

**Statistics**  
**Spring 2023**  
**Lecture 40**



Feb 19-8:47 AM

Estimating Population Mean  
 $\mu$

Conf. Interval  $\bar{x} - E < \mu < \bar{x} + E$

$\uparrow$  Sample Mean "Point-estimate"       $\uparrow$  Margin of error

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Case I:  $\sigma$  Known

$$E = Z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

$\uparrow$   $(1-\alpha) \cdot 100\%$  C-level

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TI Command:  
 ZInterval  
 input: Stats

Apr 26-7:16 AM

Given:  $n=32$ ,  $\bar{x}=80$ ,  $\sigma=10$ , C-level 90%.

Construct Conf. interval for  $\mu$ .

$E = Z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$

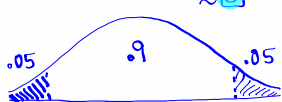
$= 1.645 \cdot \frac{10}{\sqrt{32}} = 2.908 \approx 3$

$\bar{x} - E < \mu < \bar{x} + E$

$80 - 3 < \mu < 80 + 3$

$77 < \mu < 83$

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



we are 90% Confident that Pop. mean is between 77 and 83.

STAT	TESTS	ZInterval
		inpt: Stats
		$\sigma=10$
		$\bar{x}=80$
		$n=32$
		C-level: .9
		Calculate
		(77.092, 82.908)
		$77.092 < \mu < 82.908$

Since  $\bar{x}$  is a whole #, we round to a whole #.

$E = \frac{83 - 77}{2} = 3$

$\bar{x} = \frac{83 + 77}{2} = 80$

$77 < \mu < 83$

Apr 26-7:20 AM

20 randomly selected Students had a mean age of 30.8 yrs.

$n=20$   $\bar{x}=30.8$

It is known that standard deviation of ages of all students is 12.5 yrs.

$\sigma=12.5$

Find 98% Conf. interval for the mean age of all students.

C-level: .98

$< \mu <$

Since  $\sigma$  is known  $\Rightarrow$  ZInterval

(24.298, 37.302)

inpt: Stats

$24.298 < \mu < 37.302$

$\sigma=12.5$

$\bar{x}=30.8$

$n=20$

C-level: .98

Since  $\bar{x}$  is 1-decimal, we round to 1-decimal.

$E = \frac{37.3 - 24.3}{2} = 6.5$

$\bar{x} = \frac{37.3 + 24.3}{2} = 30.8$

$24.3 < \mu < 37.3$

we are 98% confident that the mean age of all students is between 24.3 and 37.3 yrs.

Apr 26-7:33 AM

15 randomly selected nurses had the following monthly salaries:

6200	6250	6400	7000	5800
5950	6000	6800	7200	6950
4800	5000	6000	7000	7500

1) Find  $\bar{x}$ , Round to whole #  
 $\bar{x} = 6323$

2) Assume standard deviation of salaries of all nurses is \$850, find 99% Conf. interval for mean salaries of all nurses.  
 $\sigma = 850$   $\langle \mu \rangle$   
 C-level: .99

Since  $\sigma$  is known  $\Rightarrow$  Z Interval (5757.7, 6888.3)

inpt: [Stats]  
 $\sigma: 850$   $5757.7 < \mu < 6888.3$   
 $\bar{x} = 6323 \rightarrow$  whole #  
 $n = 15$   
 C-level: .99  
 Calculate

$E = \frac{6888 - 5758}{2} = 565$   
 $\bar{x} = \frac{6888 + 5758}{2} = 6323$

$5758 < \mu < 6888$

Apr 26-7:43 AM

25 randomly selected exams had a mean score of 84.5.  
 $n = 25$   $\bar{x} = 84.5$

Assume standard deviation of scores of all exams is 18.2.  $\sigma = 18.2$

Find confidence interval for the mean of all exams.  $\langle \mu \rangle$

C-level not given  $\rightarrow$  use .95  
 $\sigma$  is known  $\Rightarrow$  Z Interval  
 $\bar{x}$  is one decimal  $\Rightarrow$  Round to 1-decimal.

Z Interval  
 inpt: [Stats]  
 $\sigma: 18.2$   
 $\bar{x}: 84.5$   
 $n = 25$   
 C-level: .95

$77.4 < \mu < 91.6$

$E = \frac{91.6 - 77.4}{2} = 7.1$   
 $\bar{x} = \frac{91.6 + 77.4}{2} = 84.5$

Apr 26-7:56 AM

t-Dist.

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

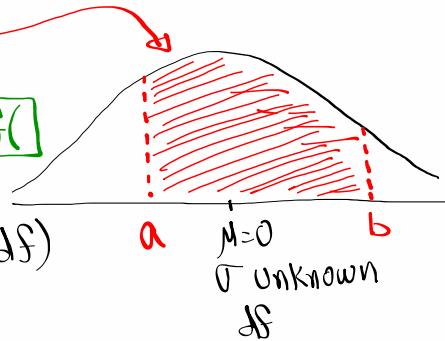
2)  $\mu=0$ ,  $\sigma$  unknown

3) It comes with degrees of freedom.

$$P(a < t < b)$$

end VARS tcdf(

tcdf( Lower, upper, df)



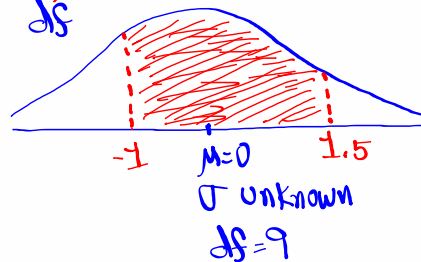
Apr 26-8:06 AM

Find  $P(-1 < t < 1.5)$  with  $df=9$ .

$$= \text{tcdf}(-1, 1.5, 9)$$

L    U    df

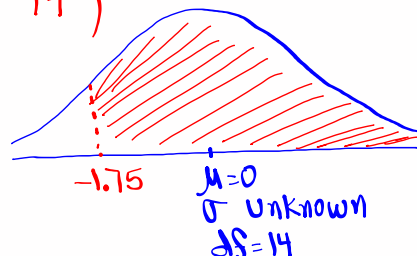
$$= \boxed{.744}$$



Find  $P(t > -1.75)$  with  $df=14$ .

$$= \text{tcdf}(-1.75, \text{E99}, 14)$$

$$= \boxed{.949}$$

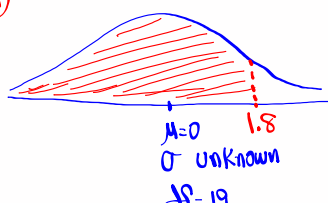


Apr 26-8:10 AM

Find  $P(t < 1.8)$  with  $df = 19$ .

$= tcdf(-E99, 1.8, 19)$

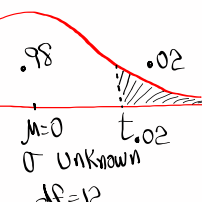
$= \boxed{.956}$



Find  $t_{.02}$  with  $df = 12$ .

$t_{.02} = \text{invT}(\text{Left Area}, df)$

$\boxed{2nd} \text{ } \boxed{VARS} = \boxed{2.303}$



IS You don't have invT in Your calc, down load the app "WabbitEMU"


Apr 26-8:15 AM

Find  $\pm t_{\alpha/2}$  for 90% C-level with  $df = 19$

middle area = .9

$1 - .9 = .1 \rightarrow \alpha$

$.1 \div 2 = .05 \rightarrow \alpha/2$



$t_{.05} = \text{invT}(.95, 19)$

$= \boxed{1.729}$

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Exam II: Tuesday May 2, 2023  
 SG 1 - SG 21  
 You can arrive as early as 6:00 AM.

Apr 26-8:22 AM