1. A sample of 35 different payroll departments found that employees worked an average of 240.6 days a year. If the population standard deviation is 18.8 days, find the 90% confidence interval for the average number of days μ worked by all employees who are paid through payroll departments.

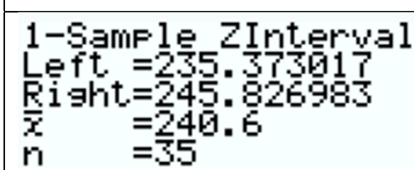
Given:
$n = 35 \quad \bar{x} = 240.6 \quad \sigma = 18.8 \quad 90\%\ CI \quad Z_{\alpha/2} = 1.645$

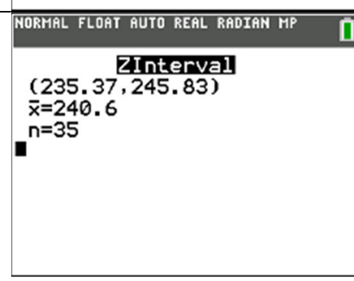
$\bar{x} \pm Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$

$240.6 \pm 1.645\frac{18.8}{\sqrt{35}}$

$240.6 \pm 5.23 \quad \Longrightarrow \quad 235.4 < \mu < 245.8$

CASIO 9750	*TI84 CE Plus*
F4 for INTR, F1 for Z, F1 for 1-S	STAT, TESTS, then 7: Z-Interval





2. A study of 65 bolts of carpet showed that their average length was 78.2 yards. The standard deviation of the population is 2.6 yards. a) Find the best point estimate of the mean. b) Find the 80% confidence interval for the mean length per bolt of carpet?

Given:
$n = 65 \quad \bar{x} = 78.2 \quad \sigma = 2.6 \quad 80\%\ CI \quad Z_{\alpha/2} = 1.28$

a) The best point estimate is the sample mean, 78.2 yards

b) $\bar{x} \pm Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$

$78.2 \pm 1.28\frac{2.6}{\sqrt{65}}$

$78.2 \pm 0.41 \quad \Rightarrow 77.8 < \mu < 78.6$

CASIO 9750 F4 for INTR, F1 for Z, F1 for 1-S	*TI84 CE Plus* STAT, TESTS, then 7: Z-Interval
1-Sample ZInterval Data :Variable C-Level :0.8 σ :2.6 x̄ :78.2 n :65 Save Res:None None LIST	ZInterval Inpt:Data Stats σ:2.6 x̄:78.2 n:65 C-Level:0.8
1-Sample ZInterval Left =77.786712 Right=78.613288 x̄ =78.2 n =65	ZInterval (77.787,78.613) x̄=78.2 n=65

3. The average number of mosquitos caught in 36 mosquito traps in a particular environment was 800 per trap. The standard deviation of mosquitos caught in the entire population of traps is 100 mosquitos. What is the 99% confidence interval for the true mean number of mosquitos caught in all mosquito traps?

Given:

$n \ = \ 36 \qquad \bar{x} = 800 \qquad \sigma = \ 100 \qquad 99\%\ CI \qquad Z_{\alpha/2} = 2.576$

$$\bar{x} \pm Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

$$800 \pm 2.576\frac{100}{\sqrt{36}}$$

$$800 \pm 42.93 \quad \Longrightarrow \ 757 < \ \mu < 843$$

CASIO 9750 F4 for INTR, F1 for Z, F1 for 1-S	*TI84 CE Plus* STAT, TESTS, then 7: Z-Interval
1-Sample ZInterval Data :Variable C-Level :0.99 σ :100 x̄ :800 n :36 Save Res:None None LIST	ZInterval Inpt:Data Stats σ:100 x̄:800 n:36 C-Level:0.99 Calculate
1-Sample ZInterval Left =757.069512 Right=842.930488 x̄ =800 n =36	ZInterval (757.07,842.93) x̄=800 n=36

4. The average number of mosquitos caught in 36 mosquito traps in a particular environment was 800 per trap. The standard deviation of mosquitos caught in the entire population of traps is 100 mosquitos. What is the 95% confidence interval for the true mean number of mosquitos caught in all mosquito traps? Compare the result to the previous question. Why this interval is smaller?

$n \ = \ 36 \qquad \bar{x} = 800 \qquad \sigma = \ 100 \qquad 95\%\ CI \qquad Z_{\alpha/2} = 1.96$

$\bar{x} \pm Z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$

$800 \pm 1.96 \frac{100}{\sqrt{36}}$

$800 \pm 32.7 \quad \Longrightarrow \; 767 < \mu < 833$

The 95% confidence is smaller since there is less of a chance that the mean is contained in the interval as opposed to the 99% confidence interval.

CASIO 9750 F4 for INTR, F1 for Z, F1 for 1-S	*TI84 CE Plus* STAT, TESTS, then 7: Z-Interval
1-Sample ZInterval Data :Variable C-Level :0.95 σ :100 x̄ :800 n :36 Save Res:None None LIST	ZInterval Inpt:Data Stats σ:100 x̄:800 n:36 C-Level:0.95
1-Sample ZInterval Left =767.333934 Right=832.666066 x̄ =800 n =36	ZInterval (767.33,832.67) x̄=800 n=36

5. Find $t_{\alpha/2}$ for n = 20 and a 95% confidence interval.

$df = n - 1 = 19$

Table F The *t* Distribution

	Confidence intervals	80%	90%	95%	98%	99%
	One tail, α	0.10	0.05	0.025	0.01	0.005
d.f.	Two tails, α	0.20	0.10	0.05	0.02	0.01
1		3.078	6.314	12.706	31.821	63.657
2		1.886	2.920	4.303	6.965	9.925
3		1.638	2.353	3.182	4.541	5.841
4		1.533	2.132	2.776	3.747	4.604
5		1.476	2.015	2.571	3.365	4.032
6		1.440	1.943	2.447	3.143	3.707
7		1.415	1.895	2.365	2.998	3.499
8		1.397	1.860	2.306	2.896	3.355
9		1.383	1.833	2.262	2.821	3.250
10		1.372	1.812	2.228	2.764	3.169
11		1.363	1.796	2.201	2.718	3.106
12		1.356	1.782	2.179	2.681	3.055
13		1.350	1.771	2.160	2.650	3.012
14		1.345	1.761	2.145	2.624	2.977
15		1.341	1.753	2.131	2.602	2.947
16		1.337	1.746	2.120	2.583	2.921
17		1.333	1.740	2.110	2.567	2.898
18		1.330	1.734	2.101	2.552	2.878
19		1.328	1.729	2.093	2.539	2.861
20		1.325	1.725	2.086	2.528	2.845

CASIO 9750
F5 for DIST, F2 for T, F3 for InvT
Area = α/ 2 = 0.05/2

```
Inverse Student-t
Data      :Variable
Area      :0.05÷2
df        :19
Save Res:None
Execute
```

EXE

```
Inverse Student-t
xInv =2.09302405
```

TI84 CE
2nd Distr, then 4: invT
Area = α/ 2 = 0.05/2

```
invT
area:0.05/2
df:19
Paste
```

Enter

```
NORMAL FLOAT AUTO REAL RADIAN MP
invT(0.05/2,19)
                    -2.093024022
```

6. Find the critical value $t_{\alpha/2}$ needed to construct a confidence interval of the given level with the given sample size. Level 90%, sample size 8

Table F The *t* Distribution

d.f.	Confidence intervals	80%	90%	95%	98%	99%
	One tail, α	0.10	0.05	0.025	0.01	0.005
	Two tails, α	0.20	0.10	0.05	0.02	0.01
1		3.078	6.314	12.706	31.821	63.657
2		1.886	2.920	4.303	6.965	9.925
3		1.638	2.353	3.182	4.541	5.841
4		1.533	2.132	2.776	3.747	4.604
5		1.476	2.015	2.571	3.365	4.032
6		1.440	1.943	2.447	3.143	3.707
7		1.415	1.895	2.365	2.998	3.499
8		1.397	1.860	2.306	2.896	3.355

CASIO 9750
F5 for DIST, F2 for T, F3 for InvT
Area = α/ 2 = 0.10/2

```
Inverse Student-t
Data      :Variable
Area      :0.10÷2
df        :7
Save Res:None
Execute
```

EXE

```
Inverse Student-t
xInv =1.89457861
```

TI84 CE
2nd Distr, then 4: invT
Area = α/ 2 = 0.10/2

```
invT
area:0.10/2
df:7
Paste
```

Enter

```
invT(0.10/2,7)
                    -1.894578584
```

7. Five squirrels were found to have an average weight of 8.9 ounces with a sample standard deviation is 0.9. Find the 95% confidence interval of the true mean weight.

Given:

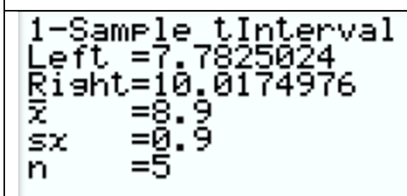
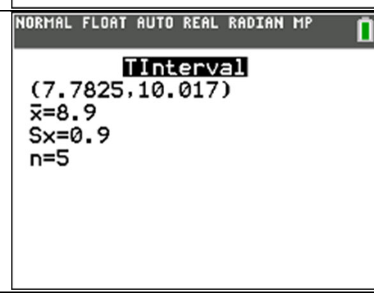
$n = 5 \quad \bar{x} = 8.9 \quad s = 0.9 \quad 95\%\ CI \quad t_{\alpha/2} = 2.776 \quad df = 4$

$\bar{x} \pm \mathrm{t}_{\alpha/2}\frac{s}{\sqrt{n}}$

$8.9 \pm 2.776\frac{0.9}{\sqrt{5}}$

$8.9\ \pm 1.11$

$(7.8, 10.0) \quad ==> \quad 7.8 < \mu < 10.0$

<table>
<tr><th>CASIO 9750
F4 for INTR, F2 for T, F1 for 1-S</th><th>TI84 CE Plus
STAT, TESTS, then 8: T-Interval</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>
</td><td>
</td></tr>
</table>

8. Boxes of raisins are labeled as containing 22 ounces. Following are the weights, in ounces, of a sample of 12 boxes. It is reasonable to assume that the population is approximately normal.
22.08, 22.25, 21.95, 22.39, 22.08, 22.11, 21.89, 21.60, 22.34, 22.03, 22.06, 22.32
Construct a 90% confidence interval for the mean weight.

Given the raw data, if using the formula to calculate the interval you need to find the sample mean & sample standard deviation.

Sample mean, $\bar{x} = 22.09$ sample standard deviation, $s = 0.22$

$n = 12$ (twelve data values). 90%, for $df = 11$, $t_{\alpha/2} = 1.796$

$\bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$

$22.09 \pm 1.796\frac{0.22}{\sqrt{12}}$

22.09 ± 0.1141

$21.977 < \mu < 22.206$

CASIO 9750	TI84 CE Plus
First, enter data on List 1 F4 for INTR, F2 for T, F1 for 1-S then press F1 to change Data to List 1-Sample tInterval Data :List C-Level :0.9 List :List1 Freq :1 Save Res:None Execute CALC	First, enter data on List 1 STAT, TESTS, then 8: T-Interval then for Inpt select Data, press Enter: TInterval Inpt:Data Stats List:L1 Freq:1 C-Level:0.9 Calculate
1-Sample tInterval Left =21.9772526 Right=22.2060807 $\bar{x}$ =22.0916667 sx =0.22069449 n =12	TInterval (21.977,22.206) $\bar{x}$=22.09166667 Sx=0.2206944961 n=12

9. Six measurements were made of the magnesium ion concentration (in parts per million, or ppm) in a city's municipal water supply, with the following results. It is reasonable to assume that the population is approximately normal. 180, 176, 182, 182, 216, 204
Calculate the 99% confidence interval for the mean magnesium ion concentration.

Given the raw data, if using the formula to calculate the interval you need to find the sample mean & sample standard deviation.
Sample mean, $\bar{x} = 190$ sample standard deviation, $s = 16.1$
$n = 6$ (six data values). 99%, for $df = 5,\ t_{\alpha/2} = 4.032$

$$\bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$$

$$190 \pm 4.032\frac{16.1}{\sqrt{6}}$$

$$190 \pm 26.5$$
$$163.5 < \mu < 216.5$$

CASIO 9750	TI84 CE Plus
First, enter data on List 1 F4 for INTR, F2 for T, F1 for 1-S then press F1 to change Data to List 1-Sample tInterval Data :List C-Level :0.99 List :List1 Freq :1 Save Res:None Execute CALC	First, enter data on List 1 STAT, TESTS, then 8: T-Interval then for Inpt select Data, press Enter: TInterval Inpt:Data Stats List:L1 Freq:1 C-Level:0.99 Calculate
1-Sample tInterval Left =163.498052 Right=216.501948 $\bar{x}$ =190 sx =16.0996894 n =6	TInterval (163.5,216.5) $\bar{x}$=190 Sx=16.09968944 n=6

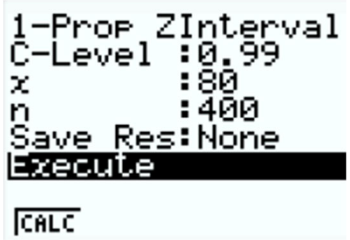
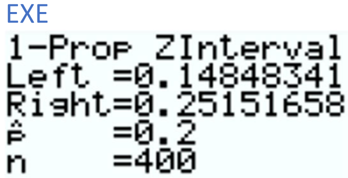
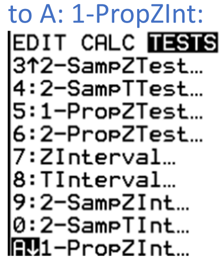
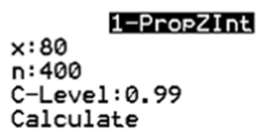
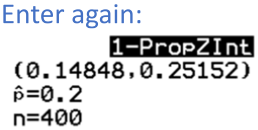
10. A sample of 400 racing cars showed that 80 of them cost over \$700,000. What is the 99% confidence interval for the true proportion of racing cars that cost over \$700,000?

Given $x = 80,\ n = 400;\ \hat{p} = \frac{x}{n} = \frac{80}{400} = 0.2 \quad \hat{q} = 0.80\ ; for \quad 99\% \quad CI \quad the \quad z_{\alpha/2} = 2.576$

$$\hat{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\hat{p} \cdot \hat{q}}{n}}$$

$$0.2 \pm 2.576\sqrt{\frac{0.2(0.8)}{400}}$$

$$0.2 \pm 0.0515 \quad \Rightarrow 0.148 < p < 0.252$$

CASIO 9750	*TI*84
F4 for INTR, F1 for Z, F3 for 1-P  EXE  	STAT, then TESTS, then scroll down to A: 1-PropZInt:  Enter:  Enter again: 

11. A recent study of 750 internet users in Europe found that 35% of internet users were women. What is the 95% confidence interval of the true proportion of women in Europe who use the internet?

Given: $n = 750;\ \hat{p} = 0.35 \quad \hat{q} = 0.65;$ for 95% CI the $z_{\alpha/2} = 1.96$

$$\hat{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\hat{p} \cdot \hat{q}}{n}}$$

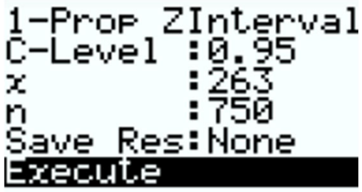
$$0.35 \pm 1.96\sqrt{\frac{0.35(0.65)}{750}}$$

$$0.35 \pm 0.0341 \quad \Rightarrow 0.316 < p < 0.384$$

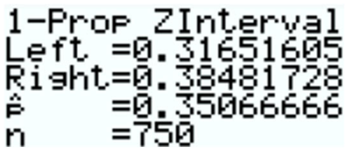
For calculators we need x; and $x = n \times \hat{p}$. Then, round x to the nearest integer.
In this example: $750 \times 0.35 = 262.5 \approx 263$

CASIO 9750

F4 for INTR, F1 for Z, F3 for 1-P

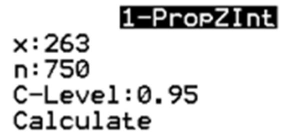


EXE

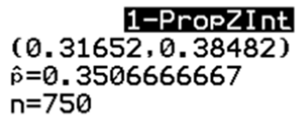


*TI*84

STAT, then TESTS, then
A: 1-PropZInt, then Enter:



Enter:



12. A random sample of 100 voters found that 46% were going to vote for a certain candidate. Find the 90% confidence interval for the population proportion of voters who will vote for that candidate.
Given: $\text{n} = 100; \hat{p} = 0.46 \quad \hat{q} = 0.54; \quad \text{for} \quad 90\% \quad \text{CI} \quad \text{the} \quad z_{\alpha/2} = 1.645$

$$\hat{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\hat{p} \cdot \hat{q}}{n}}$$

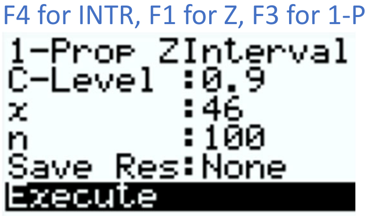
$$0.46 \pm 1.645 \sqrt{\frac{0.46(0.54)}{100}}$$

$$0.46 \pm 0.0820 \quad \Rightarrow 0.378 < p < 0.542 \quad \Rightarrow \quad \text{as a percentage: } 37.8\% < p < 54.2\%$$

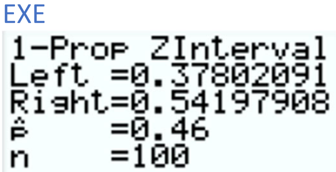
Again, for calculators we need x; and $x = n \times \hat{p}$
In this example: $100 \times 0.46 = 46$

CASIO 9750

F4 for INTR, F1 for Z, F3 for 1-P

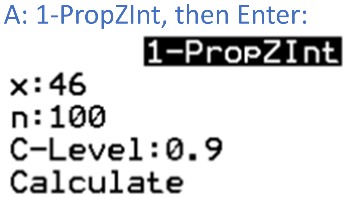


EXE

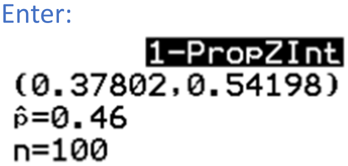


*TI*84

STAT, then TESTS, then
A: 1-PropZInt, then Enter:



Enter:



13. In a sample of 60 mice, a biologist found that 38% were able to run a maze in 30 seconds or less. Find the 90% confidence interval for the population proportion of mice who can run a maze in 30 seconds or less.
Given: $\text{n} = 60;\ \hat{p} = 0.38\quad \hat{q} = 0.62;\ \text{ for }\ 90\%\ \text{ CI }\ \text{ the }\ z_{\alpha/2} = 1.645$

$$\hat{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\hat{p} \cdot \hat{q}}{n}}$$

$$0.38 \pm 1.645\sqrt{\frac{0.38(0.62)}{60}}$$

$0.38 \pm 0.1031 \quad \Rightarrow\ 0.277 < p < 0.482 \quad \Rightarrow \quad$ as a percentage: $27.7\% < p < 48.3\%$

Again, for calculators we need x; and $x = n \times \hat{p}$
In this example: $60 \times 0.38 = 22.8 \approx 23$

<table>
<tr><td>CASIO 9750
F4 for INTR, F1 for Z, F3 for 1-P
1-Prop ZInterval
C-Level :0.9
x :23
n :60
Save Res:None
Execute
EXE
1-Prop ZInterval
Left =0.28008925
Right=0.48657741
p̂ =0.38333333
n =60</td><td>TI84
STAT, then TESTS, then
A: 1-PropZInt, then Enter:
1-PropZInt
x:23
n:60
C-Level:0.9
Enter:
1-PropZInt
(0.28009,0.48658)
p̂=0.3833333333
n=60</td></tr>
</table>

14. A college believes that 28% of applicants to that school have parents who have remarried. How large a sample is needed to estimate the true proportion of students who have parents who have remarried to within 3 percentage points with 95% confidence?

$$n = \hat{p} \cdot \hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$

Given $\hat{p} = 0.28.\ Error = 3\% \ \Rightarrow E = 0.03$ and a 95% confidence: $z_{\alpha/2} = 1.96$

$$n = 0.28 \times 0.72\left(\frac{1.96}{0.03}\right)^2 = 860.5 \approx 861$$

```
0.28*0.72(1.96/0.03)²
                    860.5184
```

15. A researcher wants to construct a 90% confidence interval for the proportion of elementary school students in Seward County who receive free or reduced-price school lunches. What sample size is needed so that the confidence interval will have a margin of error of 0.06?

$$n = \hat{p} \cdot \hat{q} \left(\frac{z_{\alpha/2}}{E}\right)^2$$

Given: $E = 0.03$ and a 90% confidence: $z_{\alpha/2} = 1.645$
Since no estimation of the proportion, $\hat{p}$ is given, use $\hat{p} = \hat{q} = 0.50$

$$n = 0.5 \times 0.5 \left(\frac{1.645}{0.06}\right)^2 = 187.9 \approx 188$$

Calculations:

```
0.5*0.5(1.645/0.06)²
                        187.9184028
```

16. The average greyhound can reach a top speed of 18.9 meters per second. A particular greyhound breeder claims her dogs are faster than the average greyhound. A sample of 50 of her dogs ran, on average, 19.5 meters per second with a population standard deviation of 1.5 meters per second. With $\alpha = 0.05$,
    a) State the hypotheses and identify the claim.
    b) Find the critical value.
    c) Compute the test value.
    d) Make the decision.
    e) Summarize the results.

<u>*Info taken from problem*</u>: $\mu = 18.9 \quad n = 50 \quad \bar{x} = 19.5 \quad \sigma = 1.5$

a)
$Ho: \mu = 18.9$
$H_1: \mu > 18.9 \quad claim$

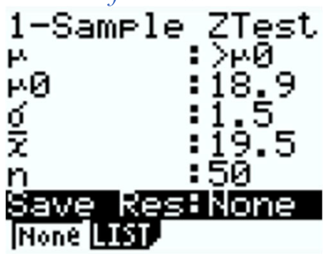
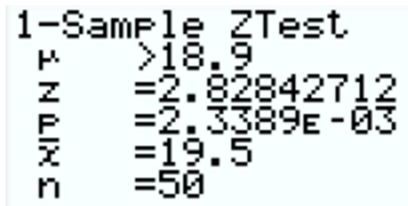
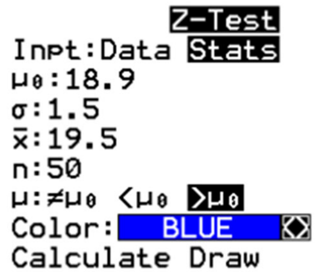
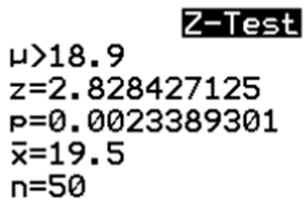
b) $\alpha = 0.05$ in one tail, right, $z_\alpha = 1.645$

c) Test *Statistics:* $z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{19.5-18.9}{1.5/\sqrt{50}} = 2.83$

d) Reject the Null Hypothesis because the test statistic falls in the critical region, that is, because $|2.83| > |1.645|$. Calculator: $P - Value = 0.0023 < \alpha$

e) There is sufficient evidence to support the breeder claims that her dogs are faster than the average greyhound.

On calculators, next page:

CASIO 9750: *F3 for TEST, F1 for Z then F1 for 1-S:*  *EXE:*  	*TI84* *STAT, then TESTS, then 1: Z-TEST, select Stats:*  *Enter:* 

17. A recent report by the American Medical Association stated the average annual salary of psychiatrists is \$192,000 with a population standard deviation of \$16,000. A group of hospital administrators randomly sampled 32 psychiatrists and found an average annual salary of \$187,000. The group claims that the average annual salary is actually lower than what the American Medical Association reported. With $\alpha = 0.01$,

a) State the hypotheses and identify the claim.
b) Find the critical value.
c) Compute the test value.
d) Make the decision.
e) Summarize the results.

Info taken from problem: $\mu = 192{,}000 \quad n = 32 \quad \bar{x} = 187{,}000 \quad \sigma = 16{,}000$

a)

$Ho: \mu = 192{,}000$
$H_1: \mu < 192{,}000 \quad claim$

b) $\alpha = 0.02$ in one tail, left, $z_\alpha = -2.326$

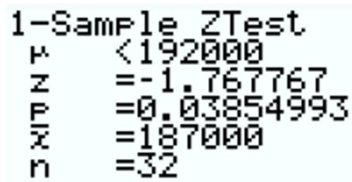
c) Test *Statistics:* $z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{187000-192000}{16000/\sqrt{32}} = -1.77$

d) Fail to Reject Null Hypothesis because the test statistic does not fall in the critical region, that is, because $|-1.77| < |-2.326|$. Calculator: $P - Value = 0.039 > \alpha$

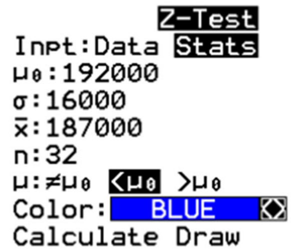
e) There is no sufficient evidence to support the administrators claim that the salary is actually lower than what the American Medical Association reported.

CASIO 9750:
F3 for TEST, F1 for Z then F1 for 1-S:

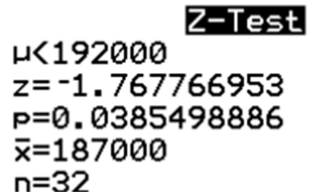
EXE:



TI84
STAT, then TESTS, then 1: Z-TEST, select Stats:



Enter:



18. Sam Ying, a career counselor, claims the average number of years of schooling for an engineer is 15.8 years. A sample of 12 engineers had a mean of 15.0 years and a standard deviation of 1.5 years. Use the $\alpha = 0.05$ level of significance.
a) State the hypotheses and identify the claim.
b) Find the critical value.
c) Compute the test value.
d) Make the decision.
e) Summarize the results.

Given: $\mu = 15.8 \quad \bar{x} = 15.0 \quad n = 12, \quad s = 1.5 \quad \alpha = 0.05$

Answer:

$H_0: \mu = 15.8\ (claim).$ $\qquad H_1: \mu \neq 15.8$

b) $df = 11 \quad \alpha = 0.05$ Critical value: $t_{\alpha/2} = \pm 2.201$

	Confidence intervals	80%	90%	95%	98%	99%
	One tail, α	0.10	0.05	0.025	0.01	0.005
d.f.	Two tails, α	0.20	0.10	0.05	0.02	0.01
1		3.078	6.314	12.706	31.821	63.657
2		1.886	2.920	4.303	6.965	9.925
3		1.638	2.353	3.182	4.541	5.841
4		1.533	2.132	2.776	3.747	4.604
5		1.476	2.015	2.571	3.365	4.032
6		1.440	1.943	2.447	3.143	3.707
7		1.415	1.895	2.365	2.998	3.499
8		1.397	1.860	2.306	2.896	3.355
9		1.383	1.833	2.262	2.821	3.250
10		1.372	1.812	2.228	2.764	3.169
11		1.363	1.796	2.201	2.718	3.106
12		1.356	1.782	2.179	2.681	3.055

c) Test statistics:

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

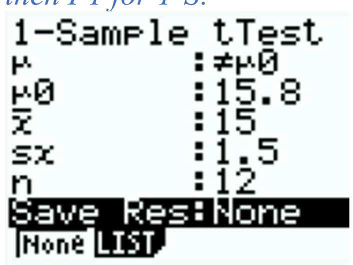
$$t = \frac{15.0 - 15.8}{1.5/\sqrt{12}} = -1.84$$

d) Fail to reject the Null Hypothesis because the test statistic does not fall in the critical region, that is, because $|-1.84| < |-2.201|$. Calculator: $P - Value\ = 0.09 > \alpha$

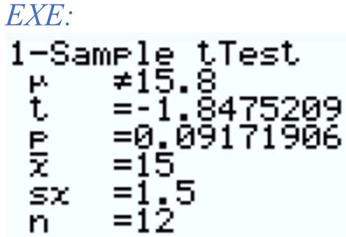
e) There is no sufficient evidence to reject the counselor's claim that the average number of years of schooling for an engineer is 15.8 years.

On Calculators:

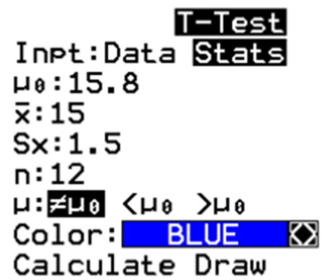
CASIO 9750:
F3 for TEST, F2 for T then F1 for 1-S:



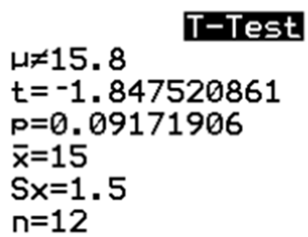
EXE:



TI84
STAT, then TESTS, then 2: T-TEST



Enter:



19. In a survey of 426 cigarette smokers, 61 of them reported that they have tried hypnosis therapy to try to quit smoking. Can you conclude that more than one-tenth of smokers have tried hypnosis therapy? Use the $\alpha =\ 0.05$ level of significance.
a) State the hypotheses and identify the claim.
b) Find the critical value.
c) Compute the test value.
d) Make the decision.
e) Summarize the results.

Given:
Significance level, $\alpha = 0.05$ in a right-tailed test $z_\alpha = 1.645$
$\hat{p} = 61/426 = 0.1432$

Hypotheses:
$H_0: p = 0.10$ $\qquad$ $H_1: p > 0.10$

Test Statistics:

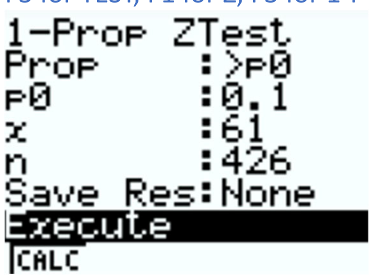
$$z = \frac{\hat{p} - p}{\sqrt{\frac{p \cdot q}{n}}}$$

$$z = \frac{0.1432 - 0.10}{\sqrt{\frac{0.10\ (0.90)}{426}}} = 2.97$$

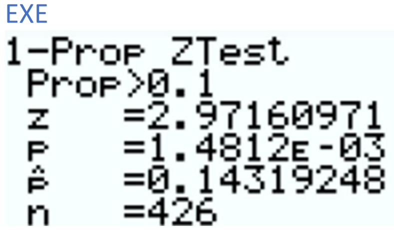
Notice that test statistics $|2.97| > |1.645|$ therefore, we reject the Null.
Accordingly, $p - value \ = \ 0.001 < \ \alpha$

There is enough evidence to support the claim that more than one-tenth of smokers have tried hypnosis therapy.

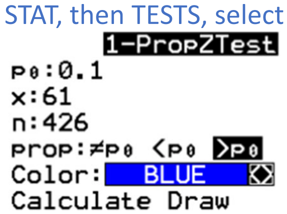
CASIO 9750
F3 for TEST, F1 for Z, F3 for 1-P



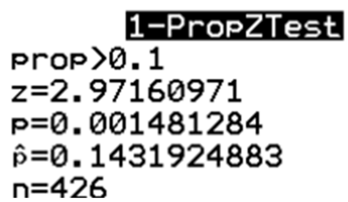
EXE



TI 84
STAT, then TESTS, select 5: 1-PropZTest



Enter



20. Professor Brown teaches at U-Chem university and believes that the rate of first-time failure in his general chemistry classes is 33%. He samples 96 students from last semester who were first-time enrollees in general chemistry and finds that 23 of them failed his course. Using $\alpha = \ 0.05$, can you conclude that the percentage of failures differs from 33%?
a) State the hypotheses and identify the claim.
b) Find the critical value.
c) Compute the test value.
d) Make the decision.
e) Summarize the results.

Given:
Significance level, $\alpha = 0.05$ in a two-tailed test $z_{\alpha/2} = \pm 1.96$

$\hat{p} = 23/96 \; = \; 0.2396$

Hypotheses:

$H_0: p = 0.33 \qquad\qquad H_1: p \neq 0.33$

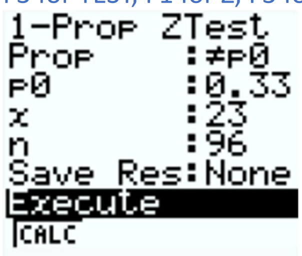
Test Statistics:

$$z = \frac{\hat{p}-p}{\sqrt{\frac{p \cdot q}{n}}}$$

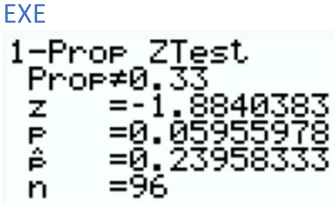
$$z = \frac{0.2396 - 0.33}{\sqrt{\frac{0.33\,(0.67)}{96}}} = -1.88$$

CASIO 9750

F3 for TEST, F1 for Z, F3 for 1-P

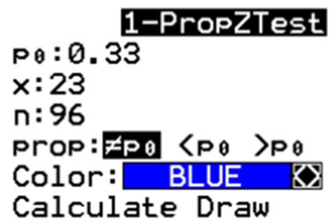


EXE

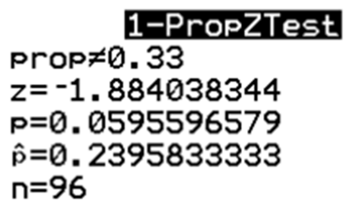


TI 84

STAT, then TESTS, select 5: 1-PropZTest



Enter



d) Fail to reject the Null Hypothesis. Notice that test statistics $|-1.88| < |-1.96|$ therefore, the critical value is not in the rejection region; likewise, $p - value \; = \; 0.06 \; > \; \alpha$

e) There is not enough evidence to reject the claim that the rate of first-time failure in his general chemistry classes is 33%