Hypothesis Testing about a Mean Small Sample

Earthquakes occur at a mean of 5.0 km, as claimed by the Geology Club at ELAC. A sample of 25 Earthquakes reveal a mean of 4.6 km with a standard deviation of 0.8 km. Use the 5% level of significance to test this claim.

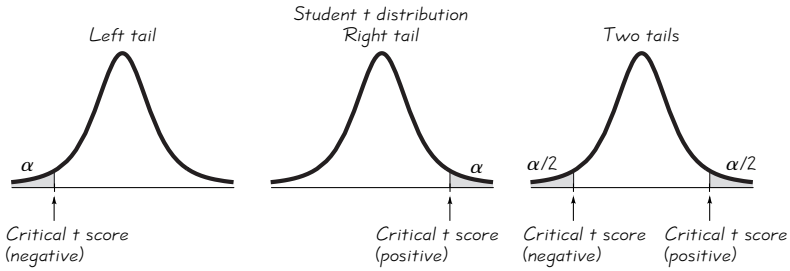

TABLE A-3 *t* Distribution

	α					
Degrees of Freedom	.005 (one tail) 0.01 (two tails)	.01 (one tail) .02 (two tails)	.025 (one tail) .05 (two tails)	.05 (one tail) .10 (two tails)	.10 (one tail) .20 (two tails)	.25 (one tail) .50 (two tails)
1	63.657	31.821	12.706	6.314	3.078	1.000
2	9.925	6.965	4.303	2.920	1.886	.816
3	5.841	4.541	3.182	2.353	1.638	.765
4	4.604	3.747	2.776	2.132	1.533	.741
5	4.032	3.365	2.571	2.015	1.476	.727
6	3.707	3.143	2.447	1.943	1.440	.718
7	3.500	2.998	2.365	1.895	1.415	.711
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10	3.169	2.764	2.228	1.812	1.372	.700
11	3.106	2.718	2.201	1.796	1.363	.697
12	3.054	2.681	2.179	1.782	1.356	.696
13	3.012	2.650	2.160	1.771	1.350	.694
14	2.977	2.625	2.145	1.761	1.345	.692
15	2.947	2.602	2.132	1.753	1.341	.691
16	2.921	2.584	2.120	1.746	1.337	.690
17	2.898	2.567	2.110	1.740	1.333	.689
18	2.878	2.552	2.101	1.734	1.330	.688
19	2.861	2.540	2.093	1.729	1.328	.688
20	2.845	2.528	2.086	1.725	1.325	.687
21	2.831	2.518	2.080	1.721	1.323	.686
22	2.819	2.508	2.074	1.717	1.321	.686
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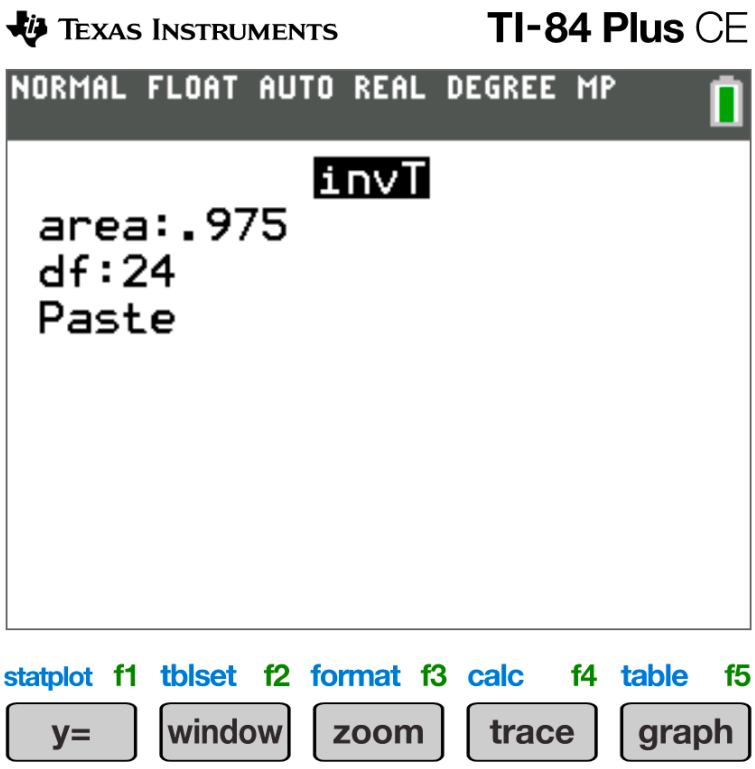
28	2.763	2.467	2.048	1.701	1.313	.683
29	2.756	2.462	2.045	1.699	1.311	.683
Large (z)	2.575	2.326	1.960	1.645	1.282	.675

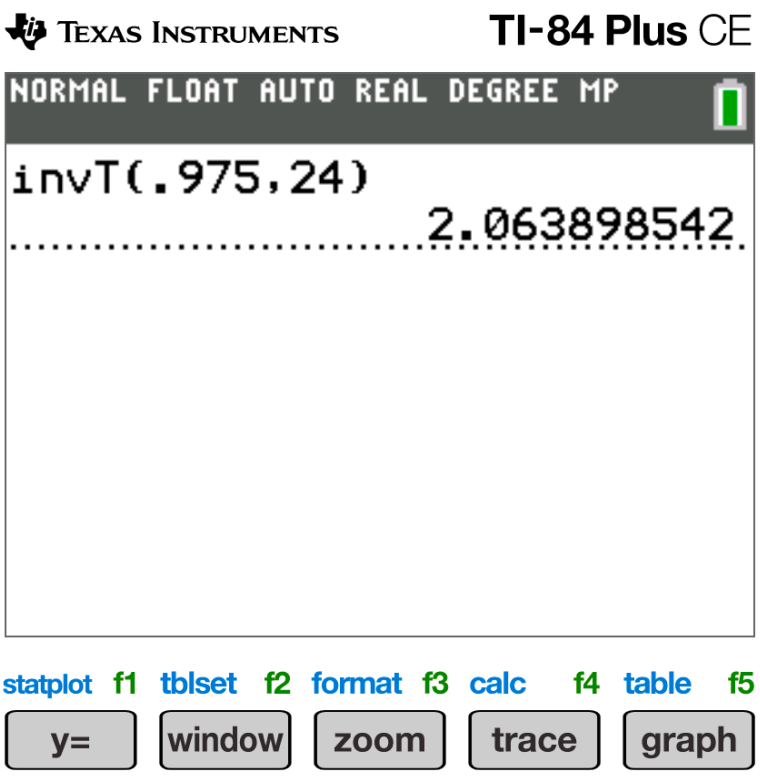
Create Your Decision Rule by determining your critical value(s).
Approximate the critical value(s) to the nearest thousandths.

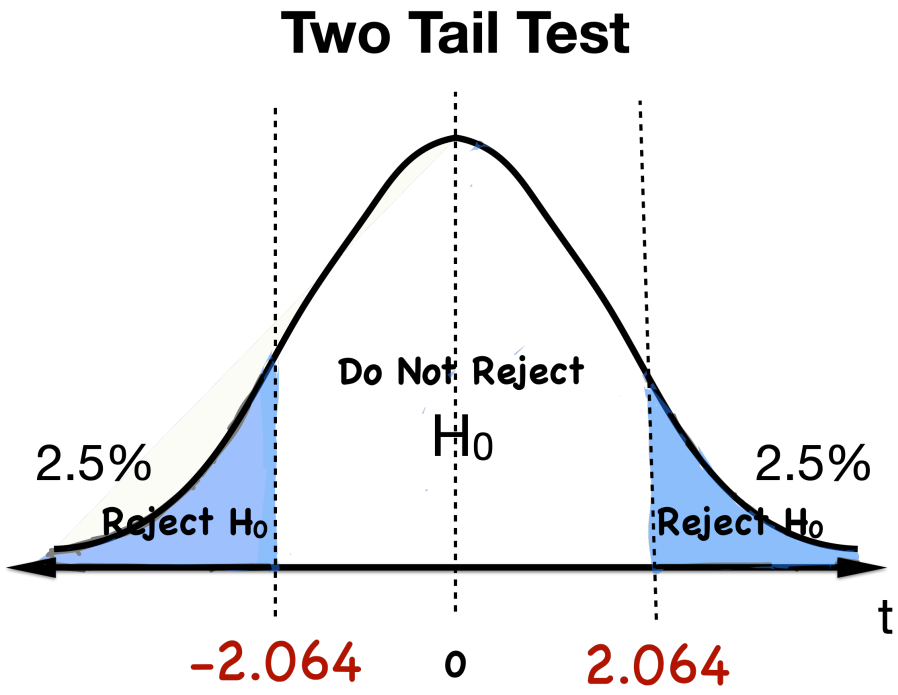
TI-83 or TI-84 Plus Finding the z vaue corresponding to a known area.

1. Press **2nd** then **vars** to access DISTR (distributions) menu.
2. Select **InvT** and click **enter**.
3. Enter the **area to the left** of the right most **Critical Value**.
4. Enter the **degree of freedom**.

InvT
area: 0.975
$df: 24$

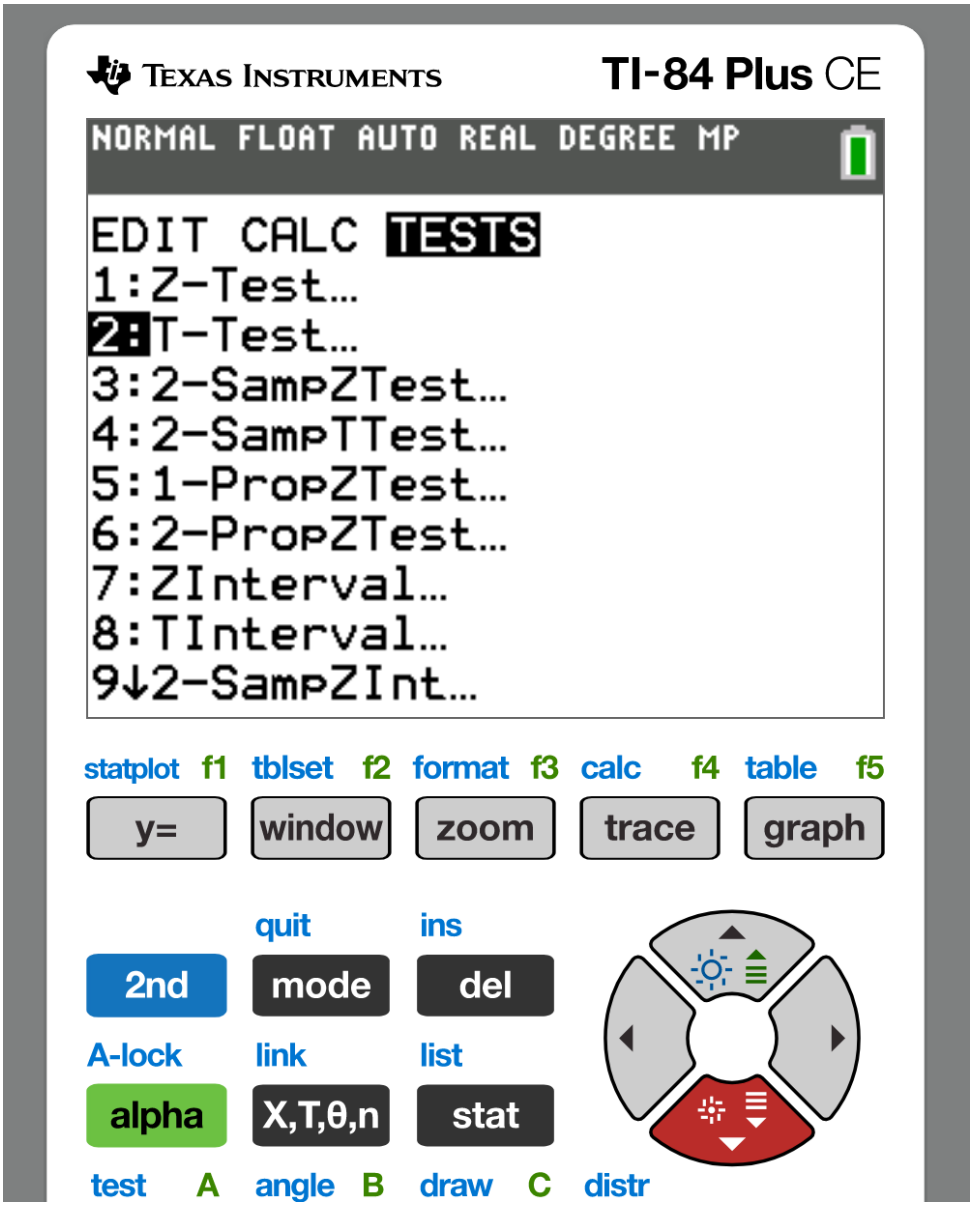



Texas Instruments
TI-84 Plus CE
NORMAL FLOAT AUTO REAL DEGREE MP
invT(.975,24)
2.063898542
statplot f1 tblset f2 format f3 calc f4 table f5
y= window zoom trace graph

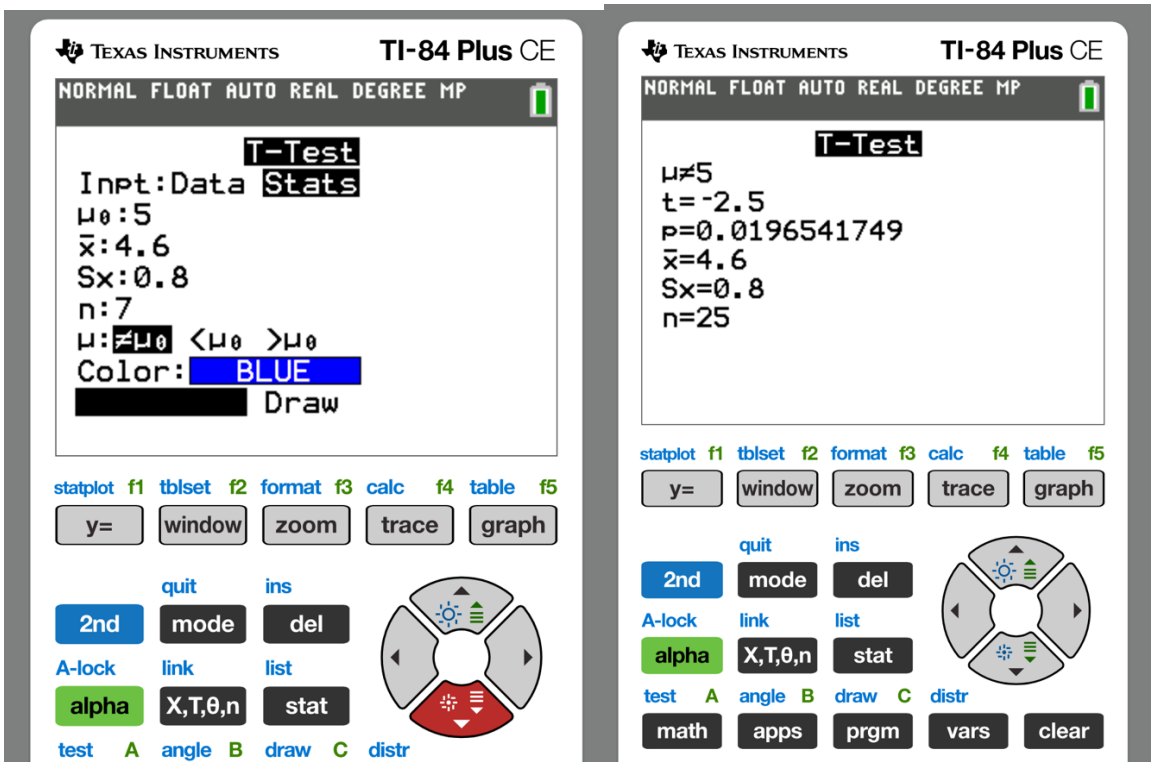

Two Tail Test
Do Not Reject
H0
2.5%
Reject H0
2.5%
Reject H0
t
-2.064
0
2.064

Compute your Test Statistic.
Approximate your test statistic to the nearest thousandths.

TI-84 Plus CE
1. Press **STAT**, then select **TESTS** in the top menu.
2. Select **T-Test** in the menu and press **ENTER.**
3. Enter the Input: Stats, the claimed mean μ_0 , standard deviation σ, sample size n, alternate hypothesis type.
4. Calculate



This is what you will see using the hypothesis testing information.



The test Statistic is measured as a t value as $\boldsymbol{t = -2.5}$

The mean IQ scores for College Professors is no more than 125 as claimed by the Faculty Association. A sample of 8 College Professors are listed below:

125, 115, 108, 143, 120, 136, 112, 145

Use the 1% level of significance to test this claim.

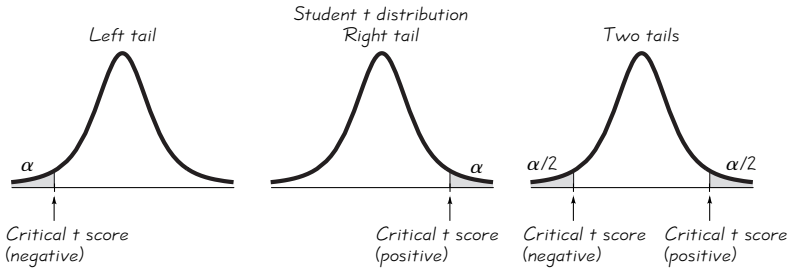


TABLE A-3 *t* Distribution

	α					
Degrees of Freedom	.005 (one tail) 0.01 (two tails)	.01 (one tail) .02 (two tails)	.025 (one tail) .05 (two tails)	.05 (one tail) .10 (two tails)	.10 (one tail) .20 (two tails)	.25 (one tail) .50 (two tails)
1	63.657	31.821	12.706	6.314	3.078	1.000
2	9.925	6.965	4.303	2.920	1.886	.816
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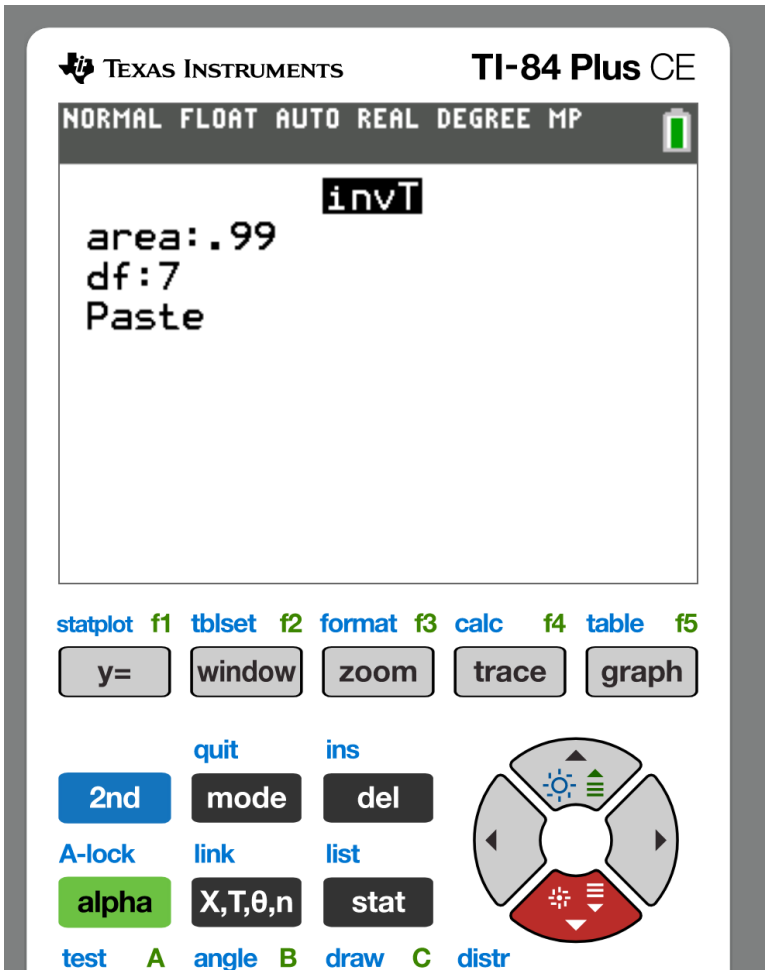
27	2.771	2.473	2.052	1.703	1.314	.684
28	2.763	2.467	2.048	1.701	1.313	.683
29	2.756	2.462	2.045	1.699	1.311	.683
Large (z)	2.575	2.326	1.960	1.645	1.282	.675

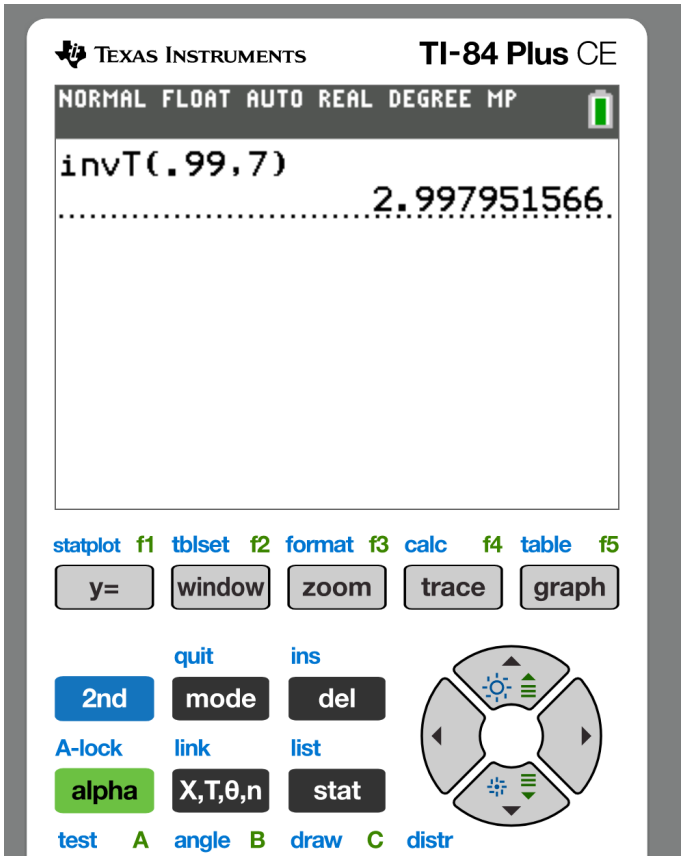
Create Your Decision Rule by determining your critical value(s).
Approximate the critical value(s) to the nearest thousandths.

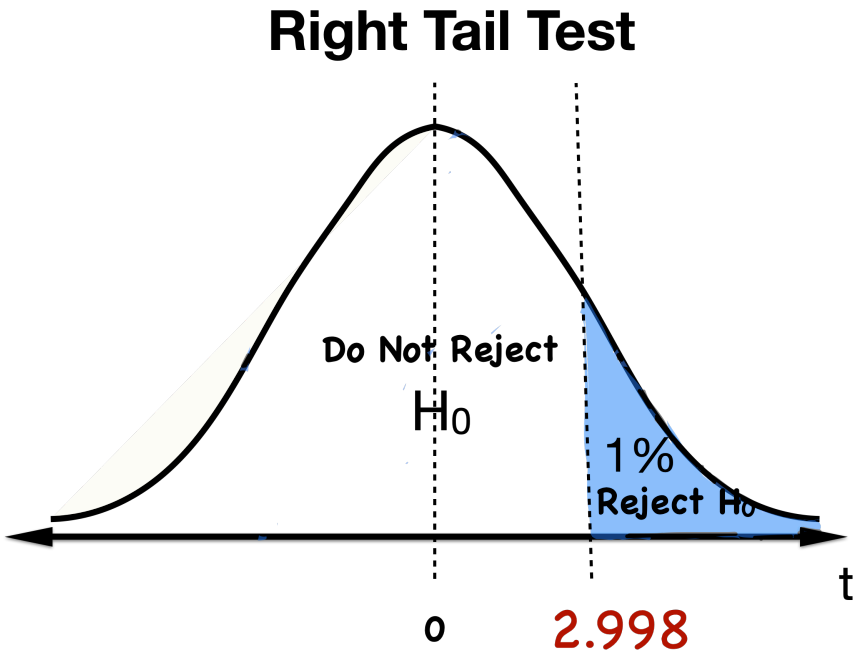
TI-83 or TI-84 Plus Finding the z vaue corresponding to a known area.

1. Press **2nd** then **vars** to access DISTR (distributions) menu.
2. Select **InvT** and click **enter**.
3. Enter the **area to the left** of the right most **Critical Value**.
4. Enter the **degree of freedom**.

InvT
area: 0.99
df: 7

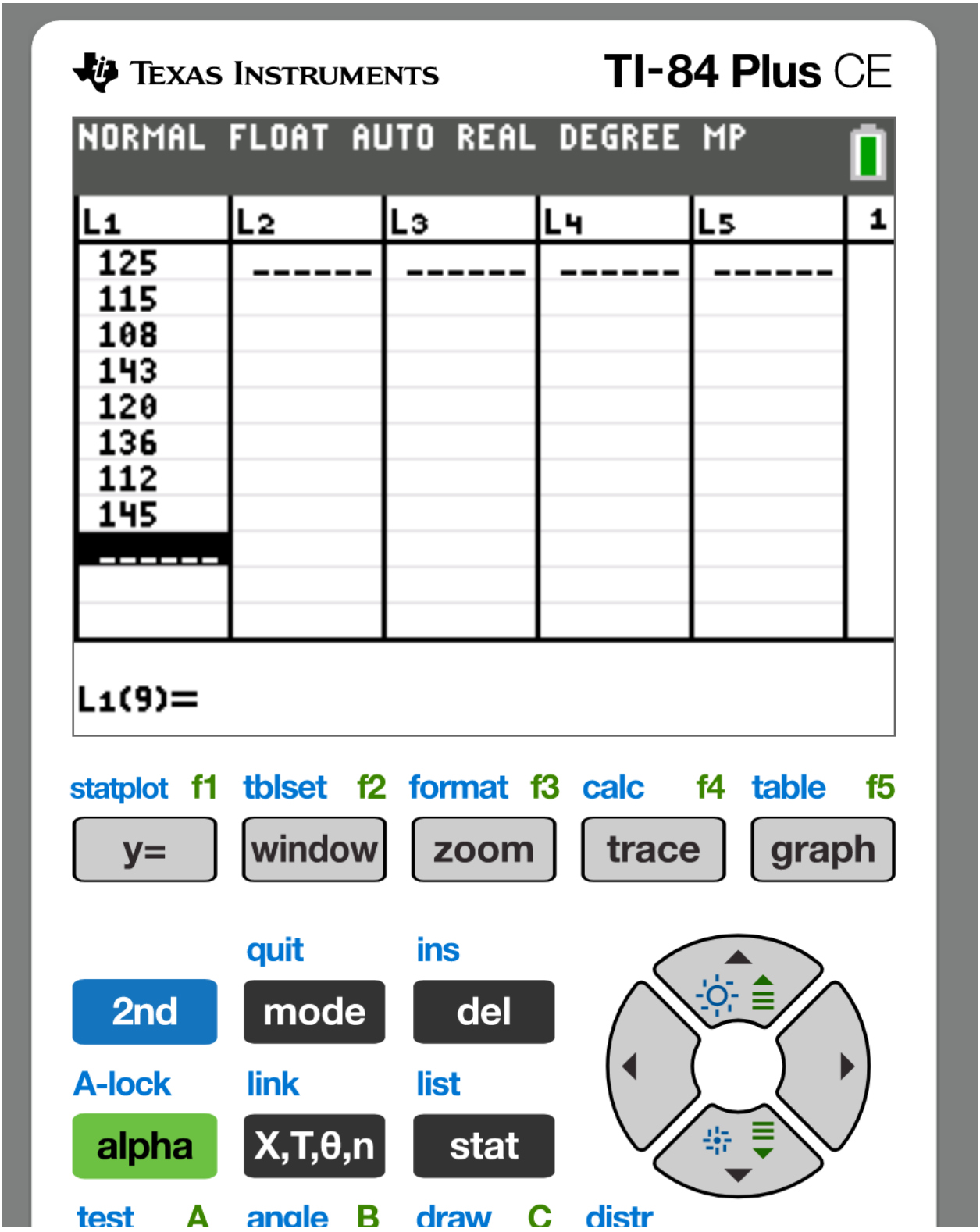



Texas Instruments
TI-84 Plus CE
NORMAL FLOAT AUTO REAL DEGREE MP
invT(.99,7)
2.997951566
statplot f1 tblset f2 format f3 calc f4 table f5
y= window zoom trace graph
quit ins
2nd mode del
A-lock link list
alpha X,T,θ,n stat
test A angle B draw C distr

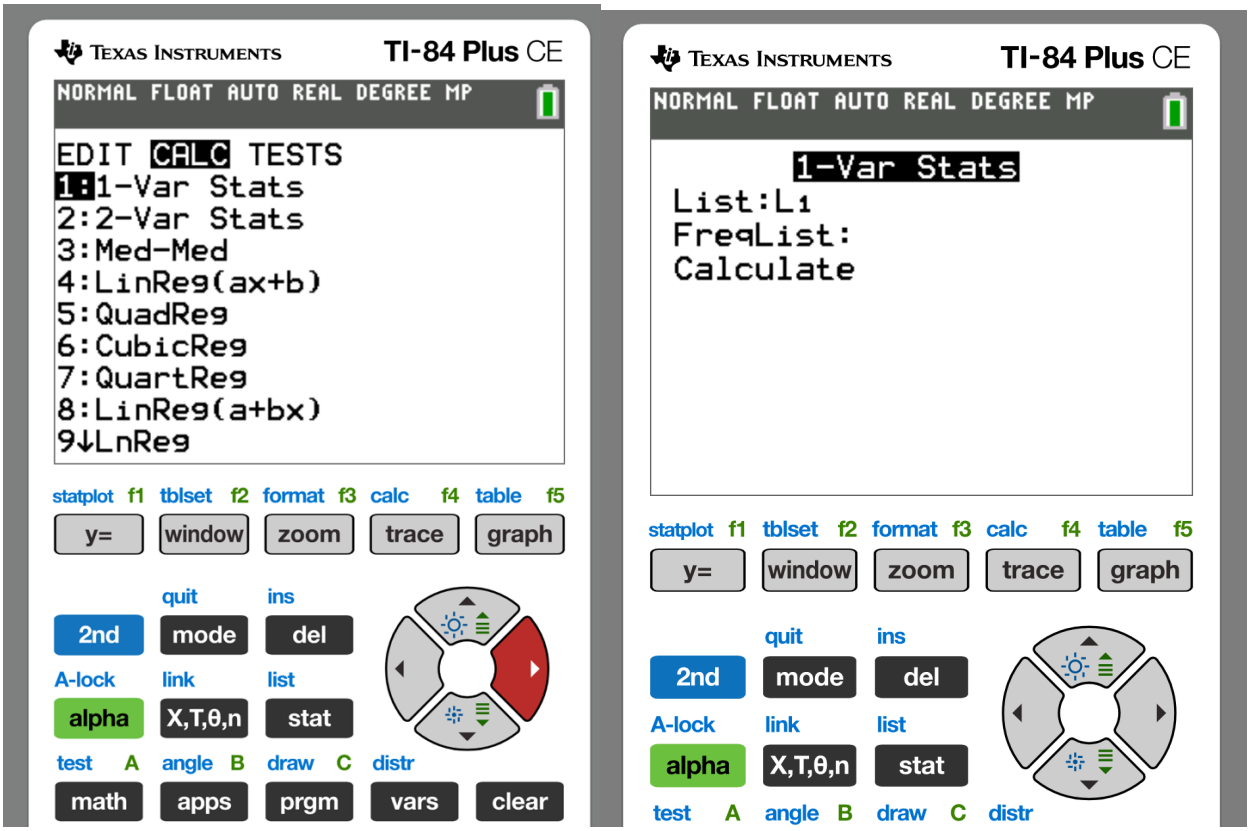

Right Tail Test
Do Not Reject
H0
1%
Reject H0
t
0
2.998

You will need to enter your data set in the L_1

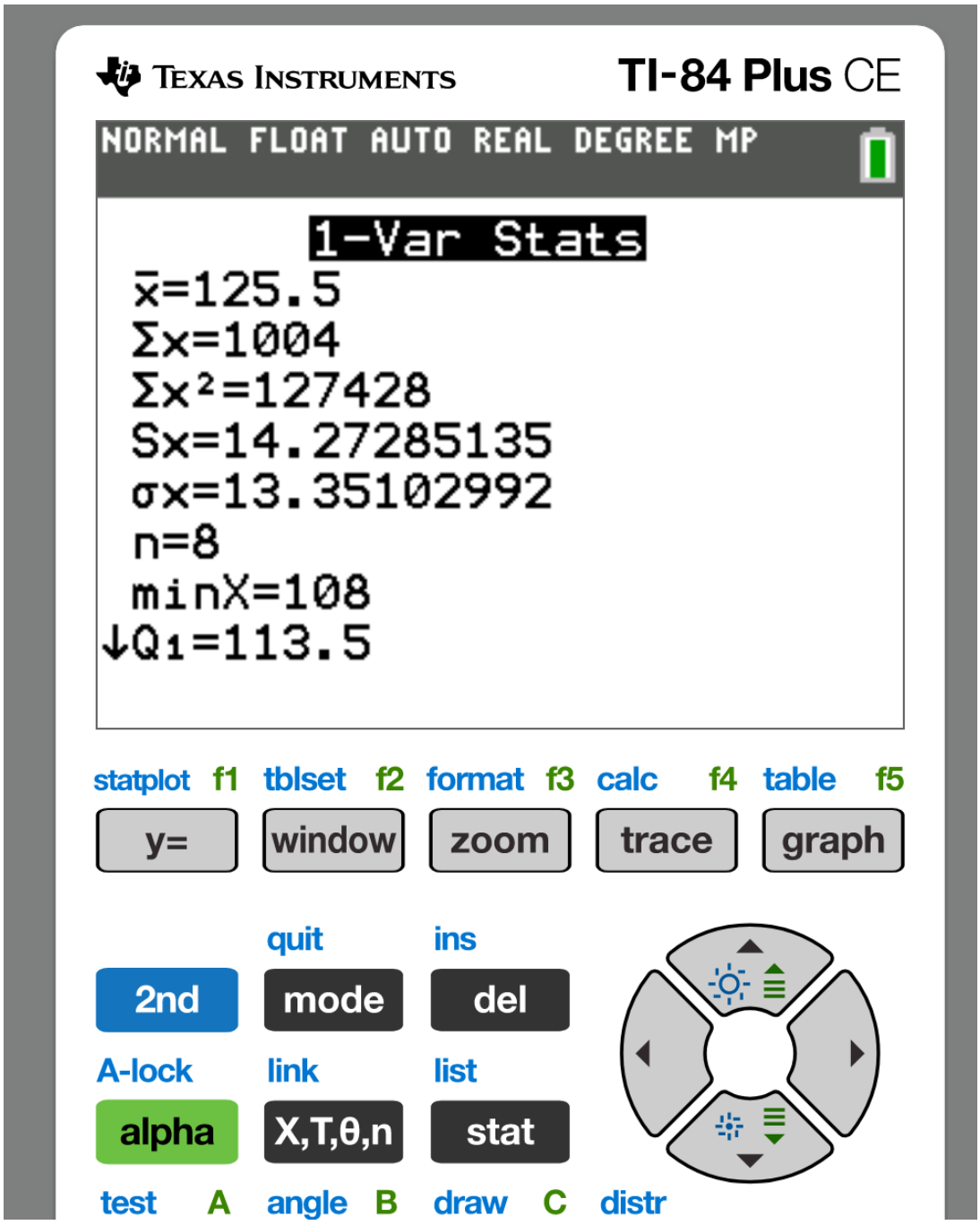
1. Click on **STAT** and **Edit**



2. Click **STAT** move the cursor to **CALC.**
3. Click on **1-Var-Stats**
4. Make sure List is on L_1



Notice what you obtained with the small sample size information



$\bar{x} = 125.5$ and $s = 14.3$

Compute your Test Statistic.
Approximate your test statistic to the nearest Thousandths.

TI-84 Plus CE
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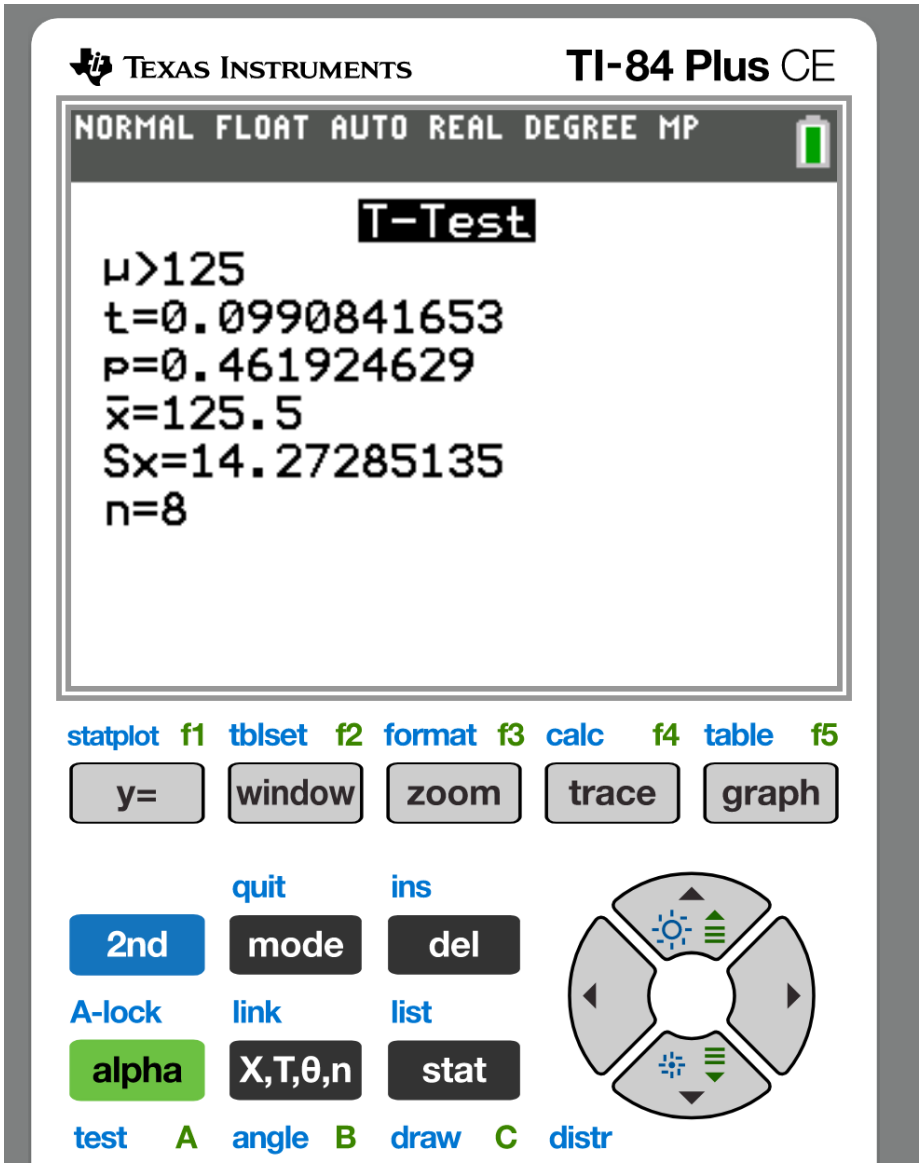
2. Select **T-Test** in the menu and press **ENTER.**
3. Enter the Input: Stats, the claimed mean μ_0 , standard deviation σ, sample size n, alternate hypothesis type.
4. Calculate



The test Statistic is measured as a t value as $\boldsymbol{t = 0.099}$

The mean pulse rate of adult males is at least 72 bpm (beats per minute) as claimed by the Nursing Association of America. A sample of 25 adult males pulse rates reveal a mean pulse rate of 75.5 bbm with a standard deviation of 6.6 bbm. Use the 10% level of significance to test this claim.

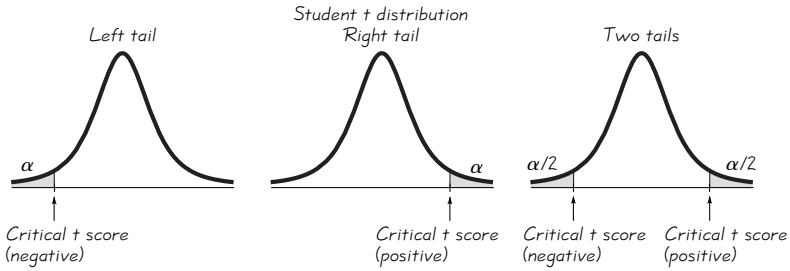


TABLE A-3 *t* Distribution

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20	2.845	2.528	2.086	1.725	1.325	.687
21	2.831	2.518	2.080	1.721	1.323	.686
22	2.819	2.508	2.074	1.717	1.321	.686
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27	2.771	2.473	2.052	1.703	1.314	.684
28	2.763	2.467	2.048	1.701	1.313	.683
29	2.756	2.462	2.045	1.699	1.311	.683
Large (z)	2.575	2.326	1.960	1.645	1.282	.675

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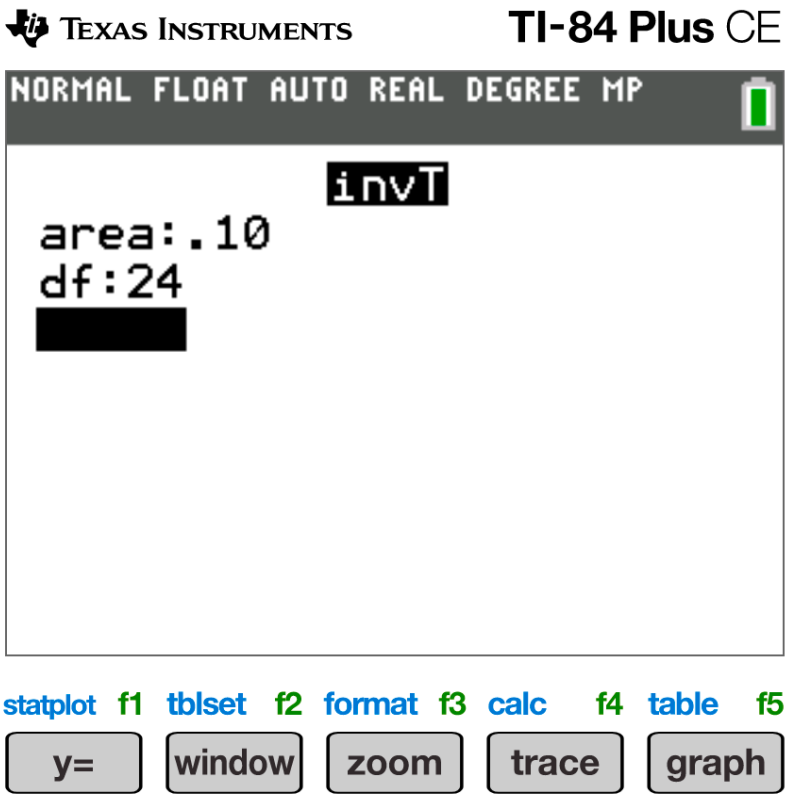
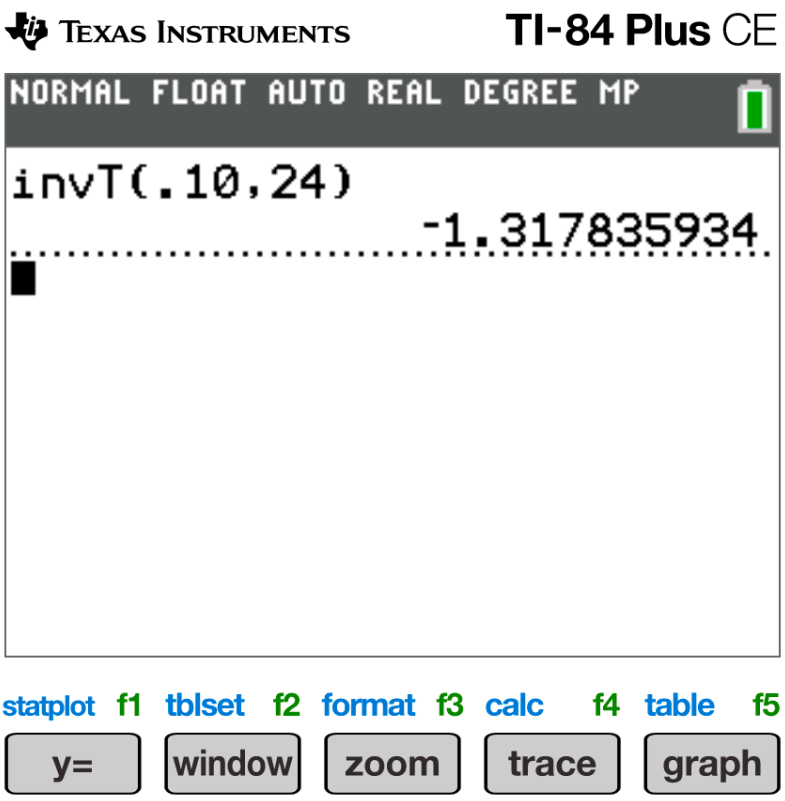
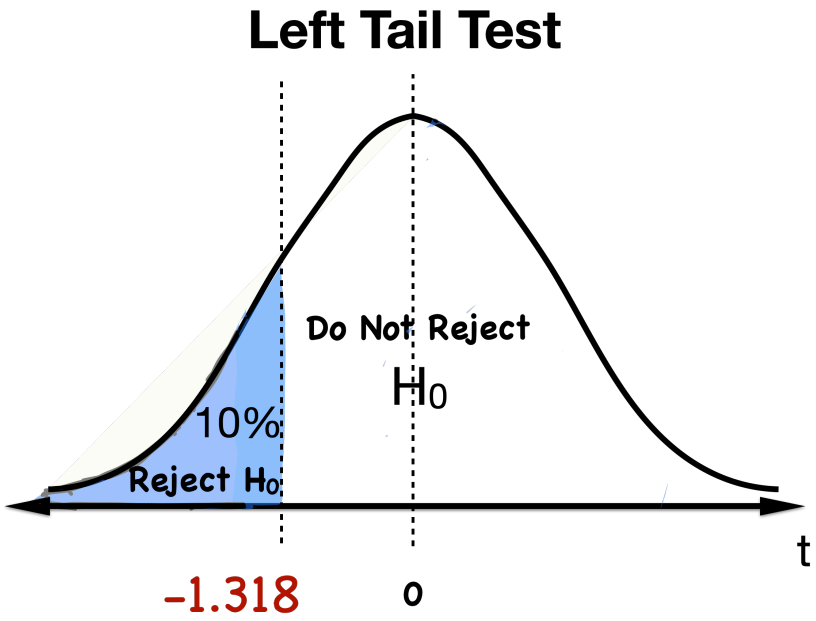
2. Select **InvT** and click **enter**.
3. Enter the **area to the left** of the right most **Critical Value**.
4. Enter the **degree of freedom**.

InvT
area: 0.10
$df: 24$




Texas Instruments
TI-84 Plus CE
NORMAL FLOAT AUTO REAL DEGREE MP
invT(.10,24)
-1.317835934
statplot f1 tblset f2 format f3 calc f4 table f5
y= window zoom trace graph


Left Tail Test
Do Not Reject
H0
10%
Reject H0
t
-1.318
0

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TI-84 Plus CE
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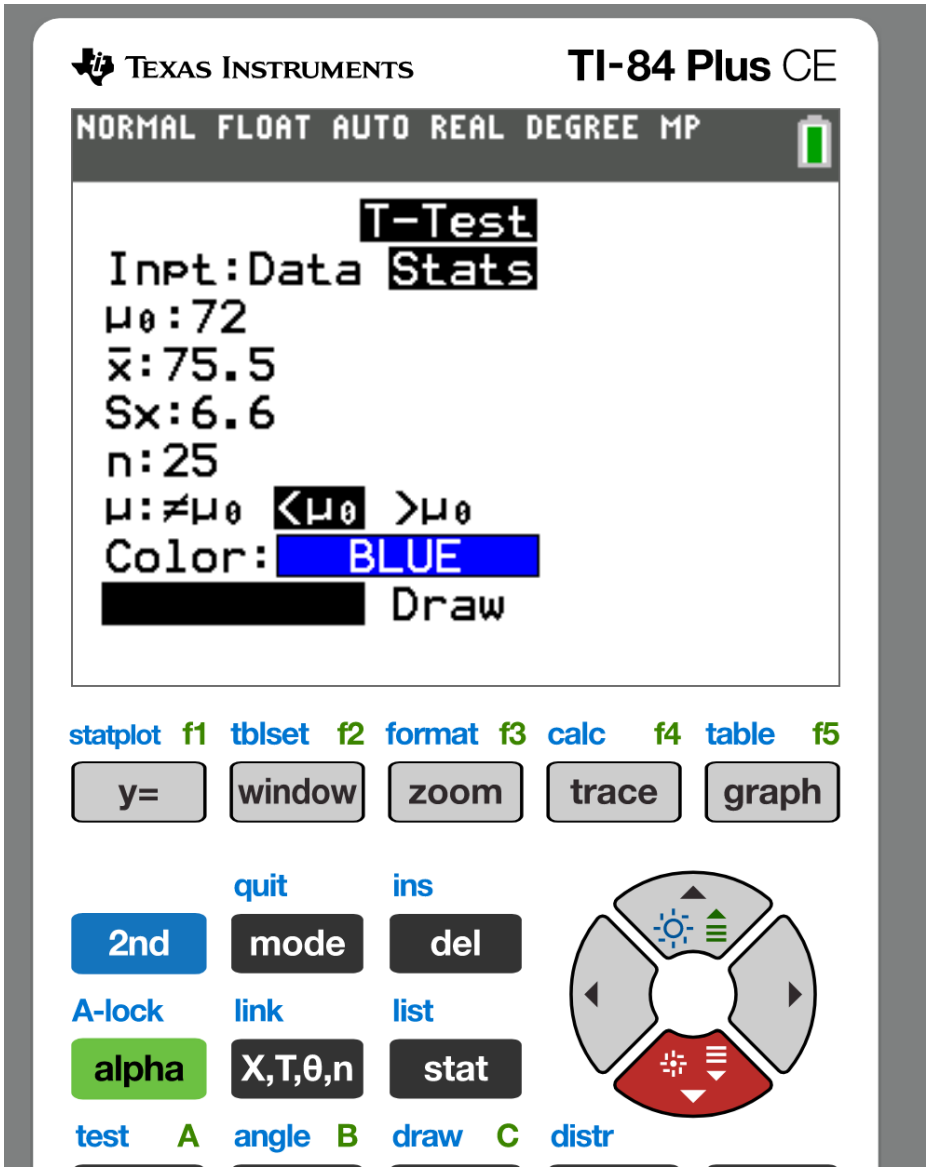
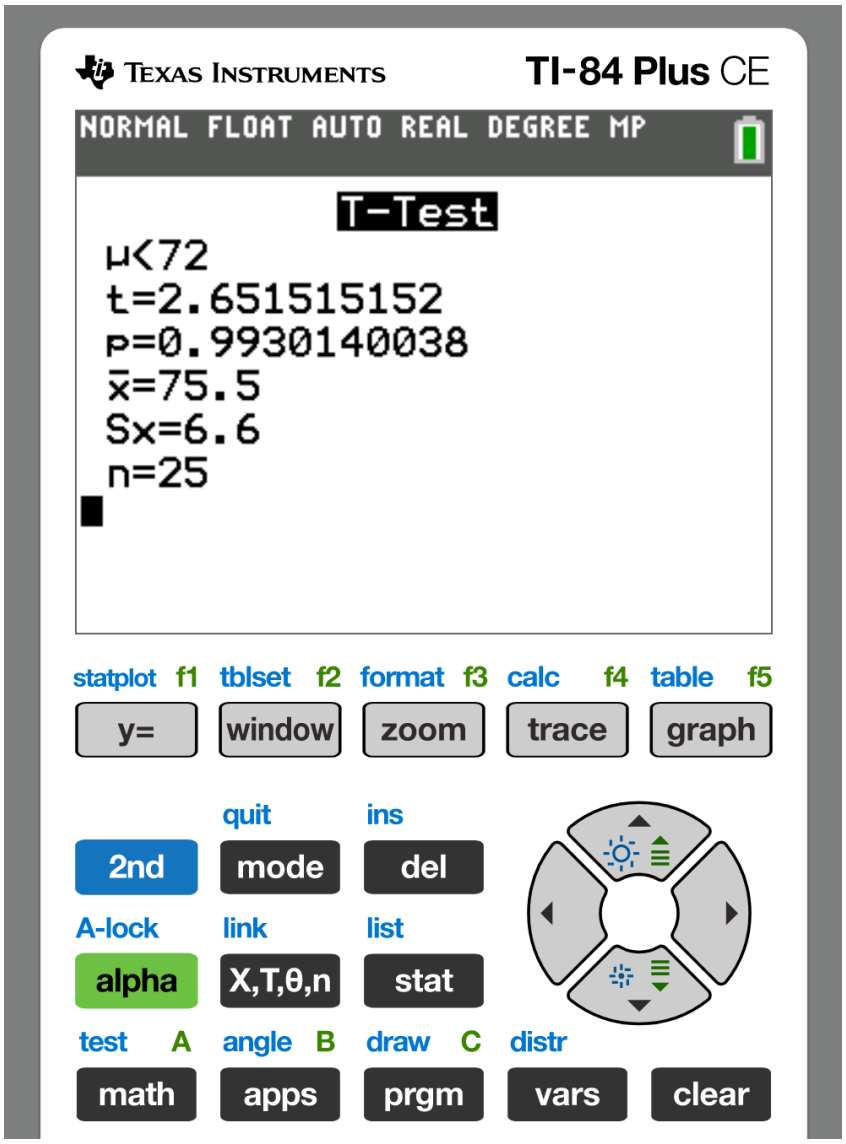
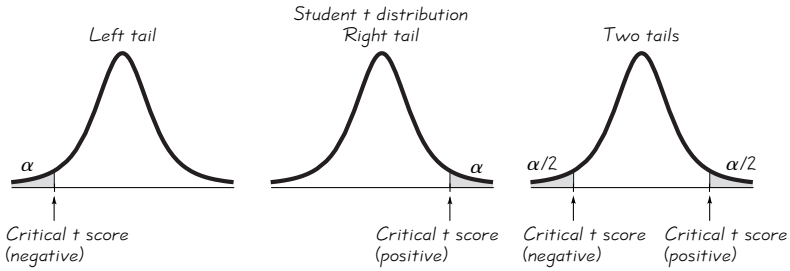




The test Statistic is measured as a t value as $\boldsymbol{t = 2.652}$

The mean lifespan of California resident's is 77.8 years as claimed by the State of California. A sample of 20 California residents reveal a mean lifespan of 76.2 years with a standard deviation of 9.8 years. Use the 1% level of significance to test this claim.



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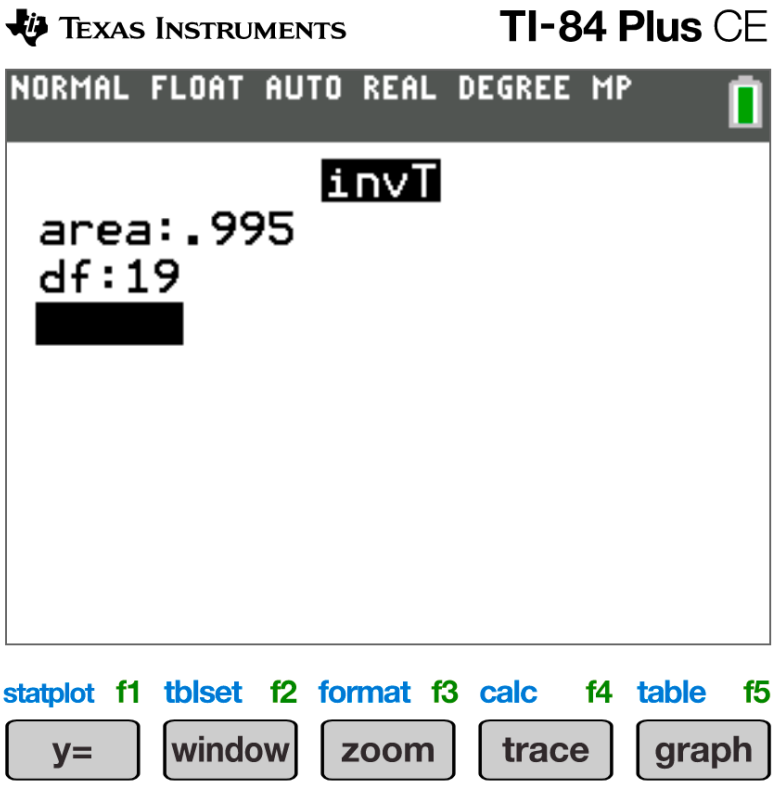
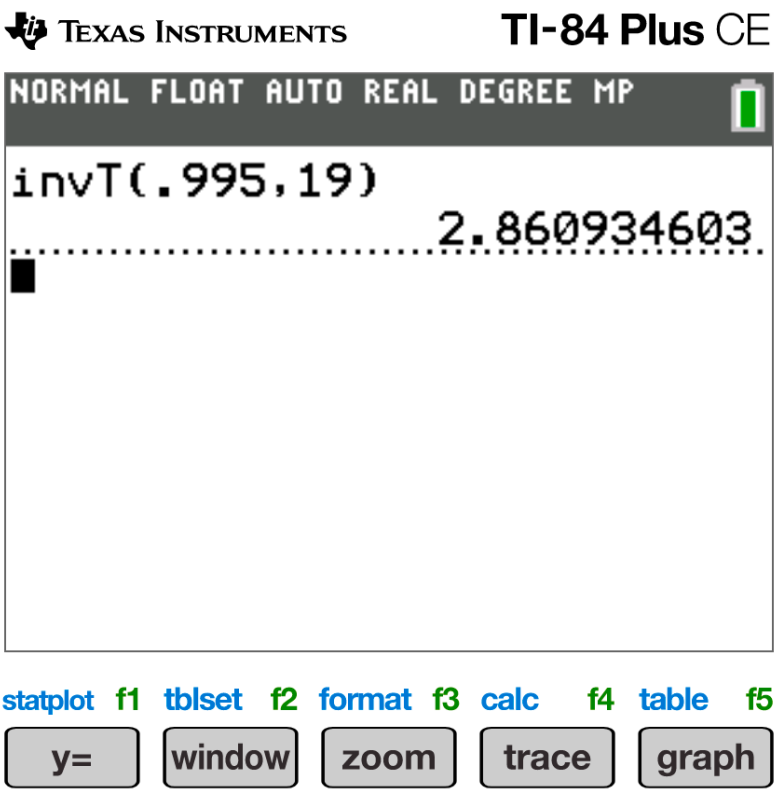
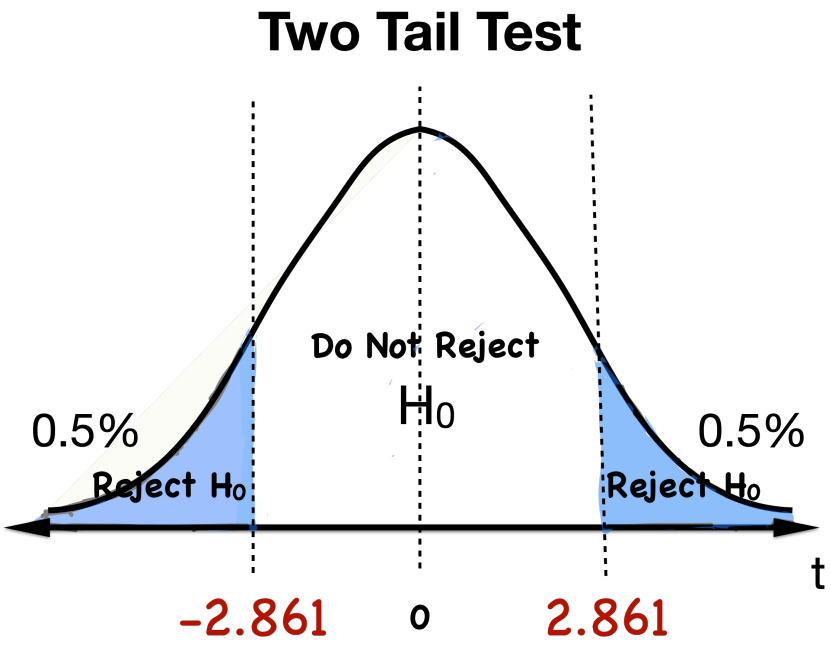
4. Enter the **degree of freedom**.

InvT
area: 0.995
df: 19

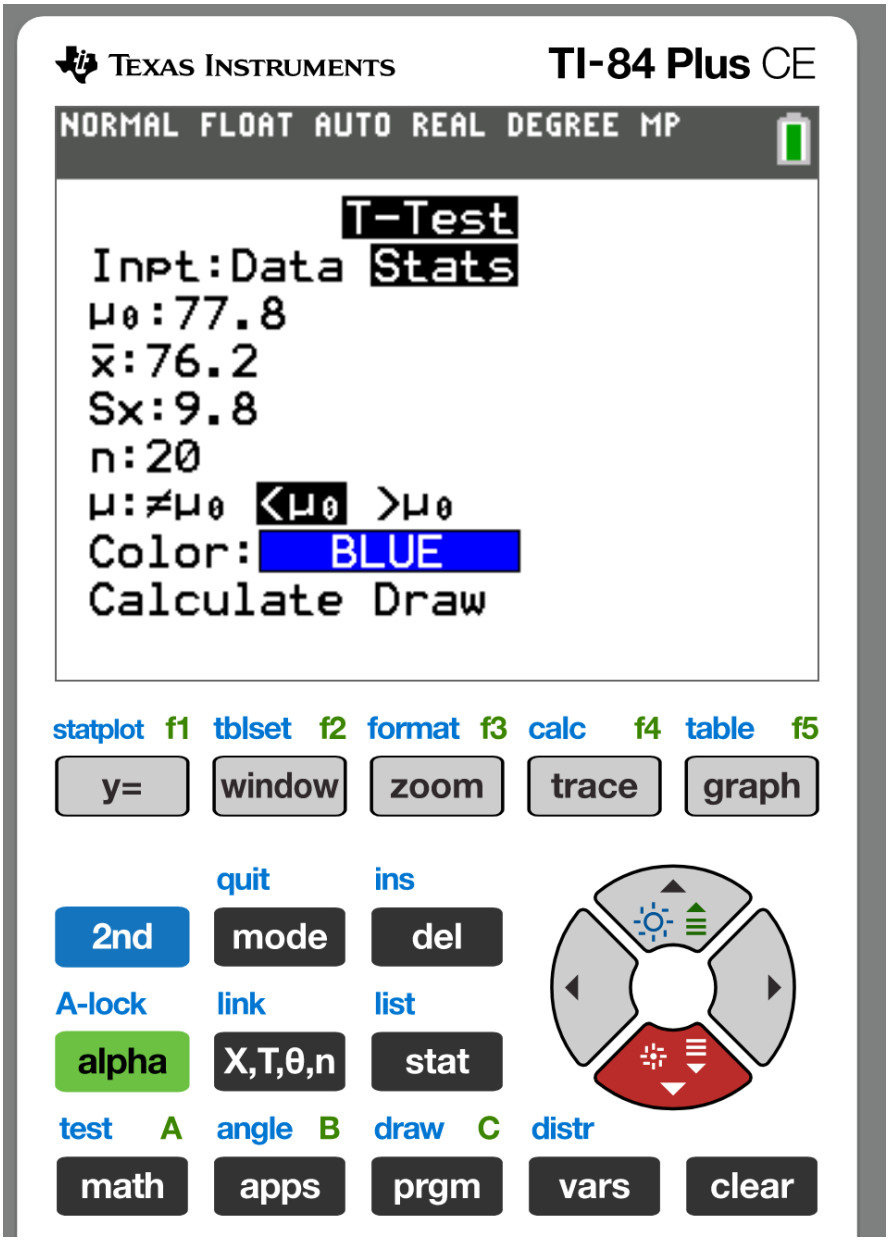


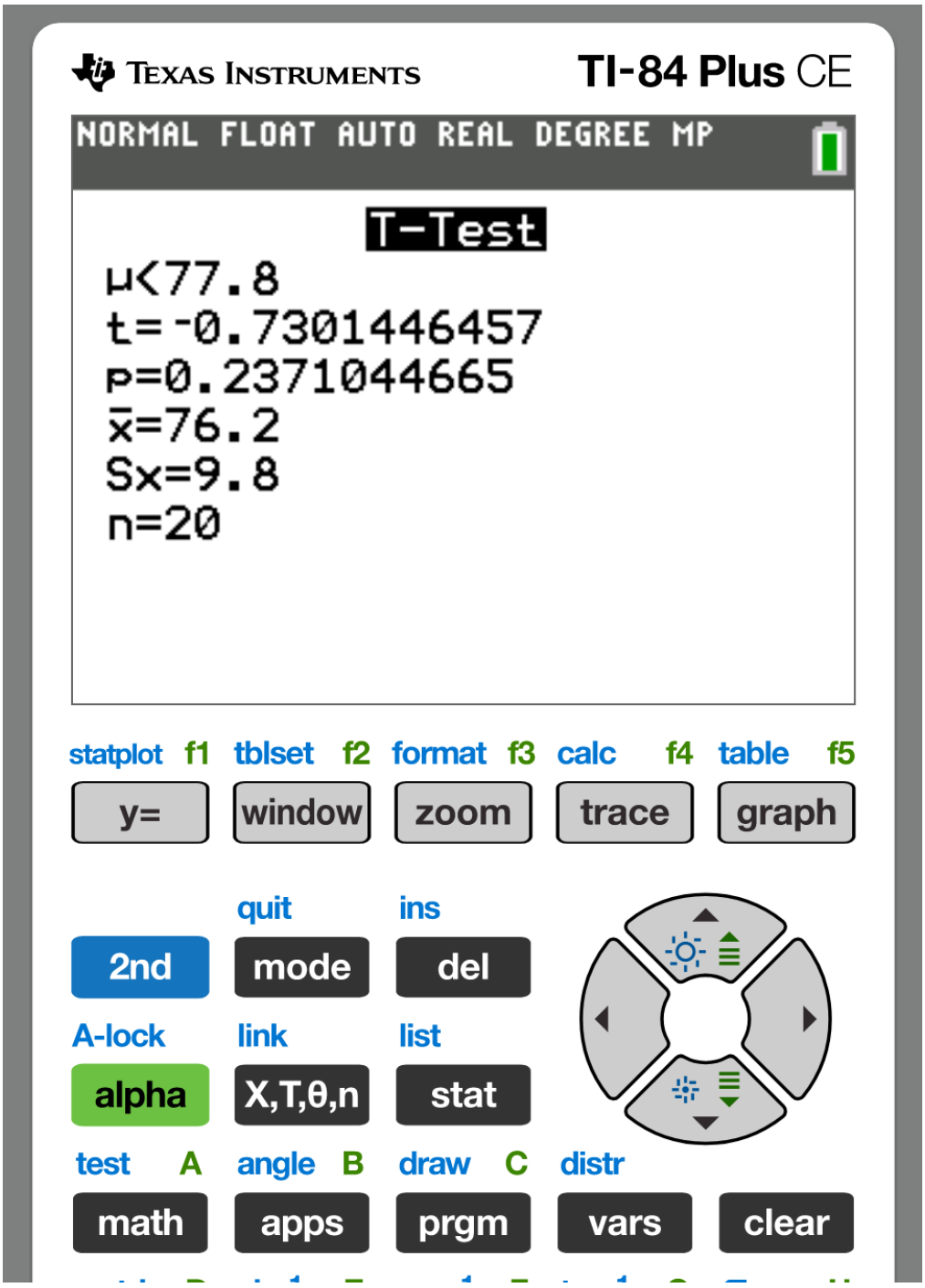

Texas Instruments
TI-84 Plus CE
NORMAL FLOAT AUTO REAL DEGREE MP
invT(.995,19)
2.860934603
statplot f1 tblset f2 format f3 calc f4 table f5
y= window zoom trace graph


Two Tail Test
Do Not Reject
H_0
0.5%
0.5%
Reject H_0
Reject H_0
t
-2.861
0
2.861

Compute your Test Statistic.
Approximate your test statistic to the nearest thousandths.

TI-84 Plus CE
1. Press **STAT**, then select **TESTS** in the top menu.
2. Select **T-Test** in the menu and press **ENTER.**
3. Enter the Input: Stats, the claimed mean μ_0 , standard deviation σ, sample size n, alternate hypothesis type.
4. Calculate





The test Statistic is measured as a t value as $t = -0.730$

Insomnia treatment with Zopiclone induces a mean wake up time less than 103.2 minutes as claimed by Big Pharma. A sample of 12 insomnia patients treated with Zopiclone reveal the following data values in minutes.

102, 108, 100, 110, 106, 111, 98, 100, 102, 90, 105, 92

Use the 5% level of significance to test this claim.

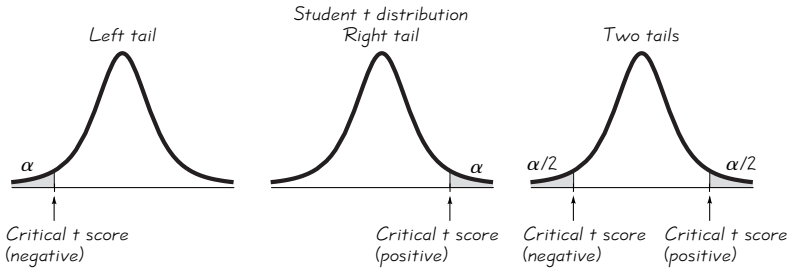


TABLE A-3 *t* Distribution

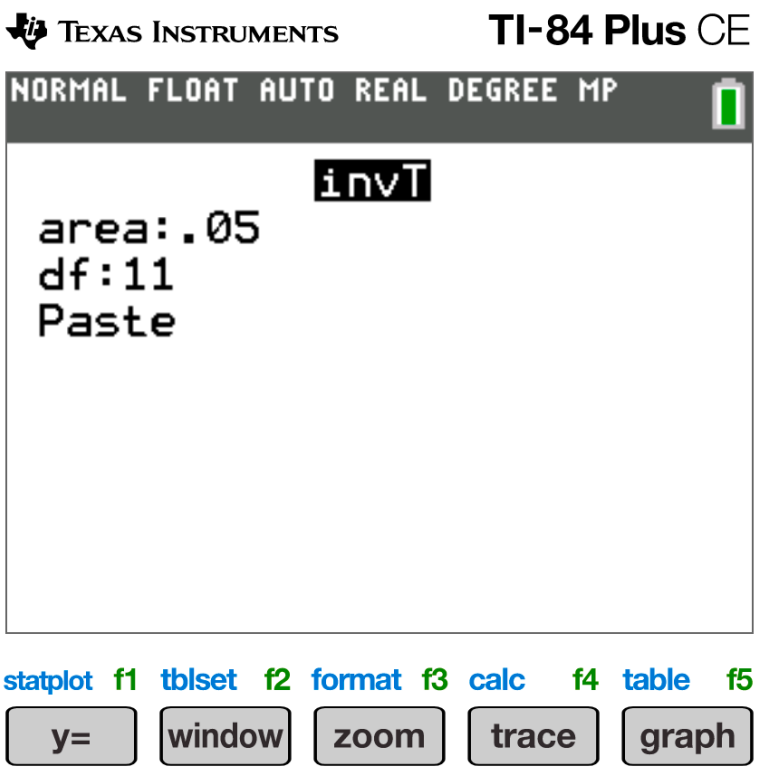
	α					
Degrees of Freedom	.005 (one tail) 0.01 (two tails)	.01 (one tail) .02 (two tails)	.025 (one tail) .05 (two tails)	.05 (one tail) .10 (two tails)	.10 (one tail) .20 (two tails)	.25 (one tail) .50 (two tails)
1	63.657	31.821	12.706	6.314	3.078	1.000
2	9.925	6.965	4.303	2.920	1.886	.816
3	5.841	4.541	3.182	2.353	1.638	.765
4	4.604	3.747	2.776	2.132	1.533	.741
5	4.032	3.365	2.571	2.015	1.476	.727
6	3.707	3.143	2.447	1.943	1.440	.718
7	3.500	2.998	2.365	1.895	1.415	.711
8	3.355	2.896	2.306	1.860	1.397	.706
9	3.250	2.821	2.262	1.833	1.383	.703
10	3.169	2.764	2.228	1.812	1.372	.700
11	3.106	2.718	2.201	1.796	1.363	.697
12	3.054	2.681	2.179	1.782	1.356	.696
13	3.012	2.650	2.160	1.771	1.350	.694
14	2.977	2.625	2.145	1.761	1.345	.692
15	2.947	2.602	2.132	1.753	1.341	.691
16	2.921	2.584	2.120	1.746	1.337	.690
17	2.898	2.567	2.110	1.740	1.333	.689
18	2.878	2.552	2.101	1.734	1.330	.688
19	2.861	2.540	2.093	1.729	1.328	.688
20	2.845	2.528	2.086	1.725	1.325	.687
21	2.831	2.518	2.080	1.721	1.323	.686
22	2.819	2.508	2.074	1.717	1.321	.686
23	2.807	2.500	2.069	1.714	1.320	.685
24	2.797	2.492	2.064	1.711	1.318	.685
25	2.787	2.485	2.060	1.708	1.316	.684
26	2.779	2.479	2.056	1.706	1.315	.684
27	2.771	2.473	2.052	1.703	1.314	.684
28	2.763	2.467	2.048	1.701	1.313	.683
29	2.756	2.462	2.045	1.699	1.311	.683
Large (z)	2.575	2.326	1.960	1.645	1.282	.675

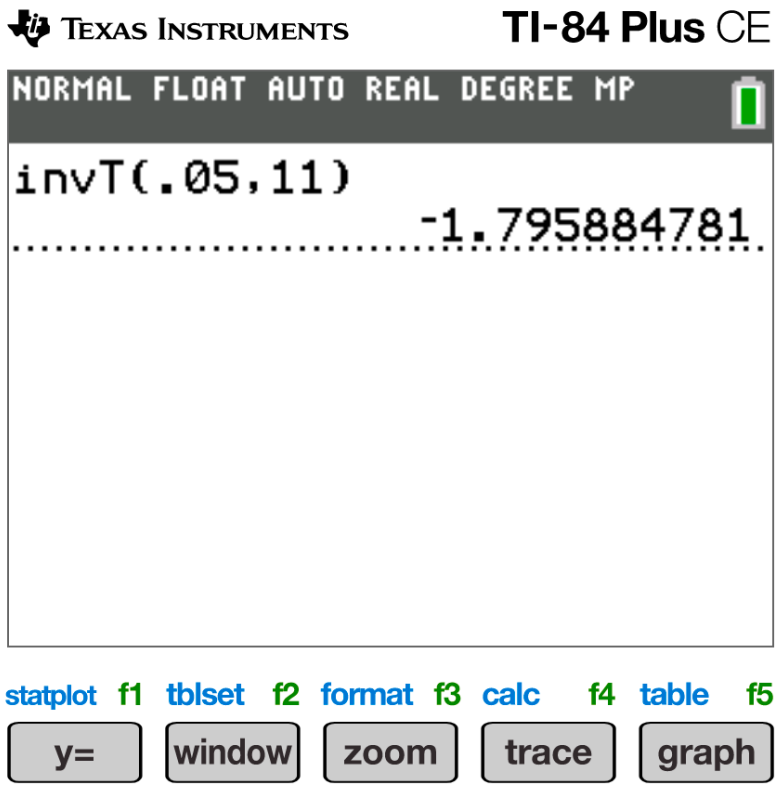
Create Your Decision Rule by determining your critical value(s).
Approximate the critical value(s) to the nearest thousandths.

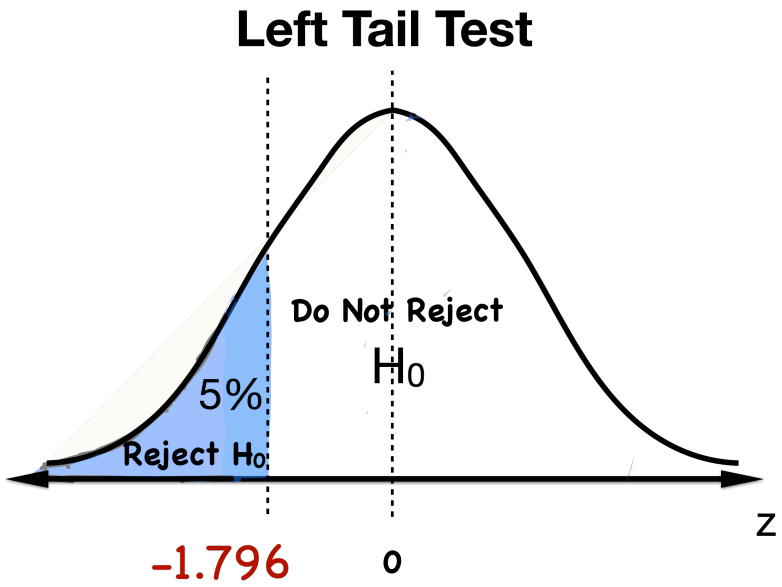
TI-83 or TI-84 Plus Finding the z vaue corresponding to a known area.

1. Press **2nd** then **vars** to access DISTR (distributions) menu.
2. Select **InvT** and click **enter**.
3. Enter the **area to the left** of the right most **Critical Value**.
4. Enter the **degree of freedom**.

InvT
area: 0.05
df: 11

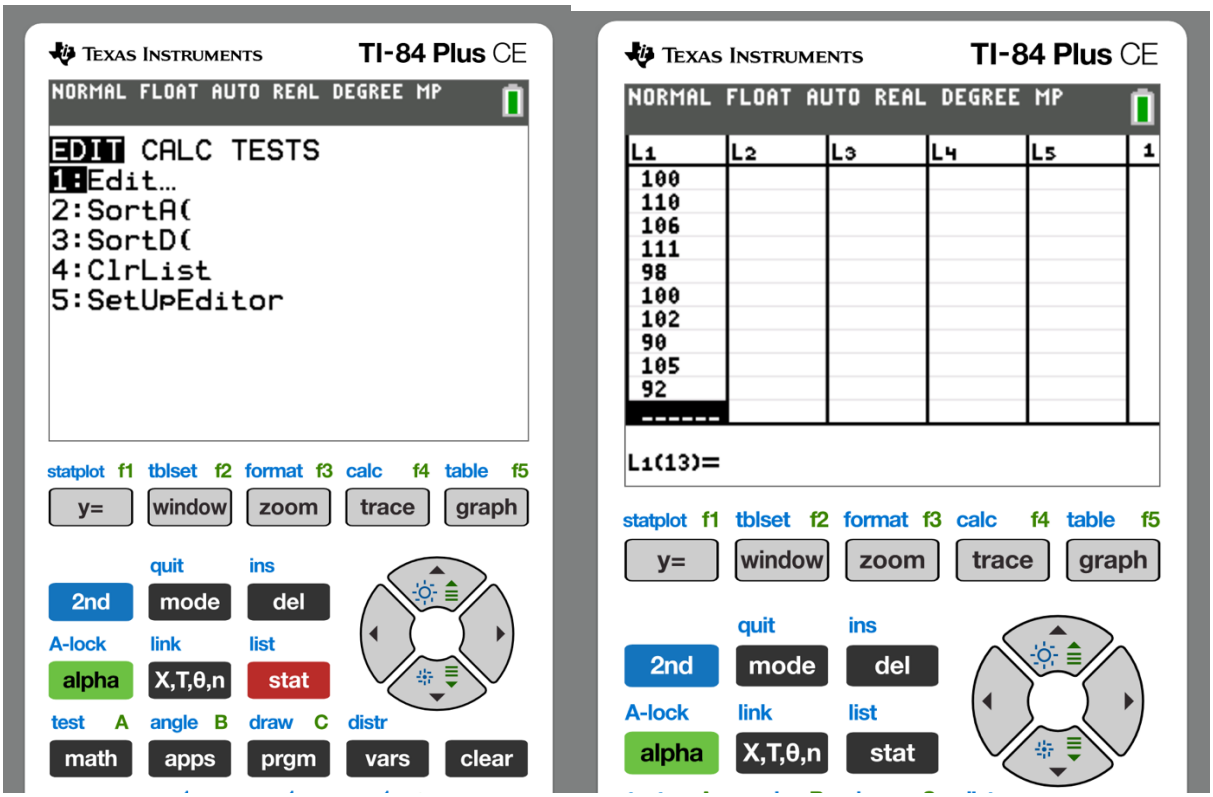



Texas Instruments
TI-84 Plus CE
NORMAL FLOAT AUTO REAL DEGREE MP
invT(.05,11)
-1.795884781
statplot f1 tblset f2 format f3 calc f4 table f5
y= window zoom trace graph


Left Tail Test
Do Not Reject
H0
5%
Reject H0
z
-1.796
0

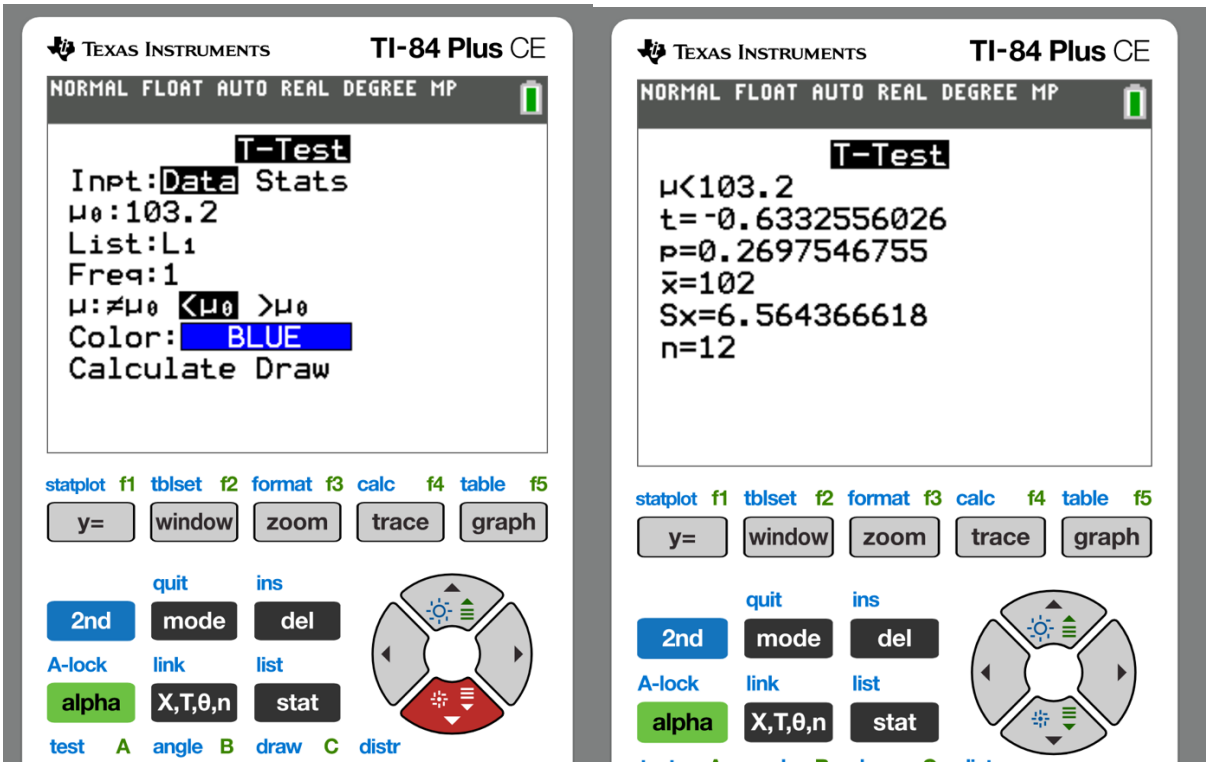
You will need to enter your data set in the L_1

1. Click on **STAT** and **Edit**
2. Click **STAT** move the cursor to **CALC.**
3. Click on **1-Var-Stats**
4. Make sure List is on L_1



Compute your Test Statistic.
Approximate your test statistic to the nearest thousandths.

TI-84 Plus CE
1. Press **STAT**, then select **TESTS** in the top menu.
2. Select **T-Test** in the menu and press **ENTER.**
3. Enter the Input: Stats, the claimed mean μ_0 , standard deviation σ, sample size n, alternate hypothesis type.
4. Calculate



The test Statistic is measured as a t value as $\boldsymbol{t = -0.633}$

The mean number of units college students take in a remote (online) learning environment is not 12 units as claimed by campus researchers. A sample of 15 college students reveal a mean of 10.5 units with a standard deviation of 2.3 units. Use the 10% level of significance to test this claim.

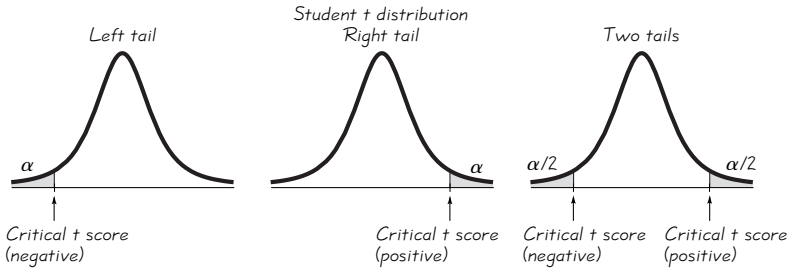


TABLE A-3 *t* Distribution

	α					
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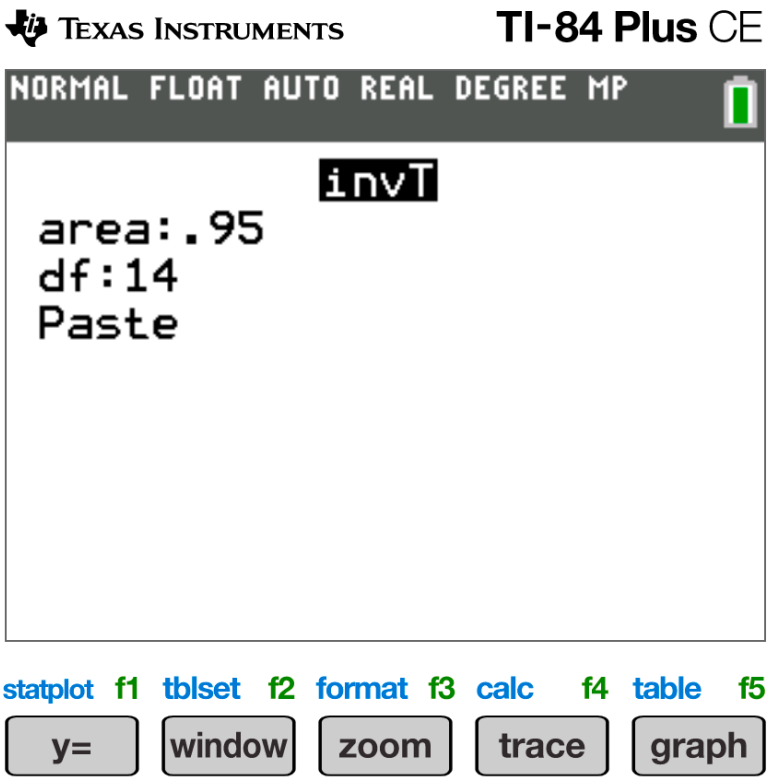
22	2.819	2.508	2.074	1.717	1.321	.686
23	2.807	2.500	2.069	1.714	1.320	.685
24	2.797	2.492	2.064	1.711	1.318	.685
25	2.787	2.485	2.060	1.708	1.316	.684
26	2.779	2.479	2.056	1.706	1.315	.684
27	2.771	2.473	2.052	1.703	1.314	.684
28	2.763	2.467	2.048	1.701	1.313	.683
29	2.756	2.462	2.045	1.699	1.311	.683
Large (z)	2.575	2.326	1.960	1.645	1.282	.675

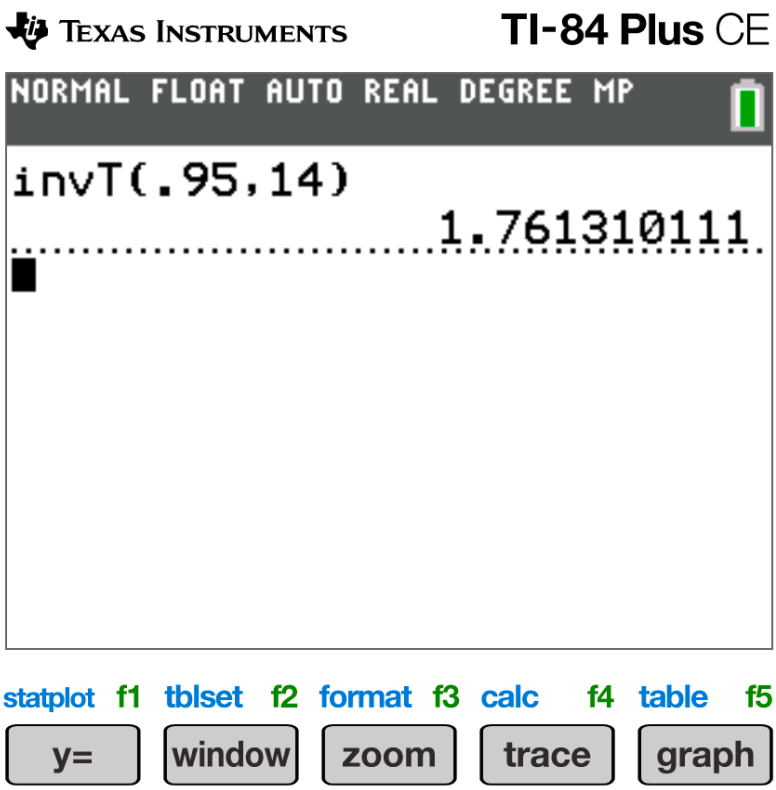
Create Your Decision Rule by determining your critical value(s).
Approximate the critical value(s) to the nearest thousandths.

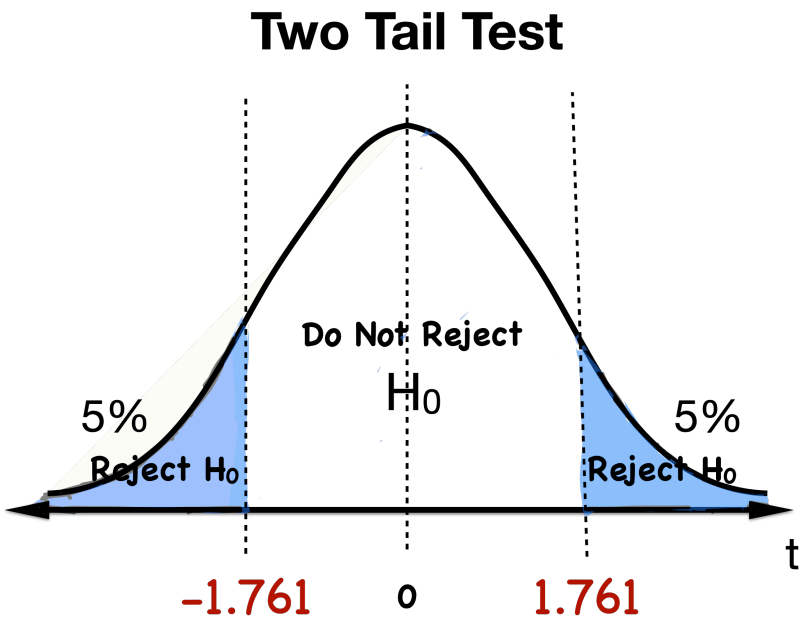
TI-83 or TI-84 Plus Finding the z vaue corresponding to a known area.

1. Press **2nd** then **vars** to access DISTR (distributions) menu.
2. Select **InvT** and click **enter**.
3. Enter the **area to the left** of the right most **Critical Value**.
4. Enter the **degree of freedom**.

InvT
area: 0.95
df: 14

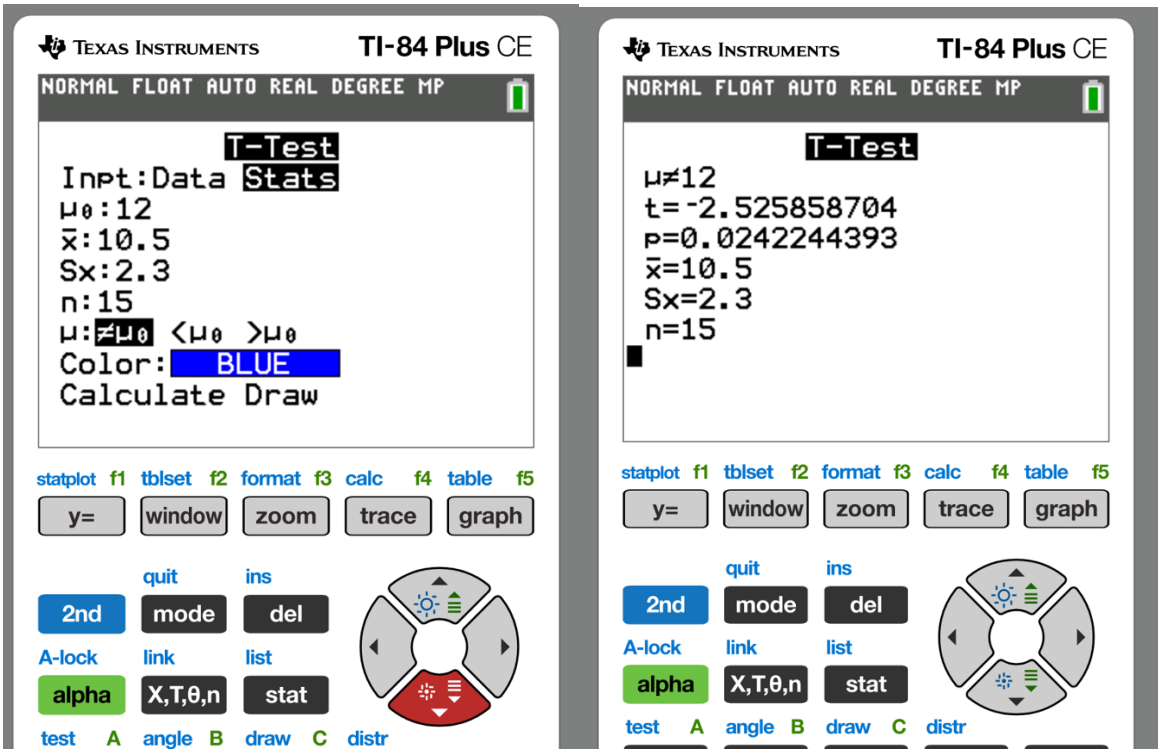



TEXAS INSTRUMENTS
TI-84 Plus CE
NORMAL FLOAT AUTO REAL DEGREE MP
invT(.95,14)
1.761310111
statplot f1 tblset f2 format f3 calc f4 table f5
y= window zoom trace graph


Two Tail Test
Do Not Reject
H0
5%
Reject H0
5%
Reject H0
t
-1.761
0
1.761

Compute your Test Statistic.
Approximate your test statistic to the nearest hundredths.

TI-84 Plus CE
1. Press **STAT**, then select **TESTS** in the top menu.
2. Select **T-Test** in the menu and press **ENTER.**
3. Enter the Input: Stats, the claimed mean μ_0 , standard deviation σ, sample size n, alternate hypothesis type.
4. Calculate



The test Statistic is measured as a t value as $\boldsymbol{t = -2.526}$