AP STATISTICS • EXERCISE SHEET

6.2 Constructing a Confidence Interval for a Population Proportion

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

Objective

Build the skills to answer exam questions on **a confidence interval for a population proportion**.

You must be able to:

- construct a confidence interval $\hat{p} \pm z^* \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$
- use the appropriate **critical value** z^*
- interpret the interval

1 Worked examples

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

■ **The confidence interval**

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}},$$

where the **margin of error** is z^* times the standard error. For 95% confidence, $z^* = 1.96$.

■ **Interpretation**

"We are 95% confident that the true proportion p lies within the interval."

■ **Example**

$\hat{p} = 0.6$, $n = 100$, 95%: $\text{ME} = 1.96\sqrt{\dfrac{0.6(0.4)}{100}} = 1.96(0.049) = 0.096$.

2 Practice

2.1 Write the formula for a confidence interval for a proportion. [1]

2.2 State the z^* value for a 95% confidence interval. [1]

2.3 A poll gives $\hat{p} = 0.5$ with $n = 100$. Find the 95% margin of error. [2]

3 Exam-style questions

3.1 A confidence interval for p has the form [1]

- **A** $\hat{p} \pm \text{ME}$
- **B** $\hat{p} \times \text{ME}$
- **C** $\hat{p}/\text{ME}$
- **D** ME only

3.2 For a 95% confidence interval, z^* is about [1]

- **A** 1.28
- **B** 1.645
- **C** 1.96
- **D** 2.58

3.3 $\hat{p} = 0.4$, $n = 100$, 95% confidence.

(a) Find the margin of error. [2]

(b) Give the confidence interval. [1]

4 Go further

- work through the **6.2 Constructing a Confidence Interval for a Population Proportion** lesson on the **Learn** page;

- read the **Inference for Categorical Data: Proportions** section of the AP Statistics handout on the **Know** page.

Solutions

2.1 $\hat{p} \pm z^* \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$.

2.2 1.96.

2.3 $\text{ME} = 1.96\sqrt{\dfrac{0.5(0.5)}{100}} = 1.96(0.05) = 0.098$.

3.1 A.

3.2 C.

3.3 (a) $\text{ME} = 1.96\sqrt{\dfrac{0.4(0.6)}{100}} = 1.96(0.049) = 0.096$. (b) $(0.304,\ 0.496)$.