Statistics

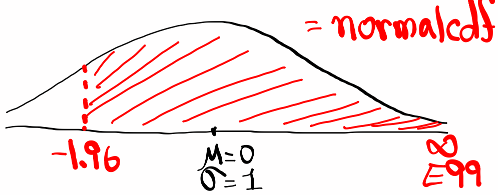
Summer 2022

Lecture 16

Class QZ 16

Drawing, labeling, shading, and full TI command required.

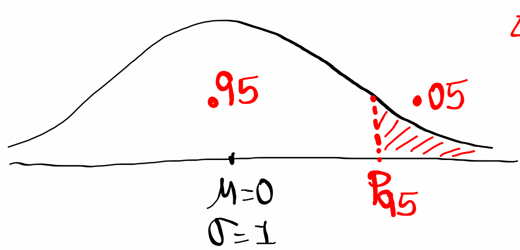
1) find $P(Z > -1.96)$



$= \text{normalcdf}(-1.96, E99, 0, 1)$

$= \boxed{.975}$

2) find $Z = P_{95}$, Round to 3-decimal places.



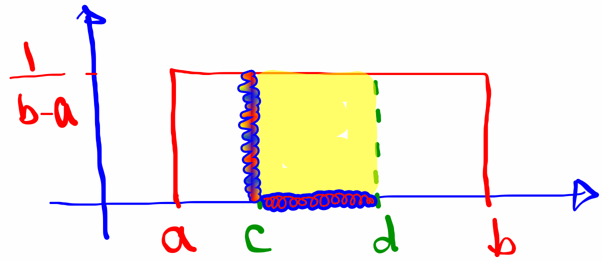
$Z = P_{95}$

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

$= \boxed{1.645}$

Uniform Prob. dist:

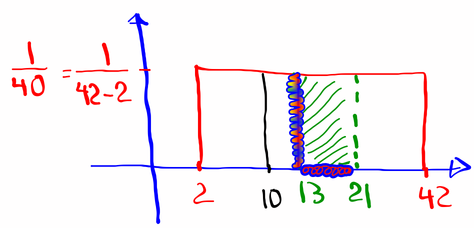
1) Graph is rectangular for all values $a \le x \le b$ with the width of $\frac{1}{b-a}$



2) $P(x=c)=0$

3) $P(c < x < d) = (d-c) \cdot \frac{1}{b-a}$

Consider a uniform Prob. dist. for all values from 2 to 42.



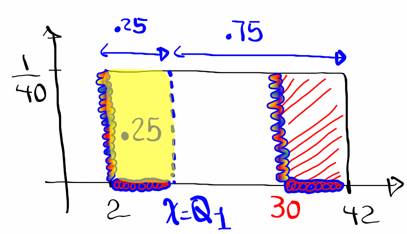
1) $P(\underbrace{x=10}_{\text{Line}}) = \underset{\uparrow}{0}$ Area

2) $P(13 < x < 21) = (21-13) \cdot \frac{1}{40} = \frac{8}{40} = \boxed{\frac{1}{5}} = \boxed{.2}$

3) $P(x > 30)$

$= (42-30) \cdot \frac{1}{40}$

$= \frac{12}{40} = \boxed{\frac{3}{10}} = .3$



4) Find $x = Q_1$

25% below, 75% above

$(x-2) \cdot \frac{1}{40} = .25$

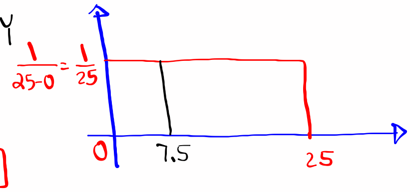
$x-2 = 40(.25)$

$x-2 = 10$

$\boxed{x=12}$

Consider a uniform Prob. dist. for $0 \le x \le 25$.

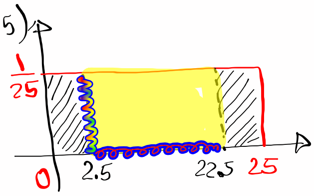
1) Draw & label clearly



2) Find $P(x = 7.5) = \boxed{0}$

Line has Zero Area

3) Find $P(x < 2.5 \text{ or } x > 22.5)$

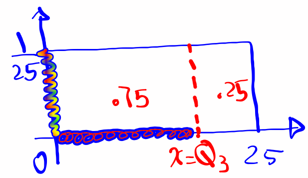


$= 1 - P(2.5 < x < 22.5)$

$= 1 - (22.5 - 2.5) \cdot \frac{1}{25}$

$= 1 - \frac{20}{25} = \frac{5}{25} = \boxed{\frac{1}{5}} = \boxed{.2}$

4) Find $x = Q_3$



$(x - 0) \cdot \frac{1}{25} = .75$

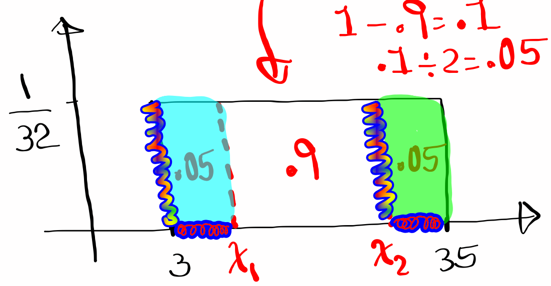
$x = 25(.75)$ $\boxed{x = 18.75}$

Consider a Uniform Prob. dist for $\boxed{3 \le x \le 35}$

Find two values that separate the middle 90% from the rest.

$1 - .9 = .1$

$.1 \div 2 = .05$



$(x_1 - 3) \cdot \frac{1}{32} = .05$

$x_1 - 3 = 32(.05)$

$x_1 - 3 = 1.6$

$\boxed{x_1 = 4.6}$

$(35 - x_2) \cdot \frac{1}{32} = .05$

$35 - x_2 = 32(.05)$

$35 - x_2 = 1.6$

$35 - 1.6 = x_2$

$\boxed{x_2 = 33.4}$

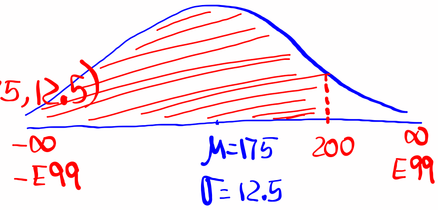
Consider a normal Prob. dist with $\mu = 175$ and $\sigma = 12.5$.

$E^{99} \neq E99$

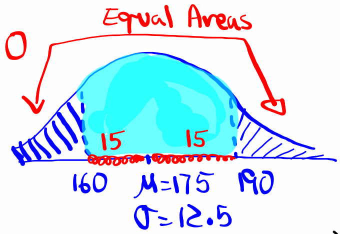
1) find $P(x < 200)$

$= \text{normalcdf}(-E99, 200, 175, 12.5)$

$= \boxed{.977}$



2) $P(\underbrace{x < 160 \text{ and } x > 190}_{\text{M.E.E.}}) = 0$



3) $P(x < 160 \text{ OR } x > 190)$

$= 1 - P(160 < x < 190) = 1 - \text{normalcdf}(160, 190, 175, 12.5)$

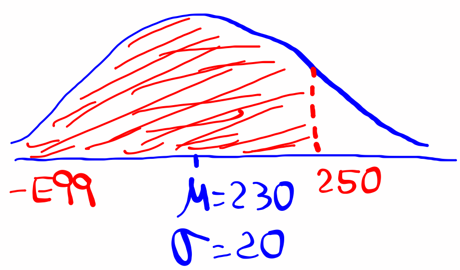
$= \boxed{.230}$

Given $N(230, 20)$

1) find $P(X < 250)$

$= \text{normalcdf}(-E99, 250, 230, 20)$

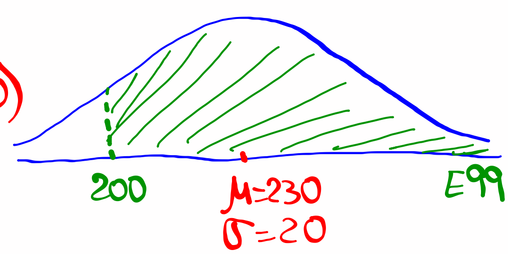
$= \boxed{.841}$



2) find $P(x > 200)$

$= \text{normalcdf}(200, E99, 230, 20)$

$= \boxed{.933}$



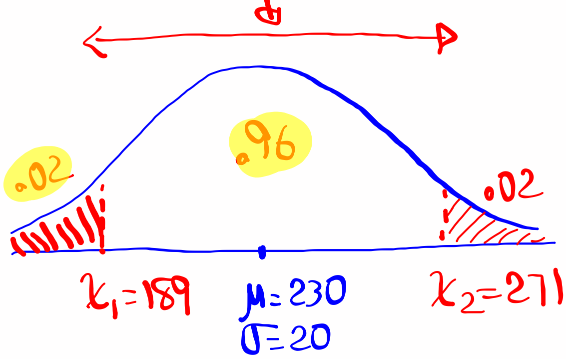
3) Find two x-values, rounded to whole numbers, that separate the middle 96% from the rest.

$1 - .96 = .04$

$.04 \div 2 = .02$

$x_1 = \text{invNorm}(.02, 230, 20)$

$\approx \boxed{189}$



$x_2 = \text{invNorm}(.98, 230, 20) \approx \boxed{271}$

Ages of nurses are normally distributed with mean of 42.5 Yrs with standard deviation of 5.4 Yrs. $N(42.5, 5.4)$

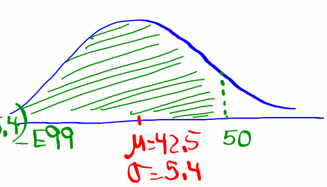
If we randomly select one nurse, find the prob. that he/she is

1) below 50 Yrs old.

$P(x < 50)$

$= \text{normalcdf}(-E99, 50, 42.5, 5.4)$

$= \boxed{.918}$

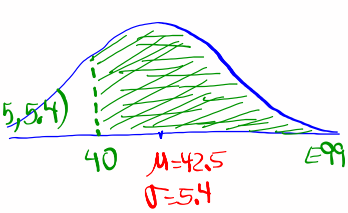


2) more than 40.

$P(x > 40)$

$= \text{normalcdf}(40, E99, 42.5, 5.4)$

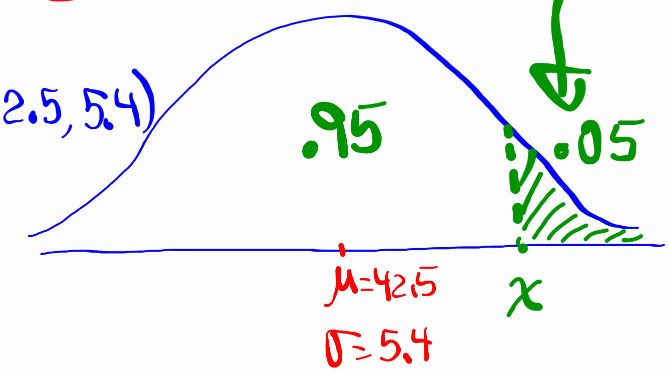
$= \boxed{.678}$



3) Find the age, round to 1-decimal, that separates the top 5% from the rest.

$x = \text{invNorm}(.95, 42.5, 5.4)$

$\approx \boxed{51.4}$



Clear all lists.

Store 2, 6, 10, 14, 18 in L1.

Use 1-Var Stats with L1

Find

$\mu = 10$

$\sigma = 5.657$

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

σ^2 (Reduced Fraction) $= 32$

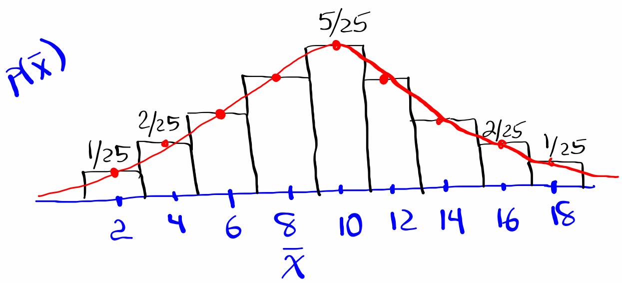
2,2	2,6	2,10	2,14	2,18
6,2	6,6	6,10	6,14	6,18
10,2	10,6	10,10	10,14	10,18
14,2	14,6	14,10	14,14	14,18
18,2	18,6	18,10	18,14	18,18

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

2	4	6	8	10
4	6	8	10	12
6	8	10	12	14
8	10	12	14	16
10	12	14	16	18

25 means

$\bar{x}$	$P(\bar{x})$
2	1/25
4	2/25
6	3/25
8	4/25
10	5/25
12	4/25
14	3/25
16	2/25
18	1/25



$\bar{x}$	$P(\bar{x})$
2	1/25
4	2/25
6	3/25
8	4/25
10	5/25
12	4/25
14	3/25
16	2/25
18	1/25

$\bar{x} \rightarrow L2$

$P(\bar{x}) \rightarrow L3$

list　　freq List

Use 1-Var Stats L2, L3

$\mu = 10$

$\sigma = 4$

σ^2 (Reduced Fraction) $= 16 = \frac{32}{2}$

Repeat the last example with

$\underbrace{1,\ 3,\ 5,\ 7}_{L1}$

$\mu = 4$

$\sigma = 2.236$

σ^2 (Reduced fraction) $= 5$

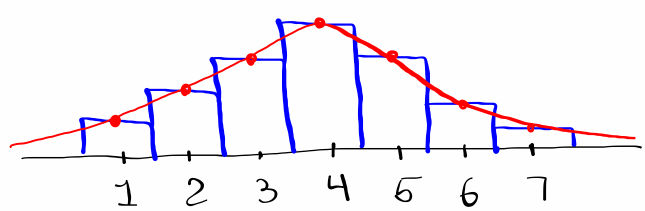
take all Samples of $\boxed{\text{Size } 2}$ with replacement.
then find $\bar{x}$ of each Sample.

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

1	2	3	4
2	3	4	5
3	4	5	6
4	5	6	7

$\bar{x}$	$P(\bar{x})$
1	1/16
2	2/16
3	3/16
4	4/16
5	3/16
6	2/16
7	1/16

$\bar{x}$	$P(\bar{x})$
1	1/16
2	2/16
3	3/16
4	4/16
5	3/16
6	2/16
7	1/16



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

1-Var Stats with L2 & L3

$\mu = 4$

$\sigma = 1.581$

σ^2 (Reduced fraction) $= \frac{5}{2}$

Central Limit theorem:

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

$$\boxed{\sigma_{\bar{x}}^2 = \frac{\sigma^2}{n}}$$

$$\boxed{\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}}$$

Salaries of nurses are normally distributed with the mean of \$6200 and standard deviation of \$250.

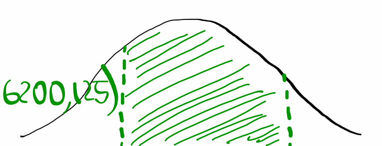
$N(6200, 250)$

If we randomly select 4 nurses, find the prob. that their mean salary is between \$6000 and \$6500.

$P(6000 < \bar{x} < 6500)$

$= \text{normalcdf}(6000, 6500, 6200, 125)$

$\approx \boxed{.937}$



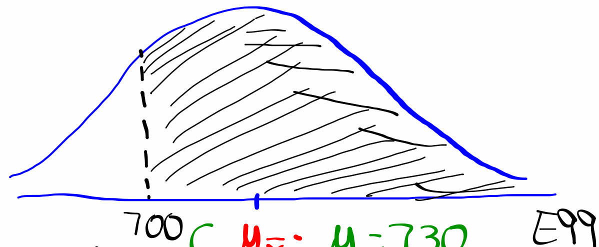
6000 6500

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6200 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{250}{\sqrt{4}} = 125 \end{cases}$

Credit Scores are normally dist. with $\mu = 730$ and $\sigma = 50$. $N(730, 50)$

If we randomly Select 5 people, find the Prob. that their mean Credit Score is above 700.

$P(\bar{x} > 700)$



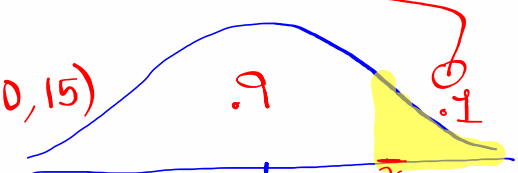
$= \text{normalcdf}(700, E99, 730, 50/\sqrt{5})$

$= \boxed{.910}$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 730 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{50}{\sqrt{5}} \end{cases}$

Length of baseball games are normally dist with $\mu = 200$ minutes and $\sigma = 30$ minutes.

For randomly Selected 4 baseball games Find $\bar{x}$ that Separates the top 10% from the rest.



$\bar{x} = \text{invNorm}(.9, 200, 15)$

$\approx \boxed{219}$

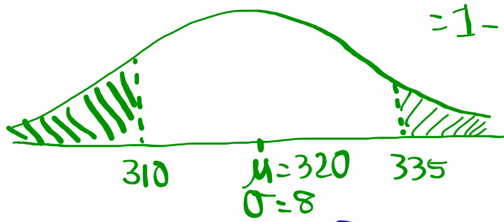
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 200 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{30}{\sqrt{4}} = 15 \end{cases}$

SG 18 – 21 ✓✓✓

Class QZ 17

Given $N(320, 8)$

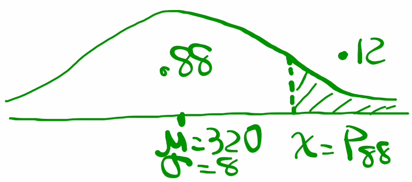
1) Find $P(x < 310 \text{ OR } x > 335)$



$= 1 - \text{normalcdf}(310, 335, 320, 8)$

$= \boxed{.136}$

2) Find $x = P_{88}$, Round to a whole #.



$x = P_{88} = \text{invNorm}(.88, 320, 8)$

$= 329.399\ldots \approx \boxed{329}$