

Reading Two-Way Tables and Scatter Plots

Grade 9 – Algebra 1 math · Worksheet Answer Key · Standards: S-ID.B.5, S-ID.B.6, S-ID.C.7, S-ID.C.8, S-ID.C.9

Each answer shows the division or substitution, then the result in bold. Regression values are rounded as in the problem statements, so a calculator may differ in the last digit. Residuals are always observed minus predicted.

Standards: S-ID.B.5, S-ID.B.6, S-ID.C.7, S-ID.C.8, S-ID.C.9 · **Level:** Grade 9 Algebra 1

Problem 1 Complete the Totals

Rows: $24 + 16 = 40$ and $18 + 22 = 40$. Columns: $24 + 18 = 42$ and $16 + 22 = 38$. Grand total: $40 + 40 = 80$ (and $42 + 38 = 80$).

Row totals 40 and 40; column totals 42 and 38; 80 students

Problem 2 Joint Relative Frequency

Cell ÷ grand total: $24 \div 80 = 0.30$.

0.30, or 30%

Problem 3 Marginal Relative Frequency

Column total ÷ grand total: $38 \div 80 = 0.475$.

47.5%

Problem 4 Conditional Relative Frequency

8th graders preferring dogs: 18 out of the 8th-grade total 40, so $18 \div 40 = 0.45$.

Cat lovers who are 8th graders: 22 out of 38, so $22 \div 38 \approx 0.579$.

45%; about 57.9%

Problem 5 Describe a Scatter Plot

As the temperature rises, sales rise: a positive association. The points stay close to a straight path: **strong and linear**. There is **no obvious outlier**.

Positive, strong, linear

Problem 6 Predict with a Line

At 80°F: $1.33(80) - 63.6 = 106.4 - 63.6 = 42.8 \approx 43$. At 66°F: $1.33(66) - 63.6 = 87.78 - 63.6 = 24.18 \approx 24$.

About 43 cups and 24 cups

Problem 7 Interpret Slope and Intercept

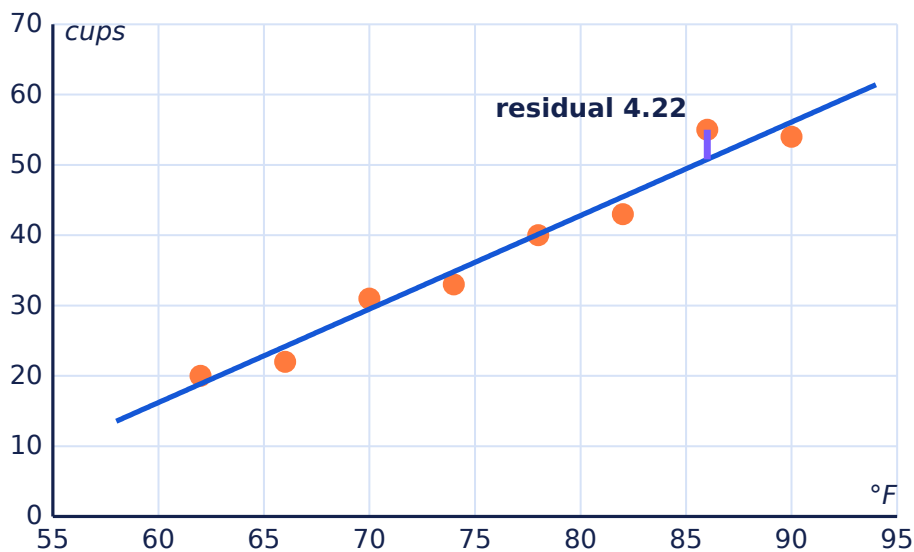
The slope 1.33 means each 1°F rise in temperature is associated with about 1.33 more cups sold.

The intercept -63.6 is the predicted sales at 0°F, which would be negative. Nothing was sold near 0°F and the data cover 62°F to 90°F, so the intercept has no real meaning.

Slope: about 1.33 more cups per degree; the intercept is not meaningful

Problem 8 Find a Residual

Predicted: $1.33(86) - 63.6 = 114.38 - 63.6 = 50.78$. Residual = observed – predicted = $55 - 50.78 = 4.22$.



$Residual = observed - predicted = 55 - 50.78$.

Predicted 50.78; residual +4.22 (the point is above the line)

Problem 9 Residual Table

62: predicted 18.86, residual 1.14. 70: predicted 29.5, residual 1.5. 82: predicted 45.46, residual -2.46. 90: predicted 56.1, residual -2.1.

The residuals are small (all under 2.5 cups) and mix positive and negative values, so the line fits well.

1.14, 1.50, -2.46, -2.10; no clear pattern

Problem 10 Match the Correlation

The sign gives the direction and the size gives the strength: 0.95 is close to 1; -0.80 is close to -1; 0.05 is close to 0; -0.30 is negative but weak.

0.95 → (d); -0.80 → (a); 0.05 → (b); -0.30 → (c)

Problem 11 Ice Cream and Sunburn

A high r shows that the two variables rise together, not that one causes the other. Hot, sunny weather leads people to buy ice cream and also to get sunburned.

Correlation does not show causation; the lurking variable is hot, sunny weather

Problem 12 Conditional Frequency, Three Columns

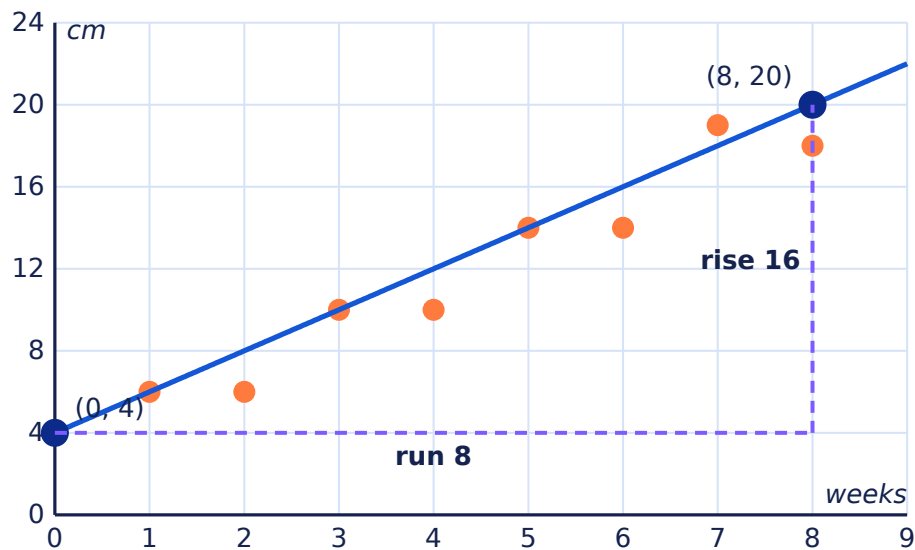
Girls total: $35 + 25 + 20 = 80$. Walkers among girls: $25 \div 80 = 0.3125$.

Car total: $12 + 20 = 32$. Boys among them: $12 \div 32 = 0.375$.

31.25% of girls walk; 37.5% of car riders are boys

Problem 13 Read a Line from a Graph

Slope: $(20 - 4) \div (8 - 0) = 2$. The y-intercept is 4, so $y = 2x + 4$.



$$\text{Slope} = \text{rise} \div \text{run} = 16 \div 8 = 2.$$

The plant grows about 2 cm per week and started at 4 cm. At week 11: $2(11) + 4 = 26$.

$y = 2x + 4$; 2 cm per week; 4 cm at the start; 26 cm at week 11

Problem 14 Is the Prediction Safe?

At 30°F: $1.33(30) - 63.6 = -23.7$, a negative number of cups. At 100°F: $133 - 63.6 = 69.4$ cups.

Both temperatures lie outside the data range 62°F to 90°F, so both predictions are extrapolations. The first is clearly impossible; the second may also be unreliable.

−23.7 cups and 69.4 cups; extrapolation makes both unreliable

Problem 15 Regression by Calculator

Linear regression gives $\hat{y} \approx -15.3x + 387.5$ and $r \approx -0.99$.

Each extra hour of sleep is associated with a reaction time about 15.3 ms shorter. The value $r \approx -0.99$ shows a very strong negative linear relationship.

$\hat{y} \approx -15.3x + 387.5$; $r \approx -0.99$

Problem 16 Build a Table from Percentages

Online with coupon: $0.45 \times 120 = 54$, so 66 without. In-store with coupon: $0.25 \times 80 = 20$, so 60 without.

	Coupon	No coupon	Total
Online	54	66	120
In-store	20	60	80
Total	74	126	200

Among coupon users: $54 \div 74 \approx 0.730$.

About 73.0%

Problem 17 Residual Plot Pattern

The residuals form a U shape: positive at both ends and negative in the middle. If a line fit well, the residuals would scatter randomly around 0.

The pattern shows that the true relationship is curved, so a quadratic model would fit better.

No; the U-shaped residuals show a curved relationship

Problem 18 Line from Two Data Points

Slope: $(300 - 420) \div (3 - 1) = -60$. Intercept: $420 = -60(1) + b$, so $b = 480$. Model: $V = -60t + 480$. Check at 5 years: $-300 + 480 = 180 \checkmark$.

The bike loses about \$60 per year. At 6 years: $-360 + 480 = 120$. Value 0: $480 \div 60 = 8$ years.

$V = -60t + 480$; \$120 at 6 years; \$0 at 8 years

Problem 19 Which Model Fits Better?

Model A: $16 + 1 + 4 + 9 = 30$. Model B: $1 + 4 + 1 + 4 = 10$.

The smaller sum means the points lie closer to the line, so Model B fits better.

A: 30; B: 10; Model B fits better

Problem 20 Firefighters and Damage

The value $r = 0.78$ shows a fairly strong positive association. It does not show that firefighters cause damage.

Bigger fires need more firefighters and also cause more damage, so the size of the fire drives both variables.

Correlation is not causation; the lurking variable is the size of the fire