GRADE 7 · UNIT 5 · LESSON 1

Random Samples vs. Population

MA.7.DP.1.3

I can tell a population from a sample, say whether a sample is random, and predict from it.

Warm-Up

1. Find the median: 14, 9, 21, 6, 17
2. Solve: $4x - 3 = 29$
3. Area of a circle, radius 6 cm. Use $\pi = 3.14$
4. What is 30% of 450?

Warm-Up

1. Find the median: 14, 9, 21, 6, 17 **14**
2. Solve: $4x - 3 = 29$ $x = 8$
3. Area of a circle, radius 6 cm. Use $\pi = 3.14$ **113.04 cm²**
4. What is 30% of 450? **135**

Vocabulary

population

everyone or everything you want to know about

sample

the part of the population you actually ask or measure

representative

a sample is representative when it looks like the population it came from

Vocabulary

random sample

every member of the population has the same chance of being chosen — like names drawn from a hat that holds every name

biased sample

a sample that leaves part of the population out, or over-picks one group

sample fraction

the part of the sample with the trait, over the whole sample

Notes

I. You cannot ask everybody

population — everyone or everything you want to know about — all 900 students

sample — the part you actually ask — the 60 students you stopped in the hall

The sample is inside the population. It is never the other way around.

Notes

II. A sample has to look like the population

representative — the sample looks like the population it came from

biased — the sample leaves part of the population out, or takes too many of one group

Ask of any plan: who cannot be chosen?

Notes

III. What makes a sample random

Random: every member of the population has the same chance of being chosen.

All 900 names in a hat, draw 60 — random.

A computer picks 60 student numbers at random from all 900 — random.

The first 60 to arrive — not random: a late student has no chance.

One class of 30 — not random: no other student can be chosen.

Notes

IV. A random sample predicts

1. The sample fraction: the part with the trait over the whole sample.

2. Take that fraction of the population.

The answer is an estimate — write "about".

Only a random sample predicts. A biased sample predicts nothing.

Example 1

A student council member surveys Windy Hill's 900 students.

Before school, he asks the first 30 students who enter the media center.

Is this a random sample? Who cannot be chosen?

Example 1

Not random — a student who arrives late has no chance of being chosen.

Biased — the sample is all early arrivals, and all media-center users.

Fix: number every student 1 to 900 and draw 30 numbers.

Answer: Not random — late arrivals and students who skip the media center cannot be chosen.

Your Turn

The cafeteria asks every student standing in the lunch line at 11:05 which hot lunch they like best.

Is this a random sample? Who cannot be chosen?

Your Turn

The cafeteria asks every student standing in the lunch line at 11:05 which hot lunch they like best.

Is this a random sample? Who cannot be chosen?

In a random sample every student has the same chance.

Here only the students in line at 11:05 can be chosen.

Answer: Not random — students who bring lunch or eat later cannot be chosen.

Example 2

In a random sample of 80 Windy Hill students, 12 walk to school.

The school has 900 students.

About how many of the 900 walk to school?

Example 2

$$\frac{12}{80} = 0.15 = 15\%$$

$$0.15 \cdot 900 = 135$$

$$\frac{900}{80} = 11.25, \quad 12 \cdot 11.25 = 135$$

Answer: About 135 students

Your Turn

In a random sample of 50 students, 18 ride the bus.

Predict how many of the 900 students ride the bus.

Your Turn

In a random sample of 50 students, 18 ride the bus.

Predict how many of the 900 students ride the bus.

Sample fraction: $\frac{18}{50}$

$$\frac{18}{50} \cdot 900 = 324$$

Answer: About 324 students

Whiteboards · Question 1 of 9

A random sample of 60 students found 21 with a library card.

Write the sample fraction in lowest terms.

Answer it.

Whiteboards · Question 1 of 9

A random sample of 60 students found 21 with a library card.

Write the sample fraction in lowest terms.

21 of 60: $\frac{21}{60}$

Divide top and bottom by 3: $\frac{21}{60} = \frac{7}{20}$

Answer: $\frac{7}{20}$

Whiteboards · Question 2 of 9

Same sample: 21 of 60 have a library card. The school has 1,200 students.

Predict how many of the 1,200 have a library card.

Answer it.

Whiteboards · Question 2 of 9

Same sample: 21 of 60 have a library card. The school has 1,200 students.

Predict how many of the 1,200 have a library card.

$$\frac{21}{60} = \frac{7}{20}$$

$$\frac{7}{20} \cdot 1{,}200 = 420$$

Answer: 420

Whiteboards · Question 3 of 9

A middle school has 770 students.

Which plan gives a random sample of 70?

A. Ask 70 students at the book fair.

B. Put all 770 names in a hat and draw 70.

C. Ask 70 students in two math classes.

D. Ask the first 70 students off the buses.

Answer it.

Whiteboards · Question 3 of 9

A middle school has 770 students.

Which plan gives a random sample of 70?

A, C and D each leave some students with no chance.

B: every one of the 770 names can be drawn.

Answer: B — every name in the hat, draw 70

Whiteboards · Question 4 of 9

A random sample of 55 of a school's 880 students found 19 who bring their lunch.

Predict how many of the 880 bring their lunch.

Answer it.

Whiteboards · Question 4 of 9

A random sample of 55 of a school's 880 students found 19 who bring their lunch.

Predict how many of the 880 bring their lunch.

$$\frac{19}{55} \cdot 880 = 304$$

Answer: About 304

Whiteboards · Question 5 of 9

In a random sample of a town's voters, 45% said yes. The town has 8,600 voters.

Predict how many of the 8,600 would say yes.

Answer it.

Whiteboards · Question 5 of 9

In a random sample of a town's voters, 45% said yes. The town has 8,600 voters.

Predict how many of the 8,600 would say yes.

$$45\% = 0.45$$

$$0.45 \cdot 8{,}600 = 3{,}870$$

Answer: About 3,870

Whiteboards · Question 6 of 9

A town asks how many households recycle.

Which sample is biased?

A. 200 who used the recycling center.

B. 200 drawn at random, called back if no answer.

C. 200 drawn at random from the address list.

D. 200 drawn at random from all the streets.

Answer it.

Whiteboards · Question 6 of 9

A town asks how many households recycle.

Which sample is biased?

Everyone at the recycling center already recycles.

Households that do not recycle cannot be in that sample.

Answer: A — the recycling center

Whiteboards · Question 7 of 9

Over 5 days, a shelter checked a random sample of 40 of its 340 animals: 14 were cats.

Predict the number of cats in the shelter.

Answer it.

Whiteboards · Question 7 of 9

Over 5 days, a shelter checked a random sample of 40 of its 340 animals: 14 were cats.

Predict the number of cats in the shelter.

$$\frac{14}{40} \cdot 340 = 119$$

Answer: 119

Whiteboards · Question 8 of 9

A second random sample of 55 of the same 880 students found 23 who bring their lunch.

Predict how many of the 880 bring their lunch.

Answer it.

Whiteboards · Question 8 of 9

A second random sample of 55 of the same 880 students found 23 who bring their lunch.

Predict how many of the 880 bring their lunch.

$$\frac{23}{55} \cdot 880 = 368$$

Answer: About 368

Whiteboards · Question 9 of 9

Two random samples of 55 of the same 880 students predicted 304 and 368.

Both were done correctly. Explain why the two predictions differ.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Two random samples of 55 of the same 880 students predicted 304 and 368.

Both were done correctly. Explain why the two predictions differ.

Each sample is 55 different students.

$\frac{19}{55} \cdot 880 = 304$ and $\frac{23}{55} \cdot 880 = 368$

Answer: Different samples hold different students, so a prediction is an estimate.

Independent Practice

1. A random sample of 60 students: 15 walk to school. Write the sample fraction in lowest terms.

2. The school has 800 students. Use that sample to predict how many walk to school.

3. In a random sample of shoppers, 35% use the self-checkout. Predict for 1,400 shoppers.

4. Over 4 afternoons, 25 of a library's 600 paperbacks were checked at random; 8 were damaged. Predict the number damaged.

5. To predict how many students at the school can swim, a coach asks 40 students at swim practice. Is it random? Who cannot be chosen?

6. A random sample of 30 of the 600 students: 12 play a sport. Predict for 600, then say in one sentence why another sample of 30 might differ.

Before You Go

A prediction from a sample is an estimate, not a count.

Two honest samples give two different numbers.

Tomorrow: what makes one sample better than another.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. Due by the Unit 5 test.

Today's skills — all required

Populations and samples (YHZ)

Identify representative and random samples (B9Z)