1. Identify each of the following as a variable or a constant. Explain the reasons for your choices.

a. The number of days in a week.
b. People's attitudes toward abortion.
c. The country of birth of presidents of the United States.
d. The value of a number divided by itself.
e. The total number of runs scored in baseball games
f. The number of days in each of the twelve months in a year.

2. Identify each of the following as a variable or a constant. Explain the reasons for your choices.

a. An individual's attitude toward abortion at a specific point in time.
b. The number of days in February.
c. People's opinion of the death penalty.
d. Grade Point Average (GPA).
e. The number of hairs on someone's head.
f. The time it takes to complete a homework assignment.
g. A student's semester GPA at the end of the semester.
h. The number 12.

3. Identify each of the following as a qualitative or a quantitative variable:

a. age
b. religion
c. yearly income
d. weight
e. gender
f. eye color
g. college major
h. political party
i. temperature

4. Identify each of the following as a qualitative or a quantitative variable.

a. a person's name
b. goals scored by a hockey team
c. length of a rope
d. shoe color
e. movie titles
f. duration of a movie
g. number of licks to get to the center of a Tootise Roll pop
h. University attended
i. brain activity as measured via EEG
j. camera price
5. Define each of the following, in your own words.
   a. What is a population?
   b. What is a sample?
   c. Null hypothesis
   d. Alternate hypothesis

6. Define each of the following, in your own words.
   a. Independent variable
   b. Dependent variable
   c. Extraneous variable
   d. Confounding variable
   e. Control variable

7. How is a sample used to make conclusions about the population?

8. What is the main difference between an experimental design and a correlational design?

9. Answer each of the following, in your own words.
   a. What are descriptive statistics used for?
   b. What are inferential statistics used for?

10. Answer each of the following, in your own words.
    a. What is the difference between a statistic and a parameter?
    b. What types of symbols are, typically, used for statistics and parameters?

11. Distinguish between a dependent variable and an independent variable

12. Distinguish between a between-subjects independent variable and a within-subjects independent variable.

For Exercises 13 – 16, identify the independent variable and the dependent variable in the scenario, and indicate whether each variable is quantitative or qualitative.

13. An antidepressant drug has been shown to have positive results on alleviating depression. To examine the drug’s effectiveness on reducing depression, Dr. Leary administers different dosages of the drug (0-mg, 10-mg, 20-mg, 30-mg, 40-mg, and 50-mg) to six different groups, and then measures the amount of brain activity in each individual; where brain activity is a measure of depression.

14. In a classic study on aggression, Eron (1963) studied the relationship between the amount of violent television shows watched by young children and the amount of aggressive behavior they showed toward peers. Eron questioned the parents of over 800 children about their child’s television viewing habits; and Eron created a four-point scale to measure preference for violent television. Aggressive behavior was measured by collecting ratings of each child by two or more children who knew the child in the study. Ratings ranged from 0 - 32, with higher scores indicating more aggressive behavior.
15. Rosenthal and Fode (1963) examined the effect of experimenter bias on the ability of rats to learn to navigate a maze. Subjects were told that they were going to teach a rat to learn to navigate a maze. One group of subjects was told that their rats were genetically smart, “maze bright” rats that should show learning during the first day and performance should increase. A second group of subjects was told their rats were genetically dumb, “maze-dull” rats that should show very little evidence of maze learning. Subjects trained their rats to enter one of two sections of a maze, by rewarding the rat when they entered the correct section. Subjects measured the number of times the rat entered the correct section of the maze each day.

16. Shepard and Metzler (1971) studied the ability of humans to ‘mentally rotate’ the image of an object. Subjects were shown two pictures, like those to the right, and then had to decide whether the two objects were the same shape, or were mirror images of the same shape. The angle of rotation separating the two objects varied from 0° to 180° in 15° increments. Subjects were assessed on how quickly they could correctly respond whether the objects were the same, or were mirror images.

17. What is the main purpose of random selection?

18. What is the main purpose of random assignment? When is it used?

19. Give two examples of a population and a sample of that population. For each of your examples, be sure that the sample is related to the population.

20. Use the following scenario to answer a – f below: Dr. Evil has given up evil to start a potato chip company that will distribute potato chips to undergraduates in the United States. Dr. Evil wants to know what potato chip flavor undergraduates like best. He asks 100 undergraduates to taste each of four potato chip flavors (1) BBQ, (2) Plain, (3) Ranch, and (4) Super-Evil. Each student gives a rating on a scale of 1 to 10 on how much they like each flavor, with 10 indicating they really like the flavor. The average ratings for each of the four chip flavors are 4.5 for BBQ, 6.7 for Plain, 2.5 for Ranch and 9.5 for Super-Evil.

   a. The population in this scenario is...
   b. The sample in this scenario is...
   c. “Fred” rates the Super-Evil Flavored chips a 10. This rating is a...
   d. The average ratings in the scenario is(are) a...

21. Use the following scenario to answer a – e below: Dr. Logan is interested in the relationship between playing violent video games and aggression in adolescent males. He randomly selects 1000 adolescent males from around New York city and administers a survey for the types of video games that each adolescent male likes to play. He then obtains measures of each adolescent male's aggression by asking each adolescent male's teacher to provide a "toughness rating" on a scale from 1 to 10. The average toughness rating for these adolescent males is 4.56.

   a. The population is...
   b. The sample is the...
   c. "Timmy," one of the adolescent males, scores a 7 on the toughness rating. This value of 7 is a...
   d. The average toughness rating is a...
   e. Is the types of video games that each adolescent male likes to play a qualitative or quantitative variable?
22. Use the following scenario to answer a – g below: Dr. Smith wants to determine whether playing music during class causes statistics students to pay more attention. He has three stats classes with 40 students/class. For one semester he teaches his morning class while playing Snoop Dogg, in his afternoon class he plays Dio and in his night class he plays no music (a control). During each class meeting, Dr. Smith counts the number of students that fall asleep. He finds an average of 6 students per meeting fall asleep in his morning class, 2 students per meeting fall asleep in his afternoon class and 5 students per meeting fall asleep in the night class.

a. The population in this scenario is...
b. The sample in this scenario is...
c. In one of Dr. Smith’s night classes, he counts 14 students that fall asleep. This number is...
d. The average of 6 students that fall asleep in the morning class is...
e. The use of different music in each class is a...
f. Counting the number of students that fall asleep uses what kind of measurement scale?
g. Before Dr. Smith can draw any conclusions about the effect of music on statistics student’s paying attention in class, Dr. Smith will need to use...

23. The town of Petoria (population = 75000) is holding a local election for mayor between candidates Bill Hicks and Peter Swanson. The local newspaper conducts a survey by asking readers to indicate their preference for Bill Hicks or Peter Swanson, by sending in a ballot provided in the paper with their preference indicated. One week later the newspaper reported it received 2500 ballots, of which 2000 favored Bill Hicks. The next day, newspaper printed a story claiming that Bill Hicks would win a landslide in the upcoming election. Based on this information, is the newspaper’s sample representative of Petoria? Why or why not? What implication does this have for the newspaper’s prediction about the election?

24. Identify whether each measure is a nominal measure, ordinal measure, interval measure, or ratio measure. Explain the reasons for your choices.

a. A cognitive scientist measures the time to solve a puzzle in seconds.
b. A historian groups the books on his shelf based on category.
c. A professor lists the publications on his curriculum vita in alphabetical order based on last names of the authors.
d. Students are asked to rate their political attitude on a scale from -5 (liberal) to 5 (conservative). The morning weather usually reports the temperature in degrees Fahrenheit.
e. A professor counts the number of students that come to his office each week.

25. Indicate whether each measure is a nominal measure, ordinal measure, interval measure, or ratio measure. Explain the reasons for your choices.

a. inches on a yardstick
b. Social Security numbers
c. dollars as a measure of income
d. order of finish in a car race
26. Indicate whether each measure is a nominal measure, ordinal measure, interval measure, or ratio measure. Explain the reasons for your choices.

   a. The speed of a slap-shop made by a hockey player.
   b. The movie titles in your DVD collection.
   c. First through third place in a pie-tasting contest.
   d. Temperature measured in degrees-kelvin.
   e. Temperature measured in degrees Celsius.
   f. The number of baseball cards in a collection.
   h. Your name.

27. Indicate whether each of the following variables is discrete or continuous.

   a. Height       b. gross domestic product    c. happiness     d. grains of sand in a sandbox

28. Identify each of the following as a qualitative or a quantitative variable:

   a. weight      b. religion          c. income        d. age        e. gender      f. eye color
ANSWERS

1. 
   a. Constant: because any week can only have 7 days  
   b. Variable: because some people can be for abortion but other can be against abortion.  
   c. Constant: because all US presidents must be born in the US.  
   d. Constant: a number divided by itself is results 1.  
   e. Variable: because it is impossible to know how many points will be scored.  
   f. Variable: because there can be 28, 29, 30, or 31 days in a month. 

2. 
   a. Constant: An individual’s attitude toward abortion cannot change at a specific point in time, but can change over time.  
   b. Variable: February can have 28 or 29 days  
   c. Variable: Everyone has a different opinion  
   d. Variable: Your GPA will be influenced by how well you do during the semester and can change depending on your grades.  
   e. Variable: Hairs grow and fall out all of the time  
   f. Variable: A homework assignment may take a little or a long time, depending on how well you know the material.  
   g. Constant: Once the GPA is known it cannot be changed.  
   h. Constant: A 12 is a 12 is a 12 and does not change. 

3. 
   a. quantitative  
   b. qualitative  
   c. quantitative  
   d. quantitative  
   e. qualitative  
   f. qualitative  
   g. qualitative  
   h. qualitative  
   i. quantitative  

4. 
   a. qualitative  
   b. quantitative  
   c. quantitative  
   d. qualitative  
   e. qualitative  
   f. quantitative  
   g. quantitative  
   h. qualitative  
   i. quantitative  
   j. quantitative  

5. 
   a. A population includes all of the people in a group that you are studying.  
   b. A sample is a smaller, subgroup that has been selected from the population.  
   c. The hypothesis that says there will be no difference between the observed outcome and the expected outcome.  
   d. The hypothesis that says there will be a difference between the observed outcome and the expected outcome. 

6. 
   a. The variable that changes or differs between groups or situations, which can be manipulated or naturally differ between groups.  
   b. The variable that is being measured.  
   d. A random variable that is unrelated to a study and is allowed to vary uncontrolled  
   e. An extraneous variable that changes as the levels of the independent variable changes, such that any observed changed in a dependent variable could be due to the independent variable or the confounding variable.  
   f. Any variable whose levels are held constant in order to reduce the possibility if it becoming a confound.
7. A sample is randomly selected from the population, meaning that individuals are selected from the population without bias. The sample should then be a good representative of the population; hence, whatever is found in the sample should be what would be found in the population.

8. Experimental designs include an independent variable and a dependent variable; correlational designs do not include an independent variable.

9. 
   a. Descriptive statistics are used to summarize data belonging to a variable. Descriptive statistics provide a single, representative value that summarizes all of the values in a set of data.
   b. Inferential statistics are used for assessing relationships between variables, and are also used to determine the likelihood that what is found in a sample would be found in a population.

10. 
   a. A statistic is a descriptive or inferential statistic that comes from the data provided in a sample; whereas a parameter is a descriptive or inferential statistic that comes from the data provided in a population.
   b. Symbols for statistics typically include upper and lowercase English letters, such as $M$, $SD$, $s$. Symbols for parameters typically include Greek letters, such as $\mu$ and $\sigma$.

11. A dependent variable is a variable being measured. An independent variable is a variable that differs between situations and can be naturally occurring (male vs. female) or manipulated.

12. A between subjects independent variable differs between groups of individuals, that is, an individual is exposed to one and only one level of the independent variable. A Within subjects independent variable differs across time or situations for the same person, that is, a person is exposed to each level of the independent variable.

13. Independent variable: Dosage of drug, which is quantitative (the levels differ in mg)
Dependent variable: Brain activity, which is quantitative [Note, ‘Depression’ is not correct—this is the construct]

14. Independent Variable: Children’s preference for violent television shows, which is quantitative.
Dependent Variable: The peer ratings of aggression, which is quantitative.

15. Independent Variable: Whether subjects believed their rat was maze-bright or maze-dull, which is qualitative.
Dependent Variable: Number of times the rat entered the correct section of the maze, which is quantitative

16. Independent Variable: The angle of rotation between the objects, which is quantitative.
Dependent Variable: The speed that the subjects could correctly identify whether the objects were the same of mirror images, which is quantitative.

17. Every individual in a population has an equal chance of being selected for a sample. The purpose of random selection is to create a sample that is representative of a population, by selecting individuals
from a population at random and without bias. Thus, any individual differences in a population are likely to be represented in the sample.

18. The purpose of random assignment is to distribute individual differences equally between groups, that is, to create groups that are as equal as possible. Random assignment is used in between subject experimental designs.

19. For examples of populations and samples, we want to see that the sample could be part of the given population; for example, the population could be all NFL players, and a sample could be an NFL team.

20. 
   a. All undergraduates in the US
   b. The 100 undergraduates who rated the potato-chips
   c. Measurement, or raw data, or datum
   d. descriptive statistic (or a sample statistic)

21. 
   a. All adolescent males, but it could be restricted to all adolescent males living in New York.
   b. The 1000 adolescent males living in New York that Dr. Logan surveys.
   c. Measurement, or a datum, or a raw data point.
   d. Sample statistic, or a descriptive statistic.
   e. Qualitative

22. 
   a. All statistic students.
   b. The students in Dr. Smith's three statistics classes.
   c. A measurement, a raw data point, or a datum.
   d. Descriptive statistic, or a sample statistic.
   e. Independent variable.
   f. Ratio, because you can have a value of zero and negative frequencies would be impossible.
   g. Inferential statistics

23. The sample is probably not representative, because the ballots came from only those individuals who read the newspaper and decided to send in the ballot. Thus, because the sample is probably not representative of the community, the conclusion that Bill Hicks will win the election is probably not reliable.

24. 
   a. Ratio, because the units are equal increments across all of the measures, and you can have a true zero-point.
   b. Nominal, because the book categories are not being organized along a dimension that conveys any of magnitude.
   c. Ordinal, because the listing of the publications is based on the order in which letters occur in the alphabet.
   d. Ordinal, although the values are equal increments, it cannot be known how much more liberal or conservative two adjacent numbers are; all you can know is the relative position.
   e. Interval, because the units are equal increments across all of the measures, but there is no true zero point because there can be negative temperature values.
f. Ratio, because the units are equal increments across all of the measures, there is a true zero point and it is possible to form ratios

25.
a. Ratio, because scale units are equal across all measures, you can have a zero-point, and you can for ratios for lengths.
b. Nominal, because these provide only a qualitative identity for an individual and there is no systematic order them.
c. Ratio, because you can have an income of zero, you can form ratios with dollars, and the incremental difference is equal.
d. Ordinal, because you only know the relative order of finishing.

26.
a. Ratio, because you can have a slap-shot with a speed of zero (no slap-shot) so there is a true zero point.
b. Nominal because these provide only an identity for the movies in your DVD collection.
c. Ordinal, because you know the order in which people finish, but not how fast people were going.
d. Ratio, because there is a true zero point where 0-Kelvin means matter ceases.
e. Interval, because there is no true zero point as there can be negative values.
f. Ratio, because you can have zero baseball cards and one person could have n-times the number of cards as someone else.
g. Ordinal, because you can only determine where someone’s grade lies relative to others, but not by how much.
h. Nominal, because there is no quantitative information associated with just a name.

27.
a. continuous  
b. discrete  
c. continuous  
d. discrete

28.
a. quantitative  
b. qualitative  
c. quantitative  
d. quantitative

e. qualitative  
f. qualitative