Elementary Statistics Lecture 10

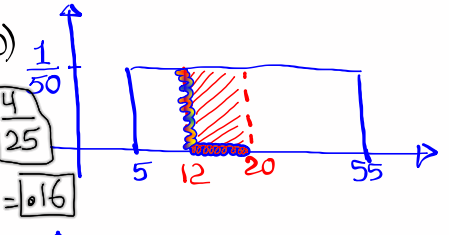
Uniform Prob. dist: SG 18

Consider a uniform Prob. dist for all values from 5 to 55.

1) Find $P(12 < x < 20)$

$= (20-12) \cdot \frac{1}{50} = \frac{8}{50} = \frac{4}{25}$

$= .16$



2) Find $x = P_{80}$

80% left

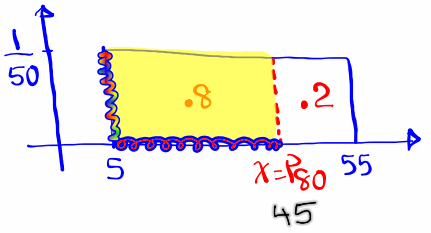
20% Right

$(x-5) \cdot \frac{1}{50} = .8$

$x - 5 = 50(.8)$

$x - 5 = 40$

$x = 45$



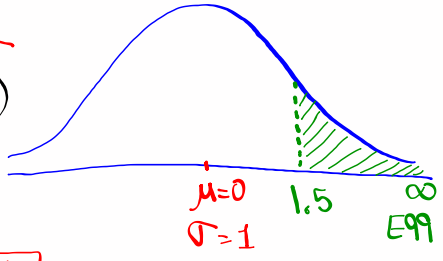
Standard Normal Prob. Dist:

Find $P(z > 1.5)$

L U μ σ

=normalcdf(1.5, E99, 0, 1)

2nd [2] 2nd VARS



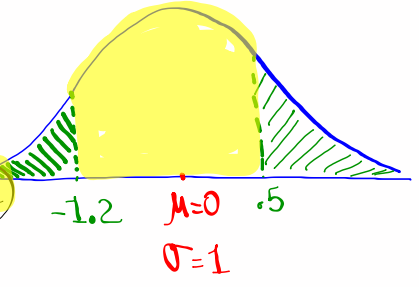
$= .067$

Find $P(z < -1.2 \text{ OR } z > .5)$

$= 1 - P(-1.2 < z < .5)$

$= 1 - \text{normalcdf}(-1.2, .5, 0, 1)$

↑ Total area $= .424$

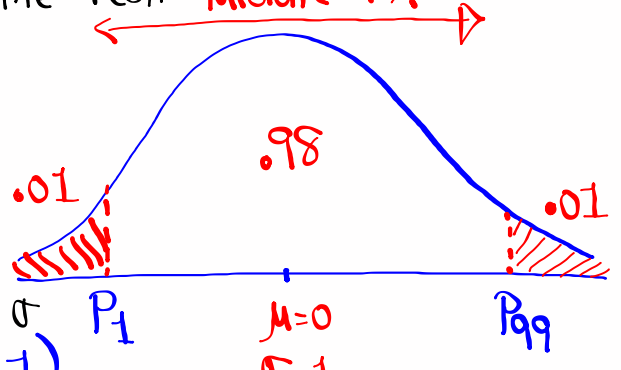


Find two z-values that separate the middle 98% from the rest. Middle 98%

$1 - .98 = .02$

$.02 \div 2 = .01$

Left Area



$z = P_1 = \text{invNorm}(.01, 0, 1)$

$= -2.326$

$z = P_{99} = \text{invNorm}(.99, 0, 1) = 2.326$

Normal Prob. dist:

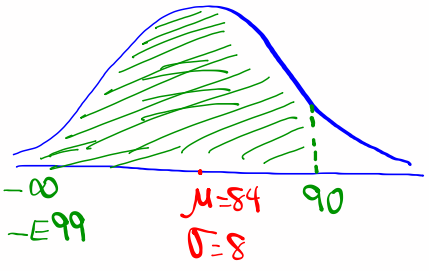
Consider a normal Prob. dist with $\mu=84$ and $\sigma=8$.

Find $P(x<90)$

=normalcdf(−E99, 90, 84, 8)

(−) → 2nd [2]

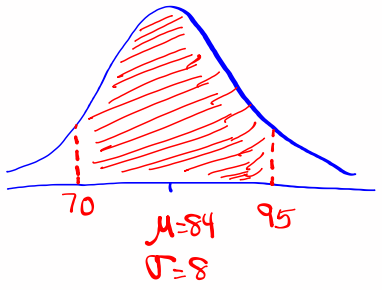
$=\boxed{.773}$



Find $P(70<x<95)$

=normalcdf(70, 95, 84, 8)

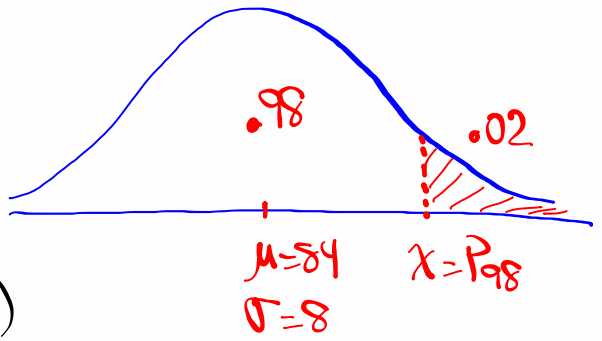
$=\boxed{.875}$



Find $x=P_{98}$, Round to a whole #

98% left

2% Right



x=invNorm(.98, 84, 8)

$=100.430 \approx \boxed{100}$

Summer temp around the College are normally dist with the mean of 95° and standard deviation of 10°. $N(95,10)$

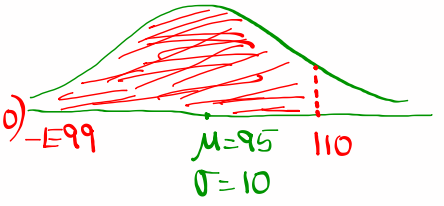
If we randomly select one Summer day, find the prob. that the temp is

a) below 110°.

$P(x<110)$

=normalcdf(−E99,110,95,10)

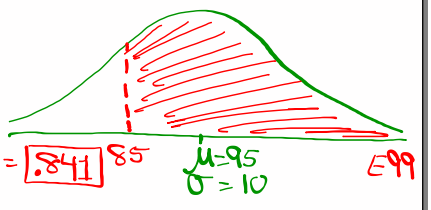
= .933



b) above 85°.

$P(x>85°)$

=normalcdf(85, E99,95,10) = .841



c) Find a temp that Separates the top 5% from the rest. Round to a whole.

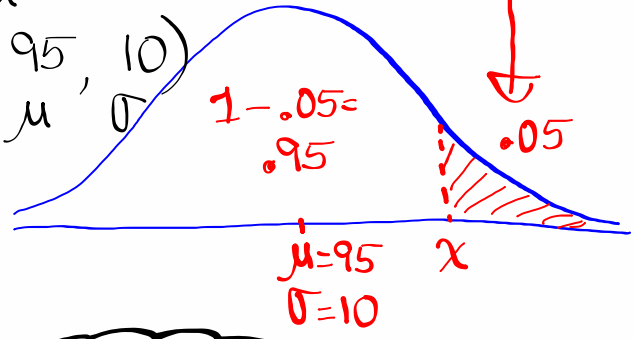
Left Area

$x = invNorm(.95, 95, 10)$

μ σ

= 111.449

≈ 111



SG 18

SG 19

Clear all lists.

Reset all lists.

Store

2, 4, 6, 8 in L1.

Use 1-Var Stats with L1 to find

$\mu = 5$

$\sigma = 2.236$

Let's take all Samples of Size 2 with replacement from this data.

σ^2 (Reduced Fraction) $= 5$

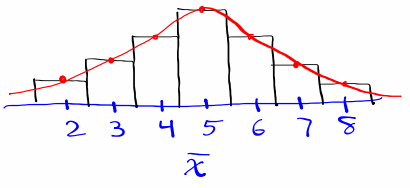
2,2	2,4	2,6	2,8
4,2	4,4	4,6	4,8
6,2	6,4	6,6	6,8
8,2	8,4	8,6	8,8

Find $\bar{x}$ of each Sample

2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

$\bar{x}$	$P(\bar{x})$
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16

Draw Prob. dist. Histogram



$\bar{x}$	$P(\bar{x})$
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16

$\bar{x} \rightarrow L2$

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

list: L2 Freq List: L3

1-Var Stats L2, L3

$\mu = 5$

$\sigma = 1.581$

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

Samples of Size 2

Clear all lists.

Store 1, 5, 9, 13, 17 in L1

Use 1-Var stats with L1 → $\mu = 9$, $\sigma = 5.657$, σ^2 (Reduced fraction) $\frac{32}{1}$

Let's take all Samples of Size 2 with replacement from this data.

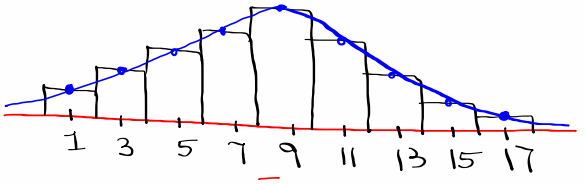
1,1	1,5	1,9	1,13	1,17
5,1	5,5	5,9	5,13	5,17
9,1	9,5	9,9	9,13	9,17
13,1	13,5	13,9	13,13	13,17
17,1	17,5	17,9	17,13	17,17

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

1	3	5	7	9
3	5	7	9	11
5	7	9	11	13
7	9	11	13	15
9	11	13	15	17

$\bar{x}$	$P(\bar{x})$
1	1/25
3	2/25
5	3/25
7	4/25
9	5/25
11	4/25
13	3/25
15	2/25
17	1/25

$\bar{x}$	$P(\bar{x})$
1	1/25
3	2/25
5	3/25
7	4/25
9	5/25
11	4/25
13	3/25
15	2/25
17	1/25



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

1-Var stats L2, L3

$\mu = 9$

$\sigma = 4$

σ^2 (exact) $= 16 = \frac{32}{2}$

Central Limit Theorem

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

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

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

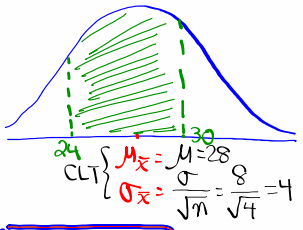
Ages of all College students are normally dist. with $\mu = 28$ and $\sigma = 8$.

If we randomly select 4 students, find the prob. that their mean age $\bar{x}$ is between 24 and 30.

$P(24 < \bar{x} < 30)$

= normalcdf(24, 30, 28, 4)

= .533

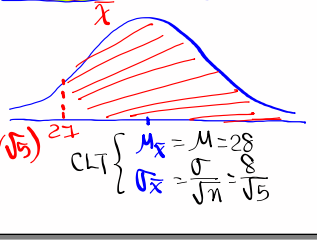


If we randomly select 5 students, find the prob. that their mean age $\bar{x}$ is above 21

$P(\bar{x} > 21)$

= normalcdf(21, E99, 28, 8/√5)

= .975

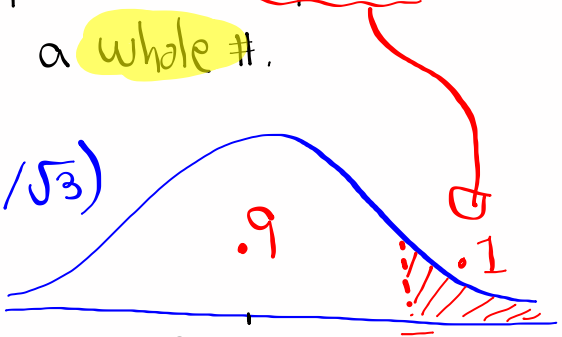


Find $\bar{x}$ for randomly selected group of 3 students that separate the top 10% from the rest. Round to a whole #.

$\bar{x} = \text{invNorm}(.9, 28, 8/\sqrt{3})$

$= 33.919$

$\approx \boxed{34}$

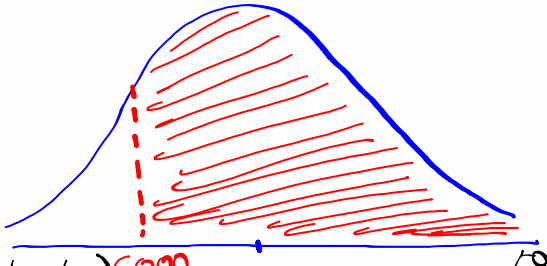


CLT $\begin{cases} \mu_{\bar{x}} = \mu = 28 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{3}} \end{cases}$

Salaries of nurses are normally dist. with $\mu = \$6200$, and $\sigma = 400$. $N(6200, 400)$

If we randomly select 10 nurses find the prob. that their mean is more than $6000.

$P(\bar{x} > 6000) =$



normalcdf(6000, E99, 6200, $400/\sqrt{10}$)

$= \boxed{.943}$

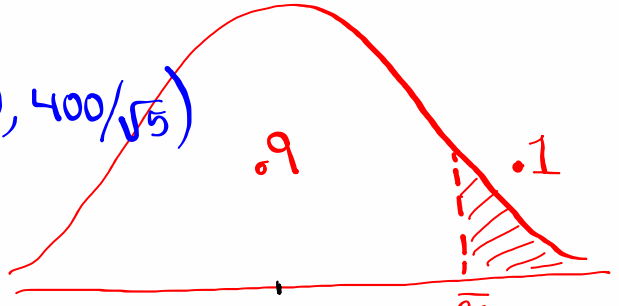
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6200 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{400}{\sqrt{10}} \end{cases}$

Find $\bar{x} = P_{90}$ for randomly selected group of 5 nurses. Round to a whole #.

$\bar{x} = \text{invNorm}(.9, 6200, 400/\sqrt{5})$

$= 6429.25$

$\approx \boxed{6429}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6200 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{400}{\sqrt{5}} \end{cases}$

Given $N(175, 25)$

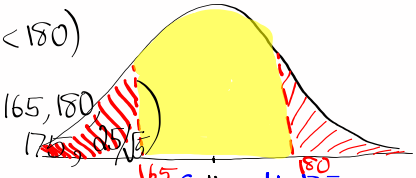
Consider groups of 5,

Find $P(\bar{x} < 165 \text{ OR } \bar{x} > 180)$

$= 1 - P(165 < \bar{x} < 180)$

$= 1 - \text{normalcdf}(165, 180$

$= \boxed{.513}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 175 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{25}{\sqrt{5}} \end{cases}$

Find $\bar{x} = Q_3$ for randomly selected groups of 4. Round to whole #

$\bar{x} = \text{invNorm}(.75, 175, 12.5)$

$\approx \boxed{183}$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 175 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{25}{\sqrt{4}} = 12.5 \end{cases}$

SG 20
SG 21