Review

- Identify the population and the sample
  - 38 nurses working in the San Francisco area were surveyed concerning their opinions of managed health care.
  - A survey of 898 U.S. adult VCR owners found that 16% had VCR clocks that were currently blinking "12:00".
- Determine whether the numerical value describes a parameter or a statistic.
  - The 2003 team payroll of the Baltimore orioles was $69,452,275.
  - In a survey of a sample of U.S. adults 62% owned a portable cellular phone.

Data Classification

Unit 1-2

Types of Data

- When doing a study, it is important to know the kind of data involved. The nature of the data you are working determines the amount of information contained in the data and indicates the most appropriate data summarization and statistical analysis. In this section, you will learn how to classify data by type and by level of measurement. Data sets can consist of two types of data:
  - Qualitative Data: consists of attributes, labels or nonnumerical entries. (statistical analysis is fairly limited)
  - Quantitative Data: consists of numerical

Example1

Model	Base Price
ZX2	$13,750
Focus LX	$13,800
Ranger XL	$14,720
Taurus LX	$20,490
Explorer Sport-Trac	$23,840
Crown Victoria	$24,515
Windstar LX	$27,000
Expedition XLT	$34,710

- The base prices of several vehicles are shown in the Table to the left. Which data are qualitative and which are quantitative? Explain your reasoning.

Example 2

City	Population
Baltimore, MD	638,614
Boston, MA	589,281
Dallas, TX	1,211,467
Las Vegas NV	508,604
Lincoln, NE	232,362
Seattle, WA	570,426

- The population of several U.S. cities are shown in the table. Which data are qualitative and which are quantitative? Explain your reasoning.

Levels of Measurement

- Another characteristic of data is it's level of measurement. The level of measurement determines which statistical calculations are meaningful. The four levels of measurement, in order from lowest to highest, are *nominal*, *ordinal*, *interval*, and *ratio*.
  - Data at the nominal level of measurement are qualitative only. Data at this level are categorized using names, labels or qualities. No mathematical computations can be made at this level.
  - Data at the ordinal level of measurement are qualitative or quantitative. Data at this level can be arranged in order, but differences between data entries are not meaningful.
  - Data at the interval level of measurement are quantitative. The data can be ordered, and you can calculate meaningful differences between data entries. At the interval level, a zero entry simply represents a position on a scale; the entry is not an inherent zero.

Inherent Zero

- An inherent zero is a zero that implies “none”. For instance, the amount of money you have in a savings account could be zero dollars. In this case, the zero represents no money; it is an inherent zero. On the other hand, a temperature of 0˚ C does not represent a condition in which no heat is present. The 0˚ C temperature is simply a position on the Celsius scale. It is NOT an inherent zero.
- An easy way to distinguish between the interval and ratio level is to determine whether the expression ”twice as much” has any meaning in the context of the data. For example $2 is twice as much as $1, so these

Nominal Level of Measurement

Network Affiliates in Portland Oregon
KATU – ABC
KGW - NBC
KOIN - CBS
KPTV - FOX

- This data set consists of the call letters of each network affiliate in Portland. The call letters are simply names of the network affiliates, so these data are at the nominal level.

Ordinal Level of Measurement

Top 5 TV Programs (from 3/08/04 to 3/14/04)	
1.	CSI
2.	American Idol – Tuesday
3.	American Idol - Wednesday
4.	Without a Trace
5.	Survivor

- This data set lists the rank of 5 TV programs. The data consist of the ranks 1,2, 3, 4, and 5. Because the rankings can be listed in order, these data are at the ordinal level. Note: The difference between the rank of 1 and 5 has no

Interval Level of Measurement

New York Yankees' World Series Victories (Years)				
1923	1927	1928	1932	1936
1937	1938	1939	1941	1943
1947	1949	1950	1951	1952
1953	1956	1958	1961	1962
1977	1978	1996	1998	1999
2000	2009			

- This data set quantitative data. Consider the dates the Yankees' World Series victories. It makes to find the differences between specific dates. For instance, the time between the Yankees' first and last World Series. 2009-1923 is 86 years. Note: it does not make sense to

tio Level of Measurement

2003 National League Home Run Totals (by Team)	
Atlanta	235
Arizona	152
Chicago	172
Cincinnati	182
Colorado	198
Florida	157
Houston	191
Los Angeles	124
Milwaukee	196
Montreal	144
New York	124
Philadelphia	166
Pittsburgh	163
San Diego	128
San Francisco	180
St. Louis	196

- Using the home run totals data, you can find differences and write ratios. From the data, you can see that Milwaukee hit 52 more homeruns than Montreal hit and that Atlanta hit twice as many home runs as Los Angeles hit. So, these data are at the ratio level.

Summarization

Level of Measurement	Put Data in Categories	Arrange data in order	Subtract data values	Determine if one data value is a multiple of another
Nominal	Yes	No	No	No
Ordinal	Yes	Yes	No	No
Interval	Yes	Yes	Yes	No
Ratio	Yes	Yes	Yes	Yes

Practice

- Consider the following data sets. For each data set, decide whether the data are at the nominal level or at the ordinal level.
  1. The final standings for the Northeast Division of the National Hockey league.
  2. A collection of phone numbers.

Practice

- Consider the following data sets. For each data set, decide whether the data are at the interval level or at the ratio level.
  1. The body temperature (in degree's Fahrenheit) of an athlete during an exercise session.
  2. The heart rates (in beats per minute) of an athlete during an exercise session.

	Examples of Data Set	Meaningful Calculations
Nominal Level *(Qualitative data)*	*Types of Music played by a radio station* Pop Modern Rock Contemporary jazz Hip hop	***Put in a category*** For instance a song played by the radio station could be put into one of the four categories shown .
Ordinal Level (*Qualitative or Quantitative data*)	*Modern Picture Association of America ratings description* G – General Audiences PG – Parental Guidance Suggested PG -13 – Parents Strongly Cautioned R – Restricted NC- 17 – No one under 17 Admitted.	*Put in a category and* ***put in order.*** For instance, a PG rating has a stronger restriction than a G rating
Interval Level (*Quantitative data*)	*Average Monthly Temperature (in degrees Fahrenheit) for Sacramento, CA* Jan – 46 Jul – 75 Feb – 51 Aug – 74 Mar – 55 Sep – 72 Apr – 59 Oct – 64 May – 65 Nov – 53 Jun – 71 Dec - 46	*Put in a category, put in order,* ***and find differenced between values.*** For instance, 71 – 65 = 6 degrees, So June is 6 degrees warmer than May.
Ratio Level (*Quantitative data*)	Average Monthly Rainfall in inches for Sacramento Jan – 3.8 Jul – 0.1 Feb – 3.5 Aug – 0.1 Mar – 2.8 Sep – 0.4 Apr – 1.0 Oct – 0.9 May – 0.5 Nov – 2.2 Jun – 0.2 Dec – 2.5	*Put in a category, put in order, find differences between values****, and find ratios of values.*** For instance, 1.0/0.5= 2. So there is twice as much as rain in April as in May.