7.3 Lesson

Key Vocabulary
population, *p. 553*
sample, *p. 553*
unbiased sample, *p. 555*
biased sample, *p. 555*

An **unbiased sample** is representative of a population. It is selected at random and is large enough to provide accurate data.

A **biased sample** is not representative of a population. One or more parts of the population are favored over others.

Example 1 B.E.S.T. Test Prep: Identifying an Unbiased Sample

You want to estimate the number of students in a high school who listen to reggaeton, a popular style of music in Puerto Rico and many other Caribbean countries. Which sample is unbiased?

Ⓐ 4 students in the hallway

Ⓑ all students on the soccer team

Ⓒ 50 Puerto Rican students at random

Ⓓ 100 students at random during lunch

Choice A is not large enough to provide accurate data.

Choice B is not selected at random.

Choice C is not representative of the population, because Puerto Rican students are favored over other students.

Choice D is representative of the population because it is selected at random and is large enough to provide accurate data.

▶ So, the correct answer is Ⓓ.

Conclusions made from the sample in Choice C may be inaccurate because Puerto Rican students may be more likely to listen to reggaeton than other students.

Try It

1. **WHAT IF?** You want to estimate the number of Puerto Rican students in a high school who listen to reggaeton. Which sample is unbiased? Explain.

GO DIGITAL

2. You want to estimate the number of eighth-grade students in your school who find it relaxing to listen to music. You consider two samples.

   - fifteen randomly selected members of the band
   - every fifth student whose name appears on an alphabetical list of eighth-grade students

   Which sample is unbiased? Explain.

random

every 5th student on the list because band members obviously enjoy music so that is biased.

The results of an unbiased sample are proportional to the results of the population. So, you can use unbiased samples to make conclusions about a population. Biased samples are not representative of a population. So, you should not use them to make conclusions about a population.

Example 2 Determining Whether Conclusions Are Valid

You want to know how the residents of your town feel about adding a new landfill. Determine whether each conclusion is valid.

a. You survey the 100 residents who live closest to the new landfill. The diagram shows the results. You conclude that 10% of the residents of your town support the new landfill.

The sample is not representative of the population, because residents who live close to the landfill may be less likely to support it.

▶ So, the sample is biased, and the conclusion is not valid.

b. You survey 100 residents at random. The table shows the results. You conclude that 60% of the residents of your town do not support the new landfill.

New Landfill	
Support	40
Do Not Support	60

The sample is representative of the population, because it is selected at random and is large enough to provide accurate data.

▶ So, the sample is unbiased, and the conclusion is valid.

Try It

3. Four out of five randomly chosen teenagers support the new landfill. So, you conclude that 80% of athe residents of your town support the new landfill. Is the conclusion valid? Explain.

NO because you only asked teens which does not represent the population.

In-Class Practice

1 I don't understand yet. 2 I can do it with help. 3 I can do it on my own. 4 I can teach someone else.

4 MTR 4. **WHICH ONE DOESN'T BELONG?** You want to estimate how many people in your city read comic books. Which sample does *not* belong with the other three? Explain your reasoning.

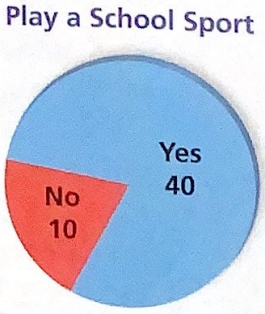
your 5 closest friends | 25 students in your school at random

75 people at random from a list of city residents

the first 50 people to arrive at a comic book convention

The other samples are not representative of people in your city.

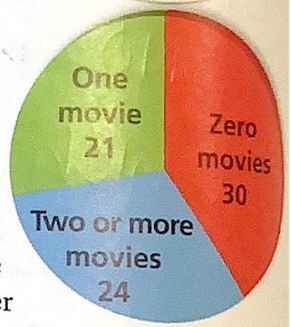
5. **ANALYZING A CONCLUSION** At a football game, you ask 50 randomly chosen students from your school whether they play a school sport. The diagram shows the results. You conclude that 80% of students in your school play a school sport. Is your conclusion valid? Explain.



NO because students that attend sporting events most likely play a sport.

Example 3 Modeling Real Life

You ask 75 randomly chosen students at a school how many movies they watch each week. There are 1200 students in the school. Estimate the number of students in the school who watch one movie each week.



Understand the problem.

You are given the numbers of movies watched each week by a sample of 75 students. You are asked to make an estimate about the population, all students in the school.

Make a plan.

The sample is representative of the population because it is selected at random and is large enough to provide accurate data. So, the sample is unbiased, and its results are proportional to the results of the population. Use a ratio table to estimate the number of students in the school who watch one movie each week.

Solve and check.

Students (one movie)	21	84	336
Total Students	75	300	1200

×4 ×4 ×4 ×4

▶ So, about 336 students in the school watch one movie each week.

Another Method

Use a proportion.

$$\frac{21}{75} = \frac{n}{1200}$$

$336 = n$ ✓

In-Class Practice

1 I don't understand yet. 2 I can do it with help. 3 I can do it on my own. 4 I can teach someone else.

6. You want to estimate the mean photo size on your cell phone. You choose 30 photos at random from your phone. The total size of the sample is 186 megabytes. Explain whether you can use the sample to estimate the mean size of photos on your cell phone. If so, what is your estimate?

7. **Dig Deeper** You ask 50 randomly chosen employees of a company how many times they used a bicycle-sharing system last month. The diagram shows the results. There are 600 people employed by the company. Estimate the number of employees who used a bicycle-sharing system at least one time last month.