Sampling Analysis

Sampling Analysis

1. Which of these is an example of a random sample?

- A. A phone plan company surveys people on the beach to see how well they are receiving service, and uses this information in future advertising.

- B. A phone survey is conducted using twenty names randomly taken from the phone book.

- C. Customers buying a new cell phone are surveyed about cell phone plans.

- D. Every twentieth caller to an independent radio station receives tickets to a concert.

2. Which of these is an example of a non-random sample?

- A. A farmer is choosing grains of wheat from a field to test for a new flavor of cereal.

- B. A cereal company puts a winning ticket in one box of cereal out of 100,000 boxes.

- C. Ten college students at a college, population 50,000, are chosen to taste test a new cereal.

- D. A cereal company surveys their employees about breakfast food preference.

3. Which of these is an example of a random sample?

- A. One of the three best basketball players on a team are randomly chosen for a basketball shoot out.

- B. A sports store asks customers whether or not they enjoy basketball.

- C. Three audience members are randomly chosen to participate in a halftime shoot-out at a basketball game.

- D. At a team owners meeting, three people are surveyed to determine the percent of the population who enjoy basketball.

4. Which of these is an example of a random sample?

- A. Five employees out of 2,000 are chosen randomly to complete an anonymous survey.

- B. The five people seated on the first row at the circus are asked their opinion about the animal acts.

- C. Henry asks five of his friends to fill out a survey to find out their favorite musicians.

- D. The five employees who work the late shift answer questions about management.

5. Which of these is an example of a non-random sample?

- A. Registered voters in Arizona are surveyed to determine if they have relatives in Florida.

- B. Airline passengers to Orlando, Florida, are asked about vacation plans.

- C. Out of all the seventh grade students in a public school district, fifteen are chosen to win a trip to a vacation destination.

  D. At a school assembly, five students are randomly chosen to receive free admission to a theme park.

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6. Bill stood outside the mall and asked every fourth person to enter the mall for their favorite sport. There were four choices: football, baseball, basketball, and other. Bill surveyed a total of 53 people. Of those surveyed, 15 said football is their favorite, 14 said baseball is their favorite, 13 said basketball is their favorite, and 11 said other.

Identify the sample size in the situation above.

- A. 53
- B. 27
- C. 67
- D. 42

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7. Amy is doing a science experiment on how a certain bacterium reacts to an antibiotic. She has 3 dishes of identical bacterium samples with 12 bacteria in each dish. She gives an antibiotic to all of the bacteria in one dish. All of the treated bacteria died, and the bacteria in the other two dishes survived.

Identify the sample in the situation above.

- A. all the bacteria in all 3 dishes
- B. all the bacteria in the treated dish
- C. the antibiotic
- D. all bacteria everywhere

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8. Josh works for Moo Time Milkshakes. The company wants to know what milkshake flavor is the most popular. Today, he surveyed every third female customer on their favorite milkshake flavor. Fifteen customers (out of 54 total) were surveyed, and 7 customers prefer MooChooChocolate, 4 customers prefer VeryStrawberry, and 4 customers prefer BananaBoBanna.

Identify the sample in the situation above.

- A. today's Moo Time Milkshakes customers
- B. every third female customer
- C. every female customer
- D. every third customer

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9. Amy is doing a science experiment on how a certain bacterium reacts to an antibiotic. She has 3 dishes of identical bacterium samples with 16 bacteria in each dish. She gives an antibiotic to all of the bacteria in one dish. All of the treated bacteria died, and the bacteria in the other two dishes survived.

Identify the population in the situation above.

- A. all the bacteria in all 3 dishes
- B. the antibiotic
- C. all bacteria everywhere
- D. all the bacteria in the treated dish

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10. Josh works for Moo Time Milkshakes. The company wants to know what milkshake flavor is the most popular. Today, he surveyed every third female customer on their favorite milkshake flavor. Twenty-two customers (out of 67 total) were surveyed, and 8 customers prefer MooChooChocolate, 4 customers prefer VeryStrawberry, and 10 customers prefer BananaBoBanna.

What type of sampling is demonstrated in the situation above?

- A. convenience sampling
- B. census
- C. random sampling
- D. negative sampling

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11. Josh works for Moo Time Milkshakes. The company wants to know what milkshake flavor is the most popular. Today, he surveyed every third female customer on their favorite milkshake flavor. Sixteen customers (out of 53 total) were surveyed, and 6 customers prefer MooChooChocolate, 4 customers prefer VeryStrawberry, and 6 customers prefer BananaBoBanna.

Identify the sample size in the situation above.

    ○ A. 53
    ○ B. 6
    ○ C. 4
    ○ D. 16

12. Selma wants to know if seventh grade students prefer to do their math homework in silence or with background music. She polled the 21 students in her music class. Seven students preferred to do their math homework in silence, and fourteen students preferred to do their math homework with background music.

Is there a sampling bias in the situation above?

    ○ A. Yes. Selma is only curious about 7th grade students, but 6th grade students may prefer background music too.
    ○ B. There is not enough information.
    ○ C. Yes. Students in the music class will probably enjoy listening to music more than other students.
    ○ D. No. Selma picked a completely random sample for her study.

13. Josh works for Moo Time Milkshakes. The company wants to know what milkshake flavor is the most popular. Today, he surveyed every third female customer on their favorite milkshake flavor. Twenty-one customers (out of 64 total) were surveyed, and 7 customers prefer MooChooChocolate, 4 customers prefer VeryStrawberry, and 10 customers prefer BananaBoBanna.

Is there a sampling bias in the situation above?

    ○ A. Yes. Josh only asked female customers.
    ○ B. There is not enough information.
    ○ C. No. The company is only interested in males' opinions.
    ○ D. No. Josh asked random customers, so there is no bias.

14. Bill stood outside the mall and asked every fourth person to enter the mall for their favorite sport. There were four choices: football, baseball, basketball, and other. Bill surveyed a total of 51 people. Of those surveyed, 11 said football is their favorite, 14 said baseball is their favorite, 11 said basketball is their favorite, and 15 said other.

Identify the sample in the situation above.

    ○ A. everyone who likes basketball
    ○ B. everyone entering the mall
    ○ C. everyone who likes football
    ○ D. every fourth person entering the mall

15. A movie theater conducted a survey to see what customers preferred at the concession stand. The theater asked every fifth person who entered the movie theater one day what his or her favorite movie snack was. Were the results of the survey valid?

    ○ A. No, because the theater did not survey everyone in the theater.
    ○ B. Yes, because the theater only surveyed children.
    ○ C. Yes, because the theater surveyed a random sample.
    ○ D. No, because the theater did not use a random sample.

16. Three different clothing stores in different parts of a city recorded the number of swimsuits they sold for four months.

Swimsuit Sales

Month	# Sold	Month	# Sold	Month	# Sold
June	239	June	289	June	212
July	224	July	241	July	249
Aug.	189	Aug.	174	Aug.	196
Sept.	157	Sept.	105	Sept.	152

Based on these results, how many swimsuits should clothing stores in the same city predict to sell in October?

- A. more swimsuits than September
- B. the same number of swimsuits as September
- C. less swimsuits than September
- D. cannot predict from these results

17. Three students from Milton Middle School are running for class president. A preliminary poll was taken in three homeroom classes, each with the same number of students. The results are shown in the table below.

Poll Results

Students	Class A %	Class B %	Class C %
Ian	46	37	45
Jessie	27	29	9
Jeremy	27	34	46

Based on these preliminary results, who could be predicted to win class president?

- A. Jeremy
- B. Jessie
- C. Ian
- D. cannot predict from these results

18. A city council conducted a survey on speed bumps to see what residents preferred. The council asked every resident in one particular neighborhood what his or her preferences were. Were the results of the city council's survey valid?

- A. Yes, because the neighborhood surveyed wanted speed bumps.
- B. Yes, because every resident in a neighborhood was surveyed.
- C. No, because neighborhoods do not have speed bumps.
- D. No, because the sample was not random.

19. Richard had a 550-piece puzzle with an image of a crossword puzzle. He took out a handful of the pieces to examine, and found the following number of letters on the pieces.

$$2, 3, 5, 5, 2, 3, 3, 5, 5, 2$$

Assuming that the sample was representative of the puzzle, what was the mean number of letters on a piece of the puzzle?

- A. 5.3
- B. 3
- C. 3.5

○ D. 2.5

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20. A company was trying to decide how to buy health care for their employees. They surveyed a random sample of 10 employees and asked them to select the monthly premium they would pay for a select set of benefits. The amounts they were willing to pay are listed below.

$168, $108, $145, $202, $168, $145, $108, $108, $184, $108

If the sample was representative of the entire company, and the company has 117 employees, what was the mode of the amount that all of the employees were willing to pay?

○ A. $184
○ B. $108
○ C. $168
○ D. $145

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21. An environmentalist was investigating the impact of a chemical spill on the minnow population in a lake. He randomly caught and released 16 minnows, counting the number of missing scales on the fish, as shown below.

4, 3, 11, 4, 9, 6, 9, 11, 4, 3, 4, 6, 9, 11, 6, 4

Assuming that the sample was representative of the entire population in the lake, what was the mean number of missing scales on a minnow?

○ A. 6.6
○ B. 4
○ C. 6.5
○ D. 7.5

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22. A book had 293 pages. Liliana wanted to estimate the number of words per page, so she counted the words on 10 random pages. The word counts are listed below.

148, 155, 173, 111, 173, 148, 155, 148, 173, 111

Assuming that the sample was representative of the entire book, what was the mean number of words per page?

○ A. 149.5
○ B. 160.6
○ C. 148
○ D. 117.4

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23. A travel agency created a pamphlet for a city. They chose the high temperature for 10 random days during the year to calculate the temperature for the entire year, as shown below.

68°F, 70°F, 84°F, 52°F, 84°F, 68°F, 70°F, 68°F, 84°F, 52°F

Assuming that the sample was representative of the daily temperature for the entire year, what was the mean daily temperature?

○ A. 71.5°F
○ B. 70°F
○ C. 68.5°F
○ D. 69°F

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24. A restaurant has 37 main dishes on their menu and lists the calorie count for each. The calories for the dishes that five friends randomly choose from the menu are listed below.

Menu Items	
Dish	**Number of Calories**
Fish Burger	1,311
Chicken Blaze	1,424
Dessert for Dinner	1,230
Beef Lasagna	1,311
Cheese Bliss	1,501

Assuming that the sample is representative of the entire menu, what is the mean number of calories per main dish?

○ A. 1,424
○ B. 1,311.5
○ C. 1,367.5
○ D. 1,355.4

25. A store had 25 containers of trail mix on the shelf. Logan bought five containers. The table below shows the number of pretzels in each of the containers.

Sample of Trail Mix	
Container	**Number of Pretzels**
A	15
B	18
C	11
D	18
E	14

Based on this sample, what was the mode of all of the containers?

○ A. 15.5
○ B. 15
○ C. 11
○ D. 18

26. On the opening day of a new movie, 228 people attended the premier. The manager surveyed 8 random people as they left the theater. He asked them to rate the movie on a scale of 1 to 10. Their ratings are below.

10, 2, 5, 10, 5, 7, 10, 7

Assuming that the sample was representative of the entire audience, what was the mean rating of the movie for the entire audience?

○ A. 6
○ B. 5.5
○ C. 7
○ D. 7.5

27. For a lesson on statistics, the students in a math class counted the number of yellow candies in 10 individual candy bags out of a box of 75 bags. The data is shown below.

17, 13, 13, 15, 20, 13, 15, 20, 17, 13

Based on this statistic, what was the mode of yellow candies for the entire box?

- ○ A. 15.6
- ○ B. 20
- ○ C. 13
- ○ D. 15

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28. The venue for an outdoor summer concert was divided into 35 sections. The event planner randomly chose 8 sections and counted the number of ice chests in the section, as shown below.

33, 51, 25, 73, 51, 33, 25, 51

Assuming that the sample was representative of the entire venue, what was the mean number of ice chests in a section?

- ○ A. 51
- ○ B. 42.75
- ○ C. 42
- ○ D. 45.5

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29. During one month in the rainy season, a tropical forest received rain every day. A scientist randomly picked seven days out of the month to record the rainfall in inches. The amounts he picked are listed below.

4.1, 2.3, 2.6, 3.7, 2.3, 3.7, 2.3

If the sample was representative of the entire month, what was the mode of the amounts of rainfall?

- ○ A. 3 inches
- ○ B. 2.3 inches
- ○ C. 2.6 inches
- ○ D. 3.7 inches

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30. Jim had a collection of 24 state quarters. He poured 10 of them onto the table and noticed the years that the quarters were produced, as shown below.

2004, 2006, 2008, 2002, 2000, 2000, 2006, 2006, 2004, 2002

Assuming that the sample was representative of the collection, what was the mode of the year that the quarters were produced?

- ○ A. 2006
- ○ B. 2000
- ○ C. 2004
- ○ D. 2008

Answers

1. B
2. D
3. C
4. A
5. B

6. A
7. B
8. B
9. A
10. C
11. D
12. C
13. A
14. D
15. C
16. C
17. C
18. D
19. C
20. B
21. C
22. A
23. B
24. D
25. D
26. C
27. C
28. B
29. B
30. A

Explanations

1. Random sampling is where each member of the sample is randomly selected from the population. The only situation which shows this is **a phone survey is conducted using twenty names randomly taken from the phone book**.

2. Random sampling is where each member of the sample is randomly selected from the population. Conversely, a non-random sample is where the selection of a member from a sample is not random because the sample population is not random.

The only situation which shows a non-random sample is **a cereal company surveys their employees about breakfast food preference**.

3. Random sampling is where each member of the sample is randomly selected from the population. The only situation which shows this is **three audience members are randomly chosen to participate in a halftime shoot-out at a basketball game**.

4. Random sampling is where each member of the sample is randomly selected from the population. The only situation which shows this is **five employees out of 2,000 are chosen randomly to complete an anonymous survey**.

5. Random sampling is where each member of the sample is randomly selected from the population. Conversely, a non-random sample is where the selection of a member from a sample is not random because the sample population is not random.

The only situation which shows a non-random sample is **airline passengers to Orlando, Florida, are asked about vacation plans**.

6. The sample is a small group selected from the total population. In this situation, every fourth person is being surveyed, so they represent the sample. There are **53** people in the sample.

7. The sample is a small group selected from the total population. In this situation, **all the bacteria in the treated dish** are being given the antibiotic, so they represent the sample.

8. The sample is a small group selected from the total population. In this situation, **every third female customer** is being surveyed, so they represent the sample.

9. The population is an entire group that have at least one thing in common. In this situation, **all bacteria in all 3 dishes** is the population because Amy wants to find out how the bacteria react to an antibiotic.

10. **Random sampling** is where each member of the sample is randomly selected from the population. Since Josh chose every third female customer, he randomly chose the sample (even though his sample was biased).

11. The sample is a small group selected from the total population. In this situation, every third female customer is being surveyed, so they represent the sample. There are **16** customers in the sample.

12. A sampling bias is caused by systematic errors in the sampling process. Since Selma only asked her music class, she may have asked students who already have a bias toward listening to background music. Twice as many students preferred background music than complete silence. This may change drastically for a different sample of students.

13. A sampling bias is caused by systematic errors in the sampling process. Since Josh only asked female customers, he left out opinions of male customers.

14. The sample is a small group selected from the total population. In this situation, **every fourth person entering the mall** is being surveyed, so they represent the sample.

15. Results of a survey are valid if the sample space is well representative of the population. The movie theater surveyed every fifth person which means all age groups and genders were represented, and the people were selected randomly.

Therefore, the results of the survey were valid because **the theater surveyed a random sample**.

16. Since the stores were all in the same city but different areas, they are a good representation for other stores in the city.

Based on the results, as the months progress through the summer, the number of swimsuits sold decreases. Since the number decreases each month, there would likely be less swimsuits sold in the following months.

Therefore, clothing stores in the same city in October could expect to sell **less swimsuits than September**.

17. Based on the poll results, Ian had the highest percentage of votes in 2 out of 3 classes. If more classes were surveyed, Ian would probably receive the most votes.

Therefore, **Ian** could be predicted to win class president.

18. Results of a survey are valid if the sample space is well representative of the population. In this case, the city council only surveyed residents of one particular neighborhood. The council did not take into account different areas of the city including other neighborhoods and apartment communities.

The sample of this survey was not a random, well representative group of the entire city.

Therefore, the results of the survey were not valid because **the sample was not random**.

19. Since the sample is representative of the puzzle, the mean of the sample can be extended to the puzzle.

$$\text{mean} = \frac{2+3+5+5+2+3+3+5+5+2}{10}$$
$$= \frac{35}{10}$$
$$= 3.5$$

Therefore, the mean number of letters on a puzzle piece was **3.5** letters.

20. Since the sample is representative of the entire company, the mode of the sample can be extended to the entire company.

To find the mode, list the numbers in order from least to greatest. The number that is listed the most times will be the mode.

$108, $108, $108, $108, $145, $145, $168, $168, $184, $202

Therefore, the mode was **$108** for health insurance.

21. Since the sample is representative of the entire population, the mean of the sample can be extended to the entire population.

$$\text{mean} = \frac{4 + 3 + 11 + 4 + 9 + 6 + 9 + 11 + 4 + 3 + 4 + 6 + 9 + 11 + 6 + 4}{16}$$

$$= \frac{104}{16}$$

$$= 6.5$$

Therefore, the mean number of missing scales on a minnow was **6.5** scales.

22. Since the sample is representative of the words per page of the book, the mean of the sample can be extended to the entire book.

$$\text{mean} = \frac{148 + 155 + 173 + 111 + 173 + 148 + 155 + 148 + 173 + 111}{10}$$

$$= \frac{1,495}{10}$$

$$= 149.5$$

Therefore, the mean number of the words per page of the book was **149.5** words.

23. Since the sample is representative of the daily temperature for the entire year, the mean of the sample can be extended to the entire year.

$$\text{mean} = \frac{68 + 70 + 84 + 52 + 84 + 68 + 70 + 68 + 84 + 52}{10}$$

$$= \frac{700}{10}$$

$$= 70$$

Therefore, the mean of the daily temperature was **70°F**.

24. Since the sample is representative of the entire menu, the mean of the sample can be extended to the entire menu.

$$\text{mean} = \frac{1,311 + 1,424 + 1,230 + 1,311 + 1,501}{5}$$

$$= \frac{6,777}{5}$$

$$= 1,355.4$$

Therefore, the mean number of calories per main dish is **1,355.4** calories.

25. Since the sample is representative of all of the containers of trail mix, the mode of the sample can be extended to all of the containers of trail mix.

To find the mode, list the numbers in order from least to greatest. The number that is listed the most times will be the mode.

11, 14, 15, 18, 18

Therefore, the mode was **18** pretzels.

26. Since the sample is representative of the entire audience, the mean of the sample can be extended to the entire audience.

$$\text{mean} = \frac{10 + 2 + 5 + 10 + 5 + 7 + 10 + 7}{8}$$

$$= \frac{56}{8}$$

$$= 7$$

Therefore, the mean rating of the movie for the entire audience was **7**.

27. Since the sample is representative of all of the bags, the mode of the sample can be extended to all of the bags.

To find the mode, list the numbers in order from least to greatest. The number that is listed the most times will be the mode.

13, 13, 13, 13, 15, 15, 17, 17, 20, 20

Therefore, the mode was **13** yellow candies.

28. Since the sample is representative of all of the sections, the mean of the sample can be extended to all of the sections.

$$\text{mean} = \frac{33 + 51 + 25 + 73 + 51 + 33 + 25 + 51}{8}$$

$$= \frac{342}{8}$$

$$= 42.75$$

Therefore, the mean number of ice chests in a section was **42.75** ice chests.

29. Since the sample is representative of the entire month, the mode of the sample can be extended to the entire month.

To find the mode, list the numbers in order from least to greatest. The number that is listed the most times will be the mode.

2.3, 2.3, 2.3, 2.6, 3.7, 3.7, 4.1

Therefore, the mode was **2.3 inches**.

30. Since the sample is representative of the collection, the mode of the sample can be extended to the collection.

To find the mode, list the numbers in order from least to greatest. The number that is listed the most times will be the mode.

2000, 2000, 2002, 2002, 2004, 2004, 2006, 2006, 2006, 2008

Therefore, the mode of the years the coins were produced was **2006**.