

Chapter 1

What Is Statistics?

1.
 - a. Interval
 - b. Ratio
 - c. Nominal
 - d. Nominal
 - e. Ordinal
 - f. Ratio **(LO1-5)**
2.
 - a. Ratio
 - b. Nominal
 - c. Ratio
 - d. Ratio **(LO1-5)**
3. Answer will vary. **(LO1-5)**
4.
 - a. Sample
 - b. Population
 - c. Population
 - d. Sample **(LO1-3)**
5. Qualitative data is not numerical, whereas quantitative data is numerical. Examples will vary by student. **(LO1-4)**
6. A population is the entire group which you are studying. A sample is a subset taken from a population. **(LO1-3)**
7. Discrete variables can assume only certain values, but continuous variables can assume any values within some range. Examples will vary. **(LO1-4)**
8.
 - a. A population is used because the professor likely has grades readily available from every student over the past 5 years.
 - b. A population is used because the information is easy to find.
 - c. A population is used because you are interested in the top five companies.
 - d. During a selected season, a random sample of days would be selected, and the electricity consumed recorded. **(LO1-3)**
- 9.

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- a. Ordinal
 - b. Ratio
 - c. The newer system provided information on the distance between exits. **(LO1-5)**
10. The cell phone provider is nominal level data. The minutes used are ratio level. Satisfaction is ordinal level. **(LO1-5)**
- 11.
- a. The ranking of wearable technologies would most likely be based on a population. All possible brands and models could be listed.
 - b. Since the ratings are self-reported, it is very likely that not all users submitted a rating. Therefore, the ratings are a sample or a subset of the population. **(LO1-3)**
12. In a presidential election all votes are counted, thus it is similar to a census of the entire population. However, an “exit” poll consists of only some voters and thus is more like a sample of the entire population. **(LO1-3)**

13.

	Discrete	Continuous
Qualitative	b. Country d. Energy drink preference g. Student rank in class h. Rating of a finance professor	
Quantitative	c. Sales volume of treadmills f. SAT scores i. Number of home video devices	a. Salary e. Temperature

	Discrete	Continuous
Nominal	b. Country	
Ordinal	d. Energy drink preference g. Student rank in class h. Rating of a finance professor	
Interval	f. SAT scores	e. Temperature
Ratio	c. Sales volume of treadmills. i. Number of home video devices	a. Salary

(LO1-4 and LO1-5)

14. Answers will vary. (LO1-5)

15. As a result of these sample findings, we can conclude that $120/300$ or 40% of the white-collar workers would transfer outside the U.S. (LO1-3)

16. The obvious majority of consumers ($400/500$, or 80%) believe the policy is fair. On the strength of these findings, we can anticipate a similar proportion of all customers to feel the same. (LO1-3)

17.

- a. From differences, it is clear that the sales of almost every brand decreased from 2019 to 2020. The primary causes are the effects of the COVID pandemic on the economy and the manufacturing supply chain.

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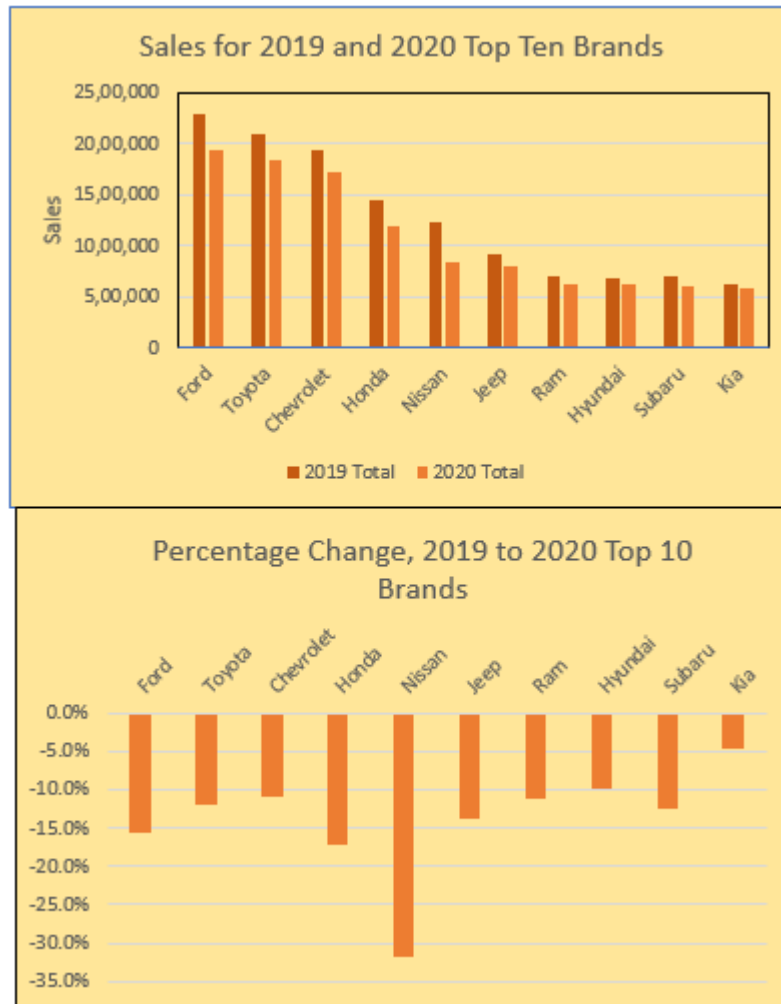
Brand	Difference
Tesla	97,777
Volvo	1,903
Mazda	526
Alfa Romeo	291
Porsche	-4,282
Genesis	-4,853
Fiat	-4,900
Lincoln	-6,702
Volkswagen	-7,638
Mini	-8,118
Jaguar	-9,219
Land Rover	-14,703
Chrysler	-16,687
Acura	-20,403
Lexus	-23,070
Cadillac	-26,755
Mercedes-B	-27,421
Kia	-28,608
Mitsubishi	-33,663
Audi	-37,486
Infiniti	-38,205
Buick	-44,177
BMW	-44,528
GMC	-49,637
Hyundai	-68,846
Ram	-78,386
Subaru	-88,179
Jeep	-127,986
Dodge	-155,562
Chevrolet	-212,006
Toyota	-247,308
Honda	-251,180
Ford	-355,230
Nissan	-390,211

- b. This analysis shows that only Tesla, Volvo, and Alfa Romeo were able to sustain an increase in sales from 2019 to 2020. All other brands experienced decreases in sales ranging from 2.1 to 53.2 percent. Over time, decreases like these are very unusual. Again, the data reflects the effects of the pandemic.

Brand	Percent Change from 2019
Tesla	50.1%
Volvo	1.8%
Alfa Romeo	1.6%
Mazda	0.2%
Volkswagen	-2.1%
Kia	-4.7%
Lincoln	-6.0%
Porsche	-7.0%
Lexus	-7.7%
Mercedes-Benz	-7.8%
GMC	-8.8%
Hyundai	-10.0%
Chevrolet	-10.9%
Ram	-11.1%
Toyota	-11.9%
Subaru	-12.6%
Acura	-13.0%
Chrysler	-13.1%
BMW	-13.7%
Jeep	-13.9%
Land Rover	-15.5%
Ford	-15.6%
Audi	-16.7%
Cadillac	-17.1%
Honda	-17.3%
Buick	-21.3%
Mini	-22.4%
Genesis	-22.9%
Mitsubishi	-27.8%
Jaguar	-29.7%
Nissan	-31.8%
Infiniti	-32.5%
Dodge	-36.8%
Fiat	-53.2%

- c. These graphs help to show the comparison in sales and percent change in sales for 2019 and 2020. In general, they show that each of the top ten auto brands lost sales from 2019 to 2020. Further, the percent decreases ranged from about 30% for Nissan to 5% for Kia.

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(LO1-2)

18. The total amount spent is \$603.86. The precents by group are: 75, 14, 4, and 7, respectively. (LO1-2)
19. The graph shows that earnings increase about \$15 billion per year over the period. However, 2008 sees a very large increase and 2009 sees a large decrease. Perhaps the earnings were affected by the “Great Recession” during the years 2008-2010. Perhaps the variability of earnings from 2013 to 2017 are related to supply and demand of oil. Supply may have increased with new production in North Dakota. Demand may be affected by other sources of energy, such as wind and solar energy generation. Also, the use of natural gas to generate energy may be substituting for oil. In 2020, the earnings were most likely affected by the global COVID pandemic.

(LO1-2)

20.

a. **Qualitative** variables: Pool, Garage, Township, Mortgage type, Default **Quantitative** variables: Price, Bedrooms, Size, Baths, FICO Years **(LO1-4)**

b. **Price** measured in dollars: Continuous, Ratio scale

Agent: Nominal

Bedrooms are counted: Discrete, Ordinal??? Ratio scale

Size measured in area of square feet: Contiguous, Ratio scale

Pool measured as present or not: nominal

Garage measured as present or not: nominal

Baths are counted: Discrete, Ordinal?? Ratio scale

Township is labeled: nominal

Mortgage type measures as adjustable or fixed: nominal

FICO is an index of a person's ability to pay their bills: ratio

Years are counted: ordinal

Default: measured as yes or no: nominal **(LO1-5)**

21.

a. League is a qualitative variable; the others are quantitative. **(LO1-4)**

b. League is a nominal level variable; the others are ratio level variables. **(LO1-5)**

22.

a. Bus Number, Manufacturer, and engine type are qualitative variables, the others are quantitative. **(LO1-4)**

b. Bus Number, Manufacturer, and Engine Type nominal level variables; the others are ratio level variables. **(LO1-5)**