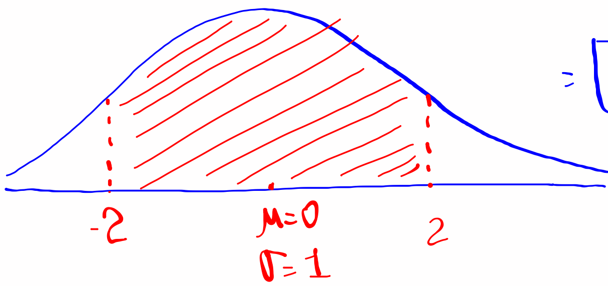
$\boxed{x = 35.2}$

find $P(-2 < Z < 2)$

L U μ σ

$= \text{normalcdf}(-2, 2, 0, 1)$

$= \boxed{.954}$



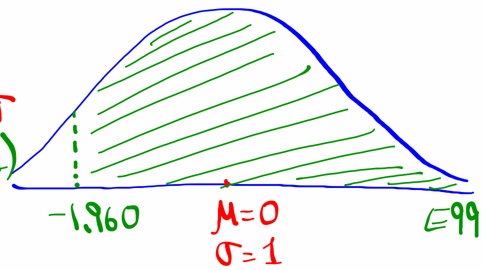
find $P(Z > -1.960)$

L U μ σ

$= \text{normalcdf}(-1.960, E99, 0, 1)$

(-)

2nd ,



$= \boxed{.975}$

find K such that $P(Z < K) = .125$

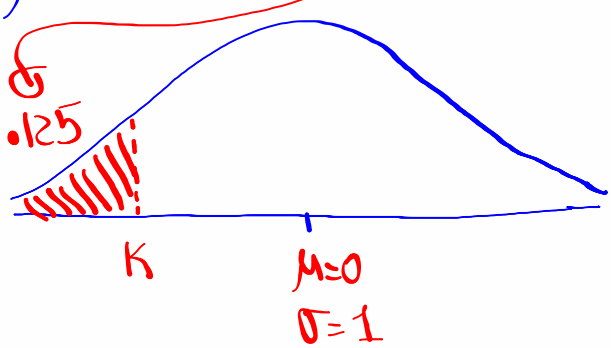
Left Area

$K = \text{invNorm}(.125, 0, 1)$

Left Area

μ

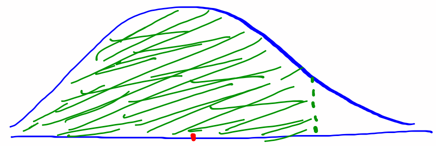
σ



$= \boxed{-1.150}$

Consider a normal Prob. dist with $\mu = 170$ and $\sigma = 15$.

1) find $P(x < 200)$



$= \text{normalcdf}(\overset{L}{-E99}, \overset{U}{200}, \overset{\mu}{170}, \overset{\sigma}{15})$ U-E99

(-) 2nd ,

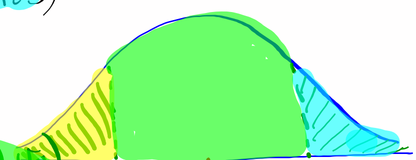
$= \boxed{.977} \approx 97.7\% \approx 98\%$

2) $P(x < 150 \text{ OR } x > 185)$

$= 1 - P(150 < x < 185)$

$= 1 - \text{normalcdf}(150, 185, 170, 15)$

$= \boxed{.250}$

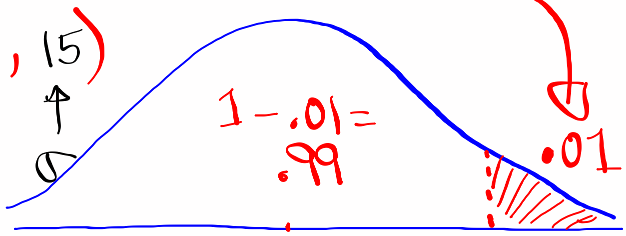


Find the x-value, rounded to a whole #, that Separates the $\boxed{\text{top } 1\%}$ from the rest.

$x = \text{invNorm}(.99, 170, 15)$

Left Area, μ, σ

$= 204.895 \approx 205$



Credit Scores are normally distributed with the mean of 725 and standard deviation of 50. $N(725, 50)$

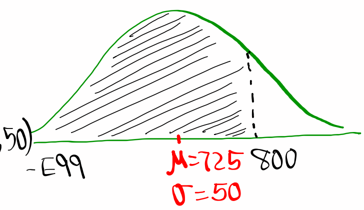
If we randomly select one person, find the prob. that his/her Credit Score is

a) below 800.

$P(x < 800)$

$= \text{normalcdf}(-E99, 800, 725, 50)$

$= \boxed{.933}$

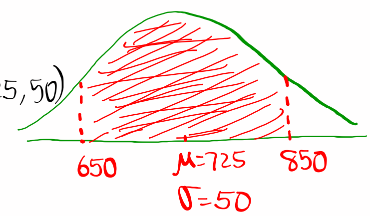


b) between 650 and 850.

$P(650 < x < 850)$

$= \text{normalcdf}(650, 850, 725, 50)$

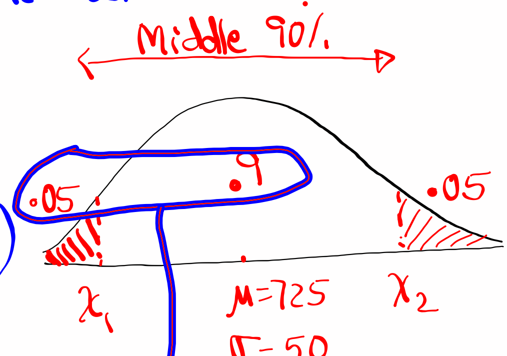
$= \boxed{.927}$



Find two credit scores that separate the middle 90% from the rest. Round to whole #.

$1 - .9 = .1$

$.1 \div 2 = .05$



90% of Credit Scores are between 643 and 807

$x_1 = \text{invNorm}(.05, 725, 50) \approx \boxed{643}$

$x_2 = \text{invNorm}(.95, 725, 50) \approx \boxed{807}$

SG 18 & SG 19 ✓✓✓

Clear all lists.

Reset all lists.

Store 0, 4, 8, 12 in L1.

STAT → CALC

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

$\mu = \bar{x} = \boxed{6}$ $\quad \sigma = \sigma_x = \boxed{4.472}$ $\quad \sigma^2(\text{exact}) = \boxed{20}$

Take all samples of size 2 from this list with replacement.

0,0	0,4	0,8	0,12
4,0	4,4	4,8	4,12
8,0	8,4	8,8	8,12
12,0	12,4	12,8	12,12

Find $\bar{x}$ of each sample.

0	2	4	6
2	4	6	8
4	6	8	10
6	8	10	12

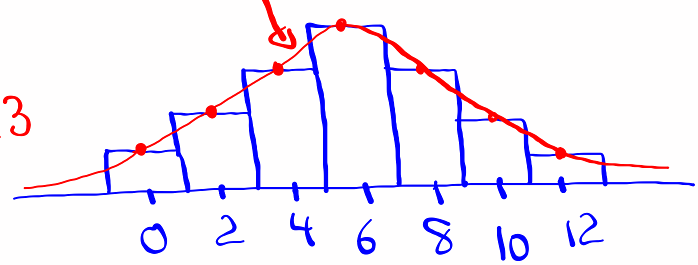
16 means

$\bar{x}$	$P(\bar{x})$
0	1/16
2	2/16
4	3/16
6	4/16
8	3/16
10	2/16
12	1/16

$\bar{x}$ (L2)	$P(\bar{x})$ (L3)
0	1/16
2	2/16
4	3/16
6	4/16
8	3/16
10	2/16
12	1/16

Draw Prob. dist. histogram.

Normal Curve



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

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

$\mu = \boxed{6}$ $\quad \sigma = \boxed{3.162}$ $\quad \sigma^2(\text{exact}) = \boxed{10}$

Clear all lists.

Store 1, 3, 5, 7, and 9 in L1

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

$\boxed{\mu = 5}$ $\quad \sigma = 2.828 \quad$ $\boxed{\sigma^2(\text{exact}) = 8}$

Take all Samples of Size 2 with replacement from this list.

1,1	1,3	1,5	1,7	1,9
3,1	3,3	3,5	3,7	3,9
5,1	5,3	5,5	5,7	5,9
7,1	7,3	7,5	7,7	7,9
9,1	9,3	9,5	9,7	9,9

Now find $\bar{x}$ of each Sample.

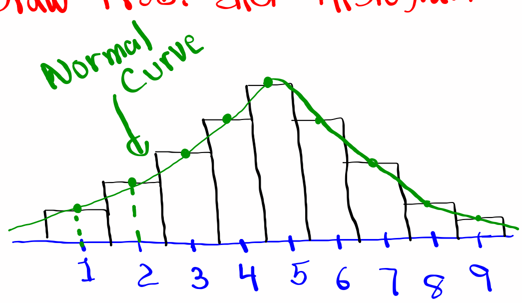
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9

25 Means

$\bar{x}$	$P(\bar{x})$
1	1/25
2	2/25
3	3/25
4	4/25
5	5/25
6	4/25
7	3/25
8	2/25
9	1/25

$\bar{x}$ (L2)	$P(\bar{x})$ (L3)
1	1/25
2	2/25
3	3/25
4	4/25
5	5/25
6	4/25
7	3/25
8	2/25
9	1/25

Draw Prob. dist. histogram



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

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

$\mu = 5 \qquad \sigma = 2 \qquad \sigma^2(\text{exact}) = 4 \qquad \boxed{n = 1}$

Total Prob. = 1

$\mu_{\bar{x}} = \mu$ $\qquad$ $\sigma^2_{\bar{x}} = \dfrac{\sigma^2}{n}$ $\quad \sigma \quad n=2$

Central - Limit Theorem

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

Ex: Consider a normal Prob. dist. with

$\mu = 250 \qquad \sigma = 36$

If we take sample of size 4,

$\mu_{\bar{x}} = \mu = \boxed{250}$

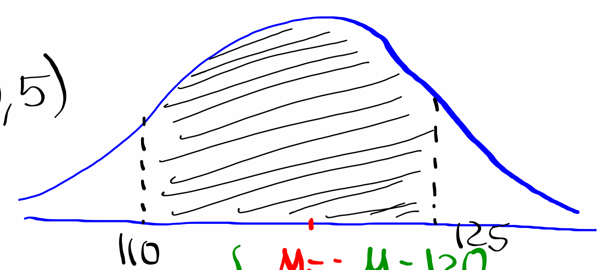
$\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{36}{\sqrt{4}} = \dfrac{36}{2} = \boxed{18}$

Suppose $N(120, 10)$, for randomly selected groups of 4, find

$P(110 < \bar{x} < 125)$

$= \text{normalcdf}(110, 125, 120, 5)$

$= \boxed{.819}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 120 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{10}{\sqrt{4}} = 5 \end{cases}$

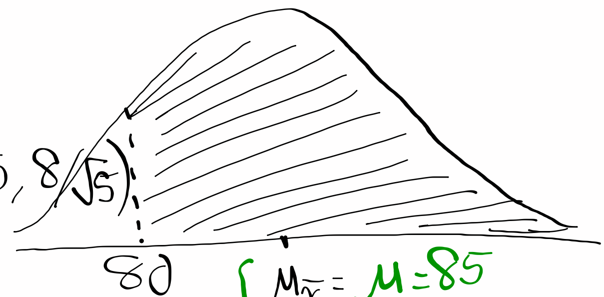
Exam Scores are normally dist. with $\boxed{\mu = 85}$ and $\boxed{\sigma = 8}$.

If we randomly select $\overbrace{\text{5 exams}}^{n=5}$, find the Prob. that $\underbrace{\text{their mean}}_{\bar{x}}$ is above 80.

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

$= \text{normalcdf}(80, E99, 85, 8/\sqrt{5})$

$= \boxed{.919}$



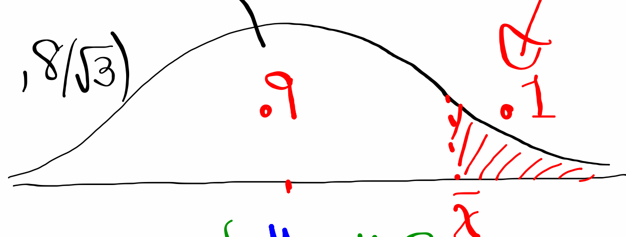
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 85 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{8}{\sqrt{5}} \end{cases}$

For randomly selected groups of 3 exams, $n=3$ find $\boxed{\bar{x}}$ that separates the $\boxed{\text{top } 10\%}$ from the rest.

$\bar{x} = \text{invNorm}(.9, 85, 8/\sqrt{3})$

$= 90.919$

$\approx \boxed{91}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 85 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{8}{\sqrt{3}} \end{cases}$

Class QZ 15

Consider a binomial Prob. dist. with

$n = 60$ and $p = .4$

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

2) Find $P(x \leq 30) = \text{binomcdf}(60, .4, 30) = \boxed{.956}$