TEST BANK AND RESOURCE GUIDE

WILLIAM CRAINE III

STATS: DATA AND MODELS

FOURTH EDITION

Richard De Veaux
Williams College

Paul Velleman
Cornell University

David Bock
Cornell University

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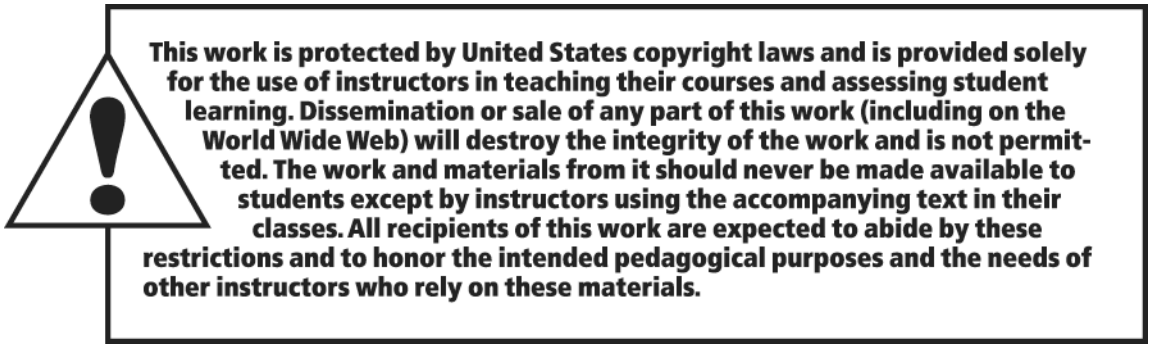

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Contents

About This Guide

This Instructor's Guide is designed to help you prepare your classes and optimize your students' experience in this course. Every textbook is a compromise. Authors must decide how to order topics, what to say, and—even more important—what *not* to say. In this *Instructor's Guide*, we bring you behind the curtain to share with you how and why this book works the way it does. You'll find pages like this preceding each of the book's six parts in this Instructor's Edition. We'll explain our approach to the course and the reasoning behind the teaching decisions we've made. We'll summarize each chapter, highlighting the important concepts and pointing out where they'll show up later in the course. We'll offer some pedagogical suggestions based on our teaching experience, and include examples and activities you may choose to use in your class. And we'll provide references to *ActivStats* and other resources that you may find helpful.

Our discussions are structured to make it easy for you to find what you may be looking for. A typical chapter introduction contains some or all of the following features:

What's It About?

We summarize the topics covered in the chapter. What's more important, we tell the *story* of the chapter. Chapters in this book are not just sequences of definitions and equations. Each chapter starts with a real-world problem and then follows the data to illustrate new concepts and methods. There's a background story about how we can understand the world with data—the fundamental purpose of Statistics and, we hope, the reason students are studying the subject. We have structured the topic order so that each new concept fits with what students have learned in previous chapters and what they will learn in subsequent ones. We'll give you the overview to help you show your students how it all fits together.

Comments

This section explains the statistical and pedagogical reasons for the choices we've made in what to teach, in how to present it, and in what order to discuss it. Some of these choices may differ from those made by other textbooks. We try to point out these differences and explain our approach.

Looking Ahead

The Looking Ahead sections point out ways that many of the ideas we introduce in early chapters foreshadow or pave the way for important features of later chapters. These are often good points to make in class to motivate students and to help them fit all these new concepts together into a coherent whole.

Class Do's

We offer pedagogical advice about approaches that have worked for us, ideas to stress, and other ways to highlight important concepts or take advantage of important features of this text. For example, we recommend that you emphasize that certain words are used by statisticians in ways that might be different from the way students use them. Recent research suggests that it helps students if they keep their own glossary of terms—but only if they write it out for themselves. Copying and pasting definitions doesn't help at all.

The Importance of What You Don't Say

One of the challenges of teaching Intro Stats is that there's so much to say. But it is easy to overwhelm a student who sees this material for the first time. Because deciding how much to say and when to say is essential, we offer some suggestions about what *not* to say and what not to say *quite yet*.

Class Examples

It's always good to have another example for class. Students seem to always want one more example. So we provide new examples different from those in the book or on the *ActivStats* DVD. These sometimes include classroom materials in the form of worksheets or guided explorations.

Simulations

We have found the simulations can be helpful to some students as supplements to a careful discussion of concepts. But randomness is not itself a simple concept for many students. So we urge caution before you base explanations of other, more sophisticated concepts on randomness alone. You'll find simulations in *ActivStats* and in *Stat Crunch*, that can supplement the discussions in this text. Other simulations are available from a variety of online sources. Some students will find these helpful. Others may find them confusing. They may work well in a classroom setting as a way to start a discussion. We suggest that you consider using these simulations, but that you not rely on them exclusively for any topic.

Resources

We offer a list of resources for background information, data sets, and classroom activities. These may include other books, videos, software, or websites.

Chapter Quiz

We offer several versions of a quiz you might choose to give after completing the chapter.

Investigative Task

Instead of a quiz, you may choose to have students complete a written assignment that asks them to apply the major concepts of the chapter. Along with each classroom-tested task we include a scoring rubric you can use as you grade each student's work and return to the student to provide them with guidance about writing clear, complete, concise statistical analyses. (We prefer these to quizzes, but that's us.)

Part Test

We offer several versions of a sample exam at the end of each of the text's seven Parts. These exams include multiple choice questions, short questions requiring some calculations or written explanations, and longer questions requiring more in-depth analysis.

A Few More Words About the Text

You'll see that this book isn't written like most other texts. We hope to entice students to read the book with a conversational style and to entertain them with occasional humor and stories. Don't be fooled into thinking that we take the subject itself lightly. We are professional statisticians and teachers. Our deep background knowledge of the subject informs many of our decisions. But our presentation is designed to entice students to read the book.

The 29 chapters of this book are grouped into seven parts. Each chapter tells a story, but each part tells a larger tale. At the end of each part, you'll find an overview of the major concepts of that part, gathering the chapter stories into a larger whole. This overview is followed by a large set of exercises that often integrate several concepts from different chapters and appear in no particular topic order. These sections are particularly helpful in preparing students for tests.

Some Important Resources

ActivStats® and Data Desk®

These award-winning programs are on the DVD bound in the book. You can also obtain versions from Pearson for a student lab. *ActivStats* includes explanations and multimedia activities to support the course, arranged into chapters that match the book. Activities include narrated and animated expositions, video stories of real-world applications, simulations that support discovery learning, interactive tools, online quizzes, and more. *ActivStats* is also a source of hundreds of additional exercises, most with data sets provided on the DVD and prepared to be used by statistics software. Versions of *ActivStats* are available to support *Data Desk* (on the DVD provided with the book), *Excel, JMP, Minitab,* and *SPSS*. Versions for packages other than *Data Desk* can optionally be bundled with student versions of the software. (Contact Pearson for information.)

ActivStats can support student learning in several ways. We have found it helpful to have students prepare for class by working through the appropriate *ActivStats* activities. Students often are more willing to encounter new material with an e-book than in a paper textbook. Students can also treat *ActivStats* as a "TA on a DVD" who has infinite patience. And you can encourage students to use the index in *ActivStats* to find quick explanations of specific concepts and methods quickly.

If you have elected to use the online materials that come with the book, these can also be used either for class preparation or review. Many of the *ActivStats* activities are available in this way as well, imbedded in the multimedia textbook found on the *MyStatLab* website that goes with the book.

Adjunct and Instructor Support Site

*(***pearsonhighered.com/irc)**

This is a one-stop resource to help you plan and prepare for your course. Features include downloadable lesson podcasts designed to help you prepare for class and all teaching tools (such as sample syllabi, extra data sets, class examples, and supplements) in one place.

Videos

- *ActivStats* presents video and animated presentations of real-world applications of Statistics. Some are condensed from the *Decisions Through Data* stories (see below). Others are unique to *ActivStats*.
- *Video lectures*, presented by the authors, to support the book's content. Contact your Pearson Sales Rep for more information.
- *Decisions Through Data*; COMAP (1-800-77COMAP), 1992. Hours 1 through 5 contain 21 lessons to show in class. Each lesson looks at real-life situations and demonstrates the use of statistics to answer important questions. The units are typically 10 to 15 minutes in length, allowing you to show the segment and have time to discuss the statistical concepts and techniques introduced. Available on DVD or VHS.

Other Books and Magazines

- *Chance*, Springer-Verlag (1-800-SPRINGER). This magazine, published quarterly, provides articles about statistics as well as excellent examples and data sets to use in class.
- *Stats*, American Statistical Association. This is a magazine for students that provides articles about statistics and examples that you might find useful for class preparation.
- *Significance. Significance* is a joint effort of the Royal Statistical Society and the American Statistical Association. It aims to publish "a statistical view of what's going on in the world." Its online site www.significancemagazine.org/view/index.html is updated daily.

StatCrunch®

StatCrunch is a powerful online tool that allows you to:

- Upload data files from your computer or the Web to you own datasets library.
- Analyze data using the extensive list of numerical and graphical procedures StatCrunch offers.
- Report your insights along with attached data sets and analysis results.
- Share your data, results and reports with the rest of the world or keep them private.
- Comment on your items or those being shared by other subscribers.

Explore and learn more at www.statcrunch.com. Accessing StatCrunch requires a StatCrunch or MyStatLab account.

Internet URLs

The Internet is a valuable source of data sets, examples, tables, random numbers, and current events. The good news is that you can probably find almost everything you need or want to know there. The bad news is that the materials will not be consistent or integrated. Be especially wary of introducing students to a variety of online applets, each with its own interface, notation, terminology, and assumptions.

Many of the data sets and examples of the book are sourced from Internet sites. Where appropriate, we provide URL references to the top level, and key search terms to help locate the particular data or discussion. These references may lead to even more up-to-date data than were available when we found them for the book. The data used in the book are available on the DVD, but you may prefer to discuss the most recent versions in class.

In the following, we provide below some useful jumping off points, with the obvious caveat that many of them may move, change, or disappear altogether between the time we compile this list and you try to use it. With our apologies in advance when a link fails, we hope you find this effort of value. You'll find information on many other useful links on our website, pearsonhighered.com/dvb.

- Software – calculators and commercial software:

  education.ti.com

  activstats.com

  datadesk.com

  minitab.com

  jmp.com

  spss.com

  statcrunch.com

- Sources of data:

  fedstats.gov

  lib.stat.cmu.edu/DASL (data sets indexed by topic)

  madd.org/drunk-driving/about/drunk-driving-statistics.html

  fbi.gov/stats-services/crimestats (crime statistics)

  amstat.org/publications/jse (*Journal of Statistics Education*)

- Statistics background

  dartmouth.edu/~chance/index.html

  courses.ncssm.edu/math/Stat_Inst/Notes.htm

Part I: Exploring and Understanding Data: Chapters 1 – 5

This Part of the book covers data displays and summaries. Many students will recognize some of the material from middle and high school, so our emphasis is on statistical thinking. Of course, we define terms and provide examples. But we also discuss *why* methods presented are used, and what we hope to learn from them. These are concepts that appear throughout the course. Even more important than what to look for in a histogram or how to summarize the spread of a distribution is the underlying lesson that there *are* reasons for displaying and summarizing data. These reasons inform and motivate the entire course.

Chapter 1
Stats Starts Here

What's it about?

Chapter 1 describes the important features of the text and then gets right down to business discussing data. We've given the chapter an unusual title and tried to grab students' attention with a humorous footnote. (Some have e-mailed us to assure us that they *do* read the footnotes.) If we can get them to read three words and the footnote, maybe we can get them to read on. Then we talk about the importance of context (the W's), about variables, and we make the distinction between categorical and quantitative data. We begin to introduce the vocabulary of Statistics.

The first few chapters cover data displays and summaries. Many students will recognize some of the material from middle and high school, so our emphasis is on statistical thinking. Of course, we define terms and provide examples. But we also discuss *why* the methods presented are used and what we hope students will learn from them. These are concepts that appear throughout the course. Even more important than what to look for in a histogram or how to summarize the spread of a distribution is the underlying lesson that there are *reasons* for displaying and summarizing data. These reasons inform and motivate the entire course.

Comments

This is the students' first look at the style of the book, and we do lay it on more heavily in the first few pages than we will when discussing, say, confidence intervals. We want to shake things up. We want them to notice that this is not the same old math or science textbook they've seen before. And we'd like to get them on our side. That's the reason for the humor and self-deprecating remarks.

Every Statistics text starts with a definition of *Statistics*. We do too, but ours is different. And the difference matters. We say that Statistics is *a way of reasoning* and that the goal is *to help us understand the world.* We've found it helpful to reinforce this idea throughout the semester, especially when we get into the methods sections of the course. This book is first and primarily about statistical thinking. Methods, definitions, and skills are all here, but each is presented with the purpose of understanding the world. That's why every example follows the *Think, Show, Tell* pattern, starting with careful reasoning and concluding with a sentence or two telling what we've learned about the world.

It is valuable to get students involved with data from the start. We don't take a "big picture" approach at this time. There will be plenty of time to build models and draw inferences later. For now, let's just get our hands dirty playing with the data. When students have a good sense of what kinds of things data can say to us, they learn to listen to the data. Throughout the course, we insist that no analysis of data is complete without telling what it means. This is where that understanding starts.

Rather than head directly for the inference, we prefer to emphasize the connection between data and what data tell us about the world. No analysis is complete without a connection back to the real-world circumstances. Setting that stage is the underlying motivation for this chapter.

It is easy to be drawn into a focus on definitions, on algorithms, and on getting the "right answer." Those are easier to teach and certainly easier to grade. Please resist the temptation. If you can help your students to stay focused on statistical thinking and understanding, this course can change the way they view the world.

A Note on Features

We don't spend time in class on the features of the text. That material is meant to be read by students, not to them. Our goal here is to get the class moving and talking about data and what we can learn from data.

Looking Ahead

Technology plays an important role in this book. We expect students to use a calculator or statistics package (such as the Student *Data Desk* program supplied on the DVD or the *StatCrunch* program available online through *MyStatLab*) for finding the numerical "answers." So we won't spend much time worrying about the calculation details, although we do expect them to understand what's happening. Instead, we focus on understanding and meaning. But the book is "technology neutral." The "computer output" in the book is designed to look a lot like many packaged results, but exactly match none of them. Students should feel comfortable using almost any statistics program or graphing calculator. This is a good time to introduce whatever technology your students will be using. Have them summarize the results of a survey of the class or some other small data set of interest to them. Point them to the *On the Computer* sections found near the end of most chapters. Those sections offer instructions to help students get started on several common statistics packages and calculators.

Class Do's

One of our favorite definitions says, "Statistics is the art of distilling meaning from data." Data have a story to tell. Our objective is to uncover that story. Collect some data in class, and ask students to look for interesting facts hiding there. Get the class thinking about what the term "data" means. Students need to understand that data are not only numbers and that they must have a context (the W's). When data are quantitative, they should also have units.

There are two ways we treat data: ***categorical*** and ***quantitative***. Don't get distracted by worrying about ratio, interval, and other distinctions. These are problematic and don't matter for the concepts and methods discussed in this book. Emphasize that the distinction between treating data as categorical or quantitative may be more about how *we* display and analyze data than it is about the variable itself. The variable "sex" is data, but just because we might

label the males as 1 and the females as 0 doesn't mean that it's quantitative. On the other hand, taking the average of those 0's and 1's does give us the percentage of males. How about *age*? It is often quantitative, but could be categorical if broken down only into *child, adult,* and *senior.* ZIP code is usually categorical, but if one business had an "average" ZIP code for their customers of 10000 while another had 90000, we'd know the latter had more customers in the western United States. Emphasize the importance of the context and the W's in summarizing these data.

Every discipline has its own vocabulary, and Statistics is no exception. Students need to understand and use that vocabulary properly. Unfortunately, many Statistics words have a common everyday usage that's not quite the same. We'll be pointing those out as we go along.

One of the first vocabulary words should be *variable.* Point out that it does not mean the same thing as it did in Algebra. There, we call "*x*" a variable, but often that meant that we didn't know its value. In Statistics, a variable is an attribute or characteristic of an individual or object whose value varies from case to case.

Why do we talk about "a statistic" when we don't discuss "a mathematic" or "a physic"? Statistics is a whole that is made up of many parts, and each of those parts has its own meaning and its own story to tell. A *statistic* is a numerical summary of data. The book wisecracks that, contrary to an advertised saying, you can't be a statistic, only a datum.

Point out that summaries of data can be verbal, visual, and numerical. All are important. In fact, any complete analysis of data almost always includes all three of these.

The Importance of What You Don't Say

One of the reasons Statistics can be difficult to teach is that we often deal with vague concepts. Students and teachers both like clear definitions; they're easier to teach, learn, and grade. But reasonable people can disagree about whether a histogram is symmetric or skewed, whether a straggling point is really an outlier or just the largest value, or whether the two groups we want to compare vary by about the same amount. It is important to allow students their own opinions and insights into data. There was a time, not long ago, when our students' first question, "Why am I taking this course?" was typically answered by "It's required. Sit down and be quiet." We propose that a better answer is "So you can learn how data can tell us about the world. Stand up and tell us what you see."

This raises the issue of ethical practice in Statistics. We are engaged in an honest search for truth and understanding, and that's what should guide our (and our students') judgments. Emphasize this point now to alert students that this isn't a course about calculating the right answer, but about understanding the world.

We are laying a foundation here. Stretching up to the attic at this point just makes everyone feel unsafe. Many fundamental Statistics terms are left unmentioned in this chapter. You'll find it best to leave it that way. We'll get to them when the students have a safe place to file them along with their other knowledge. So we have an unusually long list of terms we recommend leaving for later in the course. In particular, avoid saying the following:

Population, Sample, Hypothesis, Inference. These are certainly important in this course, but we have no background for discussing them honestly now, so they would just be confusing and intimidating.

Nominal, Ordinal, Interval, Ratio. "Nominal" is used by some software packages as a synonym for "categorical" as "continuous" is used for "quantitative." These distinctions arise from studies of measurement scales. But it isn't correct to claim that each variable falls into one of these categories. It is the use to which the data are put that determines what properties the variable must have. Ordinal categorical data may come up, but there are no special techniques for dealing with ordered categories in this course. And any differences between interval- and ratio-scaled data are commonly ignored in statistical analyses

Class Examples

You might take a quick class survey. We suggest asking for things like gender, political leaning (Liberal, Moderate, Conservative), number of siblings, number of countries visited, whether they play varsity sports, GPA, height, handedness (left or right), and shoe size. Be sure to include both categorical and quantitative values. Recall what you were interested in at that age and try some carefully worded questions on those subjects. Try this question, after getting everyone's attention: Ask your students to pick a number at random between 1 and 10 and write it down quickly. (Later, you can look to see how "random" these numbers really are.) Have the data collected and duplicated, or put it up on a website before the next class. Ask the students what story the data tell about their class. If you wish, you can make a stem-and-leaf display or scatterplot of some of the data immediately.

Hints: Data are rarely as simple as they seem. Suggest these variables, then pause for some discussion. Does touching down at an airport qualify as "visiting" a country? Does an only child count herself when counting siblings? Should shoe sizes be adjusted because men's and women's size 7 are different sizes? If you write with your left hand but throw with your right, are you left-handed? Give them a chance, and they'll find other issues—and they'll be developing a healthy skepticism toward data. That's just what we want, so they'll value the tools that help them look at data more carefully.

If you don't specify units for height, you may get some values in centimeters. Alternatively, if you specify inches, you may get a "55" from someone who meant 5'5". Those outliers make for good class discussion.

If you teach a large section, consider collecting data online. There are a number of services that will let you design an online survey and will host it for a modest price, letting students respond online at their convenience and providing you with anonymous and machine-readable responses. One we have used successfully is at surveymonkey.com. You could also have students text in responses using a free service like polleverywhere.com, and discuss the results in real time.

Consider writing the numbers 17, 21, 44, and 76 on the board. Are those data? Context is critical—they could be test scores, ages in a golf foursome, or uniform numbers of the starting backfield on the football team. In each case, our reaction and what we might ask of the data changes.

Run through some other examples of data, asking about the W's, the variables (what are they, what type is each used as, and what are the units), and so on.

- A Consumer Reports article on energy bars gave the brand name, flavor, price, number of calories, and grams of protein and fat.
- A report on the Boston Marathon listed each runner's gender, country, age, and time.

Solution:

Consumer Reports
Who: energy bars
What: brand name, flavor, price, calories, protein, fat
When: not specified
Where: not specified
How: not specified. Are data collected from the label? Are independent tests performed?
Why: information for potential consumers
Categorical variables: brand name, flavor
Quantitative variables: price (US$), number of calories (calories), protein (grams), fat(grams)

Boston Marathon
Who: Boston Marathon runners
What: gender, country, age, time
When: not specified
Where: Boston
How: not specified. Presumably, the data were collected from registration information.
Why: race result reporting
Categorical variables: gender, country
Quantitative variables: age (years), time (hours, minutes, seconds)

Resources

Decisions Through Data

Video Unit 1: What Is Statistics?

ActivStats

Have your students work through the *Introduction* in *ActivStats* now to be sure there are no glitches. Most students are computer savvy enough to pop a DVD into the computer and launch it, and that's all the *ActivStats* DVD requires. *Data* examines types of data and context.

Net Links

We like the use of course Web sites. The course resources offered by Pearson to accompany the book are a good place to start. They include the service of hosting your course Web site, starting with a template that is already richly populated. (www.mystatlab.com)

Adjunct and Instructor Support Site (pearsonhighered.com/irc)

This one-stop site is designed to help you plan and prepare your course. Features include downloadable lesson podcasts that highlight the important points to cover, and all teaching tools (such as sample syllabi, extra data sets, class examples, and supplements) in one place.

And don't overlook the book's Web site, pearsonhighered.com/dvb.

Other

Read polls, studies, or other reports in newspaper and magazine articles. It's always interesting to see how well (or poorly) they provide information about the W's.

If you have a computer and projection capabilities in class, you can find daily surveys at Gallup and other polling organizations. Current data are often particularly interesting to students. But don't use results of voluntary-response online surveys. We'll be making the point that these are fatally flawed—but we can't say that clearly without concepts and terms that we haven't developed yet.

Four chapter quizzes are provided.

Statistics Quiz A – Chapter 1 ***Name _____***

1. One of the reasons that the Monitoring the Future (MTF) project was started was "to study changes in the beliefs, attitudes, and behavior of young people in the United States." Data are collected from 8th, 10th, and 12th graders each year. To get a representative nationwide sample, surveys are given to a randomly selected group of students. In Spring 2004, students were asked about alcohol, illegal drug, and cigarette use. Describe the W's, if the information is given. If the information is not given, state that it is not specified.

   - Who:
   - What:
   - When:
   - Where:
   - How:
   - Why:

2. Consider the following part of a data set:

Age (years)	Sex	Only child?	Height (inches)	Weight (pounds)	Credit Hours	GPA	Major
21	Female	Yes	67.00	140.0	16	3.60	animal science
20	Female	No	62.00	130.0	18	3.86	biology
28	Female	No	64.00	188.0	21	3.25	psychology
21	Male	No	65.00	140.0	15	2.95	psychology
24	Female	No	67.00	130.0	20	3.00	anthropology
22	Male	Yes	68.00	135.0	15	2.94	journalism

   List the variables in the data set. Indicate whether each variable is treated as categorical or quantitative in this data set. If the variable is quantitative, state the units.

Statistics Quiz A – Chapter 1 – Key

1. One of the reasons that the Monitoring the Future (MTF) project was started was "to study changes in the beliefs, attitudes, and behavior of young people in the United States." Data are collected from 8th, 10th, and 12th graders each year. To get a representative nationwide sample, surveys are given to a randomly selected group of students. In Spring 2004, students were asked about alcohol, illegal drug, and cigarette use. Describe the W's, if the information is given. If the information is not given, state that it is not specified.
   - Who: 8th, 10th, and 12th graders
   - What: alcohol, illegal drug, and cigarette use
   - When: Spring 2004
   - Where: United States
   - How: survey
   - Why: "to study changes in the beliefs, attitudes, and behavior of young people in the United States"

2. Consider the following part of a data set:

Age (years)	Sex	Only child?	Height (inches)	Weight (pounds)	Credit Hours	GPA	Major
21	Female	Yes	67.00	140.0	16	3.60	animal science
20	Female	No	62.00	130.0	18	3.86	biology
28	Female	No	64.00	188.0	21	3.25	psychology
21	Male	No	65.00	140.0	15	2.95	psychology
24	Female	No	67.00	130.0	20	3.00	anthropology
22	Male	Yes	68.00	135.0	15	2.94	journalism

   List the variables in the data set. Indicate whether each variable is treated as categorical or quantitative in this data set. If the variable is quantitative, state the units.

   Categorical: sex, only child?, major
   Quantitative: age (years), height (inches), weight (pounds), credit hours, GPA

Statistics Quiz B – Chapter 1 ***Name _____***

In November 2003 *Discover* published an article on the colonies of ants. They reported some basic information about many species of ants and the results of some discoveries found by myrmecologist Walter Tschinkel of the University of Florida. Information included the scientific name of the ant species, the geographic location, the depth of the nest (in feet), the number of chambers in the nest, and the number of ants in the colony. The article documented how new ant colonies begin, the ant-nest design, and how nests differ in shape, number, size of chambers, and how they are connected, depending on the species. It reported that nest designs include vertical, horizontal, or inclined tunnels for movement and transport of food and ants.

1. Describe the W's, if the information is given:
    - Who:
    - What:
    - When:
    - Where:
    - How:
    - Why:

2. List the variables. Indicate whether each variable is categorical or quantitative. If the variable is quantitative, tell the units.

Statistics Quiz B – Chapter 1 – Key

In November 2003 *Discover* published an article on the colonies of ants. They reported some basic information about many species of ants and the results of some discoveries found by myrmecologist Walter Tschinkel of the University of Florida. Information included the scientific name of the ant species, the geographic location, the depth of the nest (in feet), the number of chambers in the nest, and the number of ants in the colony. The article documented how new ant colonies begin, the ant-nest design, and how nests differ in shape, number, size of chambers, and how they are connected, depending on the species. It reported that nest designs include vertical, horizontal, or inclined tunnels for movement and transport of food and ants.

1. Describe the W's, if the information is given:
    - Who: Colonies of ants. "Many species of ants," but no indication of exactly how many.
    - What: scientific name, geographic location, average nest depth, average number of chambers, average colony size, how new ant colonies begin, the ant-nest design, and how nests differ in architecture.
    - When: November 2003
    - Where: not specified
    - How: The results of some discoveries found by myrmecologist Walter Tschinkel of the University of Florida
    - Why: Information of interest to readers of the magazine

2. List the variables. Indicate whether each variable is categorical or quantitative. If the variable is quantitative, tell the units.

    Categorical: species, geographic location, how new ant colonies begin, and nest design.
    Quantitative: nest depth (feet), number of chambers (units), and colony size (units).