# Making Inferences from Random Samples

Apply the skill to decisions and designs

**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.** Plan $600$ seats using a random poll where $20$ of $30$ prefer art. Estimate art seats; is $390$ enough under this model?

**2.** A park expects $800$ visitors. A random sample has $30$ supporters of $40$. Estimate supporters and nonsupporters so counts add to $800$.

**3.** Two samples suggest participation $17/25$ and $19/25$. Estimate a planning interval for $500$ people, without claiming a guaranteed bound.

**4.** A meal plan for $1200$ uses a random sample where $38$ of $60$ choose soup. Estimate soup and other meals.

**5.** A goal is $670$ participants. Sample participation is $26$ of $40$. Estimate participation in $1000$ and the shortfall from the goal.

**6.** A plan expands from $700$ to $1400$ people. Using sample $23$ of $35$, estimate extra participant supplies.

**7.** A plan needs $950$ supporters. A random survey has $72$ of $120$ in support among $1500$ residents. Estimate support and the gap from the goal.

**8.** For an event of $500$ people, a random poll of $30$ people finds $15$ want the early session. At the same rate, how many extra places are needed if the early session holds $230$? How many people are projected to prefer the later session?

# Answer Key

1. Estimated yes $400$; no $200$; yes rate $\frac{200}{3}\%$. Short $10$ seats.
2. Estimated yes $600$; no $200$; yes rate $75\%$.
3. Estimates $340$ and $380$; variation between samples, not guaranteed bounds.
4. Estimated yes $760$; no $440$; yes rate $\frac{190}{3}\%$.
5. Estimated yes $650$; no $350$; yes rate $65\%$. Estimate is $20$ below the goal.
6. $460$ then $920$; extra $460$.
7. About $900$ supporters, $50$ below the goal.
8. $20$ more early places; about $250$ people for the later session.

## Step-by-Step Solutions

Follow each calculation, then check your own work.

### Problem 1

1. Sample rate $= 20/30 = \frac{2}{3}$.
2. Estimated count $= 600(\frac{2}{3}) = 400$.
3. Complement $= 600 - 400 = 200$; these are estimates, not a census.
4. Gap $400 - 390 = 10$.

### Problem 2

1. Sample rate $= 30/40 = \frac{3}{4}$.
2. Estimated count $= 800(\frac{3}{4}) = 600$.
3. Complement $= 800 - 600 = 200$; these are estimates, not a census.

### Problem 3

1. Sample rate $= 17/25 = \frac{17}{25}$.
2. Estimated count $= 500(\frac{17}{25}) = 340$.
3. Second estimate $= 500(19/25) = 380$; random samples can yield different rates.

### Problem 4

1. Sample rate $= 38/60 = \frac{19}{30}$.
2. Estimated count $= 1200(\frac{19}{30}) = 760$.
3. Complement $= 1200 - 760 = 440$; these are estimates, not a census.

### Problem 5

1. Sample rate $= 26/40 = \frac{13}{20}$.
2. Estimated count $= 1000(\frac{13}{20}) = 650$.
3. Complement $= 1000 - 650 = 350$; these are estimates, not a census.
4. Gap $670 - 650 = 20$.

### Problem 6

1. Sample rate $= 23/35 = \frac{23}{35}$.
2. Estimated count $= 700(\frac{23}{35}) = 460$.
3. New count $= 1400(\frac{23}{35}) = 920$; difference $460$.

### Problem 7

1. Sample rate $72/120 = 3/5$.
2. Projected support $1500(3/5) = 900$.
3. Gap $950 - 900 = 50$ supporters. This is a projection, not a guarantee.

### Problem 8

1. Early-session rate $15/30 = 1/2$, so plan for $500(1/2) = 250$ early places.
2. The room is short $250 - 230 = 20$ early places.
3. The remaining $500 - 250 = 250$ people are projected to prefer the later session.

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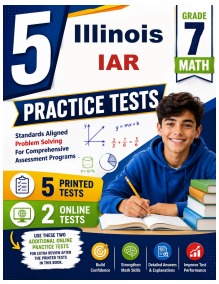


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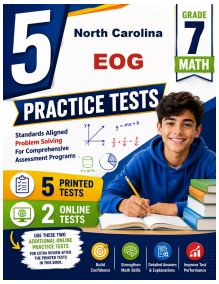


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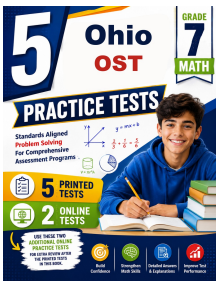


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