

Algebra 2 · Statistical Experiments, Simulation and Decisions · Worksheet

Common Core S-IC.A.2, S-IC.B.5, S-IC.B.6, S-MD.B.6, S-MD.B.7 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

This algebra 2 inference decisions worksheet gives 25 problems on statistical experiments, simulation and decisions, ordered from easy to hard, with a separate answer key.

These 25 problems practice the Common Core standards S-IC.A.2, S-IC.B.5, S-IC.B.6, S-MD.B.6 and S-MD.B.7. Early problems test whether results fit a model using simulations. Later ones compare treatments with re-randomization, judge reports, make fair random choices, and weigh decisions with expected value. Every item has a worked solution in the answer key.

Algebra 2 Common Core: S-IC.A.2 · S-IC.B.5 · S-IC.B.6 · S-MD.B.6 · S-MD.B.7

Algebra 2 Inference Decisions Worksheet: problems 1-5

Problem 1: Expected count of fives

A fair six-sided die is rolled 90 times and a five appears 27 times.

- Find the expected number of fives.
- Find how many more fives appeared than expected.
- Find the proportion of rolls that were fives.

Problem 2: Spinner model

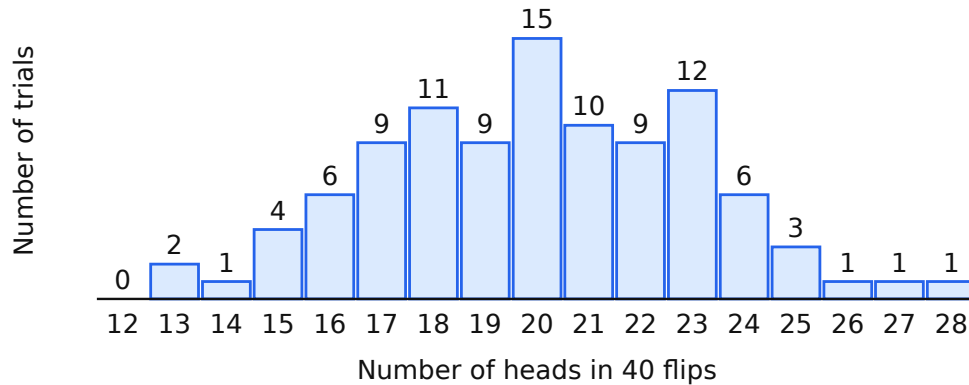
A spinner has four equal sections and one is red. Sofia spins it 50 times and gets red 22 times.

- Write the model probability of red.
- Find the expected number of reds.
- Find the proportion of reds Sofia observed.

Problem 3: Read a coin simulation

Jamal flipped a coin 40 times and got 27 heads. To test the claim that the coin is fair, he simulated 100 sets of 40 flips of a fair coin.

100 simulated sets of 40 fair-coin flips



Each bar counts simulated sets of 40 flips with that many heads.

- Find the expected number of heads in 40 fair flips.
- Count the simulated sets with 27 or more heads.
- Estimate the probability of getting 27 or more heads from a fair coin.
- Decide whether Jamal's result is consistent with a fair coin.

Problem 4: Free-throw shooter

Ethan says he makes 80% of his free throws. In a game he makes 13 of 20. A simulation of 100 sets of 20 shots at 80% gave these counts.

Shots made	10 or fewer	11	12	13	14	15	16	17	18	19	20
Sets	0	1	3	4	11	16	20	29	9	6	1

- Find the expected number of made shots in 20 attempts.
- Find how many simulated sets had 13 or fewer made shots.
- Decide whether Ethan's game is consistent with his claim.

Problem 5: Design a simulation

Mia's cereal company says 30% of boxes contain a prize card. Mia buys 12 boxes and finds prizes in only 1 of them.

- Describe how to use random digits 0 to 9 to simulate one box.
- Describe one trial of the simulation and what to record.
- Explain how to use many trials to judge Mia's result.

Algebra 2 Inference Decisions Worksheet: problems 6-10

Problem 6: Ten rolls, no six

A die is rolled 10 times and never shows a six. Assume the die is fair.

- Find the probability of no six on one roll.
- Find the probability of no six in all 10 rolls.
- Decide whether the result is consistent with a fair die.

Problem 7: Random assignment methods

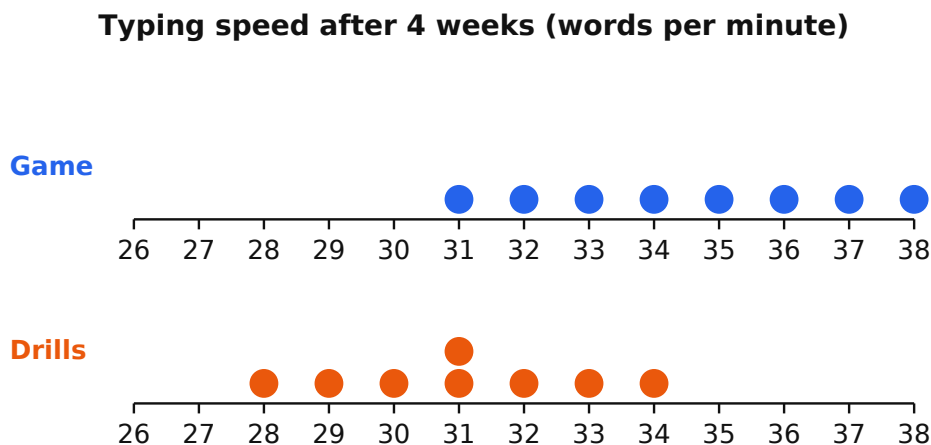
Priya has 10 bean plants and wants 5 to get a new fertilizer and 5 to get the old one. Three methods are proposed.

- Method 1: write each plant's number on a card, shuffle, and give the first 5 cards the new fertilizer.
- Method 2: give the new fertilizer to the 5 tallest plants.
- Method 3: give the new fertilizer to the plants that sprouted first.

Identify the method that is random assignment, explain why the others are not, and find how many different ways 5 of the 10 plants can be chosen.

Problem 8: Compare typing methods

Sixteen students were randomly assigned to practice typing with a game or with textbook drills. The dot plot shows their speeds after four weeks.



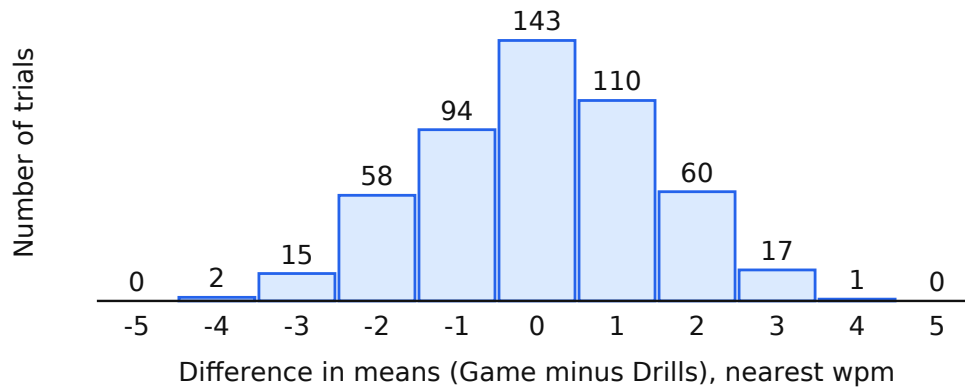
Each dot is one student. Eight students were assigned to each method.

- Find the mean speed of each group.
- Find the difference of the means.
- Explain why the plot alone cannot prove the game works better.

Problem 9: Re-randomize the typing data

The 16 typing speeds were pooled, shuffled and split into two groups of 8 a total of 500 times. Each bar counts the splits whose difference of means (Game minus Drills) rounds to that value.

500 re-randomizations of the typing data



Each bar counts re-randomizations whose difference rounds to that value. The class observed 3.5 wpm.

- Find the bars that represent a difference of 3.5 wpm or more.
- Count the re-randomizations at or above the observed difference.
- Estimate the probability of a difference this large by chance and decide whether the result is statistically significant at the 5% level.

Problem 10: Significant or not

Four randomized experiments report how often chance alone would give a difference as large as the one observed: Experiment 1, 0.003; Experiment 2, 0.12; Experiment 3, 0.048; Experiment 4, 0.31.

Identify which experiments are statistically significant at the 5% level and explain the meaning for Experiment 1.

Algebra 2 Inference Decisions Worksheet: problems 11-15

Problem 11: Types of studies

Classify each study as an experiment or an observational study, and state whether it can show that one variable causes a change in the other.

- A coach flips a coin for each of 40 swimmers to decide between two kick-turn drills, then compares times.
- A school counts how many students who walk to school are late compared with students who ride the bus.
- A clinic lets 60 patients pick either of two allergy pills and compares symptoms.

Problem 12: Biased sample report

A cafeteria posts: "83% of students love pizza." The survey asked the first 18 students in the line on Pizza Friday, and 15 said yes.

Identify two problems with the report and explain how to improve it.

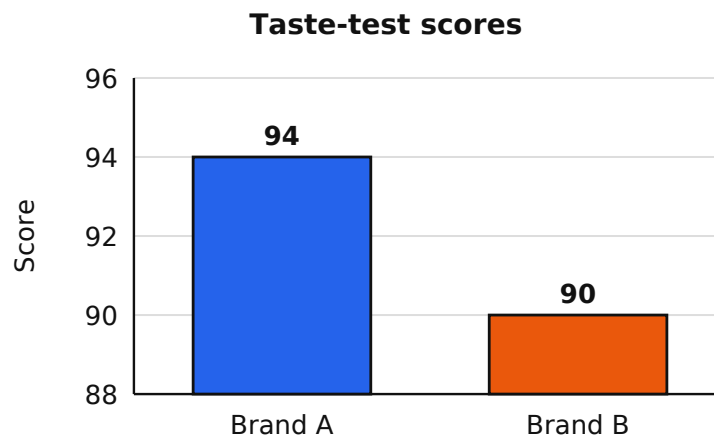
Problem 13: Cause or association

A news story says: "People who drink coffee every day live longer, so coffee extends life." The data came from a survey of 5,000 adults.

Explain why the conclusion is not justified and suggest a hidden factor.

Problem 14: Misleading graph

A magazine shows taste-test scores for two brands.



The vertical axis starts at 88, not 0.

- Compare how tall the bars look.
- Find the actual percent by which Brand A's score exceeds Brand B's.
- Explain how to make the graph honest.

Problem 15: Fair choice of one friend

Ava, Ben and Carla want to choose who goes first using one standard die.

- Assign die faces so that each friend has the same probability.
- Show that the plan is fair.
- Explain why two coin flips cannot choose fairly among all three without rerolling.

Algebra 2 Inference Decisions Worksheet: problems 16-20

Problem 16: Sum of two dice

Two friends decide who washes the dishes by rolling two dice. Dana washes if the sum is 2 to 6. Eli washes if the sum is 8 to 12. On a sum of 7, they roll again.

Find each person's probability of washing and decide whether the plan is fair.

Problem 17: Choose one of five

Five cousins use a die to choose who sets the table: faces 1 to 5 go to the five cousins, and a 6 means roll again.

- Find each cousin's probability of being chosen.
- Find the probability that the choice takes at least three rolls.
- Find the expected number of rolls needed.

Problem 18: Fair prize for a die game

At a school fair, a player pays \$1 to roll one die. If the die shows a six, the player gets a prize of \$4 back. Otherwise the player gets nothing.

- Find the expected net result per play.
- Decide whether the game is fair.
- Find the prize that would make the game fair.

Problem 19: Raffle value

The soccer club sells 500 raffle tickets at \$2 each. One ticket wins \$300 and two tickets win \$50 each.

- Find the total prize money.
- Find the expected prize value of one ticket.
- Find the expected net result for a buyer and the club's expected profit.

Problem 20: Phone warranty decision

Noah's new phone costs \$300. A warranty costs \$40 and would replace the phone for free if it fails. Without the warranty, a failure costs \$300. Phones like this fail with probability 0.08 during the coverage period.

Find the expected cost of each choice and decide which is cheaper on average. Explain one reason a person might still buy the warranty.

Algebra 2 Inference Decisions Worksheet: problems 21-25

Problem 21: Medical test outcomes

A condition affects 2% of the 10,000 people in a screening. The test is positive for 90% of people who have the condition and for 5% of people who do not.

10,000 people tested

	Has condition	No condition	Total
Test positive	?	?	?
Test negative	?	?	?
Total	200	9,800	10,000

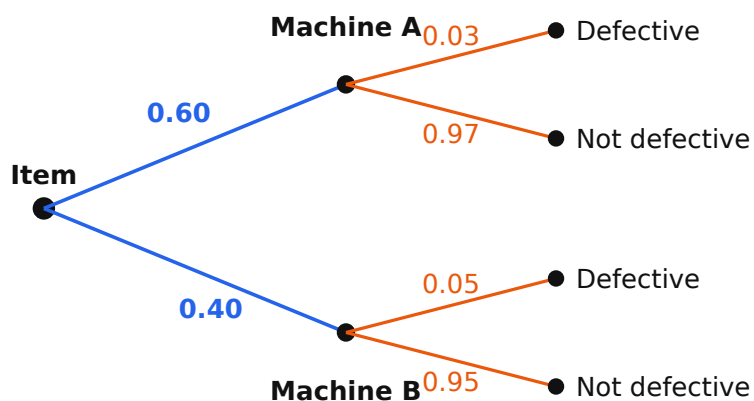
Fill the question marks. Only the column totals are known.

- Complete the table.
- Find the probability that a person with a positive test has the condition.
- Explain the result in one sentence.

Problem 22: Which machine made it

Machine A makes 60% of a factory's items and 3% of them are defective. Machine B makes the other 40% and 5% of them are defective.

Which machine made the item?



Branch probabilities for the two machines.

- Find the probability that a random item is defective.
- Given that an item is defective, find the probability it came from Machine B.
- Decide which machine to inspect first.

Problem 23: Kick or go for two

After a touchdown, a team can kick for 1 point, which succeeds 94% of the time, or run a play for 2 points, which succeeds 48% of the time.

- Find the expected points of each choice.

- b. Decide which choice scores more on average.
- c. Explain why a team that trails by 2 points late in the game might choose differently.

Problem 24: Interpret re-randomization

Researchers randomly assigned 40 volunteers to a new study app or a standard app. The app group's mean score was 6 points higher. In 500 re-randomizations of the pooled scores, 8 gave a difference of 6 points or more.

- a. Estimate the probability of a difference this large by chance.
- b. Decide whether the result is statistically significant at the 5% level.
- c. State the conclusion, and say how it would change if 60 of the 500 had been at least 6 points.

Problem 25: Headache relief experiment

A clinic randomly assigns 60 patients to two pills, 30 per group. Pill X relieves a headache for 21 patients and pill Y for 12 patients. Overall, 33 patients improved. The clinic pooled the results and randomly re-split them 1,000 times; 18 of the splits gave 21 or more improved patients in the first group.

- a. Find the proportion that improved in each group and the difference.
- b. Estimate the probability of a difference this large by chance.
- c. State whether pill X is significantly better at the 5% level and explain.

How to use this algebra 2 inference decisions worksheet

Print this algebra 2 inference decisions worksheet as a PDF, solve every problem on paper, then compare with the answer key.

