Chapter 14 / **Example 18**

Type I and type II errors

A machine produces components needed for a software company. The probability of a fault occurring in the production of a single component has to be less than 0.02. A sample of size 50 is taken from the output and tested to see if any were faulty. A test was performed with the hypotheses H_0: $p = 0.02$ and H_1: $p > 0.02$ at a 5% significance level.

a State a suitable model for the number of faults in the sample; include any additional assumptions you are making.

b Find

i the critical region for the test

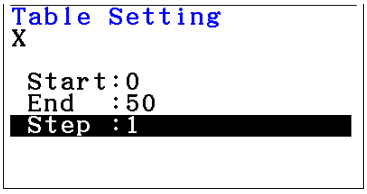
ii the probability of a type I error.

c Earlier testing indicates that the probability of a fault is 0.04. If this is the case find the probability of a type II error.

Press [MENU] 7 [TABLE].

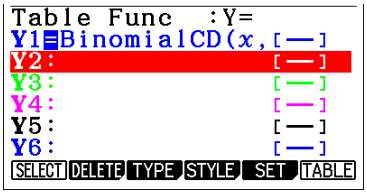
Press [F5] SET and change the settings so that the table starts from 0 and ends at 50.

Press [EXIT].



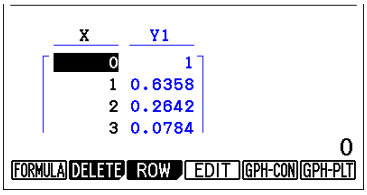
Press [OPTN] [F6] ▷ [F3] STAT [F1] DIST [F5] BINOMIAL [F2] Bcd

Type the lower bound x, the upper bound 50, 50 as the number of trials and 0.02 as the probability of success, separated by commas. Close the parentheses and press [EXE].



Press [F6] TABLE

The function is shown in the table.

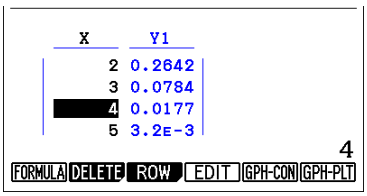


Scroll down the table using ▼

From the table, $P(X \geq 3) = 0.0784$ and $P(X \geq 4) = 0.0178$.

The critical region is $X \geq 4$

The probability of a type I error is 0.0178



Chapter 14 / **Example 18**

Type I and type II errors

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

Press OPTN F5 STAT F3 DIST F5 BINOMIAL F2 Bcd

Type the lower bound 0, the upper bound 3, 50 as the number of trials and 0.04 as the probability of success, separated by commas. Close the parentheses and press EXE.

$\mathrm{P}\ X \leq 3 \mid p = 0.04\ = 0.861$

This is the probability of a type II error.