

# 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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| <ol style="list-style-type: none"> <li>1. 144</li> <li>2. 200</li> <li>3. 100</li> <li>4. 60</li> <li>5. 100</li> <li>6. 60</li> <li>7. 200</li> <li>8. 25</li> <li>9. 50</li> <li>10. 30</li> <li>11. 80</li> <li>12. 300</li> </ol> | <ol style="list-style-type: none"> <li>13. biased</li> <li>14. not biased</li> <li>15. biased</li> <li>16. not biased</li> <li>17. biased</li> <li>18. 600</li> <li>19. 150</li> <li>20. 60</li> <li>21. about 150 bulbs</li> <li>22. biased — it over-represents sports fans</li> <li>23. about 400 fish</li> <li>24. about 2000 households</li> </ol> |
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### Step-by-Step Explanations

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| <ol style="list-style-type: none"> <li>1. <math>\frac{12}{50} \times 600 = 144</math> people.</li> <li>2. <math>\frac{8}{40} \times 1000 = \frac{1}{5} \times 1000 = 200</math> items.</li> <li>3. <math>\frac{15}{60} \times 400 = \frac{1}{4} \times 400 = 100</math> voters.</li> <li>4. <math>\frac{9}{45} \times 300 = \frac{1}{5} \times 300 = 60</math> fish.</li> <li>5. <math>\frac{7}{35} \times 500 = \frac{1}{5} \times 500 = 100</math> people.</li> <li>6. <math>\frac{18}{60} \times 200 = \frac{3}{10} \times 200 = 60</math> shoppers.</li> <li>7. <math>\frac{6}{24} \times 800 = \frac{1}{4} \times 800 = 200</math> bulbs.</li> <li>8. <math>\frac{14}{56} \times 100 = \frac{1}{4} \times 100 = 25</math> students.</li> <li>9. <math>\frac{4}{20} \times 250 = \frac{1}{5} \times 250 = 50</math> books.</li> <li>10. <math>\frac{6}{30} \times 150 = \frac{1}{5} \times 150 = 30</math> cars.</li> <li>11. <math>\frac{5}{25} \times 400 = \frac{1}{5} \times 400 = 80</math> apples.</li> <li>12. <math>\frac{20}{80} \times 1200 = \frac{1}{4} \times 1200 = 300</math> people.</li> <li>13. Gym-goers are more active than the average resident, so the sample over-represents active people — it is biased.</li> <li>14. Using a fixed interval over a complete list gives everyone a fair chance — this is a valid, unbiased method.</li> </ol> | <ol style="list-style-type: none"> <li>15. Your friends are not chosen randomly and likely share your views, so this sample is biased.</li> <li>16. Every student has an equal chance of being drawn, so this is a fair random sample.</li> <li>17. People with strong opinions self-select and can vote repeatedly, so the sample is biased.</li> <li>18. <math>\frac{30}{100} \times 2000 = \frac{3}{10} \times 2000 = 600</math> people.</li> <li>19. <math>\frac{12}{48} \times 600 = \frac{1}{4} \times 600 = 150</math> phones.</li> <li>20. <math>\frac{9}{36} \times 240 = \frac{1}{4} \times 240 = 60</math> plants.</li> <li>21. The sample defect rate is <math>\frac{3}{40}</math>. Apply it to the shipment: <math>\frac{3}{40} \times 2000 = 3 \times 50 = 150</math> defective bulbs.</li> <li>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.</li> <li>23. In the second catch, <math>\frac{10}{80} = \frac{1}{8}</math> were tagged, so the 50 tagged fish should be about <math>\frac{1}{8}</math> of the lake: <math>50 \times 8 = 400</math> fish.</li> <li>24. The sample rate is <math>\frac{24}{60} = \frac{2}{5}</math>. Apply it to the town: <math>\frac{2}{5} \times 5000 = 2000</math> households.</li> </ol> |
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