

Algebra 2 - Sampling, Surveys and Experiments - Worksheet

Common Core S-IC.A.1, S-IC.A.2, S-IC.B.3, S-IC.B.4, S-IC.B.5, S-IC.B.6 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

These 20 problems practice sampling, surveys, and experiments (Common Core S-IC.A.1, S-IC.A.2, S-IC.B.3, S-IC.B.4, S-IC.B.5 and S-IC.B.6). The first problems check identifying populations, samples, and bias, the middle problems add margin of error and reading simulations, and the last six are word problems and multi-step tasks that need designing experiments and evaluating reports.

Work in order and show every step. Write each answer in simplest form, and open the answer key only after you have tried the problem yourself.

Algebra 2 · Common Core State Standards: **S-IC.A.1, S-IC.A.2, S-IC.B.3, S-IC.B.4, S-IC.B.5, S-IC.B.6**

Exercise 1 - Population and sample

A principal wants to know how many of the 1,200 students at Lincoln High walk to school. She asks 120 students chosen at random. Name the population and the sample.

Exercise 2 - Spot the bias

To learn what music teens like, a radio host surveys 50 people leaving a concert for a single rock band. Explain why the sample is biased.

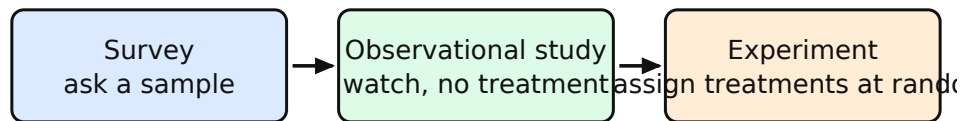
Exercise 3 - Which is random?

Method	Choose 30 students from a school of 600
A	Pick the first 30 students in the lunch line
B	Number all students and use a random number generator
C	Ask 30 volunteers from the drama club

Sampling methods.

Which method gives a random sample?

Exercise 4 - Classify the study



Only an experiment with random assignment can show cause and effect.

Classify each scenario as a survey, an observational study, or an experiment: (a) 300 residents are asked about a new park. (b) Researchers compare health of people who choose to jog and those who do not. (c) 60 plants are randomly assigned to two fertilizers.

Exercise 5 - Why randomize?

Explain why researchers randomly assign subjects to a treatment group and a control group.

Exercise 6 - Estimate a population

In a random sample of 150 students, 45 prefer a later start time. Estimate the proportion of all 2,400 students who prefer it, and how many students that is.

Exercise 7 - Margin of error

Find the margin of error $\frac{1}{\sqrt{n}}$ for samples of 100 and of 400.

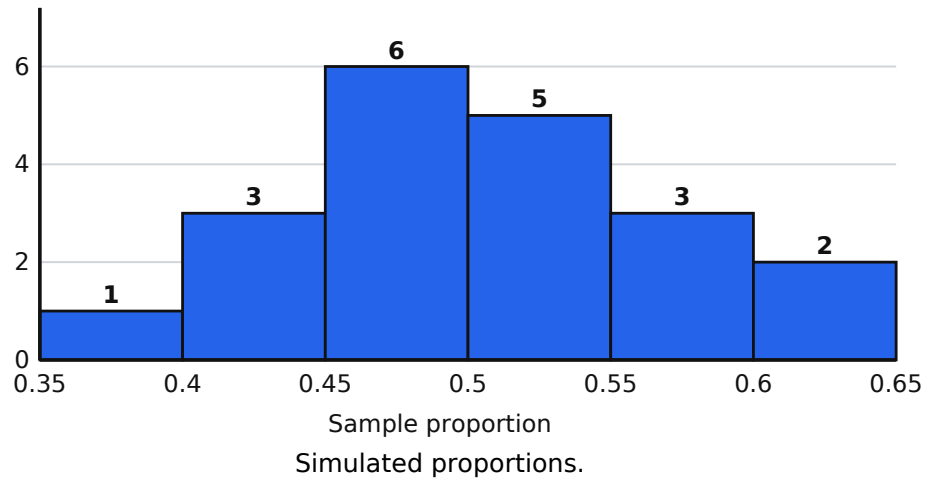
Exercise 8 - Interval estimate

A poll of 625 randomly chosen voters finds that 62% support a measure. Use $\frac{1}{\sqrt{n}}$ to give an interval for the percent of all voters.

Exercise 9 - Run a simulation

A weather site says it rains 40% of days in a town. Describe a simulation of one week using random digits.

Exercise 10 - Read a simulation



Twenty random samples of size 100 were simulated from a population with $p=0.5$. Find the fraction of simulated proportions that are 0.60 or higher.

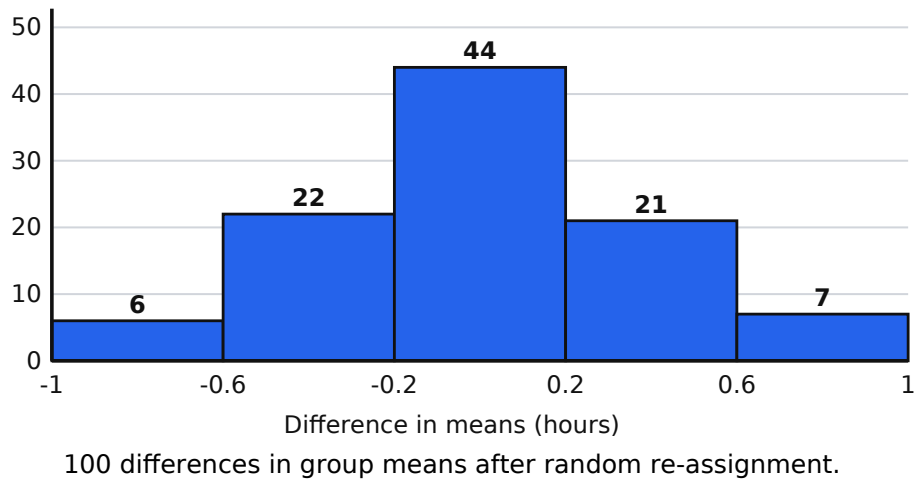
Exercise 11 - An unusual result

In a simulation of 100 samples from a population with $p=0.5$, only 1 sample had a proportion of 0.70 or more. A real poll found 0.70. What does this suggest?

Exercise 12 - Is the coin fair?

A coin lands heads 38 times in 50 flips. In 200 simulated sets of 50 fair flips, 38 or more heads occurred 2 times. Is the coin likely fair?

Exercise 13 - Compare treatments



In a randomized experiment, 20 students used a sleep app and averaged 0.8 hour more sleep than 20 students in a control group. The histogram shows 100 differences from re-randomizing

the 40 students. How unusual is a difference of 0.8 or more?

Exercise 14 - Margin of error from a simulation

The middle 95% of simulated sample proportions ranged from 0.46 to 0.58 for samples of size 100. Estimate the margin of error.

Exercise 15 - Evaluate a report

An ad says "9 out of 10 dentists recommend our gum." Only 10 dentists were asked. Find the margin of error and explain why the claim is weak.

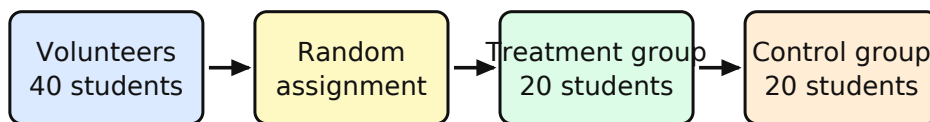
Exercise 16 - Sampling method

A school has 4 grades. Ms. Garcia randomly chooses 10 students from each grade. What is this method, and why use it?

Exercise 17 - Confounding

A study finds that people who drink coffee live longer than those who do not. Explain why this does not prove that coffee extends life.

Exercise 18 - Design an experiment



A randomized experiment compares a treatment group with a control group.

Design an experiment to test whether a new energy bar improves 100-meter sprint times using 40 volunteers. Describe the groups and the response variable.

Exercise 19 - Effect of sample size

How large a sample is needed to cut a margin of error of $\frac{1}{\sqrt{100}} = 10\%$ to 5%?

Exercise 20 - Find the error

Jamal says that a school of 3,000 students needs a sample ten times larger than a school of 300 to get the same margin of error. Is he correct?

Exercise 21 - Estimate a mean

A random sample of 36 plants has a mean height of 24 cm and a standard deviation of 6 cm. Estimate the mean height of all plants, using a margin of error of $2 \cdot \frac{6}{\sqrt{36}}$.