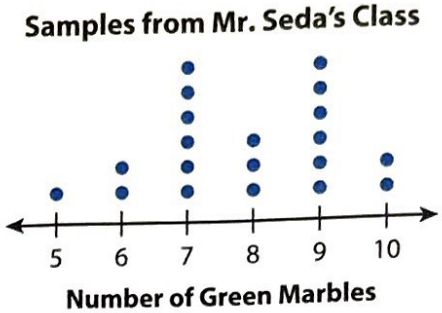
➤ **Read and try to solve the problem below.**

Mr. Seda has a bag with 500 marbles. The marbles are either green or yellow. He has 20 students in his class take turns selecting 10 marbles from the bag without looking. Each student records the number of green marbles and then returns the marbles to the bag.

What is a reasonable estimate for the number of green marbles in the bag?



TRY IT

Math Toolkit double number lines, grid paper

Mean:

$$\frac{5+6(2)+7(6)+8(3)+9(6)+10(2)}{20} = \frac{157}{20} = 7.85$$

$$\frac{7.85}{10} \overset{\times 50}{=} \frac{x}{500} = 392.5$$

A reasonable estimate is 393 green marbles in the bag

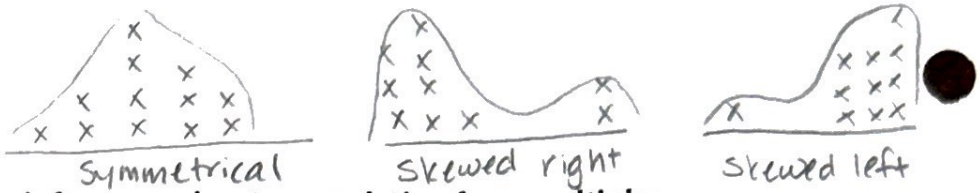
DISCUSS IT

Ask: Why did you choose that strategy to find a reasonable estimate?

Share: I chose that strategy because . . .

DISCUSS IT

continued

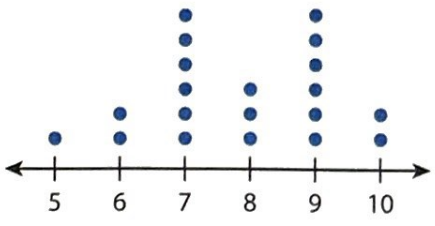


➤ **Explore different ways to make inferences about a population from multiple random samples.**

Mr. Seda has a bag with 500 marbles. Some marbles are green, and the rest are yellow. He has 20 students in his class each select 10 marbles from the bag without looking. Each student records the number of green marbles and then returns the marbles to the bag.

What is a reasonable estimate for the number of green marbles in the bag?

Samples from Mr. Seda's Class



Number of Green Marbles

Analyze It

You can use the mean of the samples to make an inference.

Each sample has 10 marbles. The mean of the number of green marbles in each sample is 7.85.

You can expect the fraction $\frac{\text{green marbles}}{\text{total marbles}}$ to be about the same for the population and the average of the samples.

Let g represent the number of green marbles in the population.

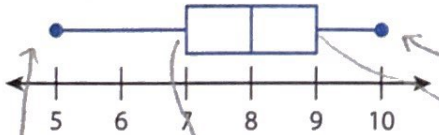
$$\frac{7.85}{10} = \frac{g}{500}$$

Analyze It

You can use the median of the samples to make an inference.

Use a box plot to organize the samples.

Samples from Mr. Seda's Class



Number of Green Marbles

Each sample has 10 marbles. The median number of green marbles in each sample is 8.

Let g represent the number of green marbles in the population.

Median $\frac{8}{10} = \frac{g}{500}$

$\frac{8}{10} = \frac{400}{500}$ (×50)

5 6 6 7 7 7 7 7 8 8 8 9 9 9 9 9 9 10 10

CONNECT IT

➤ **Use this page to deepen your understanding of making inferences about a population from multiple random samples.**

1 Talk About It

a. Why are the estimates using the mean and using the median different even though both use a measure of center?

The mean is the averge and the median is the middle. If the data is evenly spread out they would both be good representations

b. Why are the estimates using the mean and using the median both reasonable?

Both describe the center of the data, and are close values to each other

2 Show What You Know

a. The first student to select a sample got 6 green marbles in his sample. Making an inference from just this one sample might be misleading. Explain why.

Based on the other samples, 6 is not a typical value. It is less than the center so it would give an estimate that is too low

b. How can using more than one sample help you make a better inference about a population than using only one sample?

When you use only one sample, you do not know if it describes the whole population well. When using multiple samples any outliers are likely to get balanced out.

3 Reflect Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

Apply It

➤ **Use what you learned to solve these problems.**

4 Staff at a recreation center use surveys to decide whether to offer martial arts classes. Each of 15 staff members surveys a random sample of 8 recreation center members about whether they practice martial arts.

Kateri uses the median of the results and infers that $\frac{1}{8}$ of the recreation center members practice martial arts. Marvin uses the mean and infers that $\frac{1}{5}$ do. Explain why Kateri's inference is more reasonable than Marvin's.

Since the data is not symmetrical, the median is a better measure of center and provides a better basis for an inference

5 Caleb, Aimee, and Ramón each survey a random sample of 40 students in their school about whether they babysit their younger siblings. They use the results to make an inference about what percent of students in the school babysit their younger siblings. Which range of inferences is most reasonable?

Student Who Conducted Survey	Number of Students Who Babysit Siblings
Caleb	𝍸 𝍸 |
Aimee	𝍸 𝍸 ||
Ramón	𝍸 |||

A 27.5% to 30%

B 20% to 30%

C 8% to 12%

D 10.3% to 11%

C $\frac{11}{40} = \frac{\quad}{100}$ 27.5%

A $\frac{12}{40} = \frac{\quad}{100}$ 30%

R $\frac{8}{40} = \frac{\quad}{100}$ 20%

6 Josh has a bag with 171 beads. Some beads are red, some are orange, and the rest are yellow. He selects 8 beads without looking, counts how many are orange, and then puts the beads back in the bag. He does this 12 times. What is a reasonable estimate for the number of orange beads in the bag? Show your work.

Number of Orange Beads	2	3	4	5	6
Frequency	2	5	3	1	1

Mean $\frac{2(2)+3(5)+4(3)+5+6}{12} = \frac{42}{12} = 3.5$ $\frac{3.5}{8} = \frac{}{171}$ 598.5 ÷ 8 = 74.81

Median 2 2 3 3 3 3 | 3 4 4 4 5 6 (3)

$\frac{3}{8} = \frac{}{171}$ 513 ÷ 8 = 64.125

SOLUTION A reasonable estimate is 75 orange beads - Mean

A reasonable estimate is 64 orange beads - Median