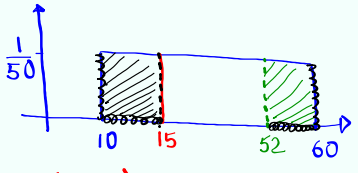
Statistics

Lecture 37

Feb 19-8:47 AM

Consider a uniform Prob. dist. for all values from 10 to 60.



1) $P(x=15)=0$

2) $P(x<15)$

$=(15-10)\cdot\frac{1}{50}=\frac{5}{50}=\frac{1}{10}$

3) $P(x>52)$

$=(60-52)\cdot\frac{1}{50}=\frac{8}{50}=\frac{4}{25}$

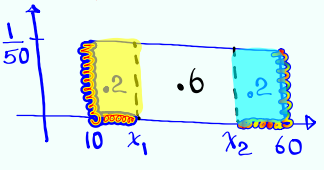
4) Find two values that separate the middle 60% from the rest.

$(x_1-10)\cdot\frac{1}{50}=.2$

$x_1-10=50(.2)$

$x_1-10=10$

$\boxed{x_1=20}$



$(60-x_2)\cdot\frac{1}{50}=.2$

$60-x_2=50(.2)$

$60-x_2=10$ $\boxed{x_2=50}$

Nov 5-8:50 AM

Ages of voters are normally dist. with mean of 48 and standard dev. of 12

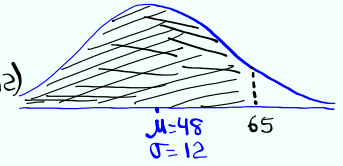
$N(48, 12)$

If we randomly select one voter find the Prob. that his/her age (x) is below 65.

$P(x < 65)$

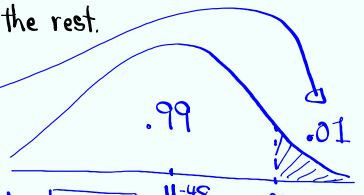
= normalcdf(-E99, 65, 48, 12)

= .922



Find the age (x), round to whole #, that separates the top 1% from the rest.

Right Area



x = invNorm(.99, 48, 12) ≈ 76

Nov 5-8:58 AM

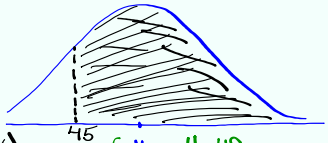
If we randomly select groups of 4 voters ($n = 4$)

find the prob. that their mean age ($\bar{x}$) is above 45.

$P(\bar{x} > 45)$

= normalcdf(45, E99, 48, 6)

= .691



CLT $\mu_{\bar{x}} = \mu = 48$, $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{12}{\sqrt{4}} = 6$

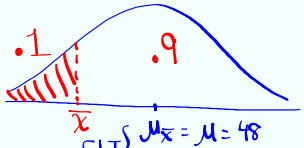
For randomly selected groups of 4 voters,

find the mean age that separates the bottom 10% from the rest.

Left Area

$\bar{x}$ = invNorm(.1, 48, 6)

≈ 40



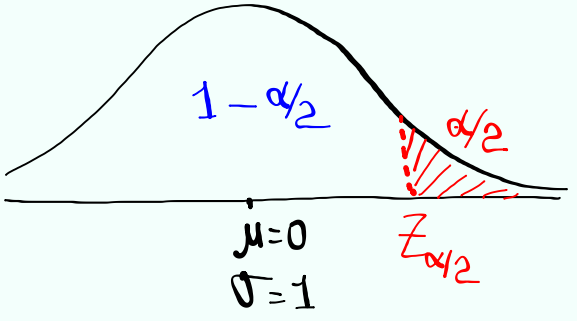
CLT $\mu_{\bar{x}} = \mu = 48$, $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{12}{\sqrt{4}} = 6$

Nov 5-9:06 AM

$z_{\alpha/2}$ → It is a value that area to its right is $\frac{\alpha}{2}$

Alpha $0 < \alpha < 1$

Significance level



To find $z_{\alpha/2}$

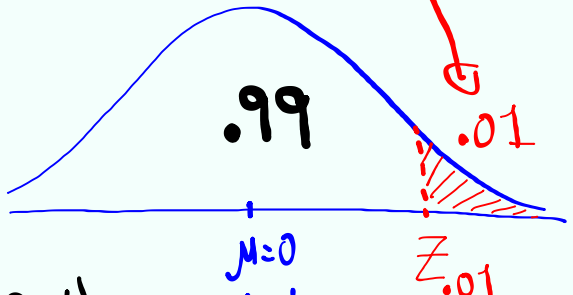
we use invNorm(Left Area, μ, σ)

Nov 5-9:15 AM

Find $z_{.01}$ → Right Area

$\frac{\alpha}{2} = .01$

$\alpha = .02$



$z_{.01}$ = invNorm(.99, 0, 1) = 2.326

Nov 5-9:19 AM

Find $\pm z_{.02}$

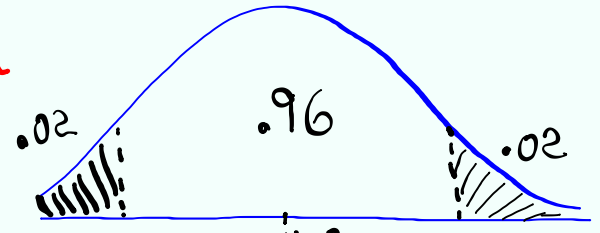
Right Area

Left Area

$\frac{\alpha}{2} = .02$

$\alpha = .04$

$1 - \alpha$ area in the middle



-2.054 $\quad$ 2.054

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

$= \boxed{2.054}$

Nov 5-9:22 AM

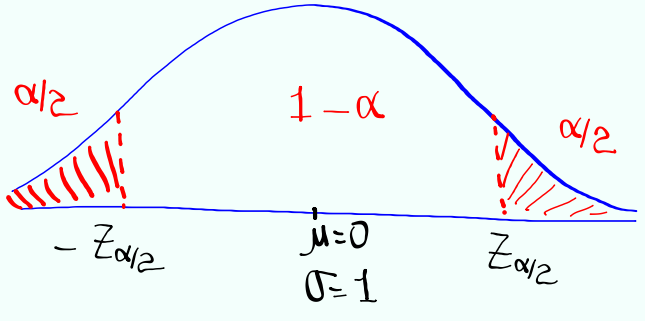
α Significance level

$0 < \alpha < 1$

$\alpha/2$ is the area on each tail.

$1 - \alpha$ is the middle area.

$(1-\alpha) \cdot 100\%$ is Confidence level.



Nov 5-9:26 AM

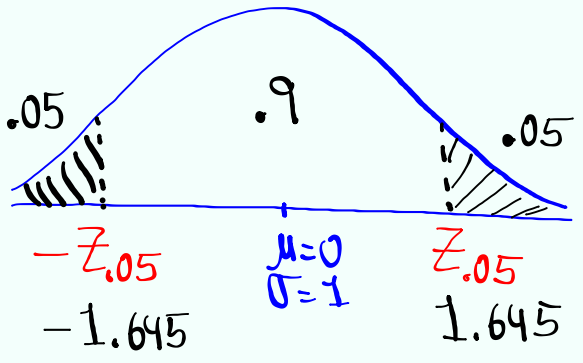
Find $\pm z_{\alpha/2}$ for 90% Confidence level.

$1-\alpha = .9$

Middle Area .9

$\alpha = .1$

$\frac{\alpha}{2} = .05$



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

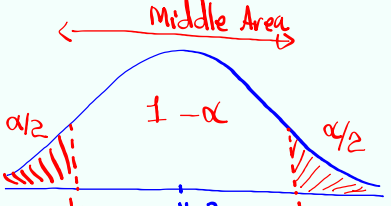
Nov 5-9:29 AM

t - dist.:

1) It is symmetric, It is bell-Shape, It has total area 1.

2) $\mu = 0$, σ is unknown

3) It comes with degrees of freedom.



How to find $t_{\alpha/2}$: 2nd VARS invT(Left Area, df) df

Download G. Calculator

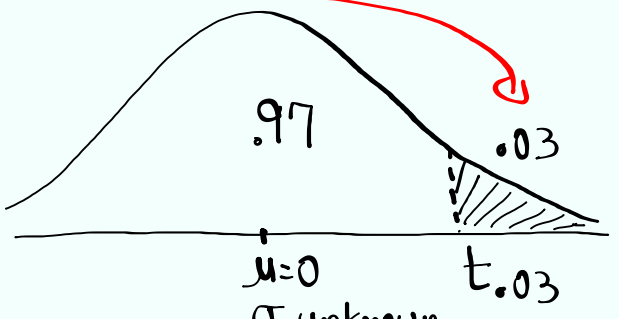
Nov 5-9:33 AM

Find $t_{.03}$ with $df = 9$

Right Area

$\frac{\alpha}{2} = .03$

$\alpha = .06$



$t_{.03} = invT(.97, 9) = \boxed{2.150}$

σ unknown

$df = 9$

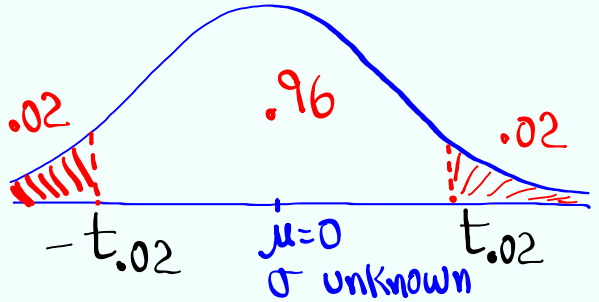
Nov 5-9:38 AM

Find $\pm t_{\alpha/2}$ for $\alpha = .04$ with $df = 24$.

$\alpha/2 = \frac{.04}{2} = .02$ ← Right tail, ← Left tail

96% Conf. level

Middle Area $1 - \alpha = 1 - .04 = .96$



$t_{.02} = invT(.98, 24) = \boxed{2.172}$

σ unknown

$df = 24$

Nov 5-9:42 AM

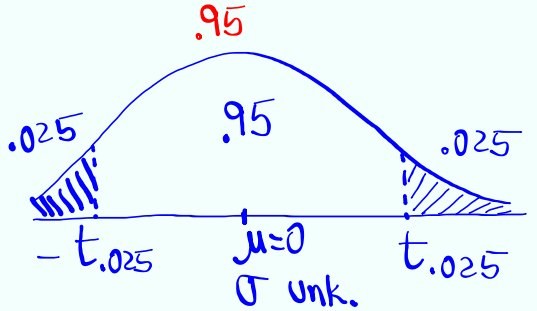
Find $\pm t_{\alpha/2}$ for 95% Conf. level with df=999.

Middle Area .95

$1-\alpha=.95$

$\alpha=.05$

$\alpha/2=.025$



$t_{.025} = \text{invT}(.975, 999)$

$= \boxed{1.962}$

As df increases $\Rightarrow t_{\alpha/2} \approx z_{\alpha/2}$

Nov 5-9:46 AM

What is degrees of freedom?

20 students

I bring 20 donuts. You can have 1 donut.

First student → 20 choices

Second " → 19 "

Third " → 18 "

Last student → (no choice) 1 donut left

df = 19

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7 clean shirts

Monday → 7 choices

Tuesday → 6 choices

df=6

⋮

Sunday → 0 choices (1 clean shirt)

Nov 5-9:51 AM