# Making Inferences from Random Samples

Spot mistakes, reason, and work backward

**Name** _____ **Date** _____ **Score** _____ / 8

**QUICK REVIEW**

Estimate population count = population size times random sample fraction. If $12$ of $20$ sampled students walk, estimate $(12/20)500 = 300$ walkers among $500$. Different random samples can yield different estimates; do not promise exactness.

**Worked example**

A random sample has $12$ walkers of $20$. Estimate walkers among $500$.

1. Sample fraction $12/20 = 3/5$.
2. Projected count $500(3/5) = 300$.
3. Projected nonwalkers $500 - 300 = 200$; both are estimates.

**Answer:** About $300$.

## Practice Problems

Show your thinking.

**1.** A student scales $19$ of $30$ to population $600$ by adding $570$. Correct the estimate using multiplication.

**2.** A model predicts $580$ supporters among $800$ from sample size $40$. Recover the supporting sample count.

**3.** Samples of $25$ have $16$ and $18$ riders. A report calls different estimates for $500$ a contradiction. Compute both and correct the claim.

**4.** A report uses $37$ as denominator for $37$ yes responses out of $60$. Correct the percent and projected NO count among $1200$.

**5.** A prediction of $625$ participants among $1000$ is called guaranteed after $40$ random observations. Recover its rate and correct the certainty claim.

**6.** A projection for $1400$ people mistakenly uses population $700$ with sample rate $22/35$. Correct the missing factor.

**7.** A sample rate is $72/120$ and a model predicts $900$ supporters. Recover the population size used by the model.

**8.** A student averages rates $3/10$ and $12/20$ from nonoverlapping random samples of the same town. They say the combined rate is $45\%$. Correct the rate and project to $500$ people.

# Answer Key

1. Estimated yes $380$; no $220$; yes rate $\frac{190}{3}\%$.
2. $29$ supporting responses.
3. Estimates $320$ and $360$; variation between samples, not guaranteed bounds.
4. Estimated yes $740$; no $460$; yes rate $\frac{185}{3}\%$.
5. Implied rate $\frac{5}{8}$; the estimate is not guaranteed.
6. $440$ then $880$; extra $440$.
7. $1500$ people.
8. $50\%$; about $250$ supporters.

## Step-by-Step Solutions

Follow each calculation, then check your own work.

### Problem 1

1. Sample rate $= 19/30 = \frac{19}{30}$.
2. Estimated count $= 600(\frac{19}{30}) = 380$.
3. Complement $= 600 - 380 = 220$; these are estimates, not a census.

### Problem 2

1. Find the model rate from the given projection: $580/800 = \frac{29}{40}$.
2. Apply that rate to the sample of $40$: $40(\frac{29}{40}) = 29$ supporting responses.
3. Check: $800(29/40) = 580$.

### Problem 3

1. Sample rate $= 16/25 = \frac{16}{25}$.
2. Estimated count $= 500(\frac{16}{25}) = 320$.
3. Second estimate $= 500(18/25) = 360$; random samples can yield different rates.

### Problem 4

1. Sample rate $= 37/60 = \frac{37}{60}$.
2. Estimated count $= 1200(\frac{37}{60}) = 740$.
3. Complement $= 1200 - 740 = 460$; these are estimates, not a census.

### Problem 5

1. The stated projection is $625$ of $1000$, so the implied rate is $625/1000 = \frac{5}{8}$.
2. Check the model: $1000(\frac{5}{8}) = 625$ projected participants.
3. Only $40$ people were observed. Another random sample could produce a different rate, so the projection is not a guarantee.

### Problem 6

1. Sample rate $= 22/35 = \frac{22}{35}$.
2. Estimated count $= 700(\frac{22}{35}) = 440$.
3. New count $= 1400(\frac{22}{35}) = 880$; difference $440$.

### Problem 7

1. Simplify the rate: $72/120 = 3/5$.
2. If $P$ is the population, $(3/5)P = 900$. Divide: $P = 900/(3/5) = 1500$.
3. Check $1500(3/5) = 900$.

### Problem 8

1. Pooling gives $3 + 12 = 15$ supporters out of $10 + 20 = 30$ respondents.
2. Correct rate $15/30 = 1/2 = 50\%$; the larger sample contributes more respondents, so equal weighting was wrong.
3. Projection $500(1/2) = 250$ supporters.

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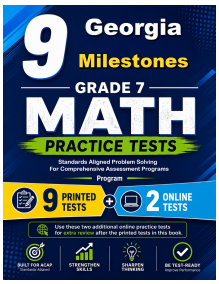


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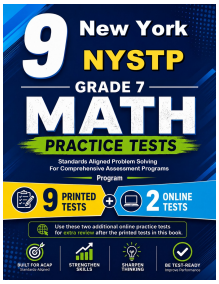


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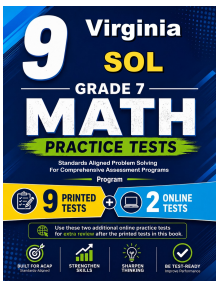


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