

## THE CHI-SQUARED GOODNESS-OF-FIT TEST

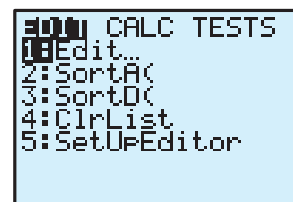
### TI-83 INSTRUCTIONS

A sample of 100 digits were randomly generated using a calculator random number generator. If the digits generated are random, we would expect that the outcomes could be modelled by a discrete uniform distribution. The following data were obtained:

Score ( $x$ )	0	1	2	3	4	5	6	7	8	9
Observed frequency ( $f_o$ )	10	17	13	7	15	3	8	12	6	9
Expected frequency ( $f_e$ )	10	10	10	10	10	10	10	10	10	10

The data can be tested to see if it is indeed random using the following steps:

**Step 1:** Press **STAT** and choose **1:Edit**.



**Step 2:** Enter the observed frequencies into **List 1** and the expected frequencies into **List 2**.

Press **2nd** **QUIT** to finish editing the data.

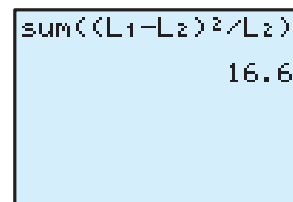
L1	L2	L3	3
10	10		
17	10		
13	10		
7	10		
15	10		
3	10		
8	10		

**Step 3:**  $\chi^2$  is calculated using the following formula:

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

To calculate a sum press **2nd** **LIST** and use the **►** key to select **MATH**, then select **5:sum(**.

Now press **(** **2nd** **L1** **-** **2nd** **L2** **)** **x^2** **÷** **2nd** **L2** **)** **ENTER** to calculate  $\chi^2$ .



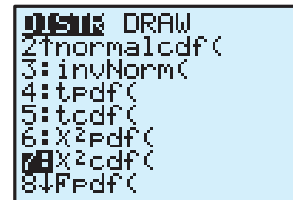
**Step 4:** The  $p$ -value is calculated using the formula:

$$1 - \chi^2 \text{cdf}(0, \chi^2, \nu)$$

where  $\nu$ , the degrees of freedom, in this example is 9.

Press **1** **=**.

Press **2nd** **DISTR** and choose **7: $\chi^2$ cdf(**.



Finish the formula by pressing **0** **,** **2nd** **ANS** **,** **9** **)** **ENTER**.

Since the  $p$ -value of 0.0554 is greater than 0.05, we do not reject  $H_0$ . Hence there is insufficient evidence to suggest that the calculator is not generating the digits randomly.

**Warning:** If  $f_e < 5$ , remember to combine classes.

