



AP Statistics FRQ Practice · Unit 6

Studying Math With Online Videos · numberbender.com

Name: _____

Date: _____

Score: / 4

What this question practices

- Stating hypotheses for a one-sample z test for a proportion
- Checking conditions and calculating the test statistic and P-value
- Writing a conclusion in context
- Type I errors

Show all your work. Answer each part in complete sentences, in the context of the problem. The data are hypothetical. Suggested time: 13 minutes.

A national survey reports that 40% of high school students use online videos to study math at least once a week. A teacher believes the proportion is higher at her school, which has about 3,000 students. She selects a random sample of 200 students from her school, and 96 of them say they use online videos to study math at least once a week.

(a) State the null and alternative hypotheses for a test of the teacher's belief. Define the parameter.

(b) Check the conditions for a one-sample z test for a proportion, then calculate the test statistic and the P-value.

(c) What conclusion should the teacher make at the $\alpha = 0.05$ significance level? Explain in context.

(d) Describe a Type I error in the context of this study.





Each part is scored *E* (essentially correct), *P* (partially correct) or *I* (incorrect), the way AP readers score free-response questions. Compare your work with the model solution, then with the scoring note.

(a) State the null and alternative hypotheses for a test of the teacher's belief. Define the parameter.

$$H_0 : p = 0.40 \quad H_a : p > 0.40$$

→ p is the proportion of *all* students at the teacher's school who use online videos to study math at least once a week.

Scoring. Essentially correct: correct hypotheses using a parameter, and the parameter defined in context.

(b) Check the conditions for a one-sample z test for a proportion, then calculate the test statistic and the P-value.

→ **Random:** the 200 students are a random sample from the school.

→ **10%:** 200 is less than 10% of the school's 3,000 students.

→ **Large Counts:** $200(0.40) = 80$ and $200(0.60) = 120$ are both at least 10.

$$\hat{p} = \frac{96}{200} = 0.48$$

$$z = \frac{0.48 - 0.40}{\sqrt{\frac{0.40(0.60)}{200}}} \approx 2.31$$

$$P\text{-value} = P(Z \geq 2.31) \approx 0.0105$$

Scoring. Essentially correct: all three conditions checked, and a correct test statistic and P-value with the formula or labeled calculator inputs (1-PropZTest).

(c) What conclusion should the teacher make at the $\alpha = 0.05$ significance level? Explain in context.

→ Because the P-value of 0.0105 is less than $\alpha = 0.05$, we reject H_0 .

→ There is convincing evidence that the proportion of all students at the teacher's school who use online videos to study math at least once a week is greater than 0.40.

Scoring. Essentially correct: compares the P-value with α , makes the correct decision, and states the conclusion about the population proportion in context, without saying the null is proven false.

(d) Describe a Type I error in the context of this study.

→ A Type I error would be concluding that more than 40% of students at the school use online videos to study math weekly, when in fact the true proportion is 40%.

Scoring. Essentially correct: rejecting a true null, described in context.

