Chapter 1

INTRODUCTION

1.1 The statistical *population* could be the collection of air quality values for all U. S. based flights flown during the period of the study. It could also be expanded to include all flights for the year or even all those that could have conceivably been flown. The *sample* consists of the measurements from the 158 actual flights on which air quality was measured.

1.2 The statistical *population* is the collection of singer preferences of students' at your school. The sample consists of the singers named by each person who calls the station.

This sample is not representative of all students' preferences. Those who listen to a particular station or program are a special subgroup with similar listening tastes. A better approach would be to use a random number table to select persons from your college directory. Use 3 digits for the page number, 2 digits for the column(if two columns of names) and 3 digits for the position in the column. Those selected can be contacted by phone.

1.3 a) A laptop owned by student.

b) Size of hard disk.

c) Collection of numbers, for all student owned laptops, specifying size of the hard disk.

1.4 a) The variable of interest is starting salary. The statistical population is the collection of all starting salaries for engineers graduating from the university. The sample consists of the 20 starting salaries for the engineers asked to report their starting salaries.

b) The variable of interest is condition of a chip, either defective or non-defective. The statistical population is the collection of conditions for all six thousand chips manufactured that day. The sample consists of the 5 defective and 45 non-defective chips that were tested.

c) The variable of interest is the tensile strength of a specimen. The statistical population is the collection of tensile strengths for all possible specimens that could be manufactured. This is somewhat abstract. The sample consists of the 20 measured tensile strengths.

1.5 We used the first page of Table 7, row 11, and columns 17 and 18. Reading down, we ignore 93, 80 and select 31, 4, and 29. After ignoring several other numbers greater than 40, we get 21 and 24. We select the five persons at these positions on the active membership role.

1.6 Number the buses from 1 to 50 or put them on an ordered list. We then select 4 random numbers which will identify the buses that will be inspected. We used the first page of Table 7, row 31, and columns 21 and 22. Reading down, we find

$$73 \quad 14 \quad 32 \quad 54 \quad 56 \quad 7 \quad 70 \quad 81 \quad 23$$

Ignoring the numbers greater than 50, we select the buses in positions 14, 32, 7, and 23 on the list.

1.7 a) For the new sample, $\overline{x} = 214.67$

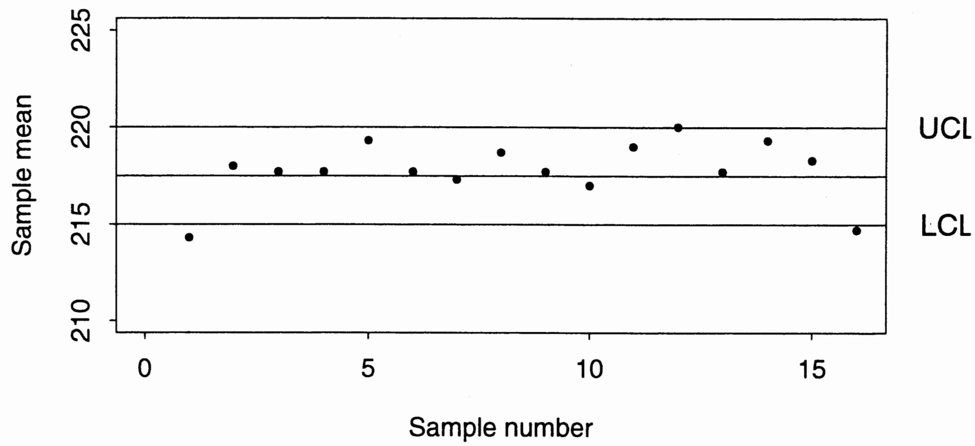

Figure 1.1: X-bar chart for slot depth. Exercise 1.7

b) The new $\overline{x}$ is below the lower control limit LCL = 215 so the process is not yet stable.

1.8 a) We calculate

$$\overline{\overline{x}} = \frac{4.25 - 3.00 - \cdots - 1.50 + 3.25}{24} = 1.698$$

b) Alternatively, we calculate

$$\frac{10 + 3 + 6 - 2 - 6 \cdots - 1 + 5 + 9 + 0}{96} = 1.698$$

The two means are always the same. The sum of the $\overline{x}$ is the sum of all 96 observations divided by 4. Dividing this sum by 24, we see that $\overline{\overline{x}}$ is also the sum of all 96 observations divided by 96.

c) The X-bar chart reveals that the process was out of control during hours 4 and 5 since the means were below the lower limit. That is, the measurements

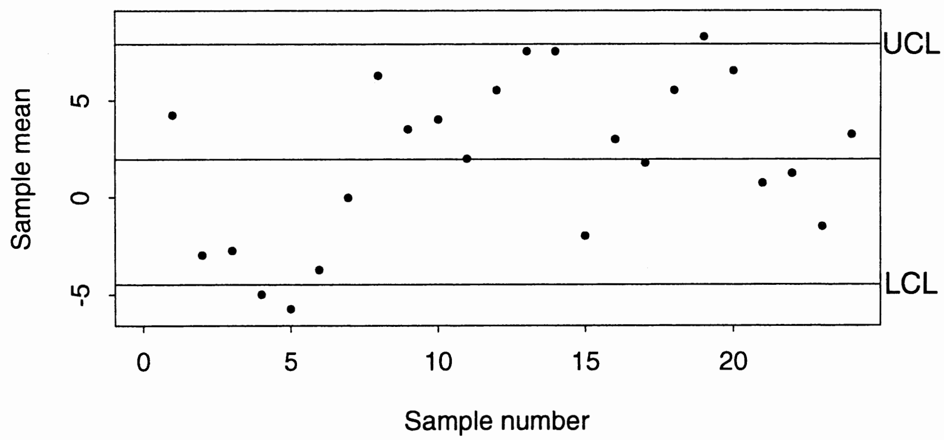

Figure 1.2: X-bar chart for crank bore diameter. Exercise 1.8

were substantially below the specification during these hours. At hour 19, the process was again out of control. This time the critical diameter was substantially greater than the specification.