

Algebra 2 · Data, Normal Distributions and Statistical Inference · Worksheet

Common Core S-ID.A.4, S-IC.A.1, S-IC.B.3, S-IC.B.4 · mathovore.fr

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

These 22 problems practice the standards S-ID.A.4, S-IC.A.1, S-IC.B.3 and S-IC.B.4. You compute means and standard deviations, use the 68-95-99.7 rule and z-scores with normal curves, and tell apart surveys, experiments and observational studies.

The last six problems are word problems that combine skills, including a simulation that produces a margin of error. A z-table or calculator is needed for a few of them.

Algebra 2 Common Core: S-ID.A.4 · S-IC.A.1 · S-IC.B.3 · S-IC.B.4

Problem 1: Find a mean

Jamal scored 12, 15, 9, 20 and 14 points in five basketball games. Find his mean score per game.

Problem 2: Standard deviation by hand

Eight students spent 2, 4, 4, 4, 5, 5, 7 and 9 minutes on a warm-up. Find the mean and the standard deviation σ .

Problem 3: Standard deviation with a root

Find the standard deviation of 6,8,10,12,14. Round to the nearest hundredth.

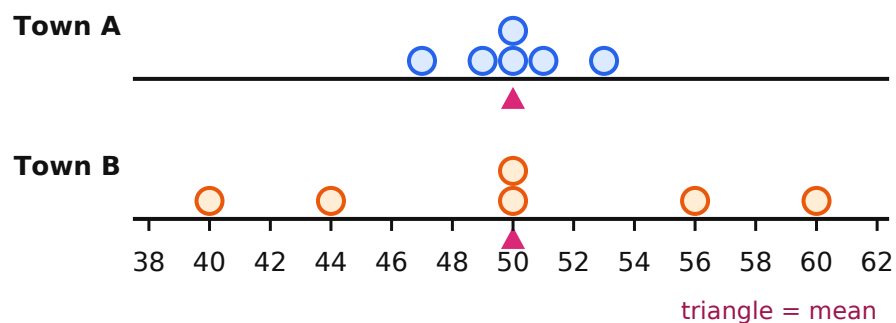
Problem 4: Shift and scale

A set of prices has mean \$40 and standard deviation \$6.

- Every price goes up by \$5. Find the new mean and standard deviation.
- Instead, every price is doubled. Find the new mean and standard deviation.

Problem 5: Compare two spreads

The dot plots show the weekly high temperature (in $^{\circ}\text{F}$) over six weeks in two towns.

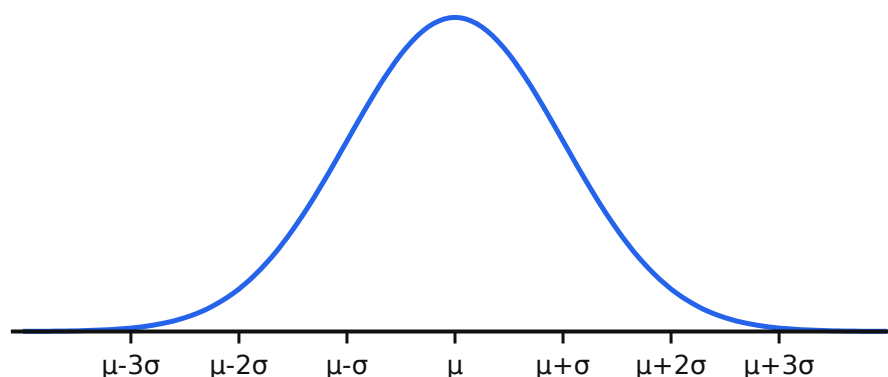


Weekly high temperatures ($^{\circ}\text{F}$) for six weeks in two towns.

Find the mean and standard deviation for each town, then state which town has the more variable temperatures.

Problem 6: Intervals from the 68-95-99.7 rule

Scores on a reasoning test are approximately normal with mean $\mu = 100$ and standard deviation $\sigma = 15$.



A normal curve with ticks at the mean and at 1, 2 and 3 standard deviations from it.

Find the intervals that contain about 68%, 95% and 99.7% of the scores.

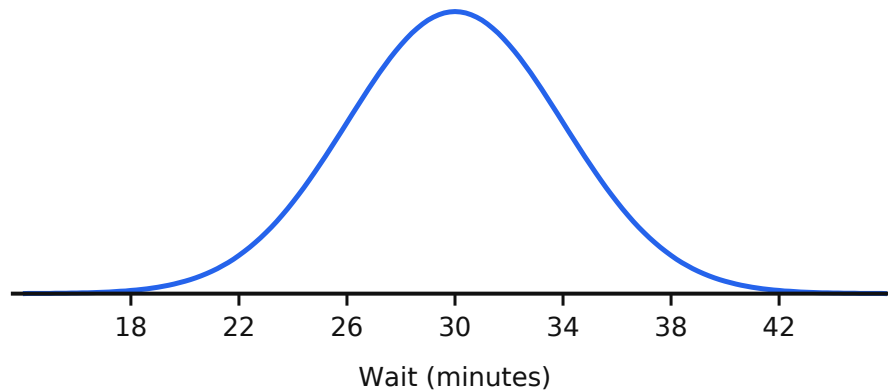
Problem 7: Apply the rule to heights

Heights of adult women in a survey are approximately normal with mean 64 in and standard deviation 2.5 in. Use the 68-95-99.7 rule to estimate the percent of women who are

- between 59 in and 69 in tall;
- taller than 66.5 in;
- shorter than 56.5 in.

Problem 8: Waiting times

Waiting times at a walk-in clinic are approximately normal with mean 30 minutes and standard deviation 4 minutes.



Waiting times at a clinic: mean 30 min, SD 4 min.

- Estimate the percent of waits between 26 and 38 minutes.
- Estimate the percent of waits longer than 42 minutes.

Problem 9: Compute a z-score

Ethan scores 85 on a placement test with mean 70 and standard deviation 6. Find his z-score and interpret it.

Problem 10: Negative z-score

A package takes 41 minutes to deliver. Deliveries have mean 50 minutes and standard deviation 4.5 minutes. Find the z-score and interpret it.

Problem 11: Value from a z-score

Scores have mean 68 and standard deviation 5. Find the score that has

- $z = -0.8$;
- $z = 1.4$.

Problem 12: Compare two scores

Mei scored 78 in math, where the class mean is 70 and the standard deviation is 5. Noah scored 84 in science, where the class mean is 75 and the standard deviation is 7. Who did better compared with their own class?

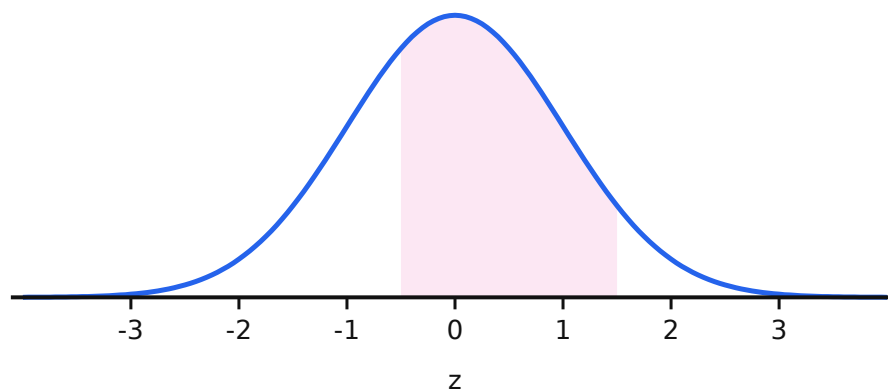
Problem 13: Area to the left

Use a z-table or calculator to find the proportion of a normal distribution that lies to the left of

- a. $z = 1.25$;
- b. $z = -0.75$.

Problem 14: Area between two z-scores

Find the proportion of a normal distribution in the shaded region, between $z = -0.5$ and $z = 1.5$.



The shaded region lies between $z = -0.5$ and $z = 1.5$.

Problem 15: Name the study

Name each study as a sample survey, an observational study or an experiment.

- a. A park district chooses 120 residents with a random number generator and asks about a new skate park.
- b. Forty tomato plants are randomly assigned fertilizer A or fertilizer B, and heights are compared after 8 weeks.
- c. A researcher compares test scores of students who already play chess with those who do not, using school records.

Problem 16: Spot the bias

Liam wants to know how students feel about longer PE classes. He polls the first 50 students who arrive at the gym before a basketball game. Explain why this sample is biased and describe a better method for a school of 800 students.

Problem 17: Design an experiment

Priya wants to know whether listening to instrumental music while studying changes quiz scores. She has 30 classmates who agree to take part. Describe a design with random assignment, say what to compare, and state what a conclusion could claim.

Problem 18: Interpret a poll

A poll of 1,000 likely voters finds that 52% favor a new bike lane, with a margin of error of 3 percentage points.

- Give the interval of plausible values for the percent of all likely voters who favor it.
- Can the city conclude that a majority favors the bike lane? Explain.

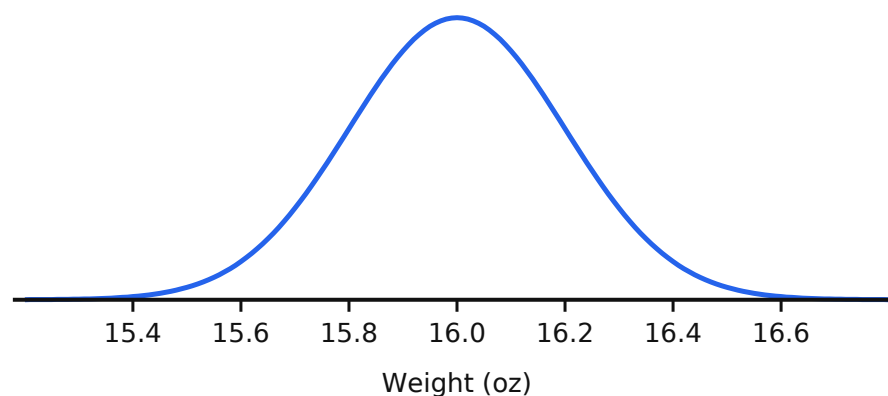
Problem 19: Exam percentiles

Scores on a math exam are approximately normal with mean 72 and standard deviation 9.

- About what percentile is a score of 90?
- About what percentile is a score of 63?
- Out of 400 students, about how many score above 90?

Problem 20: Filling machine

A machine fills bags of rice. The weights are approximately normal with mean 16.0 oz and standard deviation 0.2 oz.



- What percent of bags weigh less than 15.6 oz?
- Of 2,000 bags, about how many weigh more than 16.6 oz?
- Between which two weights do the middle 95% of bags fall?

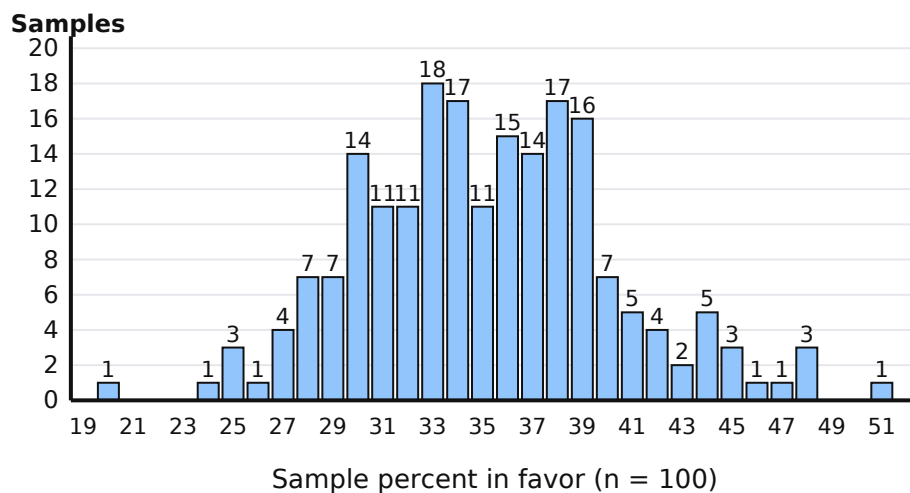
Problem 21: Percentile of a test score

Jamal scores 1,310 on an entrance exam. Scores are approximately normal with mean 1,050 and standard deviation 200.

- Find his z-score.
- Find the proportion of test takers who scored below him.
- Which score has a z-score of -0.5 ?

Problem 22: Margin of error by simulation

Diego simulates 200 random samples of 100 students from a school where 35% truly walk to school. The histogram shows the percent of walkers in each sample.



Diego's 200 simulated samples of 100 students, with the count of samples above each bar.

- Ignore the 5 lowest and the 5 highest results. What interval holds the middle 95% of the results?
- Estimate the margin of error.
- A real survey of 100 students finds 41% walk. Give an interval of plausible values and tell whether 35% is plausible.