

2.8 Least Squares Regression

Name: _____ Class: _____ Date: _____ Total: 9 marks

KEY WORDS coefficient of determination 决定系数 • residual 残差

Objective

Build the skills to answer exam questions on **least-squares regression**.

You must be able to:

- explain that the **least-squares line** minimises the sum of the **squared residuals**
- interpret the **coefficient of determination** 决定系数 r^2
- interpret the **standard deviation of the residuals** s

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ **Least squares**

The **least-squares line** is the line that makes the **sum of the squared residuals** as small as possible.

■ **r^2 and s**

- r^2 — the proportion of the variation in y that the model **explains** (between 0 and 1). It is the square of the correlation r .
- s — the standard deviation of the residuals, i.e. the **typical prediction error**.

2 Practice

2.1 State what the least-squares line minimises. [1]

2.2 State what r^2 represents. [1]

2.3 If $r = 0.8$, find r^2 . [2]

3 Exam-style questions

3.1 The least-squares line minimises the sum of the [1]

A	B
C	D

- A residuals
- B squared residuals
- C x -values
- D predictions

3.2 An r^2 of 0.64 means [1]

A	B
C	D

- A 64% of the variation in y is explained by the model
- B $r = 0.64$
- C there are 64 outliers
- D there is no relationship

3.3 A regression has $r = 0.9$.

(a) Find r^2 . [2]

(b) Interpret r^2 in context (the variation in y). [1]