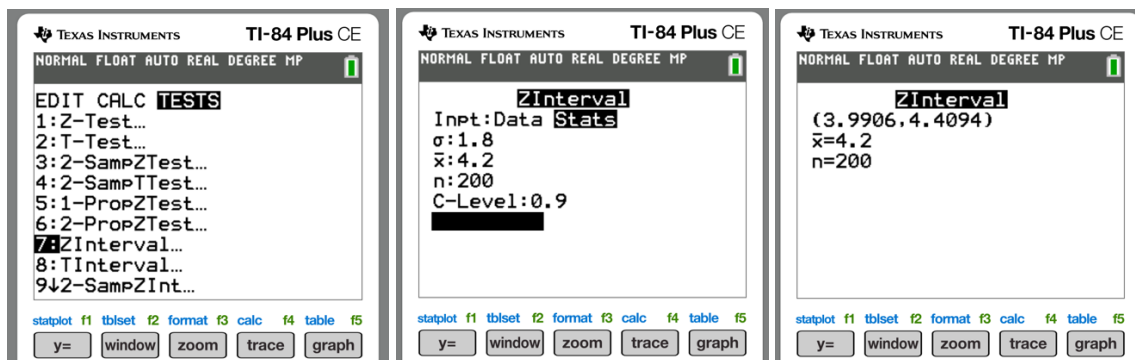


## Estimation Solutions

### Estimate a True Mean $\mu$

1. A survey of 200 college students reveal they sleep for a mean of 4.2 hours the night before a final exam with a standard deviation of 1.8 hours. Use the 90% confidence level to estimate the true mean sleep time. **Approximate your answer to the nearest tenths.**

#### ZInterval (Large Sample) and $\sigma$ is known

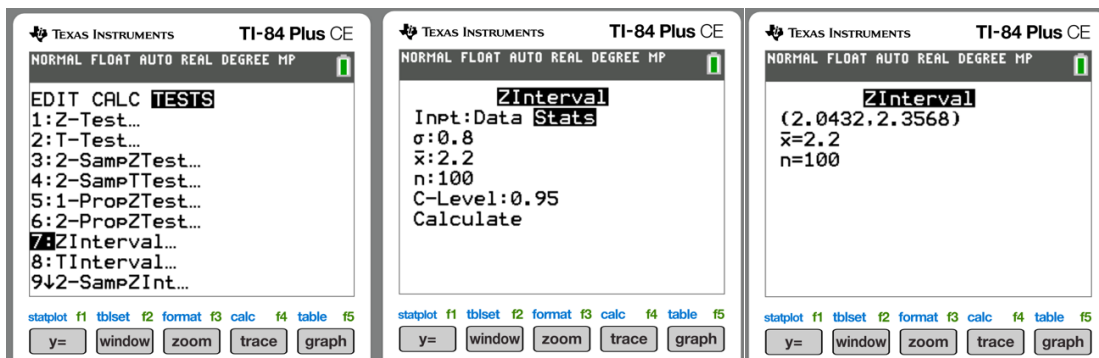


$$3.991 < \mu < 4.409$$

90% Confidence Level

2. A sample of 100 College students reveal they spend a mean of 2.2 hours per day on social media with a standard deviation of 0.8 hours. Use the 95% confidence level to estimate the true mean hours per day on social media. **Approximate your answer to the nearest thousandths.**

#### ZInterval (Large Sample) and $\sigma$ is known

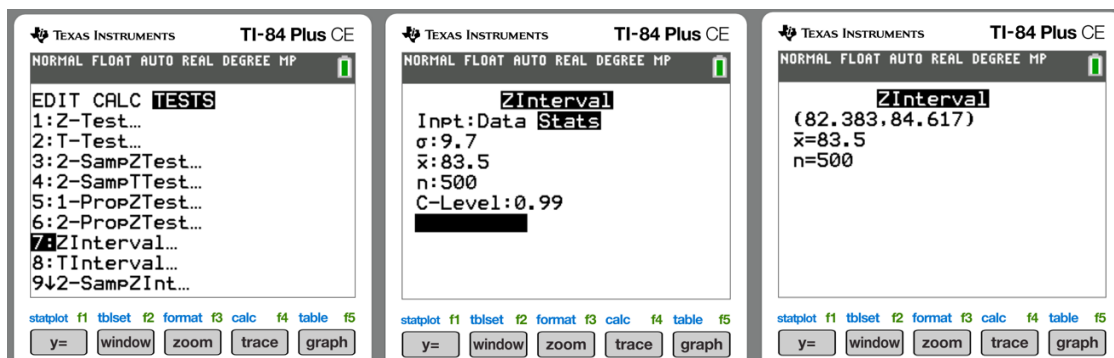


$$2.043 < \mu < 2.357$$

95% Confidence Level

3. A sample of 500 California resident reveal a mean lifespan of 83.5 years with a standard deviation of 9.7 years. Use the 99% confidence level to estimate the true mean lifespan. **Approximate your answer to the nearest thousandths.**

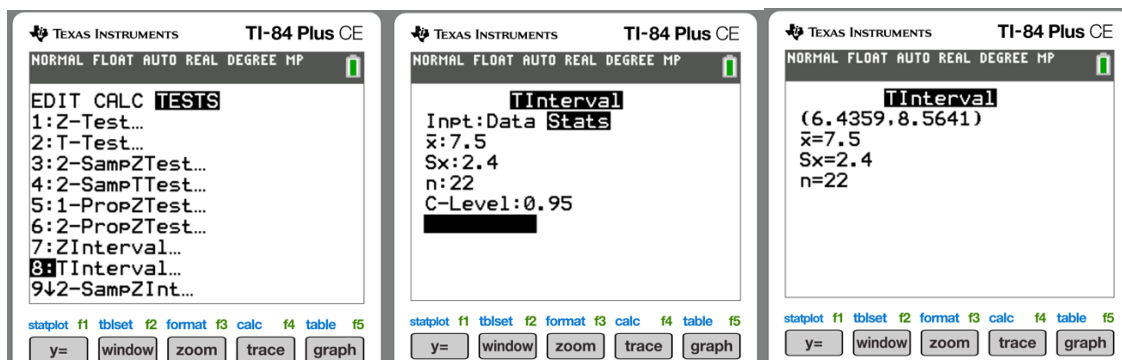
**ZInterval (Large Sample) and  $\sigma$  is known**



**$82.383 < \mu < 84.617$**   
**99% Confidence Level**

4. A survey of 22 college students reveal that college students sleep for a mean of 7.5 hours a night with a standard deviation of 2.4 hours. Use the 95% confidence level to estimate the true mean sleep time. **Approximate your answer to the nearest thousandths.**

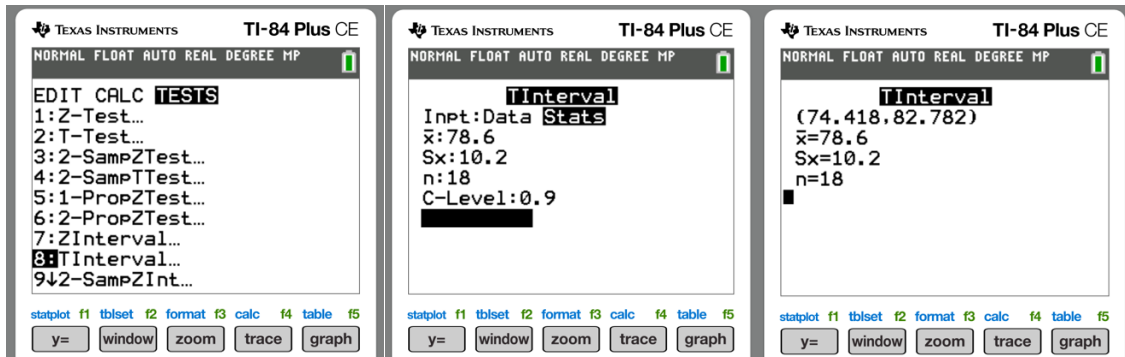
**TInterval (Small Sample) and  $\sigma$  is unknown**



**$6.436 < \mu < 8.564$**   
**95% Confidence Level**

5. A survey of 18 Hawaiian residents reveals a mean life span of 78.6 years with a standard deviation of 10.2 hours. Use the 90% confidence level to estimate the true mean life span. **Approximate your answer to the nearest thousandths.**

**TInterval (Small Sample) and  $\sigma$  is unknown**



$$74.418 < \mu < 82.782$$

90% Confidence Level

The following data represents the amount of time (hours) students sleep during summer vacation.

**8,7,8,10,6,7,9,8,12,7,7,8**

6. Compute the mean and standard deviation.  
**Approximate your answer to the nearest thousandths.**

The image shows three screenshots of a TI-84 Plus CE calculator interface:

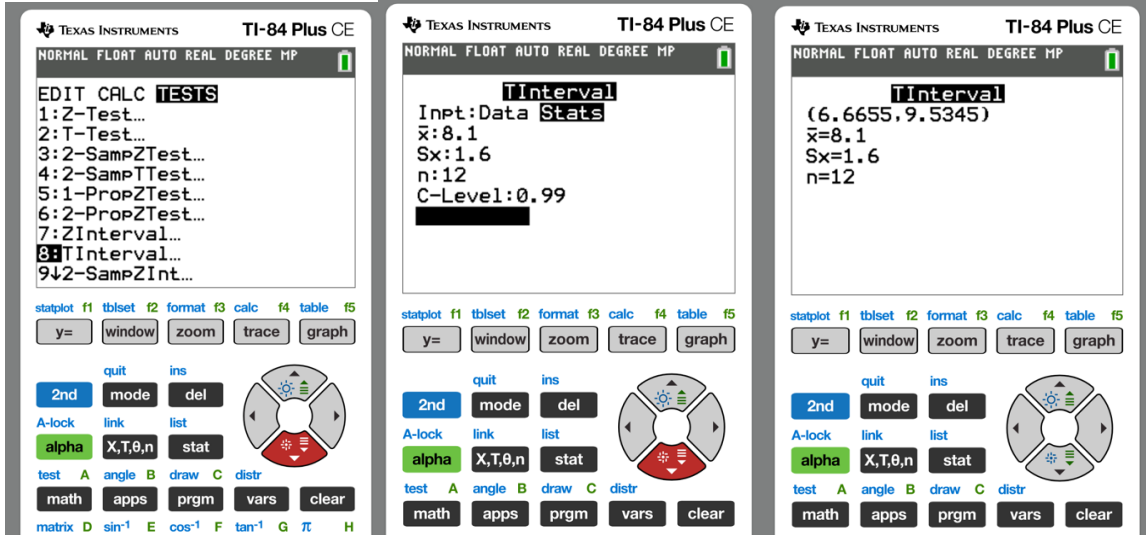
- Top Left:** The 'EDIT' menu is open, showing options: 1:Edit..., 2:SortA(), 3:SortD(), 4:ClrList, 5:SetUpEditor.
- Top Middle:** The data list L1 is being edited. The values 8, 10, 6, 7, 9, 8, 12, 7, 7, 8 are entered into the first ten rows. The cursor is at the bottom of the list.
- Top Right:** The 'CALC' menu is open, showing options: 1:1-Var Stats, 2:2-Var Stats, 3:Med-Med, 4:LinReg(ax+b), 5:QuadReg, 6:CubicReg, 7:QuartReg, 8:LinReg(a+bx), 9:LnReg.
- Bottom Left:** The '1-Var Stats' screen displays the following results:
  - $\bar{x} = 8.08333333$
  - $\Sigma x = 97$
  - $\Sigma x^2 = 813$
  - $Sx = 1.621353718$
  - $\sigma x = 1.552328001$
  - $n = 12$
  - $\min X = 6$
  - $\downarrow Q_1 = 7$

**Sample Information**

$\bar{x} \approx 8.083$   
 $s \approx 1.621$   
 $n = 12$  small sample

7. Use the 99% confidence level to estimate the true mean sleep time.  
**Approximate your answer to the nearest thousandths.**

Now use the TInterval (Small Sample)



$$6.666 < \mu < 9.535$$

95% Confidence Level

The following data represents the number of friends college students have on Instagram.

**120, 333, 257, 186, 205, 228, 302, 210, 156**

8. Compute the mean and standard deviation.  
**Approximate your answer to the nearest thousandths.**

**Sample Information**

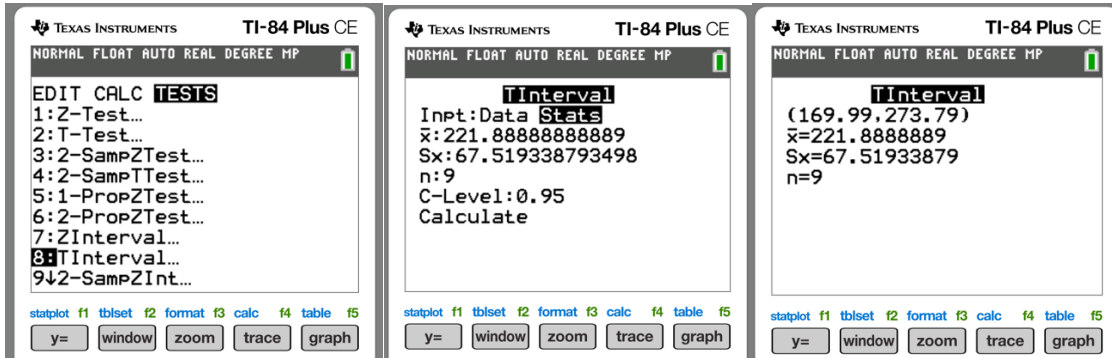
$\bar{x} \approx 221.889$

$s \approx 67.519$

$n = 9$  small sample

9. Use the 95% confidence level to estimate the true mean sleep time.  
Approximate your answer to the nearest tenths.

Now use the TInterval (Small Sample)



$$169.99 < \mu < 273.79$$

95% Confidence Level

The following data represents the number of pets college students have at home.

**3,4,0,2,1,2,0,0,0,3,0,5**

10. Compute the mean and standard deviation.

**Approximate your answer to the nearest thousandths.**

The image shows three screenshots of a TI-84 Plus CE calculator. The first screenshot shows the 'EDIT' menu with '1:Edit...' selected. The second screenshot shows a list editor with data entered into L1: 0, 2, 1, 2, 0, 0, 0, 3, 0, 5. The third screenshot shows the '1-Var Stats' results screen.

L1	L2	L3	L4	L5	1
0					
2					
1					
2					
0					
0					
3					
0					
5					

**1-Var Stats**  
 $\bar{x} = 1.666666667$   
 $\Sigma x = 20$   
 $\Sigma x^2 = 68$   
 $Sx = 1.775250729$   
 $\sigma x = 1.699673171$   
 $n = 12$   
 $\min X = 0$   
 $\downarrow Q_1 = 0$

**Sample Information**

$\bar{x} \approx 1.667$

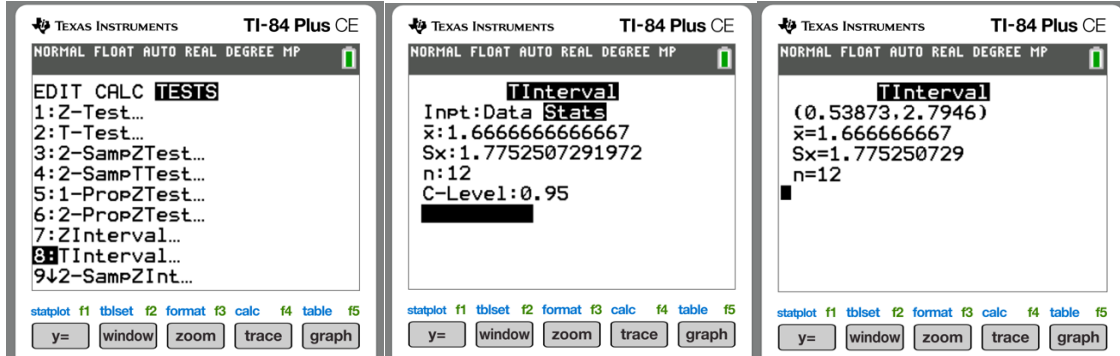
$s \approx 1.775$

$n = 12$  **small sample**



11. Use the 99% confidence level to estimate the true mean sleep time.  
Approximate your answer to the nearest tenths.

Now use the TInterval (Small Sample)



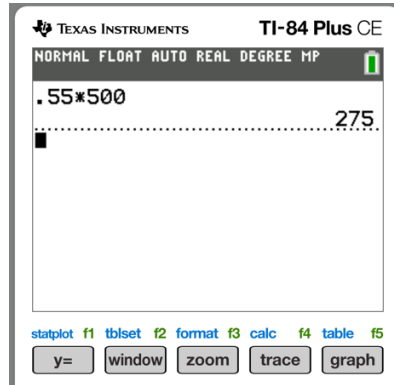
$$0.539 < \mu < 2.795$$

99% Confidence Level

## Estimate a True Proportion $P$

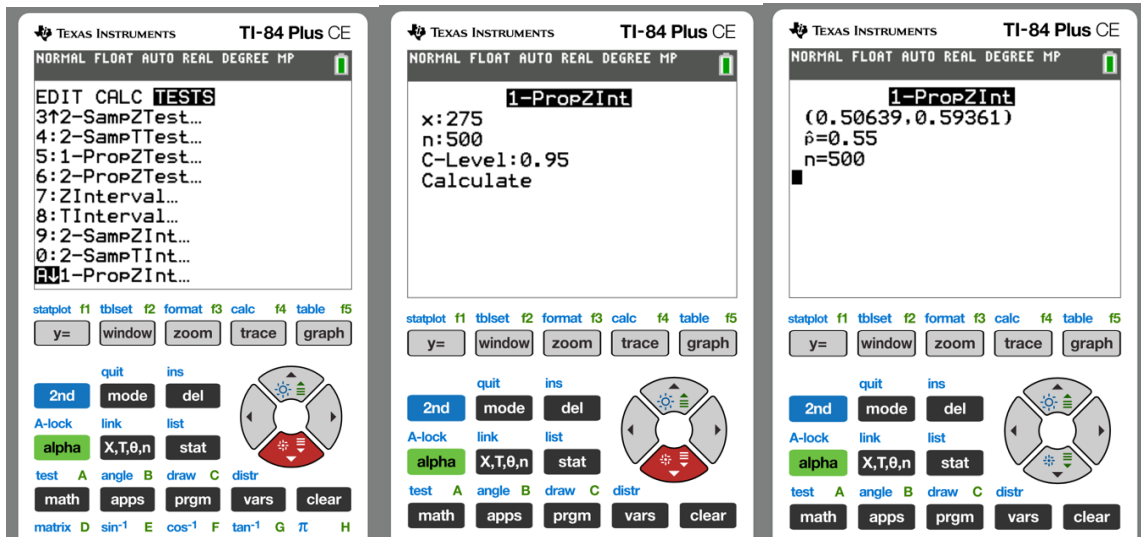
12. A sample of 500 college students reveal that 55% believe in ghosts. Use the 95% confidence level to estimate the proportion that believe in ghosts.

Approximate your answer to the nearest thousandths.



$$x = \bar{p} \cdot n$$
$$x = 0.55 \cdot 500$$
$$x = 275 \text{ successes}$$

### 1-PropZInterval

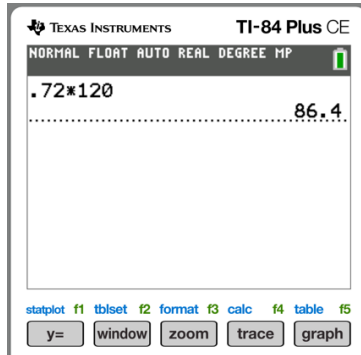


$$0.506 < P < 0.594$$

95% Confidence Level

13. A sample of 120 Las Vegas residents reveal that 72% favor a major league franchise relocating to the city and consequently increasing their local sales tax. Use the 99% confidence level to estimate the true proportion of city residents that favor the relocation of a major league franchise locating to the city.

Approximate your answer to the nearest thousandths.

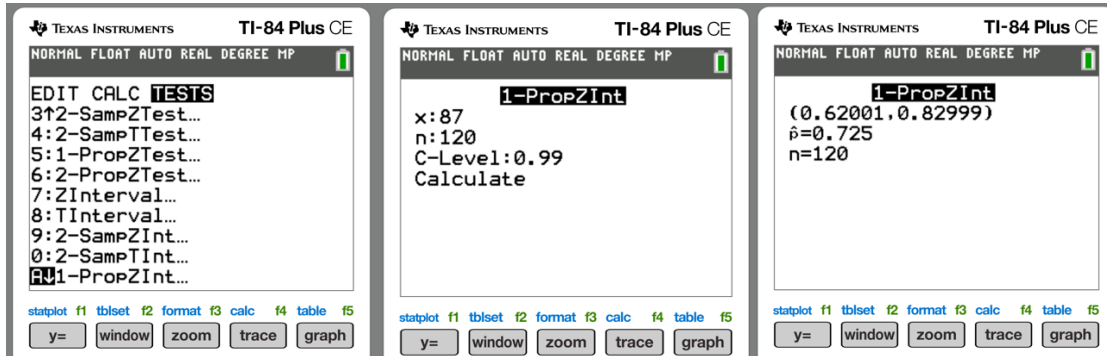


$$x = \bar{p} \cdot n$$

$$x = 0.72 \cdot 120$$

$$x = 86.4 \approx 87 \text{ successes}$$

### 1-PropZInterval



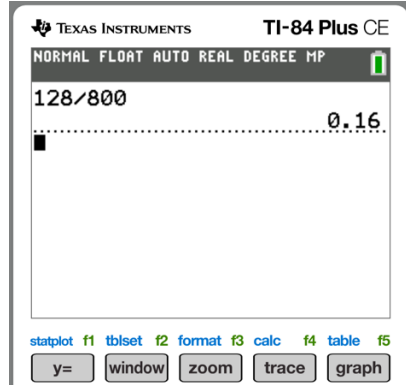
$$0.620 < P < 0.830$$

99% Confidence Level

A sample of 800 college students reveal that 128 believe in Big Foot.

14. Compute the sample proportion.

**Approximate your answer to the nearest thousandths.**

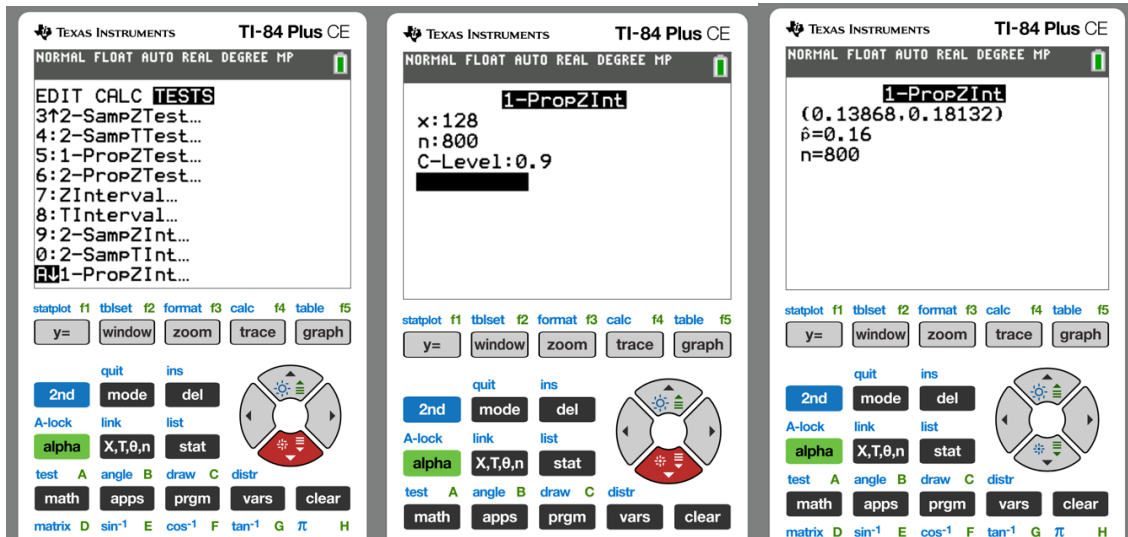


$$\bar{p} = 0.160$$

15. Use the 90% confidence level to estimate the true proportion that believe in Big Foot.

**Approximate your answer to the nearest thousandths.**

### 1-PropZInterval



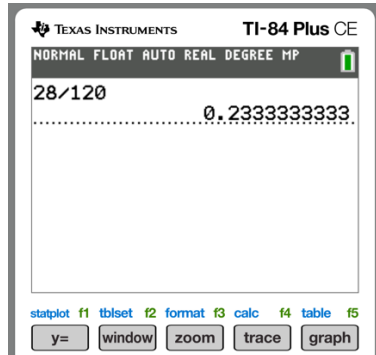
$$0.139 < P < 0.181$$

90% Confidence Level

A sample of 120 Los Angeles residents reveal that 28 favor the legalization of marijuana for recreational use at home.

16. Compute the sample proportion.

**Approximate your answer to the nearest thousandths.**

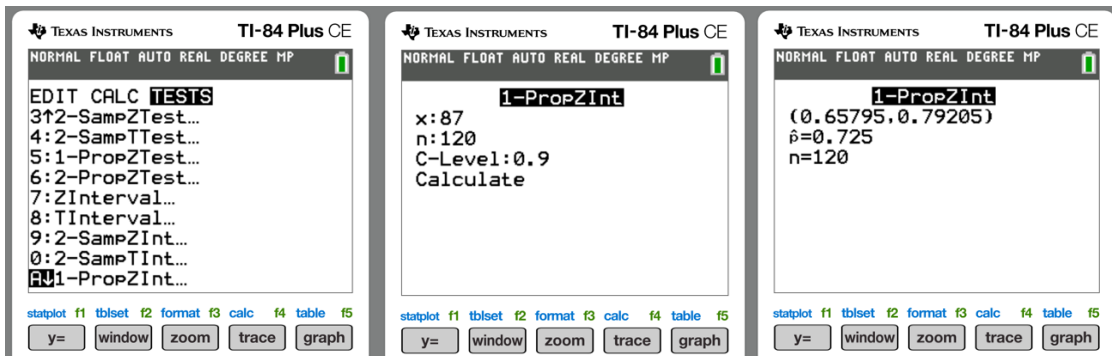


$$\bar{p} \approx 0.233$$

17. Use the 90% confidence level to estimate the true proportion of residents who favor the legalization of marijuana for recreational use at home.

**Approximate your answer to the nearest thousandths.**

### 1-PropZInterval



$$0.658 < P < 0.792$$

90% Confidence Level

## Estimate a Sample Size $n$

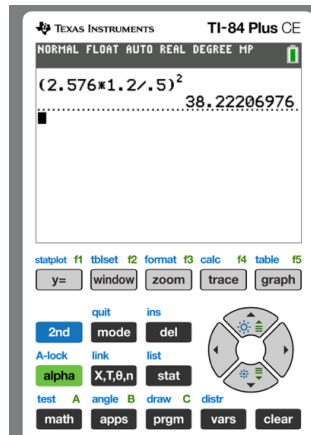
Use the margin of error  $E$ , confidence level,  $1 - \alpha$  and known standard of deviation  $\sigma$  to find the minimum sample size  $n$  to estimate a true mean  $\mu$ .

18. A new study using the 99% confidence level is to be conducted having a margin of error of  $\pm 0.5$  hours over the sleep time of college students during final exams week. If the known standard deviation from a past study is 1.2 hours, estimate the sample size need for this new study. **Approximate your answer to the nearest whole number.**

$$n = \left[ \frac{Z_{\alpha/2} \sigma}{E} \right]^2$$



$$\begin{aligned} Z_{\alpha/2} &\approx 2.576 \\ \sigma &= 1.2 \\ E &= 0.5 \end{aligned}$$

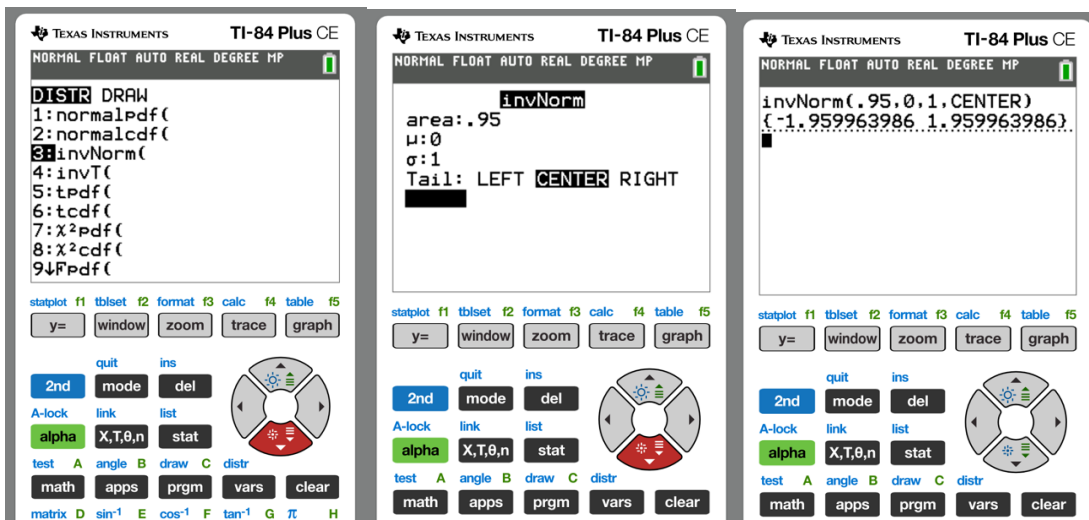


$$n \geq 39$$

Use the margin of error  $E$ , confidence level,  $1 - \alpha$  and known sample proportion  $\bar{p}$  from a previous study to find the minimum sample size  $n$  to estimate the true proportion  $P$ .

19. A new study using the 95% confidence level over the proportion of college students who believe in Big Foot with a margin of error of  $\pm 2\%$  is to be conducted. If a past study revealed that 15% believe in Big Foot, estimate the sample size  $n$  needed for this new study. **Approximate your answer to the nearest whole number.**

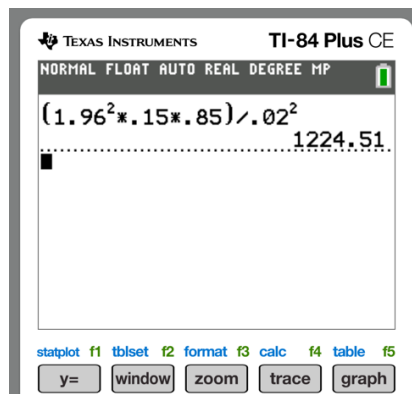
$$n = \frac{\left[ z_{\alpha/2} \right]^2 \bar{p}(1 - \bar{p})}{E^2}$$



$$z_{\alpha/2} \approx 1.96$$

$$\bar{p} = 0.15 \text{ and } 1 - \bar{p} = 0.85$$

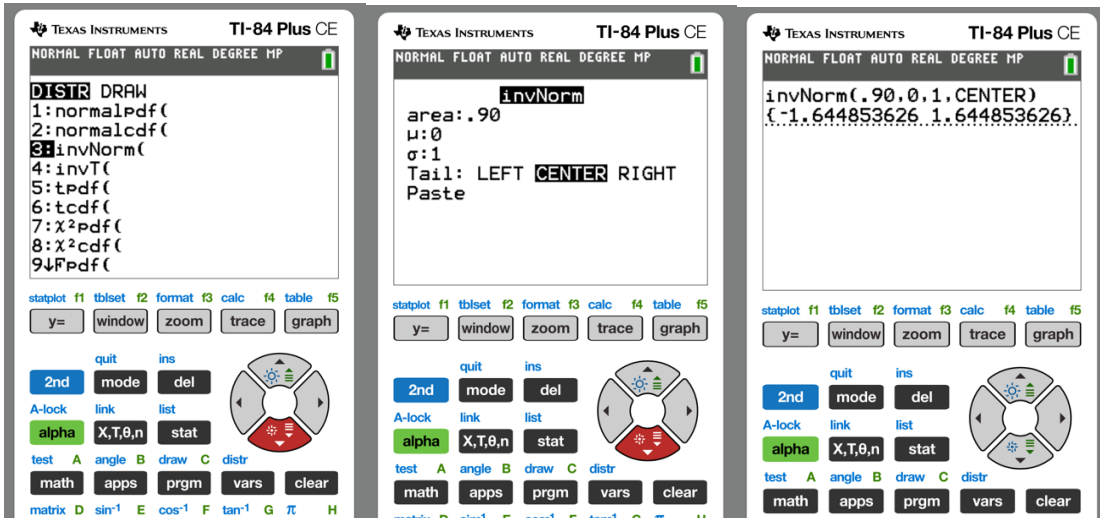
$$E = 0.02$$



$$n \geq 1225$$

20. A new study using the 90% confidence level over the proportion of college students who believe in Big Foot with a margin of error of  $\pm 1.5\%$  is to be conducted. If no past study exists on the subject, estimate the sample size  $n$  needed for this new study. **Approximate your answer to the nearest whole number.**

$$n = \frac{[z_{\alpha/2}]^2 \cdot 0.25}{E^2}$$



$$z_{\alpha/2} \approx 1.645$$

$$E = 0.015$$



$$n \geq 3007$$