Random Sampling

Name: _____ Date: _____ Score: _____ / 24

Quick Review

A **population** is the whole group you study; a **sample** is the part you actually examine. A **random** sample gives every member an equal chance, so it tends to be representative; a **biased** sample over- or under-counts groups and misleads. To estimate a population total, solve the proportion $\frac{\text{sample count}}{\text{sample size}} = \frac{\text{population estimate}}{\text{population size}}$.

◇ **Example:** In a random sample of 50 students, 12 said math is their favorite subject. Estimate how many of the school's 600 students would say the same.

⇒ The sample rate should match the school rate. In the sample, $\frac{12}{50}$ chose math, so set $\frac{12}{50} = \frac{x}{600}$. Multiply both sides by 600: $x = \frac{12}{50} \times 600 = 144$. About 144 students would pick math.

Answer: about 144 students

PRACTICE

Identify the sample issue or estimate the population value.

1. In 50 people, 12 like math. Estimate for 600. _____
2. In 40 items, 8 are defective. Estimate for 1000. _____
3. In 60 voters, 15 favor the plan. Estimate for 400. _____
4. In 45 fish, 9 are tagged. Estimate for 300. _____
5. In 35 people, 7 ride bikes. Estimate for 500. _____
6. In 60 shoppers, 18 used a coupon. Estimate for 200. _____
7. In 24 bulbs, 6 failed. Estimate for 800. _____
8. In 56 students, 14 walk. Estimate for 100. _____
9. In 20 books, 4 are mysteries. Estimate for 250. _____
10. In 30 cars, 6 are red. Estimate for 150. _____
11. In 25 apples, 5 are bruised. Estimate for 400. _____
12. In 80 people, 20 own a dog. Estimate for 1200. _____
13. Survey only at a gym: is it biased for the whole town? _____
14. Survey every 10th name on a full school list: biased? _____
15. Ask only your friends about a school policy: biased? _____
16. Draw names from a hat with all students' names: biased? _____
17. Online poll anyone can answer many times: biased? _____
18. In 100 surveyed, 30 exercise daily. Estimate for 2000. _____
19. In 48 phones, 12 need repair. Estimate for 600. _____
20. In 36 plants, 9 flowered. Estimate for 240. _____

♦ Word Problems

21. A factory's random sample of 40 light bulbs has 3 defective. About how many of a 2000-bulb shipment are likely defective? _____
22. A reporter surveys people leaving a sports stadium about the city's favorite hobby. Why is this sample biased? _____
23. Biologists tag 50 fish in a lake, release them, and later catch 80 fish, of which 10 are tagged. Estimate the lake's fish population. _____
24. In a random sample of 60 households, 24 recycle. Estimate how many of the town's 5000 households recycle. _____

Scan Me

Answer Keys

1. 144
2. 200
3. 100
4. 60
5. 100
6. 60
7. 200
8. 25
9. 50
10. 30
11. 80
12. 300
13. biased
14. not biased
15. biased
16. not biased
17. biased
18. 600
19. 150
20. 60
21. about 150 bulbs
22. biased — it over-represents sports fans
23. about 400 fish
24. about 2000 households

Step-by-Step Explanations

1. $\frac{12}{50} \times 600 = 144$ people.
2. $\frac{8}{40} \times 1000 = \frac{1}{5} \times 1000 = 200$ items.
3. $\frac{15}{60} \times 400 = \frac{1}{4} \times 400 = 100$ voters.
4. $\frac{9}{45} \times 300 = \frac{1}{5} \times 300 = 60$ fish.
5. $\frac{7}{35} \times 500 = \frac{1}{5} \times 500 = 100$ people.
6. $\frac{18}{60} \times 200 = \frac{3}{10} \times 200 = 60$ shoppers.
7. $\frac{6}{24} \times 800 = \frac{1}{4} \times 800 = 200$ bulbs.
8. $\frac{14}{56} \times 100 = \frac{1}{4} \times 100 = 25$ students.
9. $\frac{4}{20} \times 250 = \frac{1}{5} \times 250 = 50$ books.
10. $\frac{6}{30} \times 150 = \frac{1}{5} \times 150 = 30$ cars.
11. $\frac{5}{25} \times 400 = \frac{1}{5} \times 400 = 80$ apples.
12. $\frac{20}{80} \times 1200 = \frac{1}{4} \times 1200 = 300$ people.
13. Gym-goers are more active than the average resident, so the sample over-represents active people — it is biased.
14. Using a fixed interval over a complete list gives everyone a fair chance — this is a valid, unbiased method.
15. Your friends are not chosen randomly and likely share your views, so this sample is biased.
16. Every student has an equal chance of being drawn, so this is a fair random sample.
17. People with strong opinions self-select and can vote repeatedly, so the sample is biased.
18. $\frac{30}{100} \times 2000 = \frac{3}{10} \times 2000 = 600$ people.
19. $\frac{12}{48} \times 600 = \frac{1}{4} \times 600 = 150$ phones.
20. $\frac{9}{36} \times 240 = \frac{1}{4} \times 240 = 60$ plants.
21. The sample defect rate is $\frac{3}{40}$. Apply it to the shipment: $\frac{3}{40} \times 2000 = 3 \times 50 = 150$ defective bulbs.
22. People leaving a stadium are mostly sports fans, so they are not representative of the whole city. A random sample of all residents would be fairer.
23. In the second catch, $\frac{10}{80} = \frac{1}{8}$ were tagged, so the 50 tagged fish should be about $\frac{1}{8}$ of the lake: $50 \times 8 = 400$ fish.
24. The sample rate is $\frac{24}{60} = \frac{2}{5}$. Apply it to the town: $\frac{2}{5} \times 5000 = 2000$ households.

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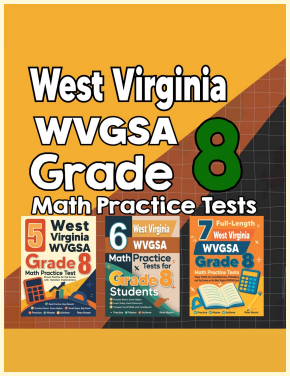

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