14.1 EXERCISES KEY

For each of the scenarios below, identify the **population**, the **sample** and the **parameter of interest**.

1. A team of biologists wants to know the average weight of fish in a lake. They decide to drop a net and measure all fish caught in three different locations in the lake.

Population: **All the fish in that lake** Sample: **The fish caught in the nets at the three locations** Parameter of Interest: **The average weight of all the fish in that lake**

2. An AP Government class wants to know the percentage of eligible voters in the state of Utah who voted in the most recent election. There are 1,938,249 people in Utah who are 18 and older. The class randomly chose 15 state house districts and discovers that 50.5% of the eligible voters in those districts actually voted.

Population: **Eligible voters in the state of Utah** Sample: **The 15 house districts that the class looked at** Parameter of Interest: **The percentage of eligible voters that voted in the last election**

3. A local radio station has added an additional radio personality and is trying to determine what type of music to play during this person's air time. This time slot is geared towards teenage listeners. The station has decided to survey 300 randomly selected students from the ages of 13 to 19.

Population: **Teenagers in their listening area** Sample: **300 students from the ages of 13 to 19** Parameter of Interest: **What type of music the teenage listeners want to hear.**

Identify which of the six sampling methods (simple random, systematic, stratified, cluster, convenience or voluntary) were used in each of the following examples and then tell whether the method is biased or unbiased.

4. You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You decide to put the name of each student in the school into a big bowl. You draw 100 names and ask those students to respond to a survey about the activities they prefer.

Method: **Simple Random Sample** Biased | **Unbiased**

5. You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You assign each student in the school a number. You randomly select a starting number among the first 10 numbers and then select every tenth student in the list from that point forward.

Method: **Systematic Sample** Biased | **Unbiased**

6. You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You use the rolls from each homeroom class. You put the all the names from one class into the bowl and draw two names from the class. You go through each homeroom class, drawing 2 names from each class. You ask those students to respond to a survey about the activities they prefer.

Method: **Stratified Sample** Biased | **Unbiased**

7. You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You get the list of all the homeroom classes and randomly select 5 classes. You go to each of the classes selected and survey all the students in that class.

Method: **Cluster Sample** Biased | **Unbiased**

8. You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You stand in the cafeteria during your lunch break and ask students in they would be willing to participate in your survey as they walk by.

Method: **Convenience Sample** **Biased** | Unbiased

9. You are interested in finding out if the crime rate in your city has changed in the past year. You decide have the evening news broadcast an invitation to respond to a poll about crime.

Method: **Voluntary Response** **Biased** | Unbiased

10. You want to know the average number of hours that high school seniors spend playing video games in your state. You randomly select 20 high schools in the state and then ask all the seniors at each of the 20 high schools about their video game habits.

Method: **Cluster** Biased | **Unbiased**

11. An auto analyst is conducting a satisfaction survey, sampling from a list of 10,000 new car buyers. The list includes 2,500 Ford buyers, 2,500 GM buyers, 2,500 Honda buyers, and 2,500 Toyota buyers. The analyst selects a sample of 400 car buyers, by randomly sampling 100 buyers of each brand.

Method: **Stratified** Biased | **Unbiased**

12. A shopping mall management company would like to know the average amount that shoppers in the mall spend during their visit. They post two survey takers near one of the exits who ask shoppers to tell them what they spent as they leave the mall.

Method: **Convenience** **Biased** | Unbiased

13. A restaurant owner wants to find out the average number of dishes ordered at each table served on Friday evenings, their busiest time. She decides to collect and analyze every fifth receipt of the night, starting at 6:00 p.m.

Method: **Systematic** Biased | **Unbiased**

14. In order to determine the average composite score on the most recent ACT exam, students were divided into groups based on whether they were enrolled in remedial, regular, or honors language arts. Individual scores were randomly selected from each group.

Method: **Stratified** Biased | **Unbiased**

Imagine that you want to know whether a new diet plan is effective in helping people lose weight. To collect data about this diet plan you might choose to conduct a survey, carry out an experiment or do an observational study to determine this.

If you used a survey, you could simply ask people that had tried the diet plan in they lost weight.

If you used an observational study, you might monitor volunteers that try the diet plan and measure how much weight they lost.

If you used an experiment, you might randomly assign participants to two groups. One group (the control group) eats as they normally would and the other group (the experimental group) eats according to the diet plan. At the end of two months, the two groups are compared to see the average weight gain or loss in each group.

15. What are the possible advantages and disadvantages of conducting a survey? (give at least one of each)

Advantage: Fairly easy to do without too much cost or time

Disadvantage: People may not be truthful in their answers

16. What are some possible advantages and disadvantages of the experiment? (give at least one of each)

Advantage: can establish if treatments cause the result

Disadvantage: Takes more time and resources to do properly, differences in the two groups may confound the results

17. What are some possible advantages and disadvantages of the observational study? (give at least one of each)

Advantage: People are self selecting to use the diet plan, more likely to adhere to the plan

Disadvantage: You have nothing to compare the results to, so you would not be able to determine the plans effectiveness.

Identify whether the following are examples of a survey(S), experiment(E) or observational study(O).

S **E** O 18. To determine whether drinking orange juice prevents colds, researchers randomly assigned participants to a group that drank no orange juice or a group that drank two glasses of orange juice a day. They measured the number of colds that each group had over the course of the year and compared the results of the two groups.

S E **O** 19. To determine whether exercise reduces the number of headaches, researchers randomly selected a group of participants and recorded the number of hours each participant exercised and the number of headaches each participant experienced.

S E O 20. To determine the effectiveness of a new advertising campaign, a restaurant asked every tenth customer if they had seen the advertisement, and if it had influenced their decision to visit the restaurant.

S **E** O 21. To determine if a new drug is an effective treatment for the flu, researchers randomly selected two groups of people that had the flu. One group was given a placebo (a sugar pill that has no physical effect) and one group was given the new drug. Researchers measured the number of days that participants experienced flu symptoms and compared the two groups to see if they were different.

S E **O** 22. To determine if higher speed limits cause more traffic fatalities, researchers compared the number of traffic deaths on randomly selected stretches of highway with 65 mph speed limits to the number of traffic deaths on an equal number of randomly selected stretches of highway with 75 mph speed limits.

23. Describe how you might select a simple random sample of 50 students from your school and use a survey to investigate which soft drink people prefer: Soda A or Soda B.

Number each student in the school and use a random digits table to select 50 of the students. Then ask them the question of which soda they prefer.

24. Describe how you might select a convenience sample of 50 students from your school and use an observational study to investigate which soft drink people prefer: Soda A or Soda B.

Stand near the soda vending machine during lunch and record how many students bought each of the two sodas until you have recorded 50 purchases. We should ignore any students who come to the machine more than one time.

25. Describe how you might select a cluster sample from your school and use an experiment to investigate which soft drink people prefer: Soda A or Soda B.

Randomly select 3 classes to use during A3 period. Have everyone in the chosen classes to blindly try both sodas and tell you which one they prefer. The order that they try the sodas should be randomly selected.

26. Describe the method you would use to determine if excessive texting causes bad grades. Explain why you chose that method and what conclusions could be drawn from the study.

An observational study would be best because asking students to do something that my harm their grades is a bit sketchy. I would create a simple random sample of students and ask each how many texts they sent during the last term and what their GPA was for that term. We could establish an association between amount of texting and grade performance but we couldn't really establish that too much texting actually caused the students grades to go up or down.