Chapter 1 Exam A

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Form a conclusion about statistical significance. Do not make any formal calculations. Either use the results provided or make subjective judgments about the results.

1) Last year, the average math SAT score for students at one school was 475. The headmaster introduced new teaching methods hoping to improve scores. This year, the mean math SAT score for a sample of students was 481. Is there statistically significant evidence that the new teaching method is effective? If the teaching method had no effect, there would be roughly a 3 in 10 chance of seeing such an increase. Does the result have statistical significance? Why or why not? Does the result have practical significance?

1) _____

Provide an appropriate response.

2) Why do you think that cluster sampling is frequently used in practice.

2) _____

Use critical thinking to determine whether the sampling method appears to be sound or is flawed.

3) "38% of adults in the United States regularly visit a doctor". This conclusion was reached by a college student after she had questioned 520 randomly selected members of her college. What is wrong with her survey?

3) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the given description corresponds to an observational study or an experiment.

4) A stock analyst selects a stock from a group of twenty for investment by choosing the stock with the greatest earnings per share reported for the last quarter.

4) _____

    A) Experiment   B) Observational study

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.

5) The name of each contestant is written on a separate card, the cards are placed in a bag, and three names are picked from the bag.

5) _____

    A) Random
    B) Cluster
    C) Convenience
    D) Stratified
    E) Systematic

6) To avoid working late, a quality control analyst simply inspects the first 100 items produced in a day.

6) _____

    A) Systematic
    B) Stratified
    C) Convenience
    D) Cluster
    E) Random

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

7) A lawyer surveyed a simple random sample of his colleagues and asked them whether   7) _____
they were left–handed or right–handed. Is this convenience sample likely to provide
results typical of all adults in the United States? Do convenience samples in general
provide good results?

Identify the sample and population. Also, determine whether the sample is likely to be representative of the population.

8) 100,000 randomly selected adults were asked whether they drink at least 48 oz of water   8) _____
each day and only 45% said yes.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Provide an appropriate response.

9) An education expert is researching teaching methods and wishes to interview teachers from a   9) _____
particular school district. She randomly selects ten schools from the district and interviews all of
the teachers at the selected schools. Does this sampling plan result in a random sample? Simple
random sample? Explain.
  A) No; no. The sample is not random because teachers in small schools are more likely to be
     selected than teachers in larger schools. It is not a simple random sample because some
     samples are not possible, such as a sample that includes teachers from schools that were not
     selected.
  B) Yes; yes. The sample is random because all teachers have the same chance of being selected.
     It is a simple random sample because all samples have the same chance of being selected.
  C) Yes; no. The sample is random because all teachers have the same chance of being selected. It
     is not a simple random sample because some samples are not possible, such as a sample that
     includes teachers from schools that were not selected.
  D) No; yes. The sample is not random because teachers in small schools are more likely to be
     selected than teachers in larger schools. It is a simple random sample because all samples
     have the same chance of being selected.

Identify the type of observational study (cross–sectional, retrospective, prospective).

10) A town obtains current employment data by polling 10,000 of its citizens this month.   10) _____
  A) Prospective   B) Retrospective   C) Cross–sectional   D) None of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

11) Distinguish between categorical and quantitative data. Give an example for each.   11) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the given value is from a discrete or continuous data set.

12) The height of 2–year–old maple tree is 28.3 ft.   12) _____
  A) Continuous   B) Discrete

Determine which of the four levels of measurement (nominal, ordinal, interval, ratio) is most appropriate.

13) Student's grades, A, B, or C, on a test.   13) _____
  A) Interval   B) Nominal   C) Ordinal   D) Ratio

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

14) Use the data in the table to answer the question. The x–values are amounts of saturated fat   14) _____
(in grams) in various regular two–ounce muffins. The y–values are amounts of saturated
fat (in grams) in various "low fat" two–ounce muffins.

Amounts of Saturated Fat in Regular and Low–Fat Muffins

x	3.7	4.9	4.3	6.4	4.2	4.5
y	1.2	2.1	2.2	1.9	1.4	2.4

Is each x–value matched with a corresponding y–value? That is, is each x–value associated
with the corresponding y–value in some meaningful way? If the x– and y–values are not
matched, does it make sense to use the difference between each x–value and the y–value
that is in the same column?

15) Explain the difference between stratified and cluster sampling.   15) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.

16) A tax auditor selects every 1000th income tax return that is received.   16) _____
    A) Stratified
    B) Systematic
    C) Random
    D) Cluster
    E) Convenience

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Use critical thinking to develop an alternative conclusion.

17) A study shows that adults who work at their desk all day weigh more than those who do   17) _____
    not. Conclusion: Desk jobs cause people to gain weight.

Provide an appropriate response.

18) Would an observational study or an experiment be more appropriate to investigate the   18) _____
    effects on humans of a substance known to be toxic? Explain.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the given value is a statistic or a parameter.

19) After inspecting all of 55,000 kg of meat stored at the Wurst Sausage Company, it was found that   19) _____
    45,000 kg of the meat was spoiled.
    A) Statistic   B) Parameter

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

20) Explain what is meant by the term "confounding" and give an example of an experiment   20) _____
    in which confounding is likely to be a problem.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the given value is from a discrete or continuous data set.

21) The temperature of a cup of coffee is 67.3°F.   21) _____
    A) Continuous   B) Discrete

Solve the problem.

22) On a test, 74% of the questions are answered correctly. If 111 questions are correct, how many   22) _____
questions are on the test?
    A) 37   B) 67   C) 150   D) 74

Identify the type of observational study (cross–sectional, retrospective, prospective).

23) Researchers collect data by interviewing athletes who have won olympic gold medals from 1992 to   23) _____
2008.
    A) Retrospective   B) Cross–sectional
    C) Prospective   D) None of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Form a conclusion about statistical significance. Do not make any formal calculations. Either use the results provided or make subjective judgments about the results.

24) Charlie's teacher claims that he does not study and just guesses on exams. On an exam   24) _____
with 201 true–false questions, Charlie answered 53.7% of the questions correctly.
Calculations using these results show that if he were really just guessing, there would be
roughly 1 chance in 7 that he would do this well. Is there statistically significant evidence
against the teacher's claim that Charlie is just guessing? Why or why not?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Provide an appropriate response.

25) A psychology student wishes to investigate differences in political opinions between business   25) _____
majors and political science majors at her college. She randomly selects 100 students from the 260
business majors and 100 students from the 180 political science majors. Does this sampling plan
result in a random sample? Simple random sample? Explain.
    A) Yes; yes. The sample is random because all students have the same chance of being selected.
        It is a simple random sample because all samples of size 200 have the same chance of being
        selected.
    B) No; yes. The sample is not random because political science majors have a greater chance of
        being selected than business majors. It is a simple random sample because all samples of size
        200 have the same chance of being selected.
    C) No; no. The sample is not random because political science majors have a greater chance of
        being selected than business majors. It is not a simple random sample because some samples
        are not possible, such as a sample consisting of 50 business majors and 150 political science
        majors.
    D) Yes; no. The sample is random because all students have the same chance of being selected. It
        is not a simple random sample because some samples are not possible, such as a sample
        consisting of 50 business majors and 150 political science majors.

1) No. The new mean SAT score is not substantially higher. Even if the new teaching method had no effect, a small increase such as this could easily be seen just by chance. No. The increase is not sufficient to be of practical significance.

2) Answers will vary. Possible answer: Cluster sampling can save time and money and be more efficient, especially when the clusters are geographically far apart from each other. For example, if a researcher wishes to interview a sample of high school teachers in a school district, it will be easier to interview all the teachers at a few schools than to interview a few teachers from many different schools.

3) The sample is biased. College students are not representative of the U.S. population as a whole.

4) B

5) A

6) C

7) Yes. There is nothing about left–handedness or right–handedness that would affect being one of the lawyer's colleagues. In terms of left– or right–handedness, a simple random sample of the lawyer's colleagues is likely to be representative of all adults in the United States. Convenience samples in general do not tend to provide good results as the sample is often not representative of a broader population.

8) Sample: the 100,000 selected adults; population: all adults; representative

9) C

10) C

11) Qualitative data can be separated into categories that are distinguished by nonnumeric characteristics. Quantitative data consist of numbers representing counts or measurements. Examples will vary.

12) A

13) C

14) The x–values are not matched with the y–values, so it does not make sense to use the differences between each x–value and the y–value that is in the same column.

15) In both cluster sampling and stratified sampling, sub–groups (clusters or strata) are formed. However, in stratified sampling, all strata are used and a sample is selected from each strata. In cluster sampling, a sample of the clusters is first selected, then all members of those clusters are selected.

16) B

17) Desk job workers are confined to their chairs for most of their work day. Other jobs require standing or walking around which burns calories. It is probably the lack of exercise that causes higher weights, not the desk job itself. Avoid causality altogether by saying lack of walking and exercise is associated with higher weights.

18) An observational study would be more appropriate. An experiment would not be appropriate because it would be unethical to administer as a treatment a substance known to be toxic. However a retrospective observational study, for example, could be carried out by examining records from the past and observing the effects where the substance had been accidentally ingested.

19) B

20) Confounding occurs in an experiment when the effects of two or more variables cannot be distinguished from each other. Examples will vary. One example is that of a school district that conducts a study regarding whether the science laboratory approach or the computer simulation approach is better for learning chemistry among seniors. A standardized achievement test is used to measure learning, and the results of the two schools are compared. Unless controlled in the study, two confounding variables are teaching expertise and student motivation.

21) A

22) C

23) A

24) No; The exam result of 53.7% is not substantially greater than 50%. Even if Charlie were just guessing, he could easily do this well just by chance.

25) C

Chapter 1 Exam B

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Form a conclusion about statistical significance. Do not make any formal calculations. Either use the results provided or make subjective judgments about the results.

     1) A manufacturer of laptop computers claims that only 1% of their computers are defective.   1) _____
In a sample of 600 computers, it was found that 3% were defective. If the proportion of
defectives were really only 1%, there would be less than 1 chance in 1000 of getting such a
large proportion of defective laptops in the sample. Is there statistically significant
evidence against the manufacturer's claim? Why or why not?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.

     2) A pollster uses a computer to generate 500 random numbers, then interviews the voters   2) _____
corresponding to those numbers.
       A) Convenience
       B) Systematic
       C) Cluster
       D) Random
       E) Stratified

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

     3) A hip hop radio show broadcast in the city of Puddelton asked people to call in and   3) _____
express their opinions on the new mayor. Are the results likely to be representative of all
adults in Puddelton? Of all listeners to the hip hop show? Why or why not?

     4) Use the data in the table to answer the question. The x–values are amounts of saturated fat   4) _____
(in grams) in various regular two–ounce muffins. The y–values are amounts of saturated
fat (in grams) in various "low fat" two–ounce muffins.

Amounts of Saturated Fat in Regular and Low–Fat Muffins

x	4.5	3.5	3.7	5.2	4.9	3.9
y	1.2	2.1	2.2	1.8	1.6	2.2

Note that the table lists measured amounts of saturated fat in two different types of
muffin. Given these data, what issue can be addressed by conducting a statistical analysis
of the values?

     5) At a school there are two different math classes of the same age. The two classes have   5) _____
different teachers. The school principal is interested in gauging the effectiveness of two
different teaching methods and asks each teacher to try one of the methods. At the end of
the semester both classes are given the same test and the results are compared. In this
experiment, what is the variable of interest? Give some examples of variables which could
be confounding variables.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the given value is a statistic or a parameter.

6) After taking the first exam, 15 of the students dropped the class.   6) _____
   A) Statistic   B) Parameter

Determine which of the four levels of measurement (nominal, ordinal, interval, ratio) is most appropriate.

7) Student's grades, A, B, or C, on a test.   7) _____
   A) Ratio   B) Ordinal   C) Nominal   D) Interval

8) Nationalities of survey respondents.   8) _____
   A) Ratio   B) Nominal   C) Interval   D) Ordinal

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

9) The table shows the weights (in pounds) and monthly incomes (in dollars) of nine   9) _____
   randomly selected women between the ages of 18 and 65. Assume that the x–values are
   the weights and the y–values are the monthly incomes.

Weight (lb)	113	132	155	122	166	140	118	129	185
Monthly Income (dollars)	1420	3650	5475	2310	4710	2910	1720	2460	4115

If we use statistical methods to conclude that there is a correlation (or relationship or
association) between the weights of women and their monthly incomes, can we conclude
that by increasing her weight a woman can increase her monthly income?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.

10) A tax auditor selects every 1000th income tax return that is received.   10) _____
    A) Stratified
    B) Convenience
    C) Random
    D) Cluster
    E) Systematic

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

11) A lawyer surveyed a simple random sample of his colleagues and asked them whether   11) _____
    they were left–handed or right–handed. Is this convenience sample likely to provide
    results typical of all adults in the United States? Do convenience samples in general
    provide good results?

12) A teacher was interested in knowing how much tax people pay in the United States. She   12) _____
    selected a simple random sample of her friends and asked them about their taxes. Is this
    sample likely to be representative of all adults in the United States?

13) Would an observational study or an experiment be more appropriate to investigate the   13) _____
    effects on humans of a substance known to be toxic? Explain.

Form a conclusion about statistical significance. Do not make any formal calculations. Either use the results provided or make subjective judgments about the results.

14) Charlie's teacher claims that he does not study and just guesses on exams. On an exam with 201 true–false questions, Charlie answered 53.7% of the questions correctly. Calculations using these results show that if he were really just guessing, there would be roughly 1 chance in 7 that he would do this well. Is there statistically significant evidence against the teacher's claim that Charlie is just guessing? Why or why not?

14) _____

Provide an appropriate response.

15) A coach uses a new technique in training middle distance runners. The times, in seconds, for 8 different athletes to run 800 meters before and after this training are shown below.

Athlete	A	B	C	D	E	F	G	H
Before	115.2	114	116.4	119.8	110.9	112.4	111.5	117.3
After	112.9	112.7	114	120.6	109.1	109.1	107.9	113.4

Does the conclusion that the technique is effective appear to be supported with statistical significance? Does the conclusion that the technique is effective appear to have practical significance?

15) _____

16) Why do you think that cluster sampling is frequently used in practice.

16) _____

Form a conclusion about statistical significance. Do not make any formal calculations. Either use the results provided or make subjective judgments about the results.

17) Last year, the average math SAT score for students at one school was 475. The headmaster introduced new teaching methods hoping to improve scores. This year, the mean math SAT score for a sample of students was 481. Is there statistically significant evidence that the new teaching method is effective? If the teaching method had no effect, there would be roughly a 3 in 10 chance of seeing such an increase. Does the result have statistical significance? Why or why not? Does the result have practical significance?

17) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the given description corresponds to an observational study or an experiment.

18) A political pollster reports that his candidate has a 10% lead in the polls with 10% undecided.
   A) Experiment   B) Observational study

18) _____

Identify the type of observational study (cross–sectional, retrospective, prospective).

19) A town obtains current employment data by polling 10,000 of its citizens this month.
   A) Cross–sectional   B) Prospective   C) Retrospective   D) None of these

19) _____

Determine whether the given description corresponds to an observational study or an experiment.

20) A doctor performs several diagnostic tests to determine the reason for a patient's illness.
   A) Observational study   B) Experiment

20) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Identify the sample and population. Also, determine whether the sample is likely to be representative of the population.

21) An employee at the local ice cream parlor asks three customers if they like chocolate ice cream.

21) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.

22) A market researcher selects 500 people from each of 10 cities.   22) _____
    A) Convenience
    B) Cluster
    C) Stratified
    D) Random
    E) Systematic

23) 49, 34, and 48 students are selected from the Sophomore, Junior, and Senior classes with 496, 348,   23) _____
and 481 students respectively.
    A) Stratified
    B) Cluster
    C) Convenience
    D) Systematic
    E) Random

Solve the problem.

24) A gardener has 75 clients, 45% of whom are businesses. Find the number of business clients.   24) _____
    A) 41 clients   B) 34 clients   C) 36 clients   D) 73 clients

Determine whether the given description corresponds to an observational study or an experiment.

25) A marketing firm does a survey to find out how many people use a product. Of the one hundred   25) _____
people contacted, fifteen said they use the product.
    A) Experiment   B) Observational study

1) Yes. If the claimed proportion of defectives of 1% were correct, there would be a very small likelihood of getting 3% defectives in the sample. The sample rate of 3% is significantly greater than the claimed rate of 1%.

2) D

3) No. A hip hop show is likely to attract a younger audience. Listeners to the show will not be representative of all adults in Puddleton so a sample from those listeners, however well selected, will not be representative. No, this sample will not be representative of all listeners to the show because it is a voluntary response sample – listeners themselves choose whether to respond. Those with stronger opinions are more likely to respond so the sample is unlikely to be representative of all listeners to the show.

4) Given the context of the data, we could address the issue of whether the two types of muffin provide the same amounts of saturated fat, or whether there is a difference between the two types of muffin.

5) The variable of interest is the teaching method. Possible confounding variables are "skill of teacher" (is one teacher better than the other?), "aptitude of students" (do the two classes have students of the same ability?), "amount of study time" (does one class have students who are more conscientious?).

6) B

7) B

8) B

9) No. If a correlation (or relationship or association) is found, this doesn't mean that one variable is the cause of another. Larger weights do not cause higher incomes, but tend to be associated with higher incomes because both weight and income are associated with a third variable, age. Older women tend to be heavier and to have higher incomes than younger women.

10) E

11) Yes. There is nothing about left–handedness or right–handedness that would affect being one of the lawyer's colleagues. In terms of left– or right–handedness, a simple random sample of the lawyer's colleagues is likely to be representative of all adults in the United States. Convenience samples in general do not tend to provide good results as the sample is often not representative of a broader population.

12) No. In terms of income, the teacher's friends are unlikely to be representative of all adults in the United States. So a sample from this group, however well selected, is unlikely to be representative of all adults in the United States.

13) An observational study would be more appropriate. An experiment would not be appropriate because it would be unethical to administer as a treatment a substance known to be toxic. However a retrospective observational study, for example, could be carried out by examining records from the past and observing the effects where the substance had been accidentally ingested.

14) No; The exam result of 53.7% is not substantially greater than 50%. Even if Charlie were just guessing, he could easily do this well just by chance.

15) Yes. Almost all runners have considerably faster times after the training.
Yes. The differences appear to be substantial.

16) Answers will vary. Possible answer: Cluster sampling can save time and money and be more efficient, especially when the clusters are geographically far apart from each other. For example, if a researcher wishes to interview a sample of high school teachers in a school district, it will be easier to interview all the teachers at a few schools than to interview a few teachers from many different schools.

17) No. The new mean SAT score is not substantially higher. Even if the new teaching method had no effect, a small increase such as this could easily be seen just by chance. No. The increase is not sufficient to be of practical significance.

18) B

19) A

20) B

21) Sample: the 3 selected customers; population: all customers; not representative

22) C

23) A

24) B

25) B