

3-7-19

Aim: *SWBAT* understand random samples and make inferences based on the population using random samples.

HW: Packet Pages 5 - 6

Do Now: Read Unit 9 Packet Page 1

**Example 1)** Carla has a list of all 720 students in her middle school. She writes the names of each student on a slip of paper and puts each slip in the box. Then she pulls 30 names from the box to decide who she will survey about the upcoming school election.

How many students are in Carla's sample? 30

How many students are in the population? 720

One of Carla's friends suggests that she survey only eighth-graders because they are the oldest and probably know more about the election than younger students. Do you think this suggestion creates a random sample? (Yes or No) Explain.

NO because the other grades are not represented.

Another one of Carla's friends suggests that she make the sample larger and survey 100 students. Which sample size is more likely to represent the population? Explain.

As long as it's a random sample, the larger the sample the more likely it will be representative of the population.

### Drawing Inferences from a Random Sample

You can use data from a random sample to generalize about a population. You can also use data from random samples to make predictions about a population.

- Maybe about half of the students in a sample say that pizza is their favorite lunch item from the cafeteria.
- You might predict that about half of the population has the same preference. The data collected might be used for making menu choices and for determining food orders.

Using Carla's survey above . . . If 16 out of the 30 people surveyed by Carla and her friends said they would vote for Ben, how many of the 720 middle school students could Carla predict would vote for Ben? (Set up and solve a proportion)

$$\frac{16}{30} = \frac{x}{720}$$

$$\frac{30x}{30} = \frac{11520}{30}$$

$$x = 384$$

Example 2) Colin asked every eighth student entering the school which of four subjects was his or her favorite. The table below shows the results of Colin's survey:

Favorite Subject	
Subject	Number of Students
Math	15
Science	20
Language Arts	10
Social Studies	5

- 1) Does Colin's survey represent a random sample? yes
- 2) Why or why not? He asked every 8<sup>th</sup> student entering the school, so it's likely to be random.

- 3) If there are 400 students at Colin's school, predict the number of students who would say that Language Arts is their favorite subject? (Set up and solve a proportion)

$$\frac{10}{50} = \frac{x}{400} \quad \frac{50x = 4000}{50} \quad x = 80$$

- 4) If there are 642 students at Colin's school, predict the number of students who would say that Math is their favorite subject? (Set up and solve a proportion)

$$\frac{15}{50} = \frac{x}{642} \quad \frac{50x = 9630}{50} \quad x = 192.6 \quad \text{About 193 students.}$$

### Variation among Random Samples

Random samples can differ from one another due to **random variation**. The amount of variation is usually small, but occasionally, the variation is much larger.

For example → If Ms. Jennings has a "mystery bag" of 100 marbles. Some of the marbles are red and the rest of them are blue. She wants her class to estimate how many of the marbles are red, without actually counting all the marbles in the bag. Instead, the class will use random samples of 10 marbles each.

Part A → Suppose Joey had 4 red marbles in his sample. Use a proportion to estimate the number of red marbles in the bag.

$$\frac{4}{10} = \frac{x}{100} \quad \frac{10x = 400}{10} \quad x = 40$$

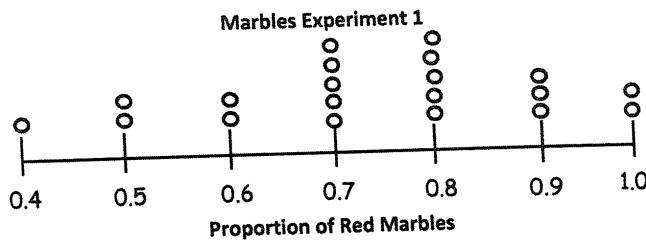
Part B → Ms. Jennings put Joey's marbles back in the bag. Then she let Angela choose 10 marbles. Suppose Angela had 6 red marbles in her sample. After replacing the Angela's marbles, Isabella chose 10 marbles and she got 9 red marbles.  
 Why do you think the amount of red marbles was different in each sample?

Students picked marbles in different ways.

\*\* In order to get a better estimate of the number of red marbles in the bag, Ms. Jennings decided the class needed to draw more random samples. Drawing more random samples would help you decide how "typical" the samples from Joey, Angela and Isabella are.

- By plotting the data on a dot plot, you can look for clusters around the same value and you can be more confident about using that value to estimate about the population.
- You can also increase the sample size. If you drew 25 marbles instead of 10, the number of red marbles drawn would probably be clustered closer together.

Part C → Ms. Jennings decided to let each of her 20 students draw a random sample from the mystery bag. The data are plotted on the dot plot below.



How are the numbers distributed on the dot plot? Do you notice a cluster?

Even though the range of red marbles chosen is between 40% and 100%, there is a cluster at 70 and 80%.

\* Part D → Use a proportion to best estimate the number of red marbles in the "mystery bag."

mean →  $\frac{7.4}{10} = \frac{x}{100}$

$\frac{10x}{10} = \frac{740}{10}$   
 $x = 74$

I would estimate there to be 74 red marbles in the bag.

## Homework - Random Samples

1. The School board wants to study computer literacy among teachers. Which would represent a **random** sample of teachers
  - a. All high school math teachers
  - b. Teachers from the middle school whose name begins with N
  - c. All male teachers
  - d. Every eighth teacher on an alphabetical list

2. An on-line bookseller randomly chooses 200 book buyers from its database and then surveys those book buyers to find out if they were satisfied with the time it took to deliver their orders. Explain if the bookseller's survey is biased or not.

---

---

---

3. Milena surveys 80 high school students who are leaving a jazz concert to determine the favorite type of music among high school students. Explain whether or not Milena's survey is biased.

---

---

---

4. Max wants to find out the exercise habits of local children. He plans to survey every third child he sees coming out of a sporting goods store. Max says his sample is not biased. Do you agree or disagree? Explain.

---

---

---

5. A researcher catches 60 fish from different locations in a lake. He then tags the fish and puts them back in the lake. Two weeks later, the researcher catches 40 fish from the same locations. 8 of these fish are tagged. Predict the number of fish in the lake using a proportion.

6. A high school has 1800 students. A random sample of 80 shows that 24 kids have cell phones. Predict the number of students in the entire high school who have cell phones using a proportion.
7. In a random sample, 3 of 400 computer chips are found to be defective. Based on the sample, about how many chips out of 100,000 would you expect to be defective
- 750
  - 3000
  - 4000
  - Cannot be Determined
8. A mint produces 150,000 souvenir coins each year. In a random sample of 400 coins, 3 have a misprint. Predict the number of coins that will have misprints in a year.
9. Zach chooses a random sample of 50 out of 400 students. He finds that 7 of them have traveled to a foreign country. Zach claims that over 50 out of all 400 students have traveled to a foreign country. Do you agree or disagree. Explain your answer on the lines below.

Circle one:      agree                  disagree

---

---

---

---