CALCULATOR INSTRUCTIONS FOR TI 81, 82, 83 AND 85 GRAPHICS CALCULATORS

The calculations necessary to summarize even a relatively small data set can be tedious and time-consuming; however, the focus in this course is **not** on crunching numbers by mindlessly plugging data into "blackbox" formulas. The solution of "real-world" statistical problems involves three parts: (1) identify the appropriate technique, (2) compute the required statistics, and (3) interpret the results. Our emphasis is on the first and third parts because calculating the statistics can be done relatively easily with calculators and/or computers.

To assist students in focusing on technique and interpretation, in this appendix we provide an introduction to several models of *Texas Instruments* graphics calculators. These calculators provide powerful hand-held tools for taking the drudgery out of the statistical analysis of data. If you have one of these particular calculators then the instructions can be followed exactly; the instructions will allow you to perform the basic operations presented in this course. You are urged to also study your user's guide; you will find that your calculator can do far more than we can cover in this appendix. If you are using a different calculator, then consult the user's guide for use of the statistical functions. **I will provide whatever assistance I can in helping you use the statistical features of your calculator, no matter what type you own.**

You do not need to purchase a special calculator for this course; the one you have now is probably sufficient. See me if you have questions about the adequacy of your calculator.

Basics

	Keystroke			
Purpose	TI81	TI82	TI83	TI85
1. Reset to factory settings	2^{nd}	2^{nd}	2^{nd}	2^{nd}
(be careful! resetting will erase	+	+	+	+
data and programs)	2	3	5	F3
		2	1	F1
			2	F4
2. Darken (lighten) screen	2^{nd}	2^{nd}	2^{nd}	2^{nd}
	$\triangle(\nabla)$	$\triangle(\nabla)$	$\triangle(\nabla)$	$\triangle(\nabla)$
3. Clear screen	CLEAR	CLEAR	CLEAR	CLEAR

The reset process erases all stored data, settings, and programs. If you are not saving anything, this routine can be used to clear the calculator before each new problem.

If you want to clear old data from the calculator without changing anything else, the following keystrokes can be used:

Purpose	Keystrokes			
	TI81	TI82	TI83	TI85
Clear the stat data editor; return to blank screen	2^{nd} MATRX ▷ ▷ 2 ENTER CLEAR	STAT 4 2^{nd} 1 ENTER CLEAR	STAT 4 2^{nd} 1 ENTER CLEAR	STAT F2 ENTER ENTER F5 2^{nd} EXIT

Note: For the TI82 and TI83, the instructions above clear data from column L1. To clear columns L1 and L2, add

, (comma)
2^{nd}
2

just before ENTER.

Histograms

To construct histograms with a TI graphics calculator it is necessary to know the lower boundary of the first class, the upper boundary of the last class, and the class length. We illustrate by constructing a histogram for the following student pulse rates (beats/minute) taken at the beginning of a lecture:

beginning-of-lecture pulse rates:

78	96	90	89	67	67	76	77	90	64
77	90	53	83	105	98	85	103	91	85
90	84	70							

Purpose	Keystroke			
	TI81	TI82	TI83	TI85
1. Access the stat data editor	2^{nd} MATRX ▷ ▷ 1	STAT 1	STAT 1	STAT F2 ENTER ENTER
2. Enter data	78 ENTER ENTER 96 ENTER ENTER	78 ENTER 96 ENTER 	78 ENTER 96 ENTER 	78 ENTER ENTER 96 ENTER ENTER
Enter other data points	⋮ 70 ENTER ENTER	⋮ 70 ENTER 	⋮ 70 ENTER 	⋮ 70 ENTER ENTER
3. Access window to set class boundaries and class width	RANGE	WINDOW ▽	WINDOW	GRAPH F2
4. Set $xmin$ to 52.5 so no data point falls on class boundary (min pulse $= 53$)	52.5 ENTER	52.5 ENTER	52.5 ENTER	52.5 ENTER
Set $xmax$ to 110 so entire histogram fits on screen	110 ENTER	110 ENTER	110 ENTER	110 ENTER
Set class length to 11	11 ENTER	11 ENTER	11 ENTER	11 ENTER
Set $ymin$ to -5 to provide some room below the histogram	-5 ENTER	-5 ENTER	-5 ENTER	-5 ENTER
Allow for maximun class frequency of 12	12 ENTER	12 ENTER	12 ENTER	12 ENTER
5. Draw histogram	2^{nd} MATRX ▷ cursor on 1:Hist ENTER ENTER	2^{nd} Y = ENTER cursor to on ENTER ▽ ▷ ▷ ▷ ENTER GRAPH	2^{nd} Y = ENTER cursor to on ENTER ▽ ▷ ▷ ENTER GRAPH	STAT F3 F1 CLEAR
6. Determine frequencies	▷ use cursor to read approx frequencies	TRACE use cursor to read freq's and class boundaries	TRACE use cursor to read freq's and class boundaries	▷ use cursor to read approx. frequencies

Finding $\bar{x}$, s, s^2, Q_1, Q_3, and the median

The TI calculators will calculate most of the statistical quantities introduced in this course. We will demonstrate how this is done for 1-variable data by using the pulse data listed in the **histogram** section. Note that these calculators do not determine Q_1 and Q_3 as was done in the text or coursepack (recall our comments about different ways to compute percentiles). You probably haven't done anything wrong if you obtain a quartile value from your calculator that differs slightly from the value obtained using the formula in the coursepack or *EXCEL*.

The TI calculators calculate Q_1 and Q_3 by first finding the median of the data, then taking the median of the lower half of the data (not including the overall median if it is an actual observation) to determine Q_1 and the median of the upper half of the data to determine Q_3.

It is assumed that the pulse data has been entered into the calculator; in the TI-82 and TI-83 it is assumed the data is in column L_1 of the stat editor.

	Keystroke			
Purpose	TI81	TI82	TI83	TI85
1. Calculate basic statistics	2^{nd} MATRX 1 ENTER	STAT ▷ 1 ENTER (use ▽ to view others)	STAT ▷ 1 ENTER (use ▽ to view others)	F1 ENTER ENTER F1
2. Calculate s^2	VARS 3 x^2 ENTER	VARS 5 3 x^2 ENTER	VARS 5 3 x^2 ENTER	EXIT EXIT STAT F5 F3 ENTER x^2 ENTER

Sorting

If you want to find Q_1 and Q_3 as shown in the coursepack or text, or arrange the data in increasing order for some other reason, the sorting feature is useful. It is assumed that the pulse data from the histogram section has been entered into the calculator; for the TI-82 and TI-83 calculators, it is assumed the data is in column L_1.

	Keystroke			
Purpose	TI81	TI82	TI83	TI85
Sort data and display the sorted list	2^{nd} MATRX ◁ 3 ENTER 2^{nd} MATRX ◁ 1	STAT 2 2^{nd} 1 ENTER STAT 1	STAT 2 2^{nd} 1 ENTER STAT 1	F3

Box Plots

The TI82 and TI83 calculators will construct box plots. The TI82 uses the maximum and minimum x-values to define the whiskers. The TI83 will draw this box plot but will also construct a box plot that defines whiskers using 1.5*(interquartile range), shows adjacent values and flags outliers. In addition, the TI82 and TI83 will display box plots for as many as 3 data sets simultan-eously on the screen. We will initially show a single box plot using the pulse data in the histogram section. It is assumed that this data is already entered in column L_1.

	Keystroke		
Purpose	TI82	TI83	TI83(outliers)
1. Set the x-scale below $xmin$ and above $xmax$; provide room under box plot	WINDOW ▽ 50 ▽ 110 ▽ ▽ − 5 (Ymin)	WINDOW 50 ▽ 110 ▽ ▽ − 5 (Ymin)	WINDOW 50 ▽ 110 ▽ ▽ − 5 (Ymin)
2. Draw the box plot	2^{nd} Y = 1 ENTER plot1 to on ▽ ▷ ▷ ENTER ▽ cursor to L_1 ENTER ▽ cursor to “1” ENTER GRAPH	2^{nd} Y = 1 ENTER plot1 to on ▽ ▷ ▷ ▷ ▷ ENTER ▽ 2^{nd} 1 ENTER ALPHA 1 GRAPH	2^{nd} Y = 1 ENTER plot1 to on ▽ ▷ ▷ ▷ ENTER ▽ 2^{nd} 1 ENTER ALPHA 1 GRAPH
3. Read values of median, Q_1, Q_3, $xmin$, $xmax$ and outliers	TRACE use ◁, ▷ to see values	TRACE use ◁, ▷ to see values	TRACE use ◁, ▷ to see values

Multiple box plots

With the TI82 and TI83 you can view as many as three box plots simultaneously on the screen. As an example we will enter 20 end-of-lecture pulse data in L_2 and simultaneously view the box plots for the 23 beginning-of-lecture pulse rates from above that should already be in L_1 and the 20 end-of-lecture pulse rates in L_2. The beginning- and end-of-lecture pulse rates are matched by student; for example, student 1 had a pulse rate of 78 beats/min. at the beginning of the lecture and 74 beats/min. at the end of the lecture (apparently, 3 students did not survive the lecture).

End-of-lecture pulse rates (beats per minute):

74	91	86	84	63	63	71	74	86	60
73	85	49	80	103	98	81	100	86	82

The table below assumes the 20 end-of-lecture pulse rates have been entered in column L_2 of the stat editor and that step 2 in the box plot table above has been completed.

	Keystroke		
Purpose	TI82	TI83	TI83(outliers)
1. Set the x-scale below $xmin$ for both data sets and above $xmax$ for both data sets; provide room under box plot	WINDOW ▽ 48 ▽ 110 ▽ ▽ − 5 (Ymin)	WINDOW 48 ▽ 110 ▽ ▽ − 5 (Ymin)	WINDOW 48 ▽ 110 ▽ ▽ − 5 (Ymin)
2. Draw the second box plot	2^{nd} Y = 2 ENTER plot2 to on ▽ ▷ ▷ ENTER ▽ cursor to L_2 ENTER ▽ cursor to “1” ENTER GRAPH	2^{nd} Y = 2 ENTER plot2 to on ▽ ▷ ▷ ▷ ▷ ENTER ▽ 2^{nd} 2 ENTER ALPHA 1 GRAPH	2^{nd} Y = 2 ENTER plot2 to on ▽ ▷ ▷ ▷ ENTER ▽ 2^{nd} 2 ENTER ALPHA 1 GRAPH
3. Read values of median, Q_1, Q_3, $xmin$, $xmax$ and outliers on both plots	TRACE use ◁ , ▷ to see values; use ▽ , △ to switch between plots	TRACE use ◁ , ▷ to see values; use ▽ , △ to switch between plots	TRACE use ◁ , ▷ to see values; use ▽ , △ to switch between plots

Note that the lower box plot for the end-of-lecture pulse rates is shifted to the left relative to the upper plot for the beginning-of-lecture pulse rates since the end-of-lecture pulse rates are lower.

A third box plot can be drawn by repeating step 2 for a third data set after it has been entered into a column of the stat editor.

Scatterplots, Linear Regression and Correlation with TI 81, 82, 83 and 85

TI 81

1. **To clear old data:**
   2nd MATRX ▷ ▷ to highlight the DATA menu; press 2 then ENTER to clear any old data.
2. **To enter new data:**
   2nd MATRX ▷ ▷ to highlight the DATA menu; press 1 to obtain the data entry screen. You are prompted for x_1; enter its value and press ENTER. Proceed in the same fashion to enter y_1, x_2, y_2, etc. Don't forget to press ENTER after y_n.
3. **To obtain slope, intercept and correlation:**
   Enter the data as explained above. Press 2nd MATRX to highlight CALC menu; press 2 to select *LinReg*; press ENTER to obtain the intercept a, slope b, and correlation r.
4. **To graph scatterplot and the least squares prediction line:**
   Obtain slope, intercept and correlation as explained in 3 above.
   1. Press Y= CLEAR to clear the $Y_1 =$ line.
   2. Press VARS ▷ ▷ to highlight the linear regression (LR) screen; press 4 to insert the equation for the least squares prediction line in the $Y_1 =$ line.
   Press 2nd MATRX ▷ to obtain the draw screen; press 2 ENTER to draw the scatterplot and the least squares prediction line. You can then press TRACE and use the cursor keys to move along the prediction line to observe $\widehat{y}$-values and the corresponding x-values. If the screen is blank press RANGE to adjust the x-variable and y-variable range shown by the axes in the scatterplot.
   Suppose you have a complicated equation in $Y_1 =$ that you don't want to clear (erase); then you can insert the equation for the least squares prediction line into a different $Y =$ line (say $Y_2 =$) by doing the following. Press 2nd VARS ▷ ▷ 1 to turn off all $Y =$ equations; then press 2nd VARS ▷ 3 to turn on the $Y_2 =$ line. Press Y= and scroll down to $Y_2 =$, press CLEAR, then go to step 2 above.
5. **To obtain $\widehat{y}$ for a particular value of the independent variable x.**
   Obtain slope, intercept and correlation as explained in 3 above. Say you want the value of $\widehat{y}$ when $x = 5$. On a new line in the "home screen" press 5 STO▷ X|T ENTER to set x equal to 5. Press VARS ▷ ▷ 4 to display the prediction line equation; press ENTER to display the value for $\widehat{y}$ when $x = 5$.

TI 82

1. **To clear old data:**
   If you are going to enter (x, y) bivariate data in L_1 and L_2, first clear any old data in those columns. Press STAT ENTER to obtain the data entry screen. Place the cursor on the list name L_1 then press CLEAR ENTER. Clear L_2 in the same manner.
2. **To enter new data:**
   Press STAT ENTER to obtain the data entry screen. Enter the x-data in the L_1 list and the y-data in the L_2 list by pressing ENTER after each observation. (The data can be entered in any 2 list columns; L_1 and L_2 are used for purposes of explanation).
3. **To obtain slope, intercept and correlation:**

Enter the data as explained above. Press [STAT] [▷] [3] to access the STAT SetUp menu. Select L_1 for the Xlist and L_2 for the Ylist under the row titled **2-Var Stats**. Press [STAT] [▷] [9] [ENTER] to obtain the intercept a, slope b, and correlation r.

4. **To graph scatterplot and the least squares prediction line:**
   Obtain slope, intercept and correlation as explained in 3 above. Put the equation of the least squares prediction line into Y_1 on the [$Y=$] list by pressing [$Y=$] [CLEAR] [VARS] [5] [▷] [▷] [7] [ENTER]. Then turn off all statistical plots by pressing [2nd] [$Y=$] [4] [ENTER]. Obtain the Plot 1 display and turn it "on" by pressing [2nd] [$Y=$] [1] [ENTER]. Select scatterplot by selecting the first icon in row "Type"; select L_1 as the Xlist and L_2 as the Ylist. To graph the scatterplot and least squares prediction line press [ZOOM] [9].
5. **To obtain $\widehat{y}$ for a particular value of the independent variable x.**
   Obtain slope, intercept and correlation as explained in 3 above. Say you want the value of $\widehat{y}$ when $x = 5$. On a new line in the "home screen" press [5] [STO▷] [X,T,θ] [ENTER] to set x equal to 5. Press [VARS] [▷] [▷] [7] to display the prediction line equation; press [ENTER] to display the value for $\widehat{y}$ when $x = 5$.
6. **Obtain residuals**
   Obtain slope, intercept, and correlation as in 3. immediately above. Place the equation of the least squares prediction line in $Y_1 =$ as described in the second sentence in 4. above. Now define $L_3 = Y_1(L_1)$ as follows. Press [STAT] [ENTER] to obtain the data entry screen; place the cursor on the list name L_3 using the cursor keys; press [2nd] [VARS] [ENTER] [ENTER] to get $L_3 = Y_1$ at the bottom of the data entry screen; then type [(] [2nd] [1] [)] to obtain $L_3 = Y_1(L_1)$. The entries in L_3 are now the predicted values of y that correspond to the x's in L_1. To put the residuals $y - \widehat{y}$ in L_4, in the data entry screen put the cursor on the list name L_4 and press [2nd] [2] [−] [2nd] [3] to obtain $L_4 = L_2 - L_3$ at the bottom of the data entry screen. The residuals are now in L_4; use **1-VarStats** to find the sum of the squares of the residuals.

TI 83

1. **To clear old data:**
   If you are going to enter (x, y) bivariate data in L_1 and L_2, first clear any old data in those columns. Press [STAT] [ENTER] to obtain the data entry screen. Place the cursor on the list name L_1 then press [CLEAR] [ENTER]. Clear L_2 in the same manner.
2. **To enter new data:**
   Press [STAT] [ENTER] to obtain the data entry screen. Enter the x-data in the L_1 list and the y-data in the L_2 list by pressing [ENTER] after each observation. (The data can be entered in any 2 list columns; L_1 and L_2 are used for purposes of explanation).
3. **To obtain slope, intercept and correlation:**
   Enter the data as explained above. Press [STAT] [▷] [8] [ENTER] to obtain the intercept a, slope b, correlation r and the square of the correlation r^2. (If r and r^2 do not appear, press [2nd] [0] and scroll down to **DiagnosticOn**; press [ENTER] [ENTER] to obtain r and r^2 along with a and b in the output.)
4. **To graph scatterplot and the least squares prediction line:**
   Obtain slope, intercept and correlation as explained in 3 above. Put the equation of the least squares prediction line into Y_1 on the [$Y=$] list by pressing [$Y=$] [CLEAR] [VARS] [5] [▷] [▷] [1]. Then turn off all statistical plots by pressing [2nd] [$Y=$] [4] [ENTER]. Obtain the Plot 1 display and turn it "on" by pressing [2nd] [$Y=$] [1] [ENTER]. Select scatterplot by selecting the first icon in row "Type"; select L_1 as the Xlist and L_2 as the Ylist. To graph the scatterplot and least squares prediction line press [ZOOM] [9].

5. **To obtain $\widehat{y}$ for a particular value of the independent variable x.**
   Obtain slope, intercept and correlation as explained in 3 above. Say you want the value of $\widehat{y}$ when $x = 5$. On a new line in the "home screen" press [5] [STO ▷] [X,T,θ,n] [ENTER] to set x equal to 5. Press [VARS] [5] [▷] [▷] [1] to display the prediction line equation; press [ENTER] to display the value for $\widehat{y}$ when $x = 5$.
6. **Obtain residuals**
   The residuals are automatically computed and stored in a list called RESID. To put the residuals in list L_3, press [STAT] [ENTER] to obtain the data entry screen. Place the cursor on the list name L_3 using the cursor keys. Press [2nd] [STAT] [ENTER] to put the residuals in the L_3 column. You can now look at a scatterplot of the residuals (with the x-variable on the x-axis and the residuals on the y-axis) using the STATPLOT key (press [2nd] [Y=].

TI 85

1. **To clear old data:**
   If you are going to enter (x, y) bivariate data, first clear any old data. Press [STAT] [F2] [ENTER] [ENTER] [F5].
2. **To enter new data:**
   Press [STAT] [F2] [ENTER] [ENTER] and you will be prompted for x_1; enter the $x_1$value and press enter; you will be prompted for y_1;enter the y_1 value and press enter. Continue in this manner until you have entered all your data. Don't forget to press [ENTER] after you type in the $y_n$value.
3. **To obtain slope, intercept and correlation:**
   Enter the data as explained above. Press [STAT] [F1] [ENTER] [ENTER] [F2] to obtain intercept, slope, and correlation.
4. **To graph scatterplot and the least squares prediction line:**

Obtain slope, intercept and correlation as explained in 3 above. Press [GRAPH] [F2] and set the range of values for the (x, y) data. Press [STAT] [F3] [F2] [F4] to draw the scatterplot and least squares prediction line.

5. **To see x and $\widehat{y}$ values graphically and find $\widehat{y}$ for a particular x:**
   Press [STAT] [F3] [F5] to clear the draw screen. Press [GRAPH] [F1] to obtain $y1 =$ on the screen. Now press [STAT] [F5] [MORE] [MORE] [F2] to put the regression equation (RegEq) in the $y1 =$ line. Now press [GRAPH] [F4] to draw the prediction line with an active cursor in the middle of the line. Use the cursor keys to move up and down the line; the (x, y) values are at the bottom of the screen. Press [GRAPH] [MORE] [MORE] [F1] to obtain an "$x =$" prompt at the bottom of the graph screen. Enter the desired value of x (between $xmin$ and $xmax$) and [ENTER] to obtain the corresponding value of $\widehat{y}$.

Factorials, permutations, and combinations

The TI graphics calculators have the $n!$ (n facorial), C_r^n or $\binom{n}{r}$ (the number of combinations of n things taken r at a time), and P_r^n (the number of permutations of n things taken r at a time) formulas in memory. We illustrate the use of the calculators by finding 6!, $\binom{6}{4}$, and P_4^6.

Purpose	Keystroke TI81	TI82	TI83	TI85
1. Enter 6	6	6	6	2^{nd} X F2 6
2. Calculate 6! and clear screen	MATH 5 ENTER CLEAR	MATH ◁ 4 ENTER CLEAR	MATH ◁ 4 ENTER CLEAR	F1 ENTER CLEAR
3. Calculate $\binom{6}{4}$ and clear screen	6 MATH ◁ 3 4 ENTER CLEAR	6 MATH ◁ 3 4 ENTER CLEAR	6 MATH ◁ 3 4 ENTER CLEAR	6 F3 4 ENTER CLEAR

To calculate P_4^6, in line 4 of step 3 substitute 2 for 3 for the TI81, 82, 83.

Random number generation

The TI graphics calculators have a random number generator that generates 10-digit random numbers between 0 and 1. Random numbers are useful for generating random samples. You can read as many of the digits of the number generated as you need. For example, to form random two-digit numbers, ignore the decimal and read only the first two digits of each number generated.

Purpose	Keystroke TI81	TI82	TI83	TI85
1. Set a random number seed of 23 (each time you use the random number generator select a new integer as seed)	23 STO ▷ ALPHA MATH ◁ 1 ENTER	23 STO ▷ MATH ◁ 1 ENTER	23 STO ▷ MATH ◁ 1 ENTER	23 STO ▷ 2^{nd} X F2 F4 ENTER
2. Generate the first random number	MATH ◁ 1 ENTER	MATH ◁ 1 ENTER	MATH ◁ 1 ENTER	2^{nd} X F2 F4 ENTER
3. Generate another random number	ENTER	ENTER	ENTER	ENTER

Binomial distributions: computing probabilities

The TI83 has the capability to compute individual and cumulative probabilities for binomial distributions. For individual probabilities the format is **binompdf**(*numtrials*,*p*[,*x*]), where *numtrials* is the number of trials for the binomial distribution, *p* is the success probability for each trial, and *x* is an integer or a list of integers at which the binomial distribution function is evaluated. The square brackets around the *x* indicate that it is optional; if you do not specify *x*, a list of probabilities from 0 to *numtrials* is returned. The binomial pdf is

$$f(x) = \binom{n}{x} p^x (1-p)^{n-x},\ x = 0,\ 1, \ldots n$$

where $n =$ *numtrials.*

For a binomial distribution with 10 trials and a success probability of .5 on each trial, in the tables below we find the probability of 4 successes and the probability of 6, 7, or 8 successes.

Purpose	Keystroke TI83
1. Find $P(x = 4)$ when x is binomial with $n = 10$, $p = .5$	2^{nd}
	VAR
	0
	10
	, (comma)
	.5
	, (comma)
	4
	)
	ENTER

Purpose	Keystroke TI83
1. Find $P(x = 6,7,$or $8)$ when x is binomial with $n = 10$, $p = .5$	2^{nd}
	VARS
	0
	10
	, (comma)
	.5
	, (comma)
	2^{nd}
	(
	6
	, (comma)
	7
	, (comma)
	8
	2^{nd}
	)
	)
	ENTER

To compute cumulative probabilities for binomial distributions with the TI83, we use **binomcdf(***numtrials, p* [,x]), which computes the probability of x or fewer successes for a binomial distribution with number of trials equal to *numtrials* and success probability *p*.x can be a real number or a list of real numbers. The square brackets around x indicate that it is optional; if you do not specify x, a list of cumulative probabilities is returned.

As examples, for a binomial distribution with $n = 13$ and $p = .7$, we compute the probability of 5 or fewer successes in the left table and the probability of 8 or fewer successes, 9 or fewer successes, and 10 or fewer successes in the right table.

Purpose	Keystroke TI83
1. Find $P(x \leq 5)$ when x is binomial with $n = 13$, $p = .7$	2^{nd} VARS ALPHA MATH ENTER 13 , (comma) .7 , (comma) 5) ENTER

Purpose	Keystroke TI83
1. Find $P(x \leq 8)$, $P(x \leq 9)$, and $P(x \leq 10)$ when x is binomial with $n = 13$ and $p = .7$	2^{nd} VARS ALPHA MATH 13 , (comma) .7 , (comma) 2^{nd} (8 , (comma) 9 , (comma) 10 2^{nd})) ENTER

Normal distributions: computing probabilities and plottingthe distributions

For a normal distribution with mean μ and standard deviation σ, **normalpdf(**x[,μ,σ]) computes the value of the normal probability density function at the specified x value. and the probability that a normal random variable assumes a value in an interval of the real line. **normalcdf(**$lowerbound, upperbound$[,μ,σ]) computes the probability that a normal random variable with mean μ and standard deviation σ assumes a value between $lowerbound$ and $upperbound$. The normal curve with mean μ and standard deviation σ can also be graphed by pasting **normalpdf(**x[,μ,σ]) to the $Y=$ list.

The brackets around μ,σ indicate that they are optional; if they are not specified, the defaults are $\mu = 0$ and $\sigma = 1$.

For a normal distribution with mean $\mu = 35$ and standard deviation $\sigma = 2$, the table on the left computes the value of the probability density function at 33 and draws the normal curve. The table on the right calculates the probability that a random variable with this normal distribution assumes a value between 32.5 and 37.3.

	Keystroke
Purpose	TI83
1. For a normal distribution with $\mu = 35$, $\sigma = 2$, compute value of density function at 33	2^{nd} VARS 1 33 , (comma) 35 , (comma) 2) ENTER
2.Draw normal density curve when $\mu = 35$, $\sigma = 2$	$Y=$ CLEAR 2^{nd} VARS 1 X,T,θ,n , (comma) 35 , (comma) 2) GRAPH
3.Examine values on curve	TRACE use $\triangleleft$, $\triangleright$ to traverse curve

Note: 1. For this example, Xmin $= 28$, Xmax $= 42$, Ymin $= 0$, Ymax $= .25$ in the WINDOW screen.

2. For plotting the normal distribution, you can set WINDOW variables Xmin and Xmax so that the mean μ falls between them, and then select **0:ZoomFit** from the ZOOM menu.

	Keystroke
Purpose	TI83
1. Compute the probability that a normal rv with $\mu = 35$, $\sigma = 2$ is between 32.5 and 37.3	2^{nd} VARS 2 32.5 , (comma) 37.3 , (comma) 35 , (comma) 2) ENTER

Note: $-$ 1E99 and 1E99 specify minus infinity and infinity, respective- ly on the calculator. If you want to view the area to the left of *upperbound*, for example, specify *lowerbound* $=$ $-$ 1E99.

t-distribution confidence intervals

The TI83 is programmed to compute intervals for the mean μ of a random variable when the variance is estimated from the data. It can be done either by entering raw data or summary data. We use the 23 student beginning-of-lecture pulse rates from the histogram section above to illustrate the former in the left table below. The right table shows the procedure for summary data using the end-of-lecture pulse rates.

In the left table below it is assumed the beginning-of-lecture pulse rates have been entered in column L_1 of the stat editor. It is not necessary to enter the end-of-lecture pulse rates for the right table since we will just use the summary data $\overline{x}$ and s.

Purpose	Keystroke TI83
1. Ask for the t confidence interval procedure	STAT ◁ 8
2. Ask for a 95% confidence interval to be constructed using data in column L_1	CURSOR TO DATA ▽ 2^{nd} 1 ▽ 1 ▽ .95 ▽ ENTER

Note: 1. If the data is in a column other than L_1, then specify its location in **List** on the TInterval screen.

2. .95 is the default confidence level. The confidence level can be changed to any level desired on the **C-Level** line.

Purpose	Keystroke TI83
1. Ask for the t confidence interval procedure	STAT ◁ 8
2. Move cursor to allow entry of $\overline{x}$ and s for end-of-lecture pulses	▷ ENTER
3. Enter 79.45 as the $\overline{x}$ value	▽ 79.45 ENTER
4. Enter 13.88 as the s value	13.88 ENTER
5. Enter 20 as the sample size	20 ENTER
6. Ask for 90% conf. interval	.90 ENTER ENTER