

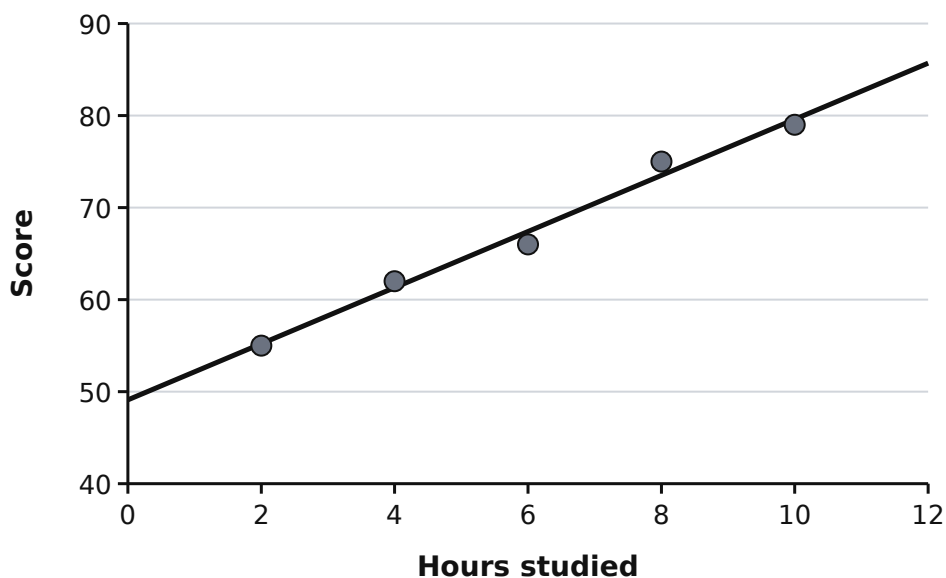
AP Statistics - Least-Squares Regression and Residuals - Test Answer Key

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/

Each solution comes with a scoring guide. Give credit for correct substitutions, correct residual signs, and interpretations that include the words predicted, per unit, and the context.

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**

Question 1 - Regression line [3 pts]



Data with the regression line.

(a) $\hat{y} = 49.1 + 3.05(7) = 70.45$.

(b) For each additional hour studied, the predicted score increases by 3.05 points.

(c) $\hat{y} = 67.40$, $e = 66 - 67.40 = -1.40$.

70.45; 3.05 points per hour; -1.40.

Scoring: 1 point per part.

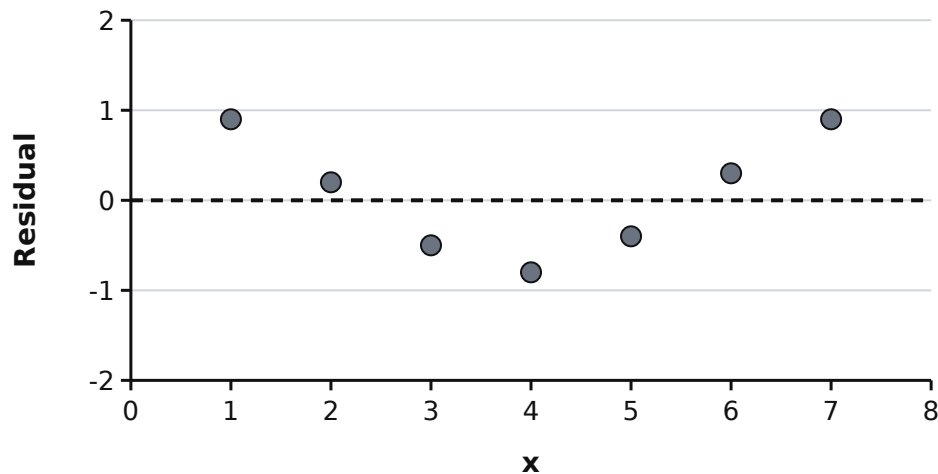
Question 2 - Interpret r squared and s [2 pts]

r squared: 88% of the variation in tips is explained by the bill total. s: actual tips typically differ from predicted tips by about \$1.20.

88% explained; typical prediction error \$1.20.

Scoring: 1 point for each interpretation.

Question 3 - Residual plot [3 pts]



A residual plot.

- (a) The residuals form a U shape.
- (b) No, the relationship is curved.
- (c) The actual value is below the predicted value.

U pattern; not linear; point below the line.

Scoring: 1 point per part.

Question 4 - Slope from summary [3 pts]

$$b = 0.8 \times \frac{4}{400} = 0.008. \quad a = 22 - 0.008(3000) = -2.$$

$$\hat{y} = -2 + 0.008x.$$

Scoring: 1 point for the slope formula, 1 point for b, 1 point for a.

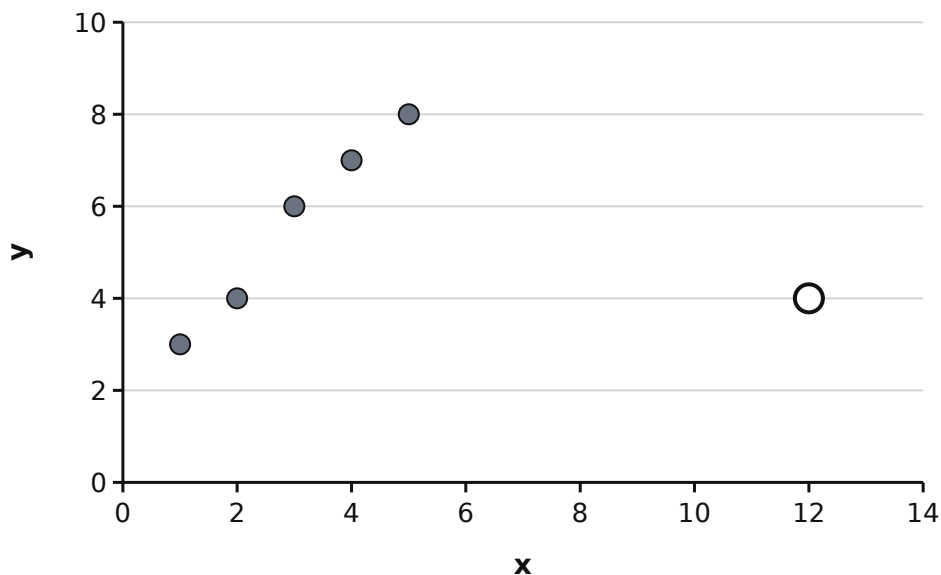
Question 5 - Extrapolation [2 pts]

$$32 + 2.4(40) = 128 \text{ inches.}$$

128 inches (over 10 feet) is absurd; age 40 is far outside the data, so the prediction is unreliable extrapolation.

Scoring: 1 point for 128, 1 point for the extrapolation comment.

Question 6 - Influential point [2 pts]



A point far from the others.

It has an extreme x value and lies far from the trend of the other points.

Removing it would change the slope substantially, so it is influential.

Scoring: 1 point for the extreme x value, 1 point for its effect on the line.

Question 7 - Interpret the intercept [3 pts]

(a) $-12 + 9.5(30) = 273$ calories.

(b) Each extra minute adds about 9.5 calories to the predicted total.

(c) $x = 0$ minutes cannot burn negative calories; the intercept is a mathematical artifact of the line.

273; 9.5 calories per minute; not meaningful.

Scoring: 1 point per part.

Question 8 - Compute r [2 pts]

$$r = -\sqrt{0.49} = -0.7.$$

r = -0.7: a moderately strong negative linear association.

Scoring: 1 point for -0.7, 1 point for the description.

Total
20 points