Making Statistical Inferences

Name: _____

Prerequisite: Understand Random Samples

Study the example showing random and biased samples. Then solve problems 1–6.

Example

The students in Mr. Walker's class want to find out about the favorite rainy day activities of their middle school's entire student population.

Random Sample:

Brielle surveyed one randomly chosen student from each of the 20 homerooms in the school.

Brielle's sample is random because every student in the school had an equal chance of being selected.

Biased Sample:

Asa surveyed 20 randomly chosen members of the school's book club.

Asa's sample is biased because all the students she surveyed are part of one group, the book club.

1 To find the information described in the example, Pam surveyed the 23 students in her Grade 7 math class. Is her sample *random* or *biased*? _____

2 To find the information described in the example, Nick surveyed every 15th student who entered the school building. Is his sample *random* or *biased*? _____

3 Pam asked for volunteers to take her survey about rainy day activities. Why might a sample created by asking for volunteers be biased?

_____

_____

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_____

Vocabulary

random sample a sample in which every element in the population has an equal chance of being selected.

biased sample a sample that does not represent the whole population.

Solve.

4 Vivek plans to survey 10 randomly chosen residents out of the 280 people that live in his community about plans for a new neighborhood dog park. Describe one way he can make the sample more likely to represent the population of residents.

5 Three park rangers had to report about the ways visitors use their facilities. Each ranger surveyed a sample of park visitors. Compare the methods. Do you think all three rangers' samples are equally representative of their parks' visitors? Explain.

- Ranger Li surveyed 30 randomly chosen visitors to her park's information center.
- Ranger Simpson divided his park into 30 same-sized zones and surveyed one randomly chosen visitor encountered in each zone.
- Ranger Patel surveyed 30 randomly chosen people who posted reviews of the park on a fishing website.

6 Jackson uses a random number generator to choose 20 students from each grade and asks how long they spend on homework. Niko says that Jackson's sample is biased. Do you agree? Explain. If it is biased, identify a different 60-student sample that can be chosen to better represent the school population.

Jackson's School

Grade	Students
6	300
7	150
8	150

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Represent Distributions of Statistics

Study the example showing how to represent distributions of statistics from random samples. Then solve problems 1–6.

Example

A box contains 80 loose white or yellow golf balls. Each student in Mr. Koger's class drew a random sample of 20 balls from the box, counted the yellow balls, and then returned the sample to the box.

Nate calculated the proportion of balls in each sample that were yellow, and then he organized the results in the following table.

Student	1	2	3	4	5	6	7	8	9	10	11	12
Number of Yellows	6	5	6	8	5	7	3	6	2	6	6	5
Proportion of Yellow	0.3	0.25	0.3	0.4	0.25	0.35	0.15	0.3	0.1	0.3	0.3	0.25

1 Marta believes it will be easier to identify clusters of data if the results are represented with a dot plot. Do you agree? Explain.

_____

2 Create a dot plot to display the proportion of yellow balls in each sample.

3 According to the data, what is a good estimate for the number yellow balls in the box? Explain.

_____

_____

Solve. Use the following situation for problems 4–6.

A box in Ms. Booth's class contains 200 loose white or yellow golf balls. The table below represents the results when 11 students each drew a random sample of the same number of balls, counted the number of yellows, and then returned the sample to the box.

Student	1	2	3	4	5	6	7	8	9	10	11
Proportion of Yellow	0.6	0.7	0.3	0.7	0.5	0.9	0.8	0.8	0.7	0.7	0.9

4 Which graphic representation of the data (a table, a dot plot, or a box plot) would best help estimate the number of yellow balls in the box?

5 Construct a box plot to display the data from Ms. Booth's class.

6 Lana believes a good estimate of the number of yellow balls in the box is 70 balls. Do you agree? Explain how she may have arrived at that answer.

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Compare Samples of Different Sizes

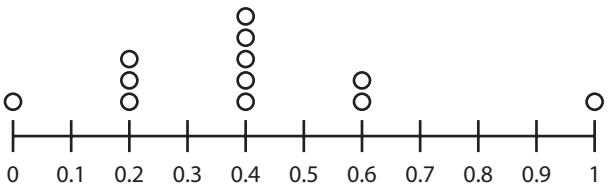
Study the example showing how to compare the distributions of the results from samples of different sizes. Then solve problems 1–7.

Example

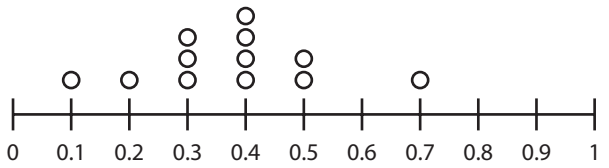
Louise and Aiden are experimenting with a bag of 90 pink or brown marbles. Louise drew 5 marbles, calculated the proportion that were brown, and returned the marbles. She drew 12 samples. Aiden conducted the same steps but used samples of 10 marbles. Their results are represented by the stacked dot plots at the right.

Notice that the same number line is used in both plots. This makes it easier to compare the spread and clustering of the data.

Louise's Results



Aiden's Results



1 Compare the shapes of the two distributions from Louise and Aiden's experiments.

2 Compare the centers of the two distributions from Louise and Aiden's experiments.

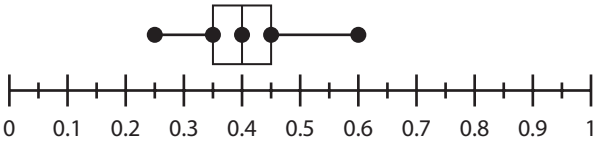
3 Compare the spreads. Which distribution is more spread out?

4 If Jo repeats the experiment but draws 20 marbles in each sample, how would you expect a dot plot of her results to compare to Louise and Aiden's plots? Explain your reasoning.

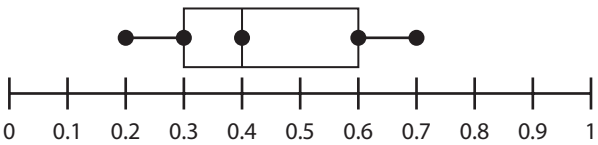
Solve.

Ken and Seyi experimented with a bag containing 250 red, white, or black marbles. They each drew a sample of marbles from the bag, calculated the proportion of the sample that was white, and returned the marbles to the bag. They repeated these steps 15 times, and created the box plots at the right to represent the results of their experiments.

Ken's Results



Seyi's Results

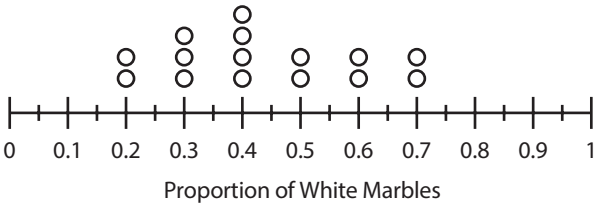


5 Each of Seyi's samples contained 20 marbles. Do you think Ken used a larger or smaller sample size in his experiment? Explain your reasoning.

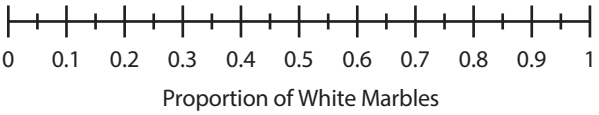
6 If you could only use one sample to make a prediction about the number of white marbles in the bag, would you rather use one of Ken's samples or one of Seyi's samples? Why?

7 The dot plot shown represents the data from Seyi's experiment. Suppose Haley used the same bag of 250 marbles and repeated Seyi's experiment 15 times using 10 marbles as her sample size. Create a dot plot on the number line underneath Seyi's plot to show a realistic set of data from Haley's experiment.

Seyi's Results



Haley's Results

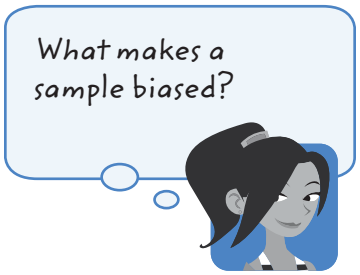


Name: _____

Making Statistical Inferences

Solve the problems.

1 Gianna wanted to estimate the mean number of words per page in the 180-page book she is reading. Which of these sampling methods gives the best estimate of the mean word count per page in the book?



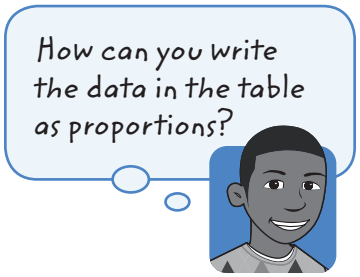
A Count the words on one randomly chosen page.

B Calculate the mean word count for a sample consisting of the 30 pages with photographs.

C Calculate the mean word count for a sample of 20 pages selected by choosing every 9th page.

D Calculate the mean word count for a sample consisting of the 10 pages that appear to have the most words.

2 A representative sample of 80 customers in a clothing store was surveyed about how they paid for their purchases. The table shows the responses.



Payment Method	Number of Customers
Cash	20
Check	12
Credit Card	24
Debit Card	16
Gift Card	8

Based on the survey results, choose *True* or *False* for each statement.

a. Tomorrow, 8 out of the first 80 customers will pay with a gift card. ☐ True ☐ False

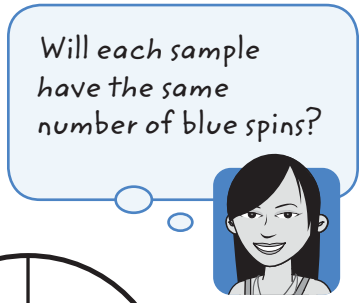
b. In a group of 40 customers, it is expected that about 10 will pay with cash. ☐ True ☐ False

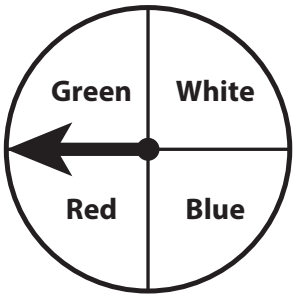
c. About 0.3 of all the store's customers will pay with a credit card. ☐ True ☐ False

d. A sample of 100 customers would provide less reliable results. ☐ True ☐ False

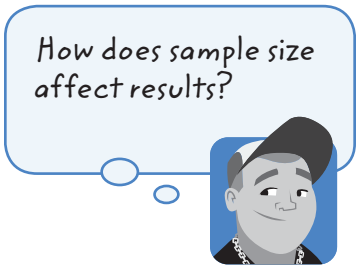
Solve.

3 Suppose you spun the fair spinner shown 10 times and recorded the number of times you landed on "Blue." Then 8 of your friends did the same thing. Without actually using a spinner, make a dot plot to show a realistic set of data for this situation. Your plot's number line should show the proportion of blue in each person's sample.





4 Suppose you and your friends decided to redo the experiment in Problem 3 using the same spinner but making 40 spins each. Explain how a dot plot representing this new data compares to the original.



5 Val asked a random sample of 50 students at her school if they brought lunch from home today. If 30 answered "yes," about what percent of students at Val's school brought lunch from home today?

A 15%

B 30%

C 50%

D 60%

Trey chose **B** as the correct answer. How did he get that answer?