Read each question carefully. Make sure you answer every part of every question.

1. Massachusetts General Hospital wanted to get an idea of the average hospital stay of patients who had circulatory problems. They looked at the records of 350 patients and found that the average was 4.7 days.
   a. Describe the population of interest in this study.
      
      All patients at Massachusetts General Hospital who had circulatory problems
   b. Describe the sample for this study.
      
      The 350 patients whose records they examined
   c. What is the variable in this study?
      
      Length of hospital stay (days)

2. Alex decided to bring a snack and beverage in to his Block 4 class. Of the 21 people, he asked 4 students in the class whether they preferred cupcakes, donuts, or brownies and whether they preferred coffee or orange juice.
   a. Alex found that 50% of the students asked preferred cupcakes. Is this a descriptive statistic or inferential statistic? Explain your answer using complete sentences.
      
      Descriptive statistic since Alex's value of 50% came from him actually collecting data.
   b. Is Alex's data set univariate or bivariate? Explain your answer using complete sentences.
      
      Bivariate since there are two values collected from each individual – snack and beverage.
3. Classify each of the following attributes as either categorical or numerical. For those that are numerical, determine whether they are discrete or continuous.

a. Number of pages in the 25 best-selling mystery novels
   \[ \text{discrete numerical} \]

b. Temperatures inside 10 pizza ovens in degrees Fahrenheit
   \[ \text{continuous numerical} \]

c. Ratings of textbooks (poor, fair, good, excellent)
   \[ \text{categorical} \]

d. Times required to complete a game of Monopoly
   \[ \text{continuous numerical} \]

4. Ages of children in Wonder Years day care center were recorded.

a. Is this numerical data considered discrete or continuous? Explain your answer.
   \[ \text{Continuous, since age is measured (on a timeline)} \]

b. It is found that the average age of a child at Wonder Years daycare is about 3.25 years. Is this a descriptive statistic or inferential statistic? Explain your answer.
   \[ \text{Descriptive statistic since the value of 3.25 is found by collecting the actual data of all the students.} \]

c. Based on the data collected, it is expected that the average age of a child in any daycare in NH is about 3.25 years. Is this a descriptive statistic or inferential statistic? Explain your answer.
   \[ \text{Inferential statistic since the value is not based on collecting the actual data from all students in daycare in NH - just Wonder Years.} \]
5. The article “Television’s Value to Kids: It’s All in How They Use It” (Seattle Times, July 6, 2005) described a study in which researchers analyzed standardized test results and television viewing habits of 1700 children. They found that children who averaged more than two hours of television viewing per day when they were younger than 3 tended to score lower on measures of reading ability and short term memory.

a. Is the study described an observational study or an experiment? Explain.

Observational Study since no treatment is given to the subjects—just a survey.

b. Describe the independent variable.

Television viewing habits

c. Describe the dependent variable.

Standardized test scores for reading and short term memory

d. Explain the concept of confounding variable in the context of this study. Include an example of a possible confounding variable.

Home environment (such as whether the children were read to by their parents) since this attribute might affect the standardized test scores of the children rather than the TV habits.

6. Two different survey questions regarding illegal immigrants were given to a sample. In one survey, subjects were asked, “Should illegal immigrants be prosecuted and deported for being in the US illegally, or shouldn’t they?” In the second survey, subjects were instead asked, “Should illegal immigrants be given a chance to keep their jobs and eventually apply for legal status?”

a. Do you expect that the results of the two surveys reported similar stances on illegal immigrants? Explain.

No—the first survey seems biased since it includes wording that has a negative connotation (“prosecuted”, “illegally”, etc) whereas the second survey includes wording that has a positive connotation.

b. The two surveys are examples of which type of sampling bias?

Measurement bias—the first will likely encourage negative responses whereas the second would encourage positive responses.
7. What type of sampling bias is described in each of the following situations? Explain your answer using complete sentences.

a. One part of the Demographic and Health Surveys Program is concerned with measures of malnutrition. Investigators measure physical aspects of growing children, and attempt to document the physical characteristics of a population at different ages. Sadly, in some countries many children die early, and thus a bias is introduced in the study when the investigators cannot collect the data from the deceased children.

   **Nonresponse bias since responses from individuals in the selected sample can not be collected (since they died).**

b. SHS is deciding whether to change their cell phone policy. They want to choose a policy that satisfies everyone in the school – faculty, students, and administration. The principal and deans devise a new policy and present it to the faculty for feedback.

   **Selection bias (aka undercover) since the selected sample excluded key groups of the population (students).**

8. Faculty at Phillips Exeter wished to investigate how long students spent doing homework the week before winter break. The head of the math department went to the school library and asked the first 30 students he saw.

a. What type of sampling method was used to obtain their sample? Simple Random, Stratified Random, Cluster, Systematic, or Convenience?

   **Convenience Sample**

b. Do believe the sampling method they used led to a sample that is representative of the population? Explain using complete sentences.

   **No, since likely the first 30 students in the library have a particular attribute in common – students.**
9. What type of sampling method was used to obtain each sample?
   a. A developer of a new diabetes medicine wishes to test its effectiveness. He obtained a list of patients willing to participate in his experiment and chooses every third to receive the treatment. 
      Systematic sampling 
   
   b. Boston College's Health Department did a study on the sleep habits of their students on school nights. They randomly selected 100 freshmen, 100 sophomores, 100 juniors, and 100 seniors to survey. 
      Stratified sampling 
   
   c. The ABC program Nightline once asked whether the United Nations should continue to have its headquarters in the United States. Viewers were invited to call one telephone number to respond "Yes" and another for "No". There was a charge for calling either number. More than 186,000 callers responded, and 67% said "No". 
      Convenience sampling 
   
   d. Chipotle has just put in to place new safety guidelines to prevent foodborne illness. They wish to find out how satisfied their employees are with the new guidelines. They pick 50 restaurants at random and survey every employee at those restaurants. 
      Cluster sampling 

10. Dolce Vita Salon's owner, Maria, wants to survey her clients regarding their satisfaction with the Salon. Which of the following correctly describes how Maria could break her client list into strata?

   A. Clients on a Monday, clients on a Tuesday, clients on a Wednesday, etc

   B. Hair coloring clients, haircut clients, styling clients, makeup clients, piercing clients

   C. Every 12th person on Maria's list of clients

   D. Clients that purchased hair care products, clients that did not purchase hair care products
11. Give an example of a double-blind experiment.

A marketing firm is taste-testing 2 brands of aspirin. They have a person assign each brand a letter—A or B. A different person gives 1 aspirin (either A or B) to subjects and records the effect the aspirin has on the subject. The 2 aspirins should look the same so that neither the subject nor person giving the treatment knows which brand is A or B.

12. You are hired by an Education Consultant company to determine whether listening to classical music while studying Statistics vocabulary results in higher test scores on the Chapter 1 Statistics test. Describe your experiment below as detailed as possible,

1. Group students by Stats grade (A, B, C, D, E)
2. On slips of paper, write MUSIC GROUP or NO MUSIC GROUP and put them in a hat for students to randomly pick from
3. Have students pick assignment from hat so that half of A group are in MUSIC GROUP (in which case they will listen to classical music through headphones while studying Stats vocabulary during 1st half of class period) and half are in NO MUSIC GROUP (in which case they will study in silence)
4. Repeat with B, C, D, and E students
5. During last half of the period, give test (same test, room, teacher, etc) to each student
6. Record the test results for each student