

Random Samples and Population Inferences

Grade 7 math · Worksheet Answer Key · Standards: 7.SP.A.1, 7.SP.A.2

Each solution names the population and sample, shows the proportion or mean, and then scales up to an estimate. For judgment problems, check that your reasoning mentions who could be chosen and how large the sample is.

Standards: 7.SP.A.1, 7.SP.A.2 · **Level:** Grade 7

Problem 1 Population and sample

The population is every one of the 520 seventh graders. The sample is the 40 students who were surveyed.

Population: all 520 seventh graders; sample: the 40 surveyed students

Problem 2 Name the population

The population is the 30 public wells. The sample is made of the 12 wells tested.

Population: 30 wells; sample size: 12

Problem 3 Fair or biased

Students at a track meet are more likely to enjoy running sports, and many students are not at the meet. Not everyone had an equal chance.

Biased sample

Problem 4 Sort the methods

(a) Every member has an equal chance: random. (b) Early swimmers are not typical of all members: biased. (c) Random numbers on the full list give equal chances: random. (d) Only people who see the post and choose to reply: biased.

(a) random, (b) biased, (c) random, (d) biased

Problem 5 Sample percent

$18 \div 50 = 0.36 = 36\%$.

36%

Problem 6 Estimate a count

Proportion: $30 \div 75 = 0.40$. Estimate: $0.40 \times 1,200 = 480$.

About 480 students

Problem 7 Is the conclusion valid

The conclusion is not valid. The 15 players are not a random sample of the town, because soccer players are likely to prefer soccer. The sample is also small compared with the town.

Not valid: the sample is biased and too small.

Problem 8 Mean from a sample

Sum: $7 + 8 + 6 + 9 + 7 + 8 + 7 + 6 + 8 + 9 + 7 + 8 = 90$. Mean: $90 \div 12 = 7.5$ oz.

Crate estimate: $400 \times 7.5 = 3,000$ oz.

Mean 7.5 oz; about 3,000 oz in the crate

Problem 9 Defective chargers

Proportion: $6 \div 200 = 0.03$. Estimate: $0.03 \times 15,000 = 450$.

About 450 chargers

Problem 10 Two samples differ

A: $14 \div 20 = 70\%$. B: $11 \div 20 = 55\%$.

The samples differ because random samples vary: each includes a different mix of students.

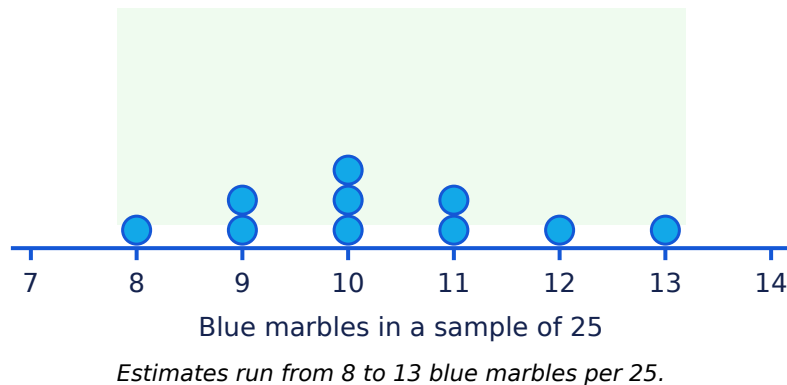
A: 70%; B: 55%; the difference is sampling variation

Problem 11 Range of estimates

Least: $8 \div 25 = 0.32 = 32\%$. Greatest: $13 \div 25 = 0.52 = 52\%$.

The typical count, 10, gives 40%.

32% to 52%



Problem 12 Which sample size

The sample of 100 is better. A larger random sample includes more of the town, so one unusual resident has less effect, and samples of that size tend to give results that are closer together.

The random sample of 100 residents

Problem 13 Electric cars

Proportion: $45 \div 120 = 0.375$. Estimate: $0.375 \times 2,400 = 900$.

About 900 cars

Problem 14 Five samples of pizza votes

Mean: $(21 + 22 + 24 + 26 + 27) \div 5 = 120 \div 5 = 24$.

Percent: $24 \div 40 = 60\%$. School: $0.60 \times 640 = 384$.

Mean 24; 60%; about 384 students

Problem 15 Infected trees

Each sample is 45 of 2,700, so the forest has $2,700 \div 45 = 60$ times as many trees.

Sample 1: $9 \times 60 = 540$. Sample 2: $12 \times 60 = 720$.

Estimates 540 and 720, so about 540 to 720 infected trees

Problem 16 Lunch survey plan

Plan: list all 650 student ID numbers, use a random number generator to choose 50 different numbers, and survey those students. Everyone has the same chance of selection.

Asking only first-period lunch students leaves out the other students, who may have different tastes, ages or schedules.

Random plan: pick 50 IDs with a random number generator from the full list; the first-lunch plan is biased because some students cannot be chosen.

Problem 17 Library visits

Sum: $3 + 5 + 4 + 6 + 2 + 7 + 5 + 4 = 36$. Mean: $36 \div 8 = 4.5$ visits.

Total estimate: $1,200 \times 4.5 = 5,400$.

About 5,400 visits

Problem 18 Combine three samples

Combined: $12 + 15 + 9 = 36$ out of 90. $36 \div 90 = 0.40 = 40\%$.

School: $0.40 \times 1,450 = 580$.

40%; about 580 students

Problem 19 Start time poll

(a) $26 \div 40 = 0.65$. At Lincoln: $0.65 \times 480 = 312$ students.

(b) The sample came from one school only. Students in other schools were never in the sample, so it does not represent the district.

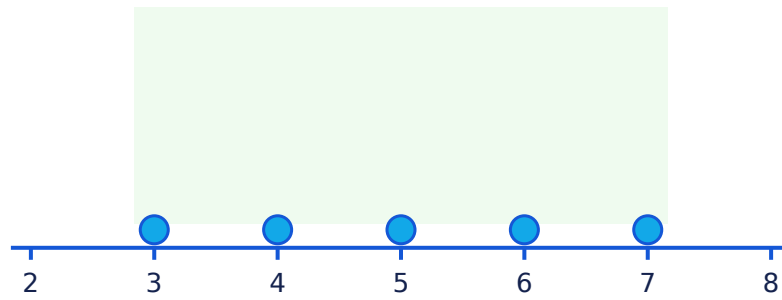
(a) about 312 students; (b) not justified, because the sample came from one school

Problem 20 Bulb quality

Mean: $(4 + 6 + 3 + 5 + 7) \div 5 = 25 \div 5 = 5$, which is 5%. Estimate: $0.05 \times 8,000 = 400$.

Least sample: $3\% \times 8,000 = 240$. Greatest sample: $7\% \times 8,000 = 560$.

Mean 5; about 400 defective bulbs; estimates range from 240 to 560



Defective bulbs in a sample of 100

Counts from 3 to 7, centered at 5.