Statistics

Lecture 10

Feb 19-8:47 AM

S6.8

Normal Prob. Dist.:

1) Use x, $P(x=c)=0$

2) Dist. is symmetric, bell-shape with total area = 1.

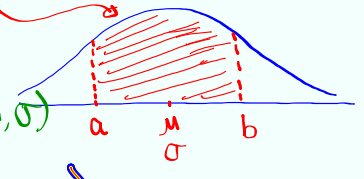
3) Mean = Mode = Median

4) μ & σ are given in the Problem.

$P(a<x<b)$ is the corresponding area within the normal curve.

How to find it:

normalcdf(L, U, μ, σ)



$N(\mu, \sigma)$

Normal Prob. dist.

Mean

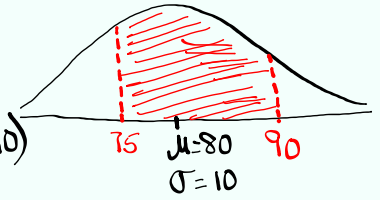
Standard Deviation

Nov 4-7:02 PM

Given $N(80, 10)$ — Normal Prob. dist. — μ, σ

Find $P(75 < x < 90)$

=normalcdf(75, 90, 80, 10)

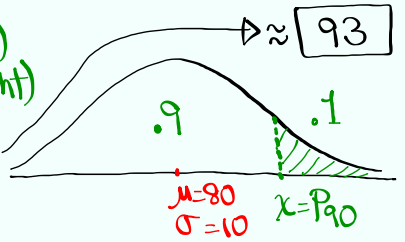


= .533

Find $x = P_{90}$, Round to whole #

Left Area — 90% below (Left), 10% above (Right)

x = invNorm(.9, 80, 10) — μ, σ



Nov 4-7:08 PM

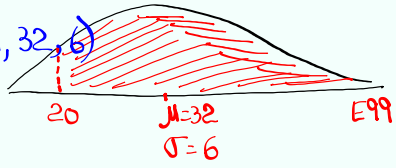
Consider a normal Prob. dist. with the mean of 32 and Standard dev. of 6.

$N(32, 6)$

Find $P(x > 20)$

=normalcdf(20, E99, 32, 6)

2nd [9]



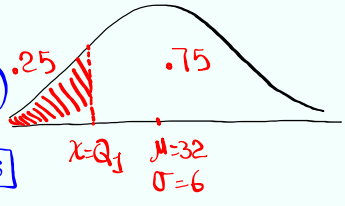
= .977 ≈ 97.7%

Find $x = Q_1$, Round to whole #.

25% below

75% above

$x = Q_1$ = invNorm(.25, 32, 6)



= 27.953 ≈ 28

Nov 4-7:15 PM

Salaries of nurses in LA County has a normal dist. with mean of \$7200/mo. and standard deviation of \$400/mo.

$N(7200, 400)$

If we randomly Select one nurse find the prob. that his/her Salary (x) is below \$8000.

$P(x<8000)$

=normalcdf(-E99, 8000, 7200, 400)

(-) 2nd , -E99 $\mu=7200$ $\sigma=400$ 8000

$=.977$

Find a Salary (x) that Separates the top 2% from the rest. Right area

$x=$invNorm$(.98, 7200, 400)$

.98 .02 $\mu=7200$ $\sigma=400$ $x=P_{98}$

$=8021.500 \approx 8021$ (4995)

≈ 8022

Nov 4-7:24 PM

Ages of students are normally dist. with $\mu=30$ Yrs and $\sigma=5$ Yrs.

If we randomly Select one Student find the Prob. that his/her age (x) is below 20 or above 40.

$P(x<20 \text{ OR } x>40)$

$=1-$normalcdf$(20, 40, 30, 5)$

Total Area

$=.046$

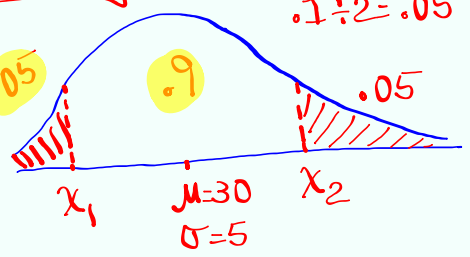
20 $\mu=30$ $\sigma=5$ 40

Nov 4-7:36 PM

Find two ages, Round to 1-dec., that Separate the middle 90% from the rest.

$1 - .9 = .1$

$.1 \div 2 = .05$



$x_1 = P_5 = \text{invNorm}(.05, 30, 5) \approx \boxed{21.8}$

$x_2 = P_{95} = \text{invNorm}(.95, 30, 5) \approx \boxed{38.2}$

SG 18 ✓

Nov 4-7:42 PM

SG 19

Clear all lists.

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

Use [1-Var Stats] with L1 only to find

$\mu = \bar{x} = \boxed{4}$ $\quad \sigma = \sigma_x = \boxed{2.236}$ $\quad \sigma^2 = \sigma_x^2 = \boxed{5}$

VARS
5: Statistics
4: σ_x
x^2 Enter

Take all Samples of Size 2 with replacement from 1,3,5,7.

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

16 Samples of Size 2.

Nov 4-8:02 PM

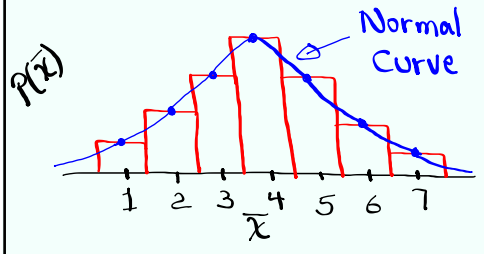
Find $\bar{x}$ of each Samples:

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

16 means

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

Draw Prob. dist. Histogram



$\bar{x} \rightarrow$ L2

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

Use 1-Var Stats with L2 & L3

$\mu_{\bar{x}} = 4$ $\quad \sigma_{\bar{x}} = 1.581$ $\quad \sigma_{\bar{x}}^2 = 2.5 = \frac{5}{2}$

Nov 4-8:10 PM

Clear all lists.

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

Use 1-Var Stats with L1 only to find

$\mu = 5$ $\quad \sigma = 2.828$ $\quad \sigma^2 = 8$

Take all Samples of Size 2 with replacement from 1, 3, 5, 7, and 9.

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

25 Samples of Size 2.

Nov 4-8:21 PM

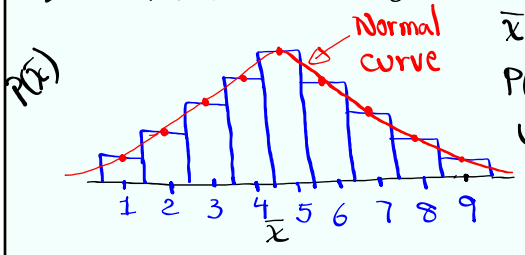
Find $\bar{x}$ of each Samples

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



$\bar{x} \rightarrow L2$

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

Use 1-Var Stats with L2 & L3

$\mu_{\bar{x}} = 5$ $\quad \sigma_{\bar{x}} = 2$ $\quad \sigma_{\bar{x}}^2 = 4 = \frac{8}{2}$

Nov 4-8:27 PM

Central Limit Theorem

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

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

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

Given $N(30, 6)$

If we take Samples of Size 4 ($n=4$)

$\mu_{\bar{x}} = \mu = 30$ CLT

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{4}} = 3$ CLT

Nov 4-8:37 PM

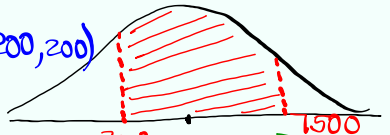
Salaries of nurses are normally dist. with $\mu = \$7200$ and $\sigma = \$400$.

If we randomly select $n = 4$ nurses, find the prob. that their mean ($\bar{x}$) salary is between \$7000 & \$7500.

$P(7000 < \bar{x} < 7500)$

= normalcdf(7000, 7500, 7200, 200)

= .775



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 7200 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{400}{\sqrt{4}} = 200 \end{cases}$

Nov 4-8:41 PM

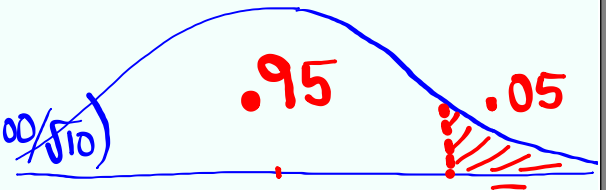
Find $\bar{x} = P_{95}$ for randomly selected group of 10 nurses.

Below

$n = 10$

$\bar{x}$ = invNorm(.95, 7200, 400/$\sqrt{10}$)

≈ 7408



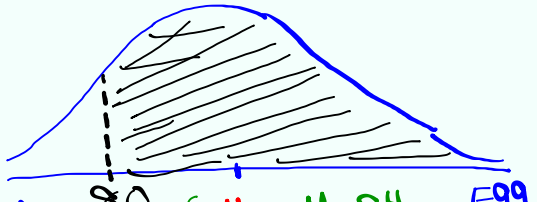
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 7200 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{400}{\sqrt{10}} \end{cases}$

Nov 4-8:47 PM

Exam Scores are N.D. with $\mu = 84$ & $\sigma = 8$

If we randomly Select $n = 3$ 3 exams, find the prob. that their mean $\bar{x}$ Score is more than 80.

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



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 84 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{3}} \end{cases}$

$= \text{normalcdf}(80, E99, 84, 8/\sqrt{3})$

$= .807$

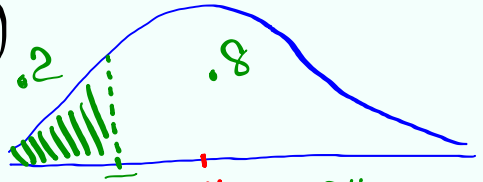
Nov 4-8:54 PM

Find $\bar{x}$ for randomly Selected $n = 4$ 4 exams that Separates the bottom 20% from the rest.

$\bar{x} = P_{20} = \text{invNorm}(.2, 84, 4)$

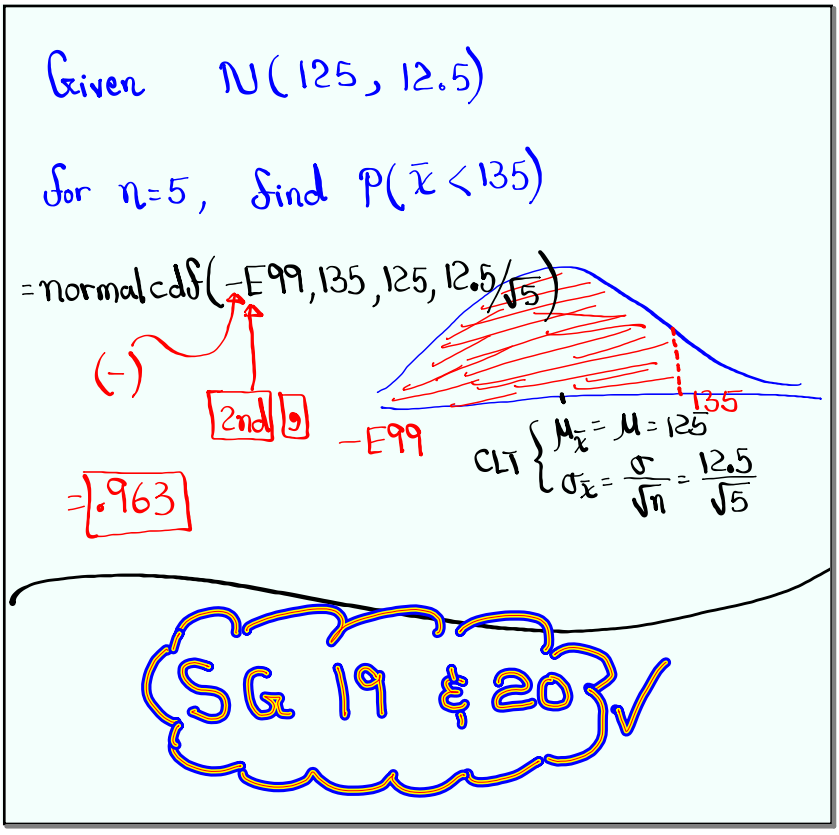
$= 80.634$

≈ 81



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 84 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{4}} = 4 \end{cases}$

Nov 4-9:00 PM


Given N(125, 12.5)
for n=5, find P(x̄ < 135)
=normalcdf(-E99, 135, 125, 12.5/√5)
(-)
2nd 9
-E99
=.963
135
CLT
μx̄ = μ = 125
σx̄ = σ/√n = 12.5/√5
SG 19 & 20 √

Nov 4-9:06 PM