AP STATISTICS • EXERCISE SHEET

9.4 Setting Up a Test for the Slope of a Regression Model

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

Objective

Build the skills to answer exam questions on **setting up a test for the slope**.

You must be able to:

- state the hypotheses $H_0 : \beta = 0$ and H_a
- write the test statistic $t = \dfrac{b}{SE(b)}$
- state the degrees of freedom $n - 2$

1 Worked examples

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

■ **Hypotheses**

- **Null** $H_0 : \beta = 0$ (no linear relationship).
- **Alternative** $H_a : \beta \neq 0$ (or one-sided).

■ **Test statistic**

$$t = \frac{b}{SE(b)}, \qquad \text{df} = n - 2,$$

where b is the sample slope and $SE(b)$ its standard error.

■ **Example**

$b = 3.0$, $SE(b) = 0.6$: $t = \dfrac{3.0}{0.6} = 5.0$.

2 Practice

2.1 State the null hypothesis for a slope test. [1]

2.2 Write the test-statistic formula for a slope. [1]

2.3 For $b = 3.0$ and $SE(b) = 0.6$, find the test statistic t. [2]

3 Exam-style questions

3.1 The null hypothesis in a slope test is usually [1]

- **A** $\beta = 1$
- **B** $\beta = 0$
- **C** $b = 0$
- **D** $\beta \neq 0$

3.2 The test statistic for a slope is [1]

- **A** $\dfrac{b}{SE(b)}$
- **B** $b \cdot SE(b)$
- **C** $\dfrac{SE(b)}{b}$
- **D** $b - SE(b)$

3.3 A regression has $b = 2.4$, $SE(b) = 0.8$, $n = 22$.

(a) Write H_0. [1]

(b) Compute t. [2]

(c) State the degrees of freedom. [1]

4 Go further

- work through the **9.4 Setting Up a Test for the Slope of a Regression Model** lesson on the **Learn** page;
- read the **Inference for Quantitative Data: Slopes** section of the AP Statistics handout on the **Know** page.

Solutions

2.1 $H_0 : \beta = 0$.

2.2 $t = \dfrac{b}{SE(b)}$.

2.3 $t = \dfrac{3.0}{0.6} = 5.0$.

3.1 B.

3.2 A.

3.3 (a) $H_0 : \beta = 0$. (b) $t = \dfrac{2.4}{0.8} = 3.0$. (c) $n - 2 = 20$.