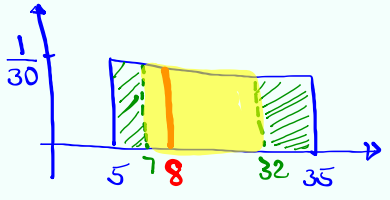
Statistics

Lecture 15

Feb 19-8:47 AM

Consider a Uniform Prob. dist. for all values from 5 to 35.



1) $P(x=8) = 0$

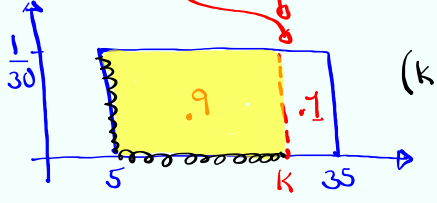
2) $P(x<7 \text{ or } x>32)$

$= 1 - P(7 < x < 32)$

$= 1 - (32-7)\cdot\frac{1}{30} = 1 - \frac{25}{30} = \frac{5}{30}$

$= \frac{1}{6}$

3) Find K such that $P(x>K) = .1$



$(K-5)\cdot\frac{1}{30} = .9$

$K-5 = 30(.9)$

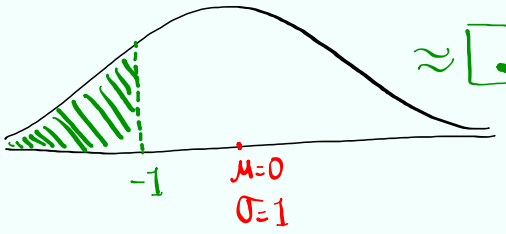
$K = 5 + 30(.9)$ $\quad K=32$

Apr 27-1:47 PM

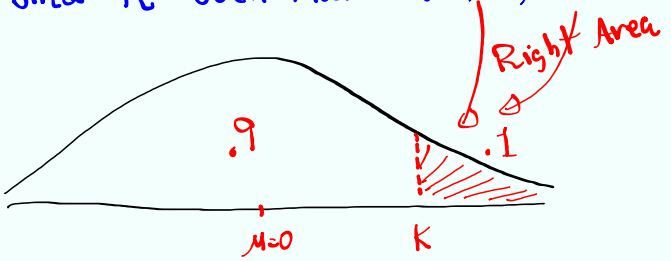
Find $P(Z < -1)$

= normalcdf(-E99, -1, 0, 1)

$\approx$ .159



Find K such that $P(Z > K) = .1$



K = invNorm(.9, 0, 1) = 1.282

Apr 27-1:54 PM

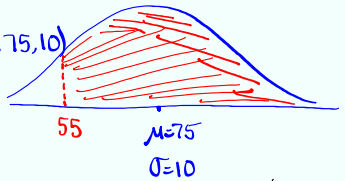
Speed of Cars on certain freeway has a normal dist with mean of 75mph and standard deviation of 10 mph. N(75,10)

If we randomly select one car, find the Prob that the Speed is above 55mph.

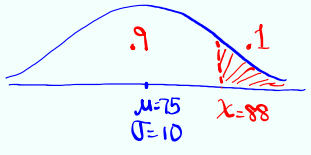
$P(x > 55)$

= normalcdf(55, E99, 75, 10)

$\approx$ .977



Find the speed of Car that Separate the top 10% from the rest.



x = invNorm(.9, 75, 10)

= 87.816 $\approx$ 88

Apr 27-2:00 PM

For Monday, Repeat Same process for population 2, 4, 6, 8, and 10.

Find μ, σ, and σ^2.

take all Samples of Size 2,

Make the table for

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

$\bar{x} \rightarrow L2$, $P(\bar{x}) \rightarrow L3$ use [1-Var Stats] with L2 & L3 to find μ, σ, and σ^2.

Apr 22-3:57 PM

Clear all lists

Store 2, 4, 6, 8, and 10 in L1.

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

$\mu = 6$ $\sigma = 2.828$ $\sigma^2 = 8$

Take all Samples of [Size 2] with replacement from this population.

2,2	2,4	2,6	2,8	2,10
4,2	4,4	4,6	4,8	4,10
6,2	6,4	6,6	6,8	6,10
8,2	8,4	8,6	8,8	8,10
10,2	10,4	10,6	10,8	10,10

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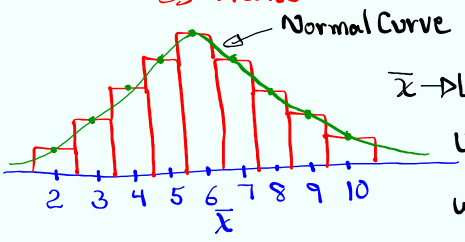
Find $\bar{x}$ of each Sample.

2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10

$\bar{x}$	$P(\bar{x})$
2	1/25
3	2/25
4	3/25
5	4/25
6	5/25
7	4/25
8	3/25
9	2/25
10	1/25

25 means



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

Use 1-Var Stats with L2 & L3

$\mu_{\bar{x}} = 6$

$\sigma_{\bar{x}} = 2$

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

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Central Limit Theorem (CLT)

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

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

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

Given $N(45, 10)$, we take all Samples of Size 4.

$$\mu_{\bar{x}} = \mu = 45$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{4}} = \frac{10}{2} = 5$$

Apr 27-2:21 PM

exam Scores are normally dist. with the mean of 82 and Standard dev. of 12.

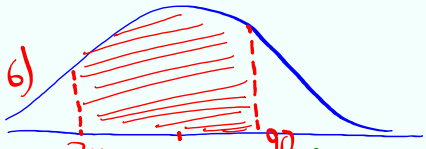
$N(82, 12)$

If we randomly Select $n=4$ exams, find the prob. that their mean Score ($\bar{x}$) is between 75 and 90.

$P(75 < \bar{x} < 90)$

= normalcdf(75, 90, 82, 6)

$\approx$ .787



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 82 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{12}{\sqrt{4}} = 6 \end{cases}$

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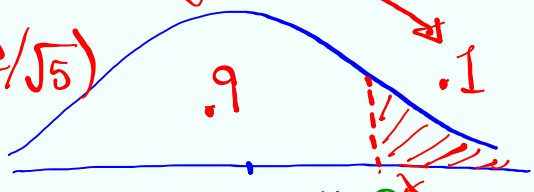
find $\bar{x} = P_{90}$ for randomly Selected 5 exams.

Round to a whole #.

$\bar{x}$ = invNorm(.9, 82, 12/$\sqrt{5}$)

= 88.878

$\approx$ 89



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 82 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{12}{\sqrt{5}} \end{cases}$

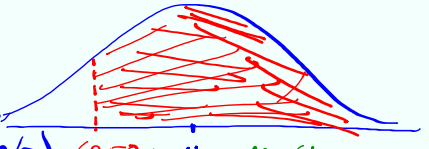
Apr 27-1:05 PM

Salaries of nurses in LA are normally dist. with mean of \$6400/mo. with standard dev. of \$300/mo. $N(6400, 300)$

If we randomly Select $n=8$ 8 nurses, find the Prob. that their mean Salary ($\bar{x}$) is above \$6250/mo.

$P(\bar{x} > 6250)$

=normalcdf(6250, E99, 6400, $300/\sqrt{8}$)



CLT $\mu_{\bar{x}} = \mu = 6400$, $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{300}{\sqrt{8}}$

$\approx$ .921

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$z_{\alpha/2}$ → Area of the right-Tail

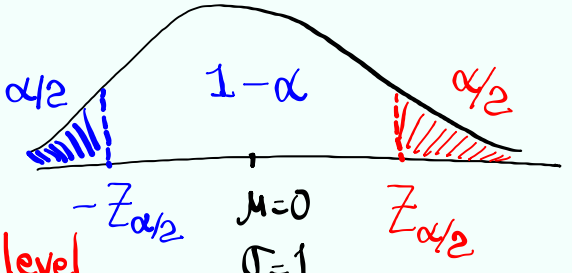
Alpha

$0 < \alpha < 1$

α Significance level

$1 - \alpha$ Confidence level

Middle Area Under the Curve



How to find it:

invNorm(

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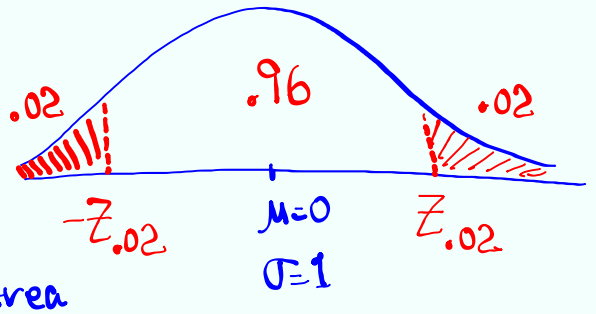
Find $z_{.02}$ ← Right area

$\alpha/2 = .02$

$\alpha = 2(.02) = .04$

$1 - \alpha = .96$ ← Middle Area



$z_{.02} = \text{invNorm}(.98, 0, 1) \approx \boxed{2.054}$

3-dec. places

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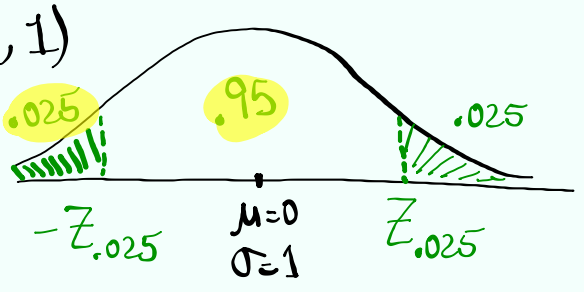
Find $z_{\alpha/2}$ for $\alpha = .05$

$\alpha/2 = .025$ Area of each tail

$1 - \alpha = .95$ Middle area

$z_{.025} = \text{invNorm}(.975, 0, 1)$

$\approx \boxed{1.960}$



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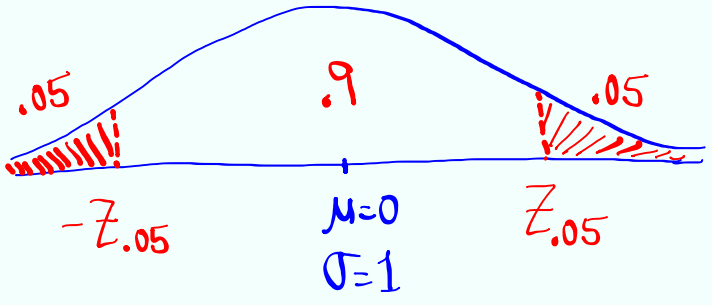
Find $\pm z_{\alpha/2}$ for 90% Confidence level

Middle Area .9



$1-\alpha=.9$

$\alpha=.1$

$\alpha/2=.05$

$z_{.05}$ = invNorm $(.95, 0, 1) \approx$ **1.645**

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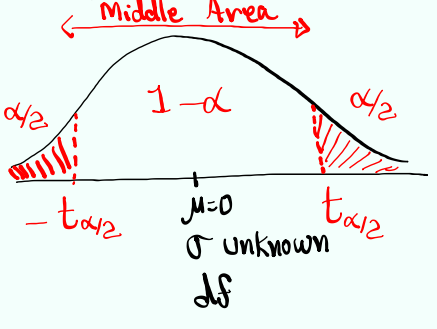
t - Dist.

1) Graph is symmetric, bell-shape with total area 1.

2) $\mu=0$, σ unknown

3) It comes with degrees of freedom df



How to find it

2nd VARS

invT(

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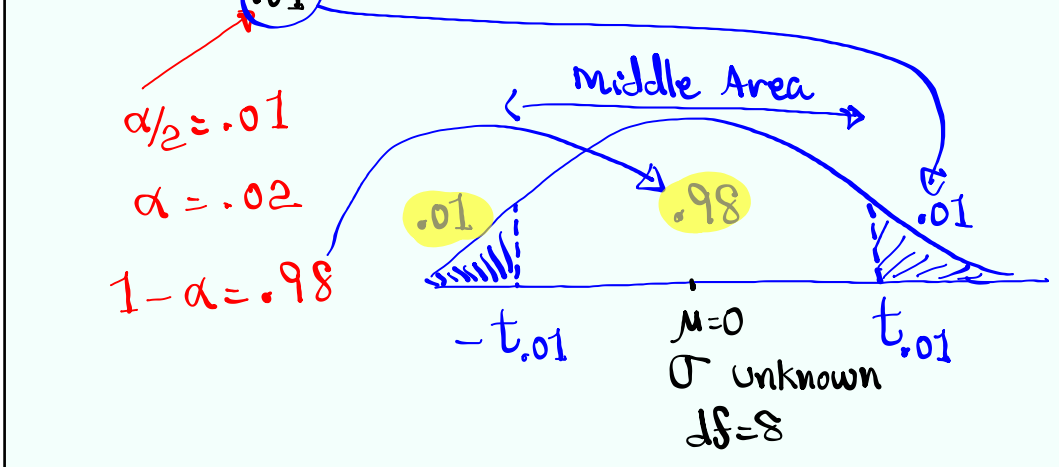
Find $t_{.01}$ with $df = 8$.



$t_{.01} = \text{invT}(.99, 8) \approx \boxed{2.896}$ (3-dec.)

df = 8

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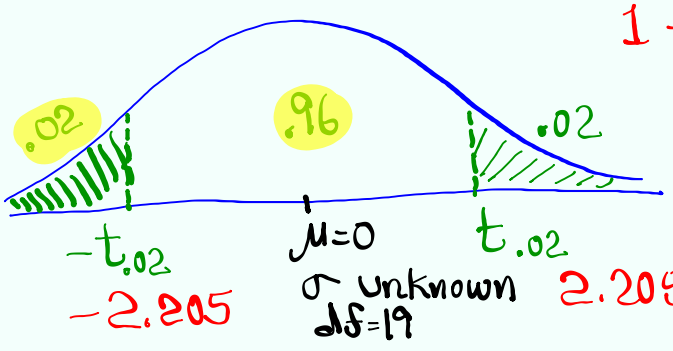
Find $\pm t_{\alpha/2}$ for 96% Confidence level with $df = 19$.

Middle Area = .96

$1 - \alpha = .96$

$\alpha = .04$

$\alpha/2 = .02$



$t_{.02} = \text{invT}(.98, 19) \approx \boxed{2.205}$

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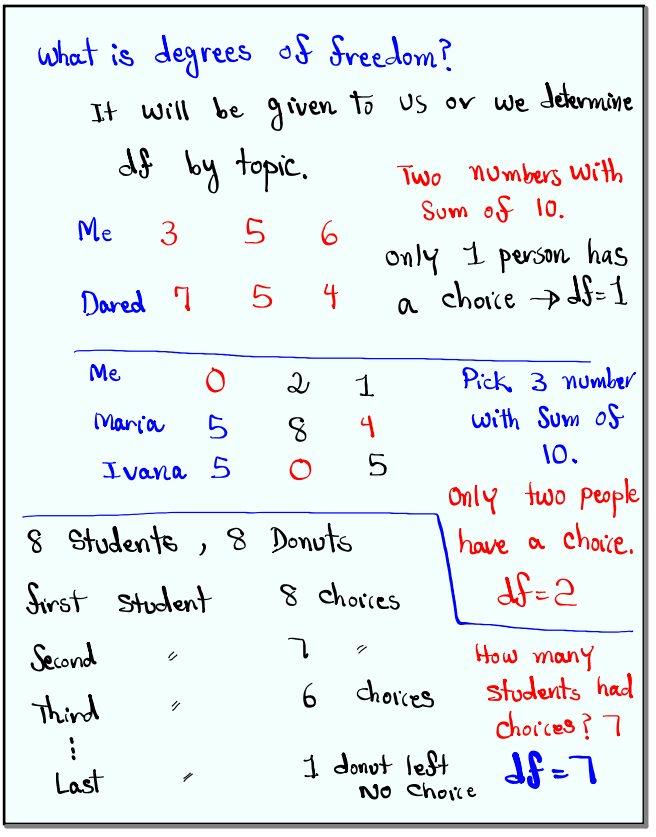
What is degrees of freedom?
It will be given to us or we determine df by topic.
Me 3 5 6
Dared 7 5 4
Two numbers with Sum of 10.
only 1 person has a choice → df=1
Me 0 2 1
Maria 5 8 4
Ivana 5 0 5
Pick 3 number with Sum of 10.
only two people have a choice.
df=2
8 Students, 8 Donuts
first student 8 choices
Second " 7 "
Third " 6 choices
Last " 1 donut left No choice
How many students had choices? 7
df=7

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