

Random Sampling

Name: _____

Date: _____

Score: _____ / 24

Q 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.

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

◆ Word Problems

- A factory's random sample of 40 light bulbs has 3 defective. About how many of a 2000-bulb shipment are likely defective? _____
- A reporter surveys people leaving a sports stadium about the city's favorite hobby. Why is this sample biased? _____
- 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. _____
- In a random sample of 60 households, 24 recycle. Estimate how many of the town's 5000 households recycle. _____



Answer Keys

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

Step-by-Step Explanations

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| <p>1. $\frac{12}{50} \times 600 = 144$ people.</p> <p>2. $\frac{8}{40} \times 1000 = \frac{1}{5} \times 1000 = 200$ items.</p> <p>3. $\frac{15}{60} \times 400 = \frac{1}{4} \times 400 = 100$ voters.</p> <p>4. $\frac{9}{45} \times 300 = \frac{1}{5} \times 300 = 60$ fish.</p> <p>5. $\frac{7}{35} \times 500 = \frac{1}{5} \times 500 = 100$ people.</p> <p>6. $\frac{18}{60} \times 200 = \frac{3}{10} \times 200 = 60$ shoppers.</p> <p>7. $\frac{6}{24} \times 800 = \frac{1}{4} \times 800 = 200$ bulbs.</p> <p>8. $\frac{14}{56} \times 100 = \frac{1}{4} \times 100 = 25$ students.</p> <p>9. $\frac{4}{20} \times 250 = \frac{1}{5} \times 250 = 50$ books.</p> <p>10. $\frac{6}{30} \times 150 = \frac{1}{5} \times 150 = 30$ cars.</p> <p>11. $\frac{5}{25} \times 400 = \frac{1}{5} \times 400 = 80$ apples.</p> <p>12. $\frac{20}{80} \times 1200 = \frac{1}{4} \times 1200 = 300$ people.</p> <p>13. Gym-goers are more active than the average resident, so the sample over-represents active people — it is biased.</p> <p>14. Using a fixed interval over a complete list gives everyone a fair chance — this is a valid, unbiased method.</p> | <p>15. Your friends are not chosen randomly and likely share your views, so this sample is biased.</p> <p>16. Every student has an equal chance of being drawn, so this is a fair random sample.</p> <p>17. People with strong opinions self-select and can vote repeatedly, so the sample is biased.</p> <p>18. $\frac{30}{100} \times 2000 = \frac{3}{10} \times 2000 = 600$ people.</p> <p>19. $\frac{12}{48} \times 600 = \frac{1}{4} \times 600 = 150$ phones.</p> <p>20. $\frac{9}{36} \times 240 = \frac{1}{4} \times 240 = 60$ plants.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>24. The sample rate is $\frac{24}{60} = \frac{2}{5}$. Apply it to the town: $\frac{2}{5} \times 5000 = 2000$ households.</p> |
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