

# 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 rapper preferences of students' at your school. The sample consists of the rappers 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) Weight of laptop.

c) Collection of numbers, for all student owned laptops, specifying the weight of the laptop.

1.4 a) The variable of interest is the tensile strength of a specimen of super strength thread. The statistical population is the collection of tensile strengths for all possible specimens that could be manufactured. This specification is somewhat of an abstraction. The sample consists of the 20 measured tensile strengths.

b) The variable of interest is resolution of a problem either satisfactory or not. The statistical population is the collection of resolutions of all problems called in that day. The sample consists of the resolution of problem from the 15 selected calls.

c) The variable of interest is condition of a flash card. It either meets or does not meet specifications.

The statistical population is the collection of conditions for thousands of flash cards manufactured that day. The sample consists of the 6 which do not meet specification and the 24 which do.

1.5 A hard drive is the population unit and the distance between the head and the disk is the variable.

The statistical population is the collection of distances for all drives that are manufactured. It could, more abstractly, be the collection of distances for all those manufactured or could be manufactured. The sample consists of the collection of distances that are measured.

1.6 Number the seniors from 0 to 9 or put them on an ordered list. We then select 5 different random numbers which will identify the students to be included on the team. We used the first page of Table 7, row 31 and column 21. Reading down, we find

7 1 3 5 5 0

Ignoring the second 5, we select the students numbered 7, 1, 3, 5 and 0.

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

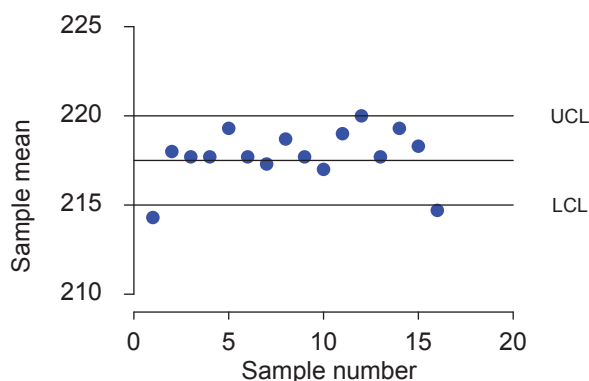


Figure 1.1: X-bar chart for slot depth. Exercise 1.7

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

1.8 a) We calculate

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

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  $\bar{x}$  is the sum of all 96 observations divided by 4. Dividing this sum by 24, we see that  $\bar{\bar{x}}$  is also the sum of all 96 observations divided by 96.

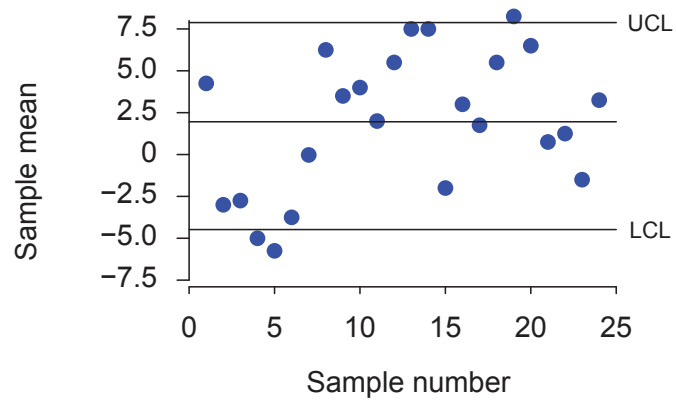


Figure 1.2: X-bar chart for crank bore diameter. Exercise 1.8

- c) The  $\bar{X}$ -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 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.

