

Grade 7 - Random Sampling and Inference - Lesson

Common Core 7.SP.A.1, 7.SP.A.2 · maths-pdf.fr/en/

A **population** is the whole group being studied, and a **sample** is a part of it. A **random sample** gives every member an equal chance of being chosen, so it is usually representative of the population. You can use the proportion in a random sample to estimate the proportion in the population, but different samples give somewhat different results.

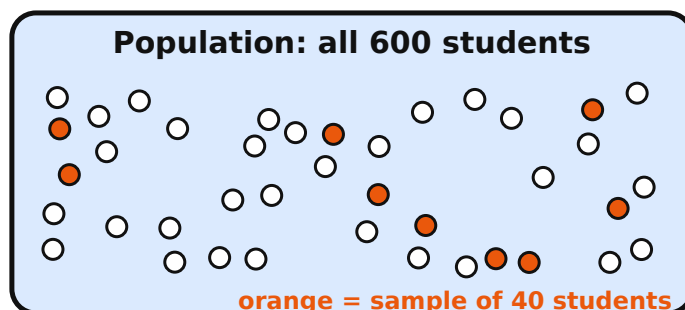
Grade 7 · Common Core State Standards: **7.SP.A.1**, **7.SP.A.2**

Key facts

- A population is the whole group; a sample is a part of it.
- A random sample gives every member an equal chance of being chosen.
- Biased samples over-represent some members and give poor estimates.
- Estimate a population count by multiplying the sample proportion by the population size.
- Larger random samples vary less and give better estimates.

What are a population and a sample?

A **population** is the whole group you want to learn about. A **sample** is a part of the population that you actually measure or survey.



The population is every member of the group. A sample is a smaller part chosen to represent it.

Surveying every student in a school of 600 takes a long time, so a class might survey just 40 and use the results to make an **inference**, a conclusion about the whole population.

What makes a sample representative?

Random sample

A sample is **random** if every member of the population has an equal chance of being chosen. Random samples are usually **representative**, meaning they have the same characteristics as the population. A biased sample over-represents some members.

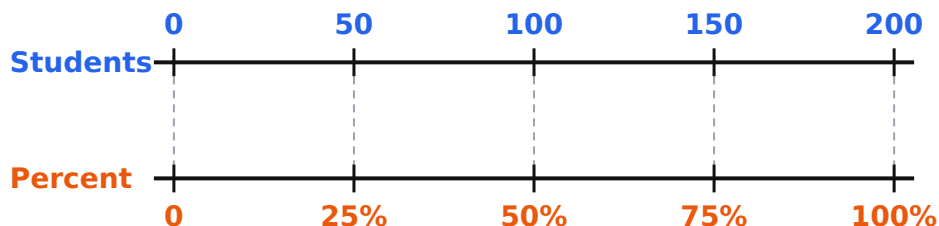
Method	Representative?
Draw 40 names from a hat	Yes: random
Ask only the chess club	No: biased
Ask the first 40 in the lunch line	Maybe not: not random

Only random sampling gives each member an equal chance.

Asking only the basketball team about favorite sports gives a **biased** sample, because team members may like basketball more than other students do. Drawing names from a hat, or using a random number generator, avoids that bias.

How do you use a sample to estimate a population?

Find the proportion in the sample and apply it to the population.

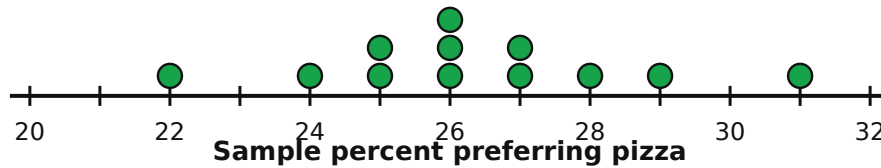


50 of 200 sampled is 25%, so we expect about 25% of the whole population.

1. Find the sample proportion: $50 \div 200 = 0.25$.
2. Multiply by the population size: $0.25 \times 1200 = 300$.
3. Say it is an estimate, not an exact count.

Why do different samples give different results?

Each random sample is a little different, which is called **sampling variability**. If you draw many samples of the same size, the results cluster around the true value. Larger samples vary less, so they give better estimates.



Samples of the same size give different results, but they cluster near the true percent.

The dot plot shows 12 samples. The center is near 26%, so an estimate close to 26% is reasonable even though single samples ranged from 22% to 31%.

Questions about random sampling and inference

What is the difference between a population and a sample?

The population is everyone or everything you want to study. A sample is a smaller group chosen from the population.

What makes a sample biased?

A sample is biased when some members of the population are more likely to be chosen than others. Asking only the basketball team about sports is biased.

How do you pick a random sample?

Use a method that gives every member an equal chance, such as drawing names from a hat or using a random number generator.

How do you estimate a population from a sample?

Find the proportion in the sample and multiply it by the population size. If 25% of a sample likes pizza, expect about 25% of 1,200 students, or 300.

Why do two random samples give different results?

Chance causes small differences between samples. This is called sampling variability, and it is smaller for larger samples.