# Chapter 1: Introduction

Defining the Role of Statistics in Business

## Teaching Objectives

Here is your chance to get the students over to your side. The key is to make sure that they know right away that statistics is important and useful to them and their careers. This will give them motivation to work hard at understanding the ideas, methods, and even the theoretical foundations of the subject. Much of the material in this chapter (including data mining and the donations database) is included in order to motivate your students by showing them how useful statistical methods can be when working with complex situations.

Students like to know what is expected from them, in as much detail as possible. Be prepared to tell them about the homework, exams, project (if you will have one), and how you will determine their final grade. You may also want to give them helpful suggestions regarding the necessary calculator skills and good ways of preparing review materials.

In your lecture, introduce them to statistics by defining it, describing its activities, and giving examples. You may also wish to briefly discuss an outline of the whole course so that they can see where you are heading.

If you have time, clip out a few recent articles from a magazine or newspaper and mention something about the statistical theory and calculations behind it. Tell them that numbers, as usually reported, do not tell the whole story and are probably not as accurate as they appear.

At this point, if there is time, you might open up to class discussion by asking students to describe some encounter they have had with statistics in their jobs. This works especially well if your typical student has been out in “the real world” before coming back for a degree. You may want to have some examples in mind, if necessary, to help get things started.

## Question Answers

1. a. If you don’t learn statistics, then you will be at a competitive disadvantage compared to those who are basically like you but are also comfortable with statistics.

b. Exercise for student.

2. Exercise for student.

3. Statistics should supplement ‑ not replace ‑ business experience, common sense, intuition, and other factors so that you can make strategic decisions based on experience, intuition, and a thorough understanding of the facts available.

4. Statistics is the art and science of collecting and understanding data.

5. The design phase involves planning the details of data‑gathering, perhaps using a random sample from a larger population.

6. Random sampling is a good method because you are guaranteed that the selection process is fair and proceeds without bias; that is, that all items had an equal chance of being selected. This assures you that, on average, the sample will be representative of the population. The randomness introduced in a controlled way during the design phase of the project will help ensure validity of the statistical inferences drawn later.

7. By exploring data, you will be able to see if the numbers really are what they claim to be and to check for obvious problems. You can also verify that the expected relationships actually exist in the data, thereby validating the planned techniques of analysis, or else find some unexpected structure in the data that must be taken into account by making some changes in the planned analysis.

8. A statistical model can help you by providing additional structure for estimation and hypothesis testing. Exploring the data can help you choose an appropriate model.

9. No, statistical estimates are not always correct. You will also need some indication of the size of the uncertainty or error.

10. A confidence interval is more useful than just an estimated value because a confidence interval also shows you how reliable the estimated value is.

11. Exercise for student.

12. Data mining is different from other statistical methods because it involves the analysis of large amounts of data, often by searching for hidden patterns. In addition to statistics, computer science and optimization are also useful in data mining.

13. Probability is the inverse of statistics. That is, whereas statistics helps you go from observed data to generalizations about how the world works, probability goes the other direction: if you assume you know how the world works, then you can figure out what kinds of observed data you are likely to see and the likelihood for each.

14. You should look for flaws with the analysis, especially unreasonable assumptions which form the basis for its conclusions. If no serious flaws can be found, consider the possibility that your intuition may not apply to this particular situation.

15. It is important to identify the source of funding because of the vast flexibility available to the analyst in each phase of a study. Remember that the analyst made many choices along the way: in defining the problems, designing the plan to select the data, choosing a framework or model for analysis, and interpreting the results.

## Problem Solutions

1. Exercise for student.

2. Exercise for student.

3. Exercise for student.

4. Exercise for student.

5. Exercise for student.

6. a. Exploring the data (examining detailed information).

b. Designing the study (choosing a sample and designing the questionnaire).

c. Modeling the data (creating a framework for analysis).

d. Hypothesis testing (deciding whether or not there is discrimination).

e. Estimation (educated guess for a numerical quantity).

7. Designing the study (to produce the needed numbers).

8. Estimation (determining the production level).

9. Exploring the data (looking through the accounting information).

10. Data mining (learning from a large data set).

11. Designing the study (while you would like, ultimately, to estimate, the initial phase involves design because no data are yet available).

12. Designing the study (planning the details for data gathering).

13. Modeling the data (identifying the model and its parameters before the model is used for estimation and hypothesis testing).

14. Hypothesis testing (deciding whether or not discrimination exists).

15. Exploring the data (looking at the data).

16. Estimation (best guess of the quality of the materials).

17. Hypothesis testing (deciding whether or not the defect rate has increased).

18. Exploring the data (looking at the data in general).

19. Modeling the data (developing a system of equations with model parameters).

20. Exploring the data (looking at the results of the survey using charts and summaries).

21. Designing the study because this is the phase that involves planning the details of data gathering (in this case, how to survey customers).