# 5.6 Regression and correlation

Name: _____ Class: _____ Date: _____ **Total: 14 marks**

**KEY WORDS** correlation • least squares • residual

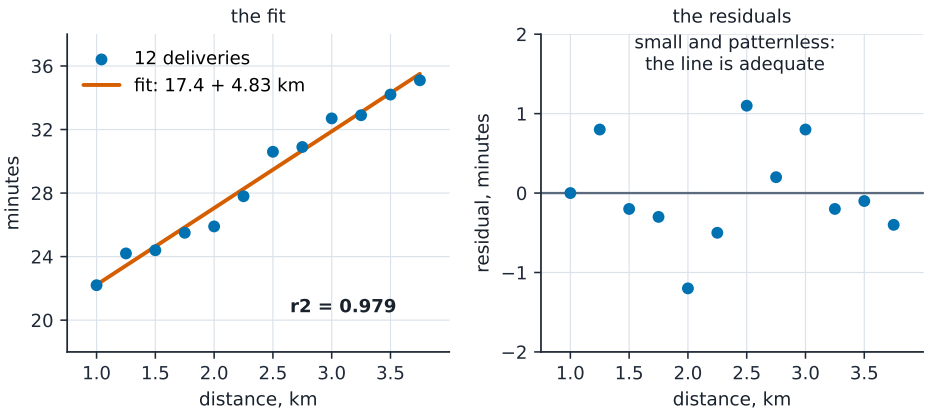
## Objective

Fit and interpret a simple regression; read residual plots; keep correlational data from making causal claims.

## 1 Key knowledge and worked examples

■ **The line, the residuals, the police**

**Least squares** gives $\hat{y} = a + bx$; $r^2$ is the shared variance. The **residual** plot grades the fit – small and patternless, or the line is wrong somewhere.
**Correlation** is association; only design earns causation.




*The fit is half the report - the residuals are the other half*

■ **Worked example. The course fit**

$\hat{y} = 17.4 + 4.83\,\text{km}$, $r = 0.989$, $r^2 = 0.979$; residuals $-1.2$ to $+1.1$, patternless ✓. Each kilometre travels with 4.83 more minutes IN THIS SAMPLE – the causal rate needs routes held fixed.

## 2 Practice

A bakery tracks 10 batches: oven temperature setting (1–5) and crust score. Fitted: score $= 2.1 + 0.62 \times$ setting; $r = 0.71$; residuals show a gentle U-shape.

**2.1** Interpret the slope and predict the score at setting 4. [3]

**2.2** Compute $r^2$ and say what it does – and does not – mean. [3]

**2.3** The U-shaped residuals: what do they tell you about the straight line, and what would you try next? [2]

**2.4** "Each setting step CAUSES +0.62 score." Rewrite the sentence honestly, and name the study that could earn the causal version. [3]

**2.5** True or false, one line each: (a) $r = 0.71$ means the fit is 71% accurate; (b) the intercept 2.1 is the score at setting zero, a setting that does not exist; (c) predicting at setting 9 is extrapolation. [3]

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