Name Answer Key

Chapter 1 Getting Started

Section 1.1 What is Statistics?

Objective: In this lesson you learned how to identify variables in a statistical study, distinguish between quantitative and qualitative variables, identify populations and samples, determine the level of measurement, and compare descriptive and inferential statistics.

Important Vocabulary			
Statistics	Individuals	Quantitative Variable	Qualitative Variable
Population Data	Sample Data	Nominal Level	Ordinal Level
Interval Level	Ratio Level	Descriptive Statistics	Inferential Statistics

Focus Points:
- Identify variables in a statistical study
- Distinguish between quantitative and qualitative variables
- Identify populations and samples
- Distinguish between parameters and statistics

I. Introduction

Statistical methods enable us to: examine information and make decisions, even when faced with uncertainties

What is **statistics**?
- The study of how to collect, organize, analyze, and interpret numerical information from data.
- Both the science of uncertainty and the technology of extracting information from data.

What must be remembered about properly applied statistical procedures?

They are no more accurate than the data, or facts, on which they are based.

Statistical results should be interpreted by whom?

By someone who understands not only the methods, but also the subject matter to which they have been applied.

Define the following terms:

1. Individuals – people or objects included/involved in the study
2. Variable – the characteristic of the individual(s) to be measured, observed, or studied.

3. Quantitative Variable – has a value or numerical measurement for which operations such as addition or averaging make sense.
4. Qualitative Variable – describes an individual by placing them into a category or group (i.e. male or female)

Note: Qualitative variables can also be called categorical *variables.*

5. Population Data – the data are from every individual of interest
6. Sample Data – the data are from only some of the individuals of interest
7. Population Parameter – a numerical measure that describes an aspect of a population
8. Sample Statistic – a numerical measure that describes an aspect of a sample.

II. Levels of Measurement: Nominal, Ordinal, Interval, Ratio

Another way to classify data is according to one of the following four *levels of measurement*. These levels indicate: the type of arithmetic that is appropriate for the data.
i.e. ordering, taking differences, taking ratios

Focus Point:
- Determine the level of measurement

The **nominal level of measurement:** applies to data that consist of names, labels, or categories
- no implied criteria by which the data can be ordered from smallest to largest.

Data at the **ordinal level** may be arranged in some order, but: differences between data values either cannot be determined or are meaningless.

The **interval level** applies to data: that can be arranged in order.
- differences between data values are meaningful

The **ratio level** applies to data: that can be arranged in order.

- Both differences between data values and ratios of data values are meaningful
- Data at this level have a true zero

To determine the level of measurement of data:

state the highest level that can be justified for the entire collection of data.

Level of Measurement	Suitable Calculation
Nominal	data can be put into categories
Ordinal	data can be ordered (smallest → largest) (best → worst) each data value can be compared with another data value.
Interval	data can be ordered; differences between values can be determined i.e. 5 more than; 12 less than
Ratio	data can be ordered; differences found, and ratios found. i.e. one data value is twice as large as another.

III. Critical Thinking

Focus Point:

- Compare descriptive and inferential statistics

Descriptive Statistics: involves methods of organizing, picturing, and summarizing information from samples or populations

Inferential Statistics: involves methods of using information from a sample to draw conclusions regarding the population

Section 1.1 Examples – What is Statistics?

(1) Television station QUE wants to know the proportion of TV owners in Virginia who watch the station's new program at least once a week. The station asked a group of 1000 TV owners in Virginia if they watch the program at least once a week.

a. Identify the individuals of the study and the variable.

The individuals are the 1000 TV owners surveyed.

The variable is the response "does" or "does not" watch the new program

b. Do the data comprise a sample? If so, what is the underlying population?

The data comprise a sample of the population or responses from all TV owners in Virginia.

c. Is the variable qualitative or quantitative?

Qualitative – 2 categories "does" or "does not"

d. Identify a quantitative variable that might be of interest.

Age, income, Number of TVs.

e. Is the proportion of viewers in the sample who watch the new program at least once a week a statistic or a parameter?

Statistic – the proportion is computed from sample data.

(2) The following describe different data associated with a state senator. For each data entry, indicate the corresponding *level of measurement* and explain your reasoning.

a. The senator's name is Sam Wilson.

Nominal level

b. The senator is 58 years old.

Ratio level

Note: age has a meaningful zero makes sense to give age ratios.

c. The years in which the senator was elected to the Senate are 1980, 1986, 1992, and 1998.

Interval level

Note: dates can be ordered, and the difference between dates has meaning

d. The senator's total taxable income last year was $878,314.

Ratio level

e. The senator surveyed his constituents regarding his proposed water protection bill. The choices for response were strong support, support, neutral, against, or strongly against.

Ordinal level

Note: choices can be ordered, but there's no meaning to differences between them

f. The senator's marital status is "married."

Nominal level

g. A leading news magazine claims the senator is ranked seventh for his voting record on bills regarding public education.

Ordinal level

Note: ranks can be ordered, but differences between ranks vary in meaning