Statistics

Fall 2022

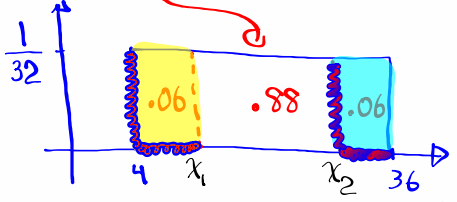
Lecture 19

Feb 19-8:47 AM

Consider a **Uniform Prob. dist** for all values **from 4 to 36**. Find two values that separate the **middle 88%** from the rest.

$1 - .88 = .12$

$.12 \div 2 = .06$



$(x_1 - 4) \cdot \frac{1}{32} = .06$

$x_1 - 4 = 32(.06)$

$x_1 = 4 + 32(.06)$

$x_1 = 5.92$

$(36 - x_2) \cdot \frac{1}{32} = .06$

$36 - x_2 = 32(.06)$

$36 - 32(.06) = x_2$

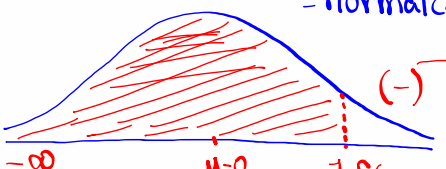
$x_2 = 34.08$

Nov 23-6:01 AM

Find $P(Z < 1.96)$

=normalcdf(L: $-E99$, U: 1.96, μ: 0, σ: 1)

(-) 2nd [,]

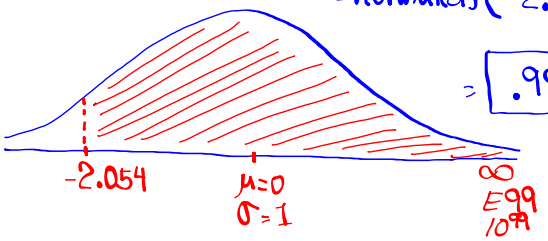


= .975

Find $P(Z > -2.054)$

=normalcdf(L: -2.054, U: E99, μ: 0, σ: 1)

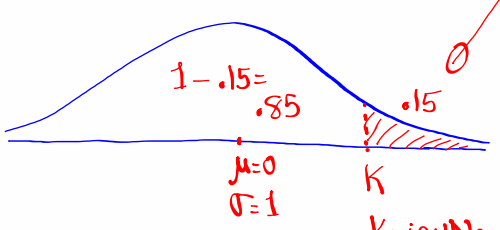
= .980



Nov 23-6:08 AM

Find K such that $P(Z > K) = .15$

Right Area



K=invNorm(Left Area: .85, μ: 0, σ: 1)

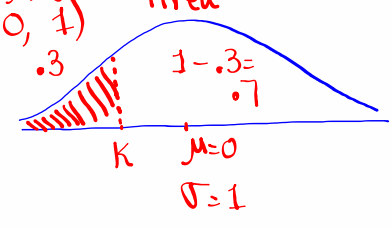
= 1.036

Find K such that $P(Z < K) = .3$

left Area

K=invNorm(Left Area: .3, μ: 0, σ: 1)

= -.524



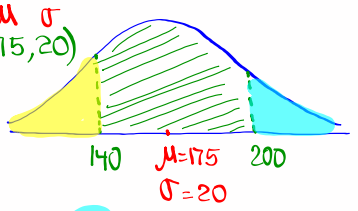
Nov 23-6:16 AM

Consider a normal Prob. dist with $\mu = 175$ and $\sigma = 20$. $N(175, 20)$

1) Find $P(140 < x < 200)$

= normalcdf(L, U, μ, σ) = normalcdf(140, 200, 175, 20)

= .854



2) Find $P(x < 140 \text{ OR } x > 200)$

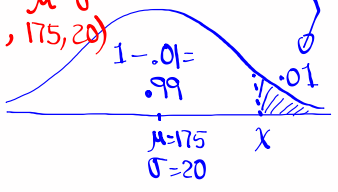
$= 1 - .854 = .146$

3) Find x-value that Separates the top 1% from the rest. Round to whole #

x = invNorm(Left Area, μ, σ) = invNorm(.99, 175, 20)

= 221.527

≈ 222



Nov 23-6:22 AM

Ages of teachers in LAUSD has a normal Prob. dist. with $\mu = 46.5$ Yrs and $\sigma = 7.5$ Yrs. $N(46.5, 7.5)$

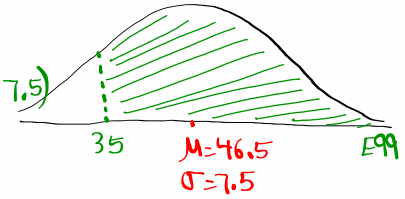
If we randomly select one teacher find the Prob. that his/her age is

1) more than 35 Yrs.

$P(x > 35)$

= normalcdf(35, E99, 46.5, 7.5)

= .937

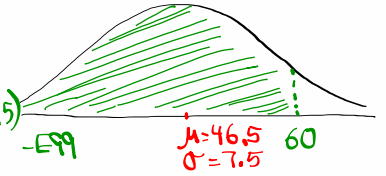


2) less than 60 Yrs.

$P(x < 60)$

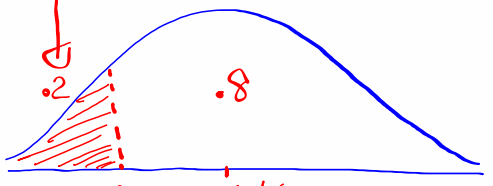
= normalcdf(−E99, 60, 46.5, 7.5)

= .964



Nov 23-6:33 AM

3) Find χ an age, rounded to 1-decimal, that Separates the bottom 20% from the rest.



2nd VARS

χ = invNorm(Left area, μ, σ)

= invNorm(.2, 46.5, 7.5)

= 40.188 $\approx$ 40.2

About 20% of teachers are below 40.2 Yrs old

About 80% of teachers are more than 40.2 Yrs old.

Nov 23-6:42 AM

Clear all lists

Reset all lists

Store 2, 4, 6, 8 in L1

Use 1-Var Stats with L1 only to find

1) $\mu = \bar{x} =$ 5 ✓

2) $\sigma = \sigma_{\bar{x}} =$ 2.236

3) σ^2 (exact) = 5 ✓

Take all Samples of Size 2 with replacement from L1.

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

Now find $\bar{x}$ of each sample

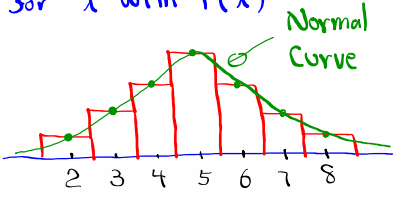
2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

16 Means

Now Complete the chart below

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

Now draw Prob. dist. histogram for $\bar{x}$ with $P(\bar{x})$



Nov 23-7:08 AM

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

Use 1-Var Stats with L2 & L3 to find

$\mu = 5$ $\quad \sigma = 1.581$ $\quad \sigma^2(\text{exact}) = 2.5 = \frac{5}{2}$

Notice For L1 $\rightarrow \mu = 5$ $\quad \sigma^2 = 5$

For L2 & L3 $\rightarrow \mu = 5$ $\quad \sigma^2 = \frac{5}{2}$

Clear all lists.

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

Use 1-Var Stats with L1 only to find

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

Now take all Samples of Size 2 with replacement.

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

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

Nov 23-7:22 AM

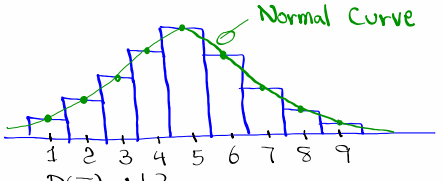
Find $\bar{x}$ of each Sample.

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

Draw Prob. dist. histogram for $\bar{x}$ and $P(\bar{x})$



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

Use 1-Var Stats with L2 & L3 to find

$\mu = 5$ $\quad \sigma = 2$ $\quad \sigma^2(\text{exact}) = 4 = \frac{8}{2}$

From L1 $\rightarrow \mu = 5$ $\quad \sigma^2 = 8$

From L2 & L3 $\rightarrow \mu = 5$ $\quad \sigma^2 = \frac{8}{2}$

Nov 23-7:35 AM

Central Limit Theorem (CLT)

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

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

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

Scores on SAT are normally dist. with $\mu = 1200$ and $\sigma = 100$.

If we take all Samples of 16 SAT Scores,

$\mu_{\bar{x}} = \mu = 1200$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{100}{\sqrt{16}} = \frac{100}{4} = 25$

Nov 23-7:46 AM

Consider a normal Prob. dist with $\mu = 88$ and $\sigma = 10$.

If we randomly select group of 4, $n = 4$

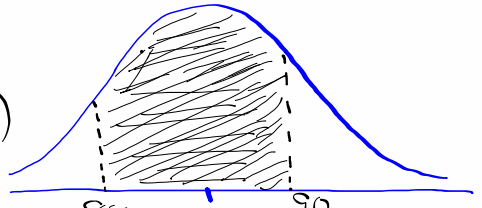
find the Prob. that their mean $\bar{x}$ is between 85 and 90.

$P(85 < \bar{x} < 90)$

= normalcdf(85, 90, 88, 5)

= .381

= 38.1% ≈ 38%



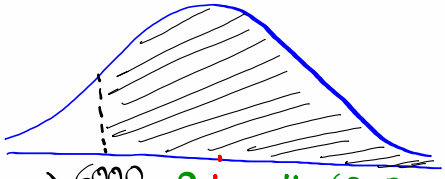
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 88 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{4}} = 5 \end{cases}$

Nov 23-7:50 AM

Salaries of nurses has a normal dist with mean of \$6200/mo. and standard dev. of \$400/mo. $N(6200, 400)$

If we randomly select 16 nurses ($n=16$), find the Prob. that their mean ($\bar{x}$) Salary is above \$6000/mo.

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



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

= normalcdf(6000, E99, 6200, 100)

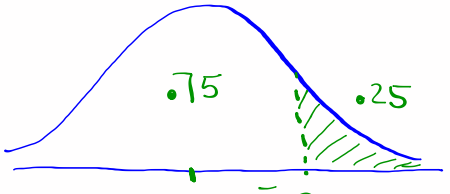
= .977 = 97.7% ≈ 98%

Nov 23-7:59 AM

For randomly selected group of 10 nurses, find $\bar{x} = Q_3$. Round to a whole #.

75% below — Left Area .75

25% above — Right area .25



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

$\bar{x}$ = invNorm(.75, 6200, 400/√10)

= 6285.317

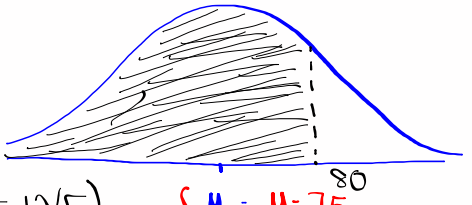
≈ 6285

Nov 23-8:07 AM

Speed of cars on FWY 60 are normally dist. with mean of 75 mph and standard dev. of 12 mph. $N(75, 12)$

If we randomly select $n=5$ 5 cars on this FWY, find the prob. that their $\bar{x}$ mean speed is below 80 mph.

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



$= \text{normalcdf}(-E99, 80, 75, 12/\sqrt{5})$

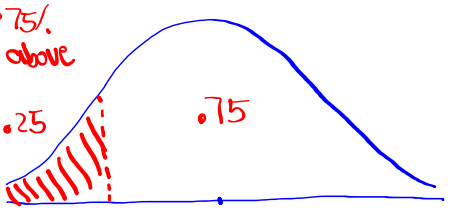
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 75 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{12}{\sqrt{5}} \end{cases}$

$= \boxed{.824} = 82.4\% \approx \boxed{82\%}$

Nov 23-8:14 AM

For randomly selected groups of 8 cars, find $\bar{x} = Q_1$, Round to a whole #.

25% below, 75% above



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 75 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{12}{\sqrt{8}} \end{cases}$

left Area

$\bar{x} = Q_1 = \text{invNorm}(.25, 75, 12/\sqrt{8})$

$\mu \quad \sigma$

$= 72.138$

$\approx \boxed{72}$

SG 20 & SG 21

Nov 23-8:23 AM