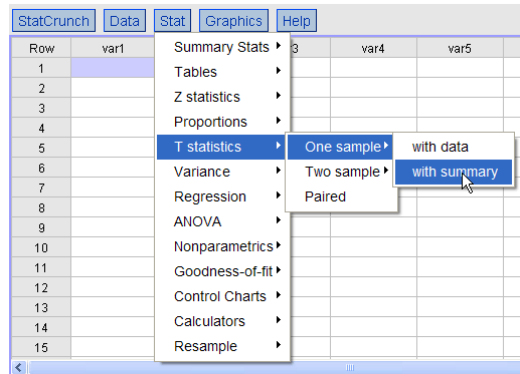


THERE ARE TWO WAYS TO DO HYPOTHESIS TESTING WITH STATCRUNCH: WITH SUMMARY DATA (AS IN EXAMPLE 7.17, PAGE 236, IN ROSNER); WITH THE ORIGINAL DATA (AS IN EXAMPLE 8.5, PAGE 301 IN ROSNER THAT USES DATA FROM TABLE 8.1 ON PAGE 298).

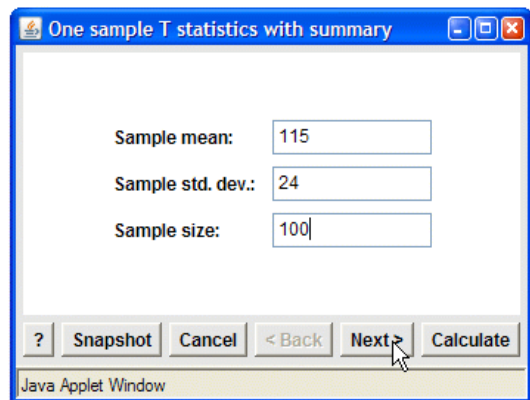
THE FIRST SET OF EXAMPLES USE SUMMARY DATA ... EXAMPLE 7.2, PAGE 227 DESCRIBES A PROBLEM AND A HYPOTHESIS TEST IS PERFORMED IN EXAMPLE 7.10, PAGE 232

YOU CAN DO THAT TEST IN STATCRUNCH AS FOLLOWS

CLICK ON STAT / T STATISTICS / ONE SAMPLE / WITH SUMMARY

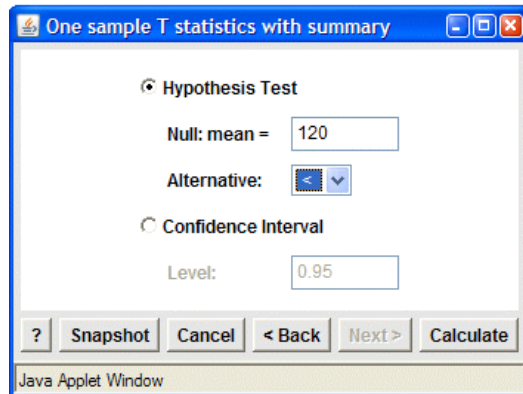


ENTER THE DATA IN THE VARIOUS BOXES, THEN CLICK ON NEXT (NOT CALCULATE)



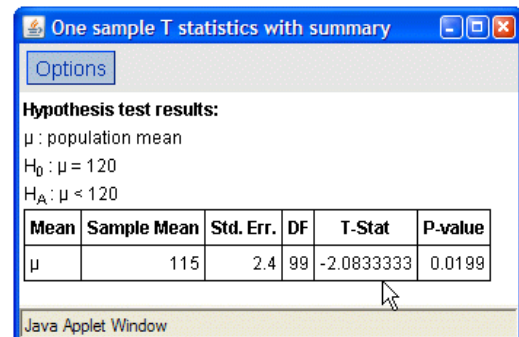
CLICK ON THE HYPOTHESIS TEST AND FILL IN THE NULL MEAN (THE POPULATION MEAN)

MAKE SURE THAT THE ALTERNATIVE BOX HAS THE SYMBOL '<' SINCE THIS TEST HAS A ONE-SIDED ALTERNATIVE HYPOTHESIS ... CLICK ON CALCULATE



YOU WILL SEE THE SAME T-STATISTIC AS IN ROSNER (2.08)

IF YOU LOOK AT EXAMPLE 7.15, PAGE 235, YOU CAN SEE THAT YOU ALSO GET THE SAME P-VALUE AS IN ROSNER (0.019)



YOU CAN ALSO TRY A HYPOTHESIS TEST WITH A TWO-SIDED ALTERNATIVE ... EXAMPLE 7.20, PAGE 239 DESCRIBES A PROBLEM AND A HYPOTHESIS TEST IS PERFORMED IN EXAMPLE 7.21, PAGE 240

CLICK ON STAT / T STATISTICS / ONE SAMPLE . WITH SUMMARY AS SHOWN ON PAGE 1

ENTER THE DATA IN THE VARIOUS BOXES, THE CLICK ON NEXT (NOT CALCULATE)

One sample T statistics with summary

Sample mean: 181.52

Sample std. dev.: 40

Sample size: 100

? Snapshot Cancel < Back Next > Calculate

Java Applet Window

CLICK ON THE HYPOTHESIS TEST AND FILL IN THE NULL MEAN (THE POPULATION MEAN)

MAKE SURE THAT THE ALTERNATIVE BOX HAS THE SYMBOL '=' SINCE THIS TEST HAS A TWO-SIDED ALTERNATIVE HYPOTHESIS ... CLICK ON CALCULATE

One sample T statistics with summary

Hypothesis Test

Null: mean = 190

Alternative: =

Confidence Interval

Level: 0.95

? Snapshot Cancel < Back Next > Calculate

Java Applet Window

YOU WILL SEE THE SAME T-STATISTIC AS IN ROSNER (-2.12)

IF YOU LOOK AT EXAMPLE 7.22, PAGE 242, YOU CAN SEE THAT YOU ALSO GET THE SAME P-VALUE AS IN ROSNER (0.019)

Options

**Hypothesis test results:**

$\mu$  : population mean

$H_0$  :  $\mu = 190$

$H_A$  :  $\mu \neq 190$

Mean	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu$	181.52	4	99	-2.12	0.0365

Java Applet Window

RE-ENTER THE SAME DATA AND AGAIN, CLICK ON NEXT (NOT CALCULATE)

One sample T statistics with summary

Sample mean: 181.52

Sample std. dev.: 40

Sample size: 100

? Snapshot Cancel < Back Next > Calculate

Java Applet Window

CLICK ON CONFIDENCE INTERVAL, LEAVE THE LEVEL AT 0.95 ... CLICK ON CALCULATE

One sample T statistics with summary

Hypothesis Test

Null: mean = 0

Alternative:  $\neq$

Confidence Interval

Level: 0.95

? Snapshot Cancel < Back Next > Calculate

Java Applet Window

YOU WILL SEE THE SAME INTERVAL AS IN ROSNER IN EXAMPLE 7.40 ON PAGE 261

One sample T statistics with summary

Options

**95% confidence interval results:**

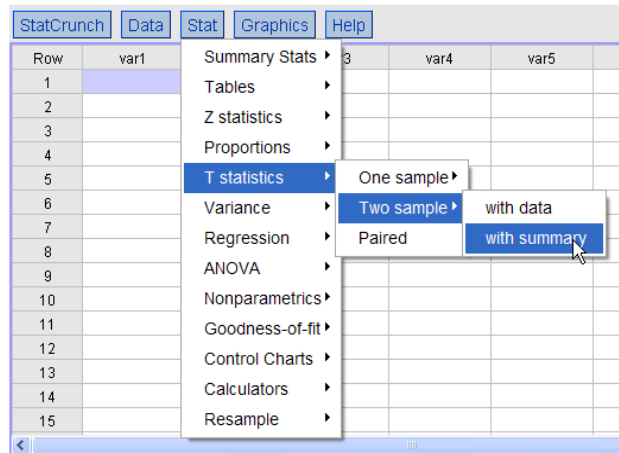
$\mu$  : population mean

Mean	Sample Mean	Std. Err.	DF	L. Limit	U. Limit
$\mu$	181.52	4	99	173.58313	189.45686

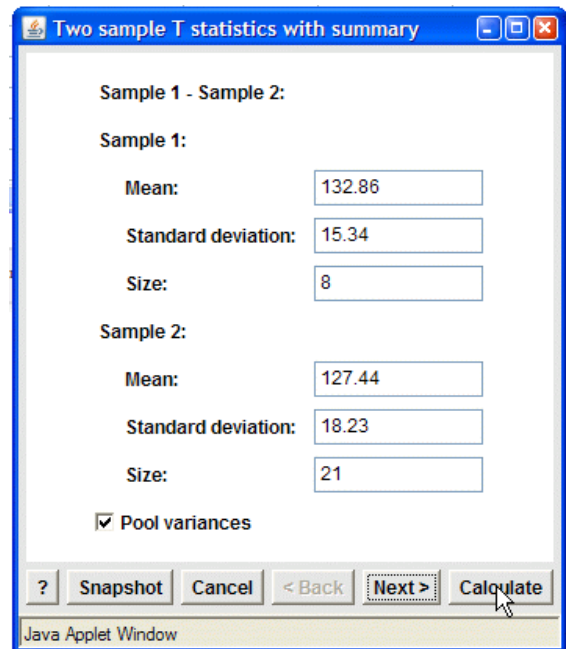
Java Applet Window

YOU CAN ALSO DO TWO-SAMPLE TESTS, THE MATERIAL IN CHAPTER 8 ... EXAMPLE 8.9, PAGE 304 DESCRIBES A PROBLEM AND A HYPOTHESIS TEST IS DONE IN EXAMPLE 8.10, PAGE 306

CLICK ON STAT / T STATISTICS / TWO SAMPLE / WITH SUMMARY

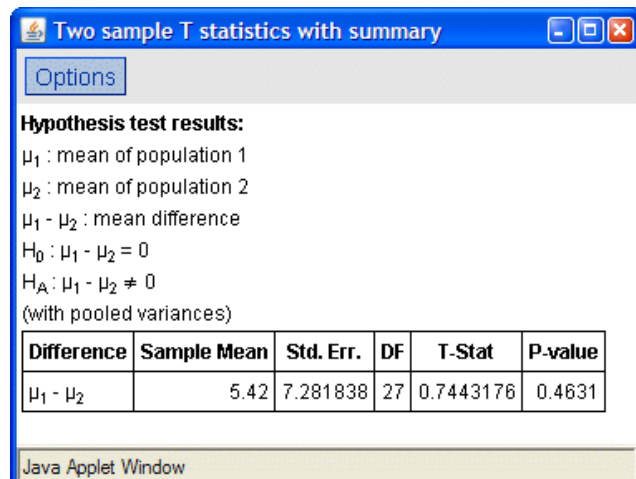


ENTER THE DATA IN THE VARIOUS BOXES AND MAKE SURE THAT THE POOL VARIANCE BOX IS CHECKED ... CLICK ON CALCULATE



YOU WILL SEE THE SAME T-STATISTIC AS SHOWN IN ROSNER (0.74) AS SHOWN IN ROSNER

YOU WILL ALSO SEE THE SAME P-VALUE (0.46) AS SHOWN IN ROSNER ON THE TOP OF PAGE 308



RE-ENTER THE DATA, BUT CLICK ON NEXT (NOT CALCULATE)

Two sample T statistics with summary

Sample 1 - Sample 2:

Sample 1:

Mean: 132.86

Standard deviation: 15.34

Size: 8

Sample 2:

Mean: 127.44

Standard deviation: 18.23

Size: 21

Pool variances

? Snapshot Cancel < Back **Next >** Calculate

Java Applet Window

CLICK ON CONFIDENCE INTERVAL, LEAVE THE LEVEL AT 0.95 ... CLICK ON CALCULATE

Two sample T statistics with summary

Hypothesis Test

Null: mean diff. = 0

Alternative:  $\neq$

**Confidence Interval**

Level: 0.95

? Snapshot Cancel < Back Next > **Calculate**

Java Applet Window

YOU WILL SEE THE SAME INTERVAL AS IN ROSNER, EXAMPLE 8.11, PAGE 309

Two sample T statistics with summary

Options

**95% confidence interval results:**

$\mu_1$  : mean of population 1

$\mu_2$  : mean of population 2

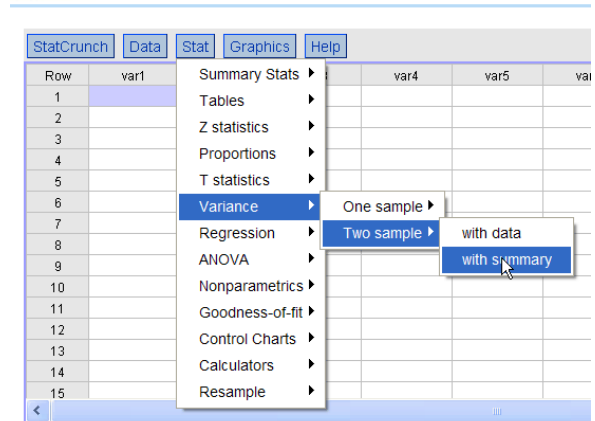
$\mu_1 - \mu_2$  : mean difference  
(with pooled variances)

Difference	Sample Mean	Std. Err.	DF	L. Limit	U. Limit
$\mu_1 - \mu_2$	5.42	7.281838	27	-9.521097	20.361097

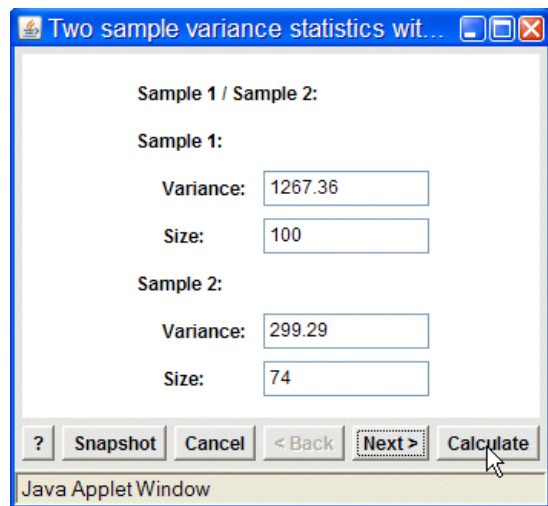
Java Applet Window

EXAMPLE 8.17, PAGE 319 ACTUALLY STARTS WITH EXAMPLE 8.12, PAGE 310 AND EXAMPLE 8.15, PAGE 314 ... EXAMPLE 8.15 DOES A TEST FOR EQUALITY OF VARIANCES PRIOR TO THE T-TEST DONE IN EXAMPLE 8.17

CLICK ON STAT / VARIANCE / TWO SAMPLE / WITH SUMMARY

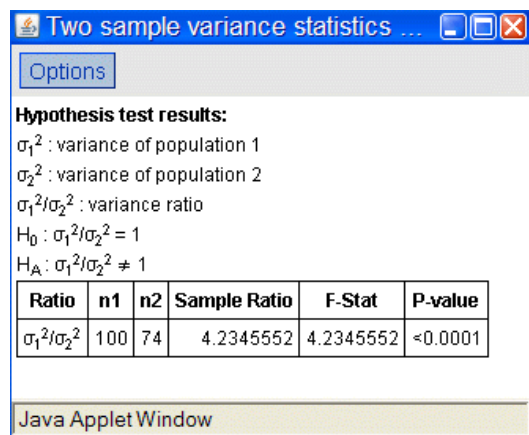


YOU WILL HAVE TO SQUARE THE STANDARD DEVIATIONS FOUND IN ROSNER BEFORE FILLING IN THE BOXES (SD=35.6 VAR=1267.36, SD=17.3 VAR=299.29), THEN PRESS CALCULATE



YOU WILL SEE THE SAME RESULT (4.23) AS IN ROSNER, EXAMPLE 8.15, PAGE 314

SINCE THE VALUE IS SIGNIFICANT ( $P < 0.0001$ ), THE VARIANCES ARE NOT EQUAL, SO THE SUBSEQUENT T-TEST WILL BE DONE ASSUMING UNEQUAL VARIANCES



ENTER THE DATA IN THE VARIOUS BOXES AND MAKE SURE THAT THE POOL VARIANCE BOX IS NOT CHECKED ... CLICK ON CALCULATE

Two sample T statistics with summ...

Sample 1 - Sample 2:

Sample 1:

Mean: 207.3

Standard deviation: 35.6

Size: 100

Sample 2:

Mean: 193.4

Standard deviation: 17.3

Size: 74

Pool variances

? Snapshot Cancel < Back Next > Calculate

Java Applet Window

YOU WILL SEE THE SAME RESULT (3.40) AS IN ROSNER, PAGE 319

ALSO NOTICE THAT THE DEGREES OF FREEDOM (151.4) IS THAT SAME THAT IS CALCULATED IN ROSNER, PAGE 319

ALSO, NOTICE THAT THE P-VALUE (0.0009) MATCHES THE EXACT P-VALUE SHOWN IN ROSNER, PAGE 320

Two sample T statistics with summary

Options

Hypothesis test results:

$\mu_1$  : mean of population 1

$\mu_2$  : mean of population 2

$\mu_1 - \mu_2$  : mean difference

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2 \neq 0$

(without pooled variances)

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	13.9	4.0887723	151.3637	3.3995533	0.0009

Java Applet Window

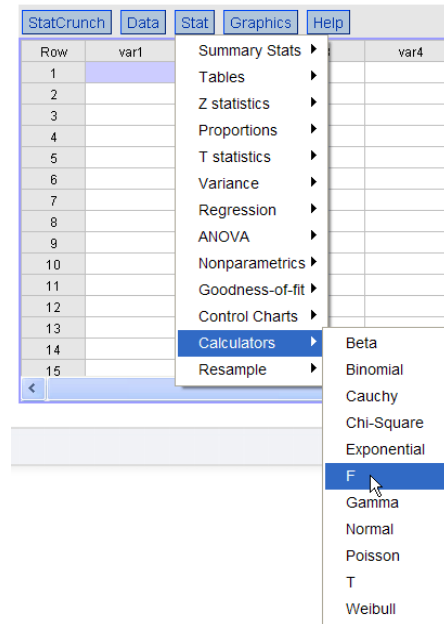
NOTE: IN ROSNER, THE EXAMPLES OFTEN INVOLVE FINDING CRITICAL VALUES OF TEST STATISTICS IN EITHER A T-TABLE OR F-TABLE ... TO DO THAT, YOU MUST KNOW THE DEGREES OF FREEDOM TO USE IN THE TABLE ... SINCE USING STATCRUNCH TO DO THE HYPOTHESIS TEST GIVES YOU A P-VALUE AS A PORTION OF THE RESULTS, YOU NEED NOT USE THE T-TABLE OR F-TABLE

YOU CAN USE TABLES IN ROSNER TO FIND CRITICAL VALUES IN BOTH THE T AND F DISTRIBUTIONS, HOWEVER THE TABLES SOMETIMES DO NOT LIST THE DEGREES OF FREEDOM NEEDED

YOU CAN ALSO STATCRUNCH TO FIND THOSE CRITICAL VALUES

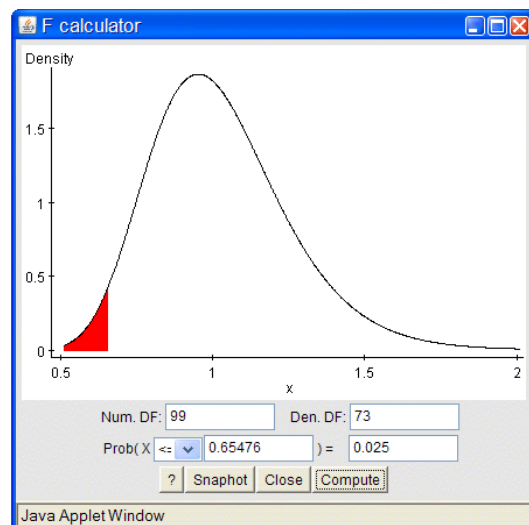
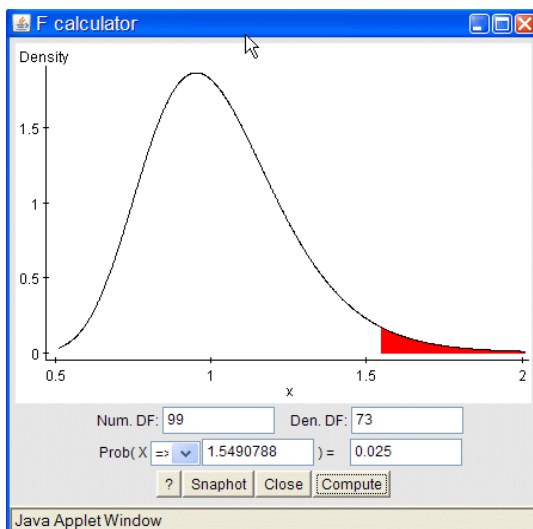
USING DATA FROM EXAMPLE 8.15, PAGE 314

FIRST CLICK STAT / CALCULATORS / F



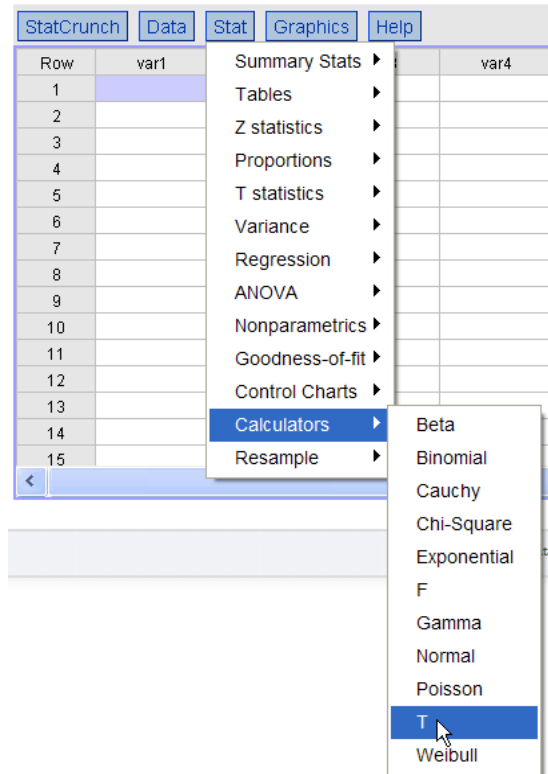
FILL IN THE DEGREES OF FREEDOM (99 AND 73) AND THEN FILL IN THE BOX ON THE LOWER RIGHT WITH 0.025 (YOU ARE PERFORMING A TWO-TAIL TEST WITH ALPHA = 0.05, SO YOU WANT 0.025 OF THE ARE IN EACH TAIL) AND MAKE SURE THAT THE PROB X BOX SAY => ... THEN REPEAT THAT PROCESS, BUT CHANGE THE PROB X BOX TO <=

YOU WILL SEE THE SAME VALUES (1.549, 0.654) AS SHOWN IN ROSNER, TABLE 8.3, PAGE 315



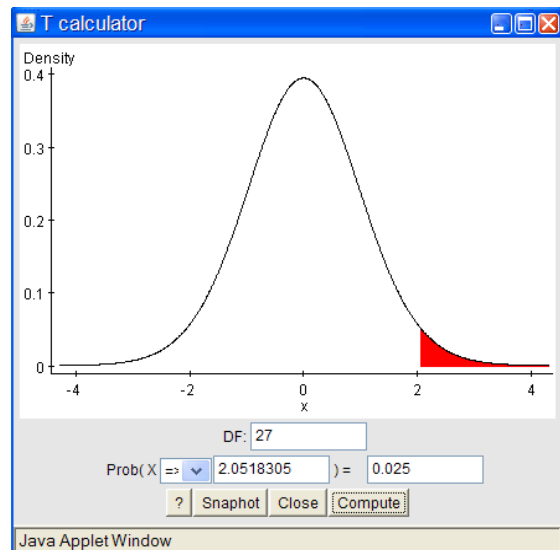
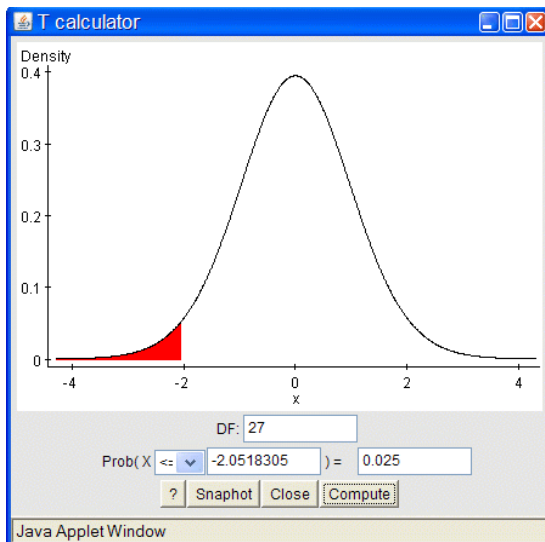
USING DATA FROM EXAMPLE 8.10, PAGE 306

FIRST CLICK STAT / CALCULATORS / T



FILL IN THE DEGREES OF FREEDOM (27) AND THEN FILL IN THE BOX ON THE LOWER RIGHT WITH 0.025 (YOU ARE PERFORMING A TWO-TAIL TEST WITH ALPHA = 0.05, SO YOU WANT 0.025 OF THE AREA IN EACH TAIL) AND MAKE SURE THAT THE PROB X BOX SAY  $\leq$  ... YOU WILL SEE THE CRITICAL VALUE IS -2.052 (SAME AS IN ROSNER) AND SINCE THE T-DISTRIBUTION IS SYMMETRIC ((UNLIKE THE F-DISTRIBUTION), YOU KNOW THAT THE OTHER CRITICAL VALUE IS 2.052

YOU CAN ALSO JUST CHANGE THE PROB X BOX TO  $\Rightarrow$  AND SEE THAT IN A GRAPHIC



THE NEXT EXAMPLE SHOWS WHAT TO DO WHEN YOU HAVE COMPLETE (NOT SUMMARY) DATA

FIRST, TRY A PAIRED T-TEST, USING DATA FROM TABLE 8.1, PAGE 298 AND FILL IN THE COLUMNS FOR VAR1 AND VAR2 (YOU NEED NOT ENTER THE DIFFERENCE COLUMN)

THEN CLICK ON STAT / T STATISTICS / PAIRED

Row	var1	var2	var3
1	115	128	
2	112	115	
3	107	106	
4	119	128	
5	115	122	
6	138	145	
7	126	132	
8	105	109	
9	104	102	
10	115	117	
11			
12			
13			
14			
15			

Row	var1	var4
1	115	
2	112	
3	107	
4	119	
5	115	
6	138	
7	126	
8	105	
9	104	
10	115	
11		
12		
13		
14		
15		

IF YOU LOOK AT THE FOOTNOTE ON TABLE 8.1M, YOU SEE THAT THE DIFFERENCE COLUMN SHOULD BE VAR2 MINUS VAR1 ... SO SELECT VAR2 FOR SAMPLE 1 AND VAR1 FOR SAMPLE 2 ... IF YOU LIKE, CHECK THE BOX FOR SAVE DIFFERENCES (THIS WILL ADD THE DIFFERENCE COLUMN TO YOU DATA TABLE)

YOU WILL SEE THE SAME ANSWER (3.32) AS SHOWN IS ROSNER, EXAMPLE 8.5, PAGE 301

YOU ALSO SEE SEE THE SAME MEAN DIFFERENCE (4.8)

**Paired T statistics**

Sample 1 - Sample 2:

Sample 1 in:

Sample 2 in:

Where:

Group by:

Save differences

? Snapshot Cancel < Back Next > Calculate

Java Applet Window

**Paired T statistics**

Options

**Hypothesis test results:**

$\mu_1 - \mu_2$  : mean of the paired difference between var2 and var1

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2 \neq 0$

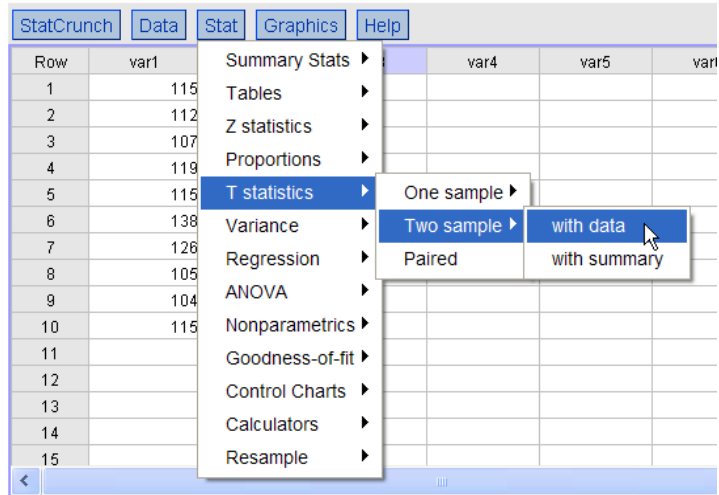
Difference	Sample Diff.	Std. Err.	DF	T-Stat	P-value
var2 - var1	4.8	1.4437605	9	3.324651	0.0089

Differences stored in column, Differences.

Java Applet Window

YOU CAN USE THE SAME TO PERFORM A REGULAR (NOT PAIRED), TWO SAMPLE T-TEST

CLICK ON STAT / T STATISTICS / TWO SAMPLE / WITH DATA

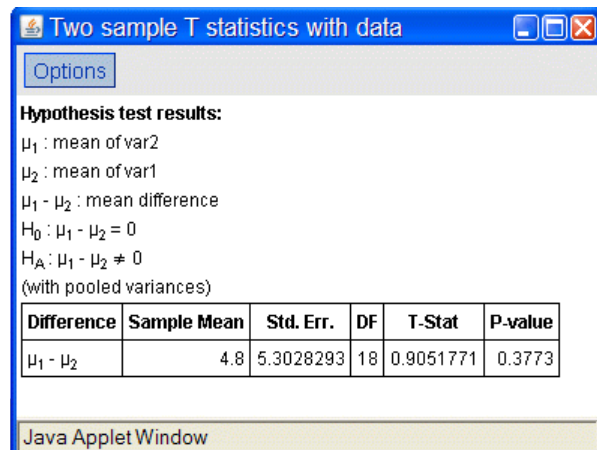
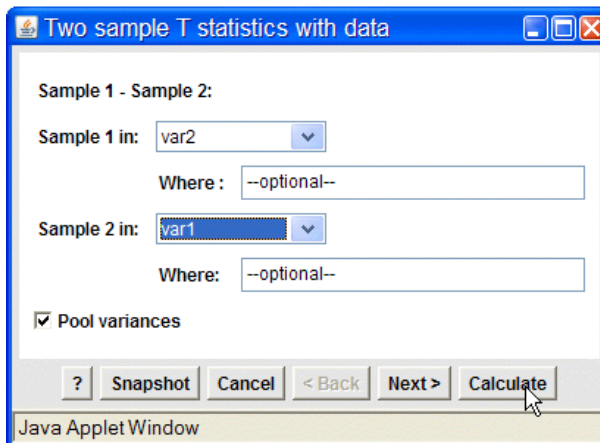


USE VAR2 AS SAMPLE 1 AND VAR1 AS SAMPLE 2 AND CLICK ON CALCULATE

NOTICE THAT THE SAMPLE MEAN IS THE SAME AS THE SAMPLE DIFF AS WHEN THE PAIRED T-TEST WAS USED ... HOWEVER, NOTICE THE P-VALUE .. IT IS 0.3773 INDICATING NO DIFFERENCE BETWEEN VAR1 AND VAR2

WHAT WAS THE CONCLUSION WHEN THE APPROPRIATE PAIRED T-TEST WAS USED ... SINCE P WAS 0.009, A DIFFERENCE WAS FOUND !!!

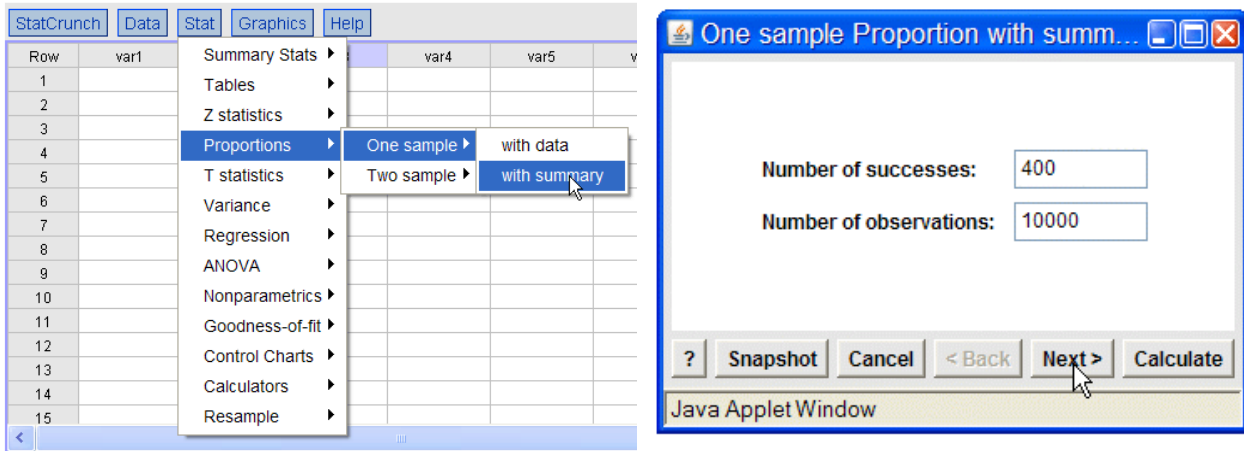
**THIS IS A VERY GOOD EXAMPLE SHOWING WHAT CAN HAPPEN IF YOU CHOOSE THE INCORRECT METHOD OF ANALYSIS**



THE LAST EXAMPLE SHOWS A ONE-SAMPLE TEST FOR A BINOMIAL PROPORTION USING DATA FROM EXAMPLE 7.48, PAGE 272 (THE DATA ARE FROM EXAMPLE 7.47, PAGE 270)

CLICK STAT / PROPORTIONS / ONE SAMPLE / WITH SUMMARY

FILL IN THE BOXES AND CLICK ON NEXT (NOT CALCULATE)



CHOOSE HYPOTHESIS TEST, FILL IN THE NULL PROP(ORTION) BOX WITH 0.02, THEN CLICK CALCULATE  
 YOU WILL SEE THE SAME RESULT (14.3) AS SHOWN IN ROSNER, PAGE 272

