

AP Statistics - Least-Squares Regression and Residuals - Quiz

Common Core AP STAT 2.6, AP STAT 2.7, AP STAT 2.8, AP STAT 2.9, HSS-ID.B.6, HSS-ID.C.7 · maths-pdf.fr/en/

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

Ten multiple-choice questions check interpreting the slope, residual, r squared, and residual plots. Read the explanations to see why the common distractors are wrong.

AP Statistics · Common Core State Standards: **AP STAT 2.6, AP STAT 2.7, AP STAT 2.8, AP STAT 2.9, HSS-ID.B.6, HSS-ID.C.7**

Questions

Question 1

In the equation $\hat{y} = 10 + 4x$, the slope 4 means:

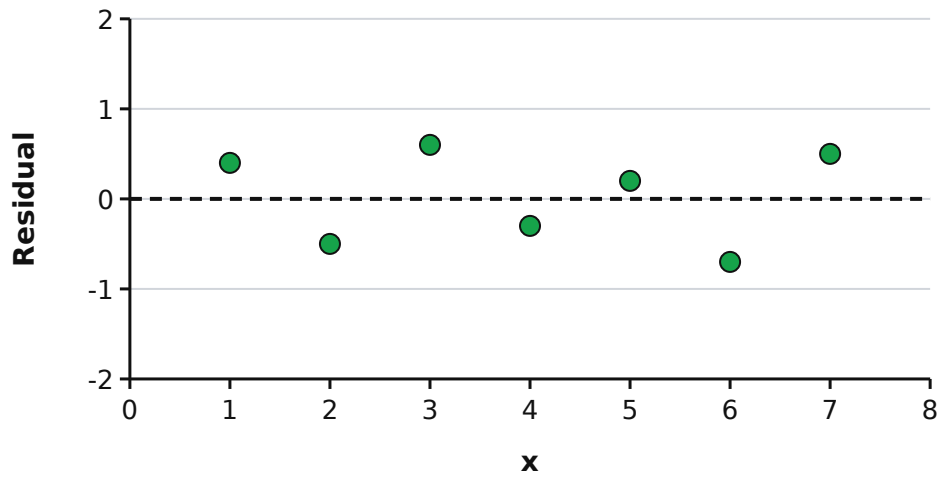
- A. the predicted y increases by 4 for each one-unit increase in x
- B. y increases by exactly 4 for every unit of x
- C. when y is 0, x is 4
- D. x increases by 4 for every unit of y

Question 2

A residual is:

- A. predicted y minus actual y
- B. the slope times x
- C. actual y minus predicted y
- D. the correlation squared

Question 3

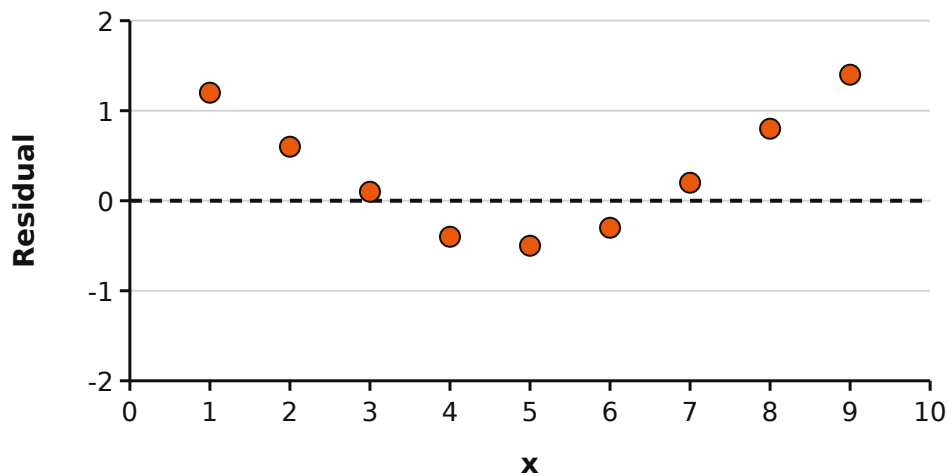


A residual plot.

What does this residual plot suggest?

- A. A linear model is appropriate
- B. A curved model is needed
- C. There are no residuals
- D. The slope is zero

Question 4



A residual plot.

What does this residual plot suggest?

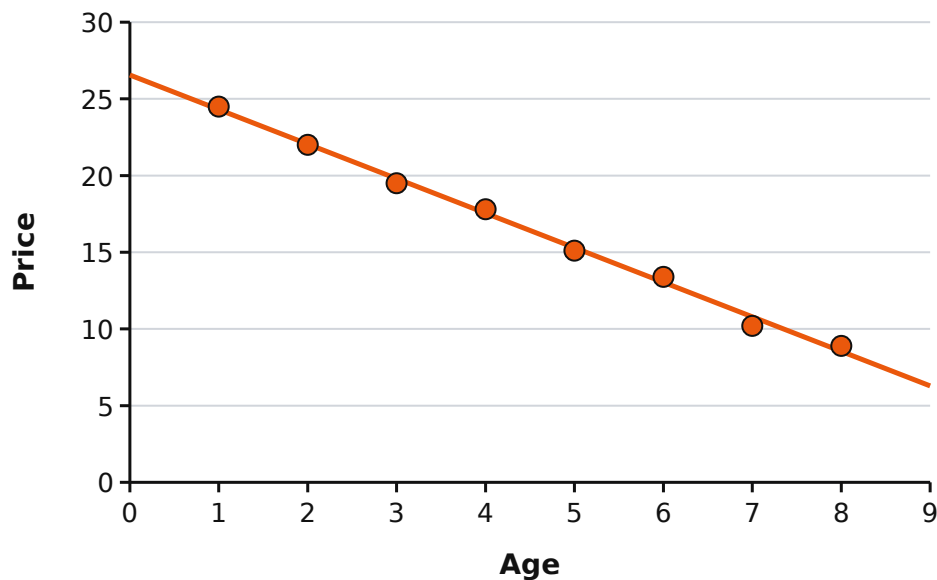
- A. A linear model is fine
- B. The relationship is not linear
- C. The data are categorical
- D. r equals 1

Question 5

$r^2 = 0.75$ means:

- A. 75% of the variation in y is explained by the linear relationship with x
- B. 75% of the points lie on the line
- C. the slope is 0.75
- D. the correlation is 0.75

Question 6



Car data and line.

Predicting the price of a car of age 20 from this line is:

- A. safe because the line is straight
- B. extrapolation and unreliable
- C. interpolation
- D. always correct

Question 7

The least-squares regression line always passes through:

- A. the origin
- B. the point $(\bar{x}, \bar{y})$
- C. the first data point
- D. the point with the largest residual

Question 8

If $r = 0.5$, $s_x = 4$, and $s_y = 10$, the slope of the LSRL is:

- A. 0.2
- B. 0.5
- C. 1.25
- D. 5

Question 9

The standard deviation of the residuals, s , measures:

- A. the slope
- B. the explained variation
- C. the correlation
- D. the typical size of the prediction error

Question 10

A point far to the right of the others that strongly changes the slope is called:

- A. a residual
- B. a lurking variable
- C. the mean
- D. influential

Answers

1. **A** - The slope is a predicted change per unit of x . Actual values vary around the line.
2. **C** - Residual = $y - \hat{y}$. A positive residual means the point is above the line.
3. **A** - Random scatter around zero without a pattern supports a linear model.
4. **B** - A clear U shape in the residuals means a curved model would fit better.
5. **A** - r^2 is the proportion of variation explained, not the number of points on the line.
6. **B** - Age 20 is far outside the data range, so there is no evidence the pattern continues.
7. **B** - Because $a = \bar{y} - b\bar{x}$, the line goes through the point of means.
8. **C** - $b = r s_y/s_x = 0.5(10/4) = 1.25$. Using s_x/s_y gives 0.2.
9. **D** - s is the typical distance of actual y values from the predicted values.
10. **D** - Points with extreme x values that substantially change the line are influential.

Remember

- LSRL: $\hat{y} = a + bx$, with $b = r s_y/s_x$ and $a = \bar{y} - b\bar{x}$; it passes through $(\bar{x}, \bar{y})$.
- Interpret the slope as the predicted change in y per unit of x , in context.
- Residual = actual - predicted; a good linear model has a residual plot with no pattern.
- r^2 is the percent of variation in y explained by the linear model; s is the typical prediction error.
- Avoid extrapolation and check for influential points.