

Algebra 1 · Two-Way Tables, Scatter Plots and Correlation · Worksheet

Common Core S-ID.B.5, S-ID.B.6, S-ID.C.7, S-ID.C.8, S-ID.C.9 · mathovore.fr

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

These 24 problems cover joint, marginal and conditional relative frequencies in two-way tables, then move to scatter plots, lines of fit, residuals and the correlation coefficient. They align with Common Core S-ID.B.5, S-ID.B.6, S-ID.C.7, S-ID.C.8 and S-ID.C.9.

The problems get harder as you go. The last six are word problems that combine prediction, interpretation, residual plots, function choice and correlation versus causation.

Algebra 1 Common Core: S-ID.B.5 · S-ID.B.6 · S-ID.C.7 · S-ID.C.8 · S-ID.C.9

Problem 1: Complete the totals

Maya asked 100 students in grades 9 and 10 to name their favorite pet. Find every missing total in the table.

Grade	Favorite pet		
	Dog	Cat	Total
Grade 9	22	18	?
Grade 10	31	29	?
Total	?	?	?

Favorite pet by grade level.

Problem 2: Joint relative frequency

The table shows the favorite pets of 100 students.

	Dog	Cat	Total
Grade 9	22	18	40
Grade 10	31	29	60

	Dog	Cat	Total
Total	53	47	100

- Find the joint relative frequency of grade 10 and cat as a decimal and a percent.
- Find the joint relative frequency of grade 9 and dog.

Problem 3: Marginal relative frequency

Use the table of 100 students.

	Dog	Cat	Total
Grade 9	22	18	40
Grade 10	31	29	60
Total	53	47	100

- Find the marginal relative frequency of students who prefer cats.
- Find the marginal relative frequency of grade 10 students.

Problem 4: Conditional frequency by row

Use the table of 100 students.

	Dog	Cat	Total
Grade 9	22	18	40
Grade 10	31	29	60
Total	53	47	100

Among grade 9 students only, find the relative frequency of dog fans and the relative frequency of cat fans.

Problem 5: Conditional frequency by column

Use the table of 100 students.

	Dog	Cat	Total
Grade 9	22	18	40
Grade 10	31	29	60
Total	53	47	100

Among students who prefer dogs, find the relative frequency of grade 9 students and of grade 10 students. Round to the nearest thousandth.

Problem 6: Association in a two-way table

Priya asked 200 students whether they listen to music while studying and whether they scored above 80 on the last quiz.

	Above 80	80 or below	Total
Music on	44	36	80
Music off	66	54	120
Total	110	90	200

Compare the conditional relative frequencies of scoring above 80 for each group. Is there evidence of an association between music and quiz scores?

Problem 7: Fill in a two-way table

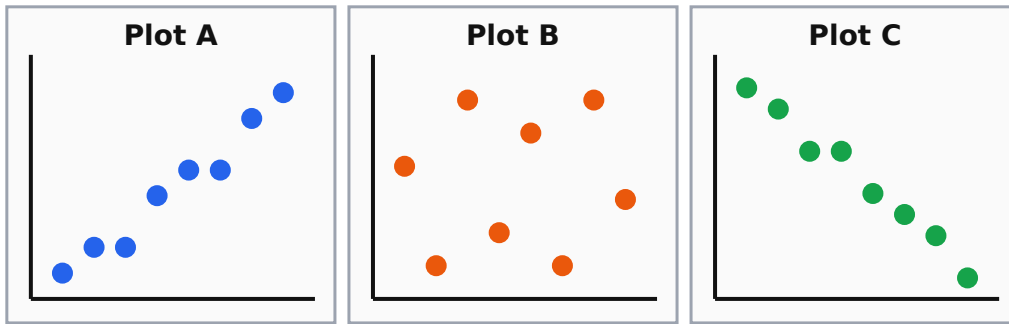
Of 80 students, 50 are in the band, 36 are in grade 9, and 28 are band members in grade 9. Complete the table, then find the conditional relative frequency of being in the band for a grade 9 student.

Activity	Grade		
	Grade 9	Grade 10	Total
Band	28	?	50
No band	?	?	?
Total	36	?	80

Band membership by grade; some cells are missing.

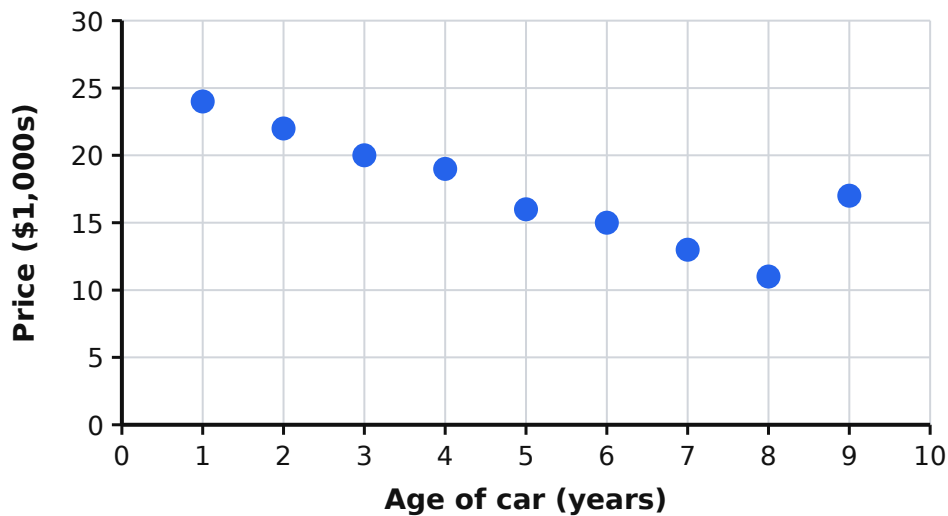
Problem 8: Classify scatter plots

Classify each scatter plot as a positive correlation, a negative correlation, or no correlation. Then name the plot with the weakest linear relationship.



Problem 9: Describe a scatter plot

Jamal plotted the price of nine used cars against their age.

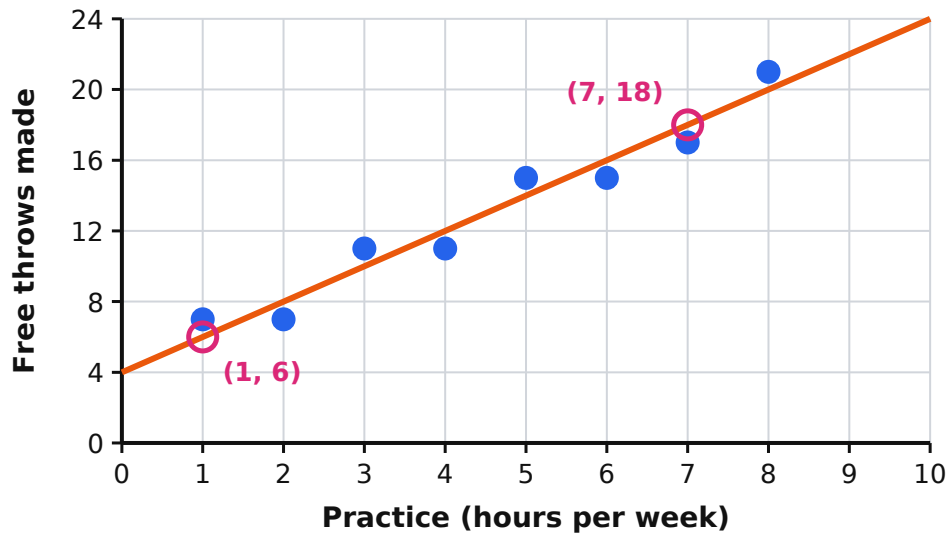


Price and age of nine used cars.

Describe the direction, strength and form of the association, and identify the point that does not fit the pattern.

Problem 10: Write the line of fit

Aisha recorded her weekly practice time and the number of free throws she made out of 25. The drawn line passes through (1, 6) and (7, 18).



Free throws and practice time.

- Write an equation for the line.
- Predict the free throws made after 9 hours of practice.

Problem 11: Predict from a line

At a lemonade stand, the line of best fit for cups sold y at an afternoon temperature of x degrees Fahrenheit is $y = 2.5x - 100$.

- Predict the cups sold when the temperature is 88°F .
- At what temperature is the stand predicted to sell 90 cups?

Problem 12: Interpret slope and intercept

A teacher models the final grade y (in points) of a student with x absences using $y = -1.6x + 91.4$. Interpret the slope and the y-intercept in context.

Problem 13: When the intercept has no meaning

The line $y = 0.36x - 14.2$ models shoe size y from height x in inches for teenagers.

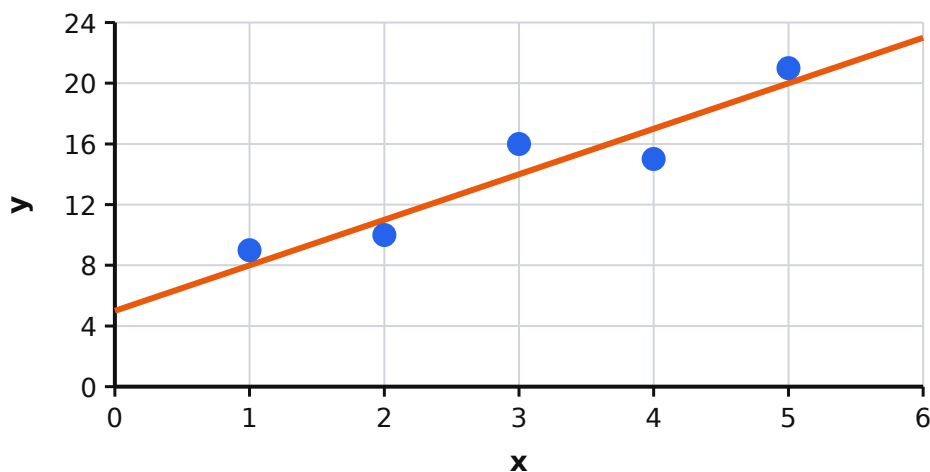
- Interpret the slope.
- Interpret the y-intercept. Does it make sense in context? Explain.
- Predict the shoe size of a teenager who is 70 inches tall.

Problem 14: Compute residuals

The line $y = 5x + 52$ predicts a quiz score y from x hours of studying. Sofia studied 4 hours and scored 77. Noah studied 6 hours and scored 79. Find each residual and say whether the point lies above or below the line.

Problem 15: Residuals in a table

The line $y = 3x + 5$ is fitted to five data points.



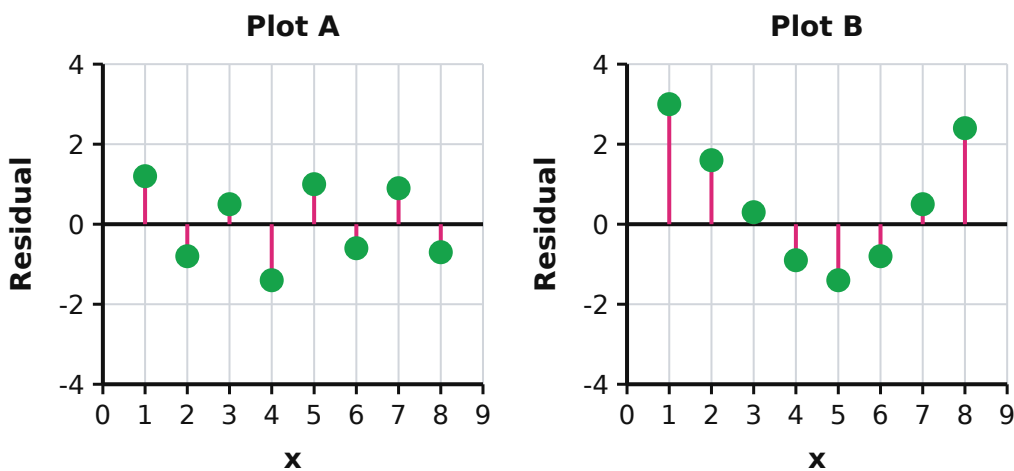
Five points and a fitted line.

x	1	2	3	4	5
y	9	10	16	15	21

- Copy and complete a table with the predicted value and the residual for each point.
- Which points are farthest from the line?
- Find the sum of the residuals.

Problem 16: Read residual plots

Diego fit a line to two different data sets and made a residual plot for each.



Residual plots for two linear models.

- For which data set is a linear model appropriate? Explain.

b. What type of function might fit the other data set better?

Problem 17: Match r to the plot

Match each correlation coefficient to a scatter plot: $r = 0.73$, $r = 0.96$, $r = -0.98$. Explain each choice.



Three scatter plots.

Problem 18: Compare strength of r

Four data sets have correlation coefficients $r = -0.88$, $r = 0.72$, $r = -0.40$ and $r = 0.15$. Order them from the strongest to the weakest linear relationship. Does $r = 0.72$ show a stronger relationship than $r = -0.88$?

Problem 19: Choose the correct conclusion

A school finds $r = 0.78$ between the number of books in a student's home and the student's reading score. Which statement is supported by the data? Explain why each other statement is not.

- A. Buying more books will raise a child's reading score.
- B. Students with more books at home tend to have higher reading scores.
- C. Low reading scores cause families to own fewer books.
- D. Books at home are the only factor that affects reading scores.

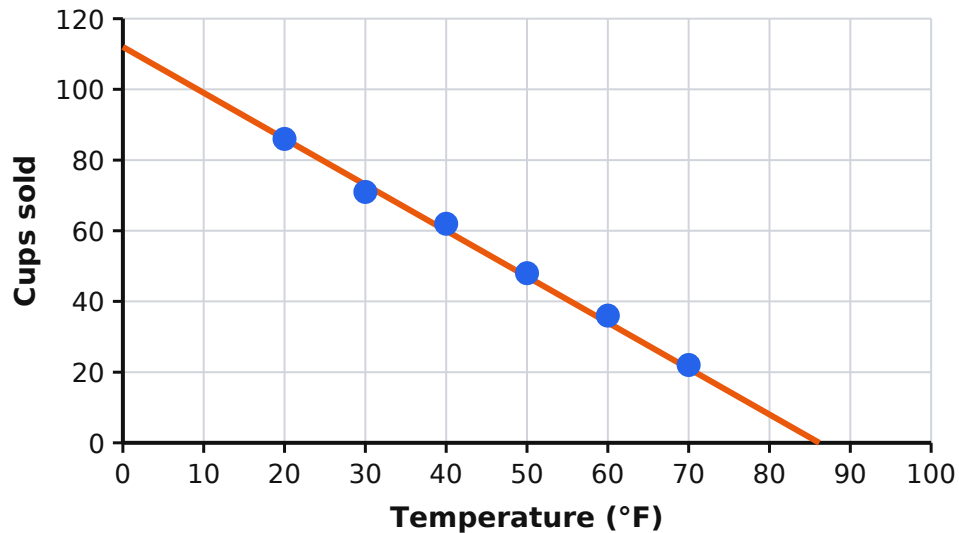
Problem 20: Find the lurking variable

Among elementary school students, shoe size and reading score have a strong positive correlation, $r = 0.85$. Does a larger shoe size cause a higher reading score? Identify a lurking variable.

Problem 21: Hot chocolate sales

A cafe recorded cups of hot chocolate sold at six temperatures. The line of best fit is

$y = -1.3x + 112$, where x is the temperature in degrees Fahrenheit.



Hot chocolate sales and temperature.

Temp (°F)	20	30	40	50	60	70
Cups	86	71	62	48	36	22

- Predict the cups sold at 25°F .
- Find the residual at 40°F .
- Interpret the slope.
- Predict the cups sold at 90°F and comment on the result.

Problem 22: Lunch choices by grade

The cafeteria manager surveyed 250 students about school lunch.

Grade	Lunch choice		
	Buy lunch	Pack lunch	Total
Grade 9	78	52	130
Grade 10	54	66	120
Total	132	118	250

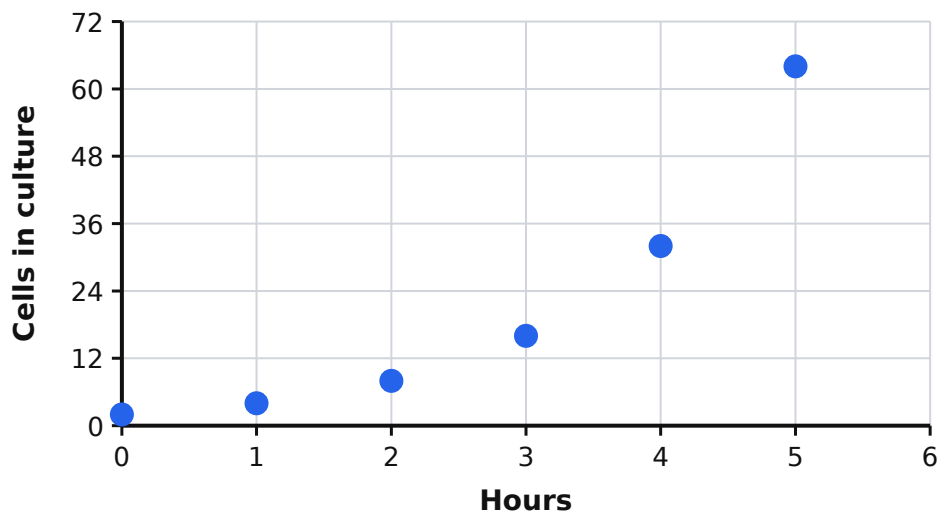
Lunch choice by grade.

- Find the joint relative frequency of grade 10 and packing lunch.
- Find the marginal relative frequency of buying lunch.
- Find the conditional relative frequency of buying lunch for each grade.

d. Does the data suggest an association between grade and buying lunch? Explain.

Problem 23: Choose a function type

A lab counts the cells in a culture each hour.



Cell counts over six hours.

Hour	0	1	2	3	4	5
Cells	2	4	8	16	32	64

- Explain why a line is not a good model.
- Choose linear, quadratic or exponential and write an equation.
- Predict the cells at hour 6.

Problem 24: Extrapolation risk

Using data for ages 10 to 15, a doctor found the line $y = 2.2x + 30$ relating age x in years to height y in inches.

- Predict the height of a 13-year-old.
- Predict the height of a 40-year-old. Is the result believable? Explain.