Chapter 14 / **Example 15**

Estimating parameters

The lengths of fish caught in a lake are thought to be normally distributed. To test this belief 200 fish were caught and measured and the results are shown in the table below.

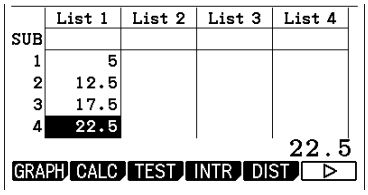
Length (x cm)	$0 < x < 10$	$10 < x < 15$	$15 < x < 20$	$20 < x < 25$	$25 < x < 30$	$30 < x < 40$
Number of fish	45	55	38	27	25	10

Using estimates of the mean and standard deviation of the population taken from the sample data, test the hypothesis at the 5% level that the lengths of the fish are normally distributed.

Press MENU 2 STAT to display the List Editor screen.

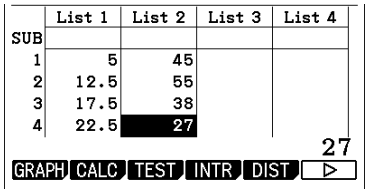
Type the mid-interval values: 5, 12.5, 17.5, 22.5, 27.5, 35 in the first column.

Press EXE after each number to move to the next cell.



Press ▶ to move to the next column.

Enter the frequencies in the second column.



To find the summary statistics.

Press F2 CALC and F6 SET.

Set 1Var XList to List1 and 1Var Freq to List2 (press F2 LIST type 2 and press EXE).

Press EXIT and F1 1-VAR.

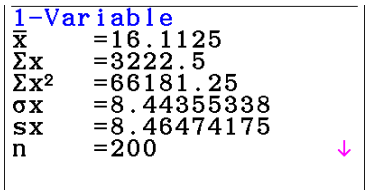
The GDC displays a list of statistics for the data.

From the sample

$\bar{x}$ = 16.1 cm, Sx= 8.46 cm.

H_0: The fish in the lake have an N(16.1, 8.46^2) distribution.

H_1: The fish in the lake do not have an N(16.1, 8.46^2) distribution.



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The fx-CG50 stores these values, but only in a temporary store that will be overwritten. To use these values to calculate the expected values, you need to store them as variables.

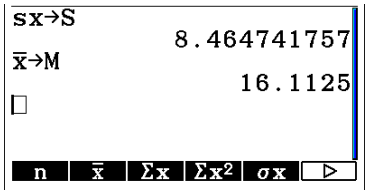
Press MENU 1 RUN·MAT to display the Run-Matrix screen for arithmetical calculations.

To store the value of σ

Press vars F3 STAT F1 X F6 ▷ F1 sx → ALPHA × [S] and press EXE.

To store the value of μ

Press F6 ▷ F2 $\bar{x}$ → ALPHA 7 [M] and press EXE.



Press MENU 2 STAT to display the List Editor screen.

Calculate the expected values directly in the table.

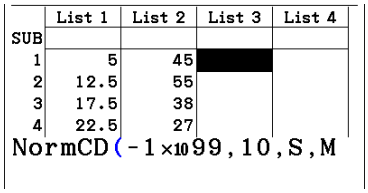
Press ▶ to move to the next column.

Press OPTN F6 ▷ F6 ▷ F1 STAT F1 DIST F1 NORM F2 Ncd.

Type -1×10^{99} as the value of Lower and 10 as the value of Upper (separate all items with ,)

Press ALPHA × [S] , ALPHA 7 [M].

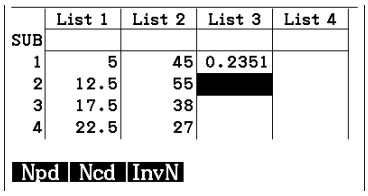
Close the parentheses and press EXE.



The probability is entered directly in the table.

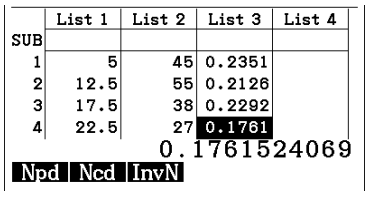
Press F2 Ncd and repeat for the remainder of the column, using the boundaries:

10-15, 15-20, 20-25, 25-30 and 30-1E99



Now press ▶ to move to the next column and ▲ to move up to the top cell.

Type $L_3 \times 200$ and press EXE.



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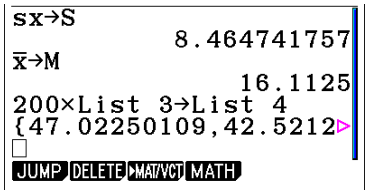
Estimating parameters

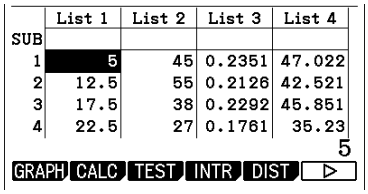
Press MENU 1 to display the Run-Matrix screen for arithmetical calculations.

Type 200 × SHIFT 1 [List] 3 → SHIFT 1 [List] 4 and press EXE.



Press MENU 2 to display the List Editor screen.

The GDC displays the expected values in List 4.



You are now ready to conduct the χ^2 test.

Press F3 TEST F3 CHI F1 GOF.

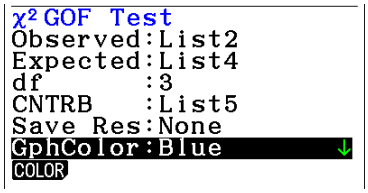
Observed: List2

Expected: List4

Since the mean and standard deviation were both estimated, the number of degrees of freedom is 6 − 1 − 1 − 1 = 3.

CNTRB: List5.

Navigate down to Execute using ▼ and press F1 CALC.



p-value = 0.0334.

0.0334 < 0.05, the result is not significant so there is insufficient evidence to reject the null hypothesis that the lengths of fish in the lake follow a normal distribution.