



# “FRAPPY”

{Free Response AP Problem...Yay!}

The following problem is taken from an actual Advanced Placement Statistics Examination. Your task is to generate a complete, concise statistical response in 25 minutes. You will be graded based on the AP rubric and will earn a score of 0-4. After grading, keep this problem in your binder for your AP Exam preparation.

Sunshine Farms wants to know whether there is a difference in consumer preference for two new juice products - Citrus Fresh and Tropical Taste. In an initial blind taste test, 8 randomly selected consumers were given unmarked samples of the two juices. The product that each consumer tasted first was randomly decided by the flip of a coin. After tasting the two juices, each consumer was asked to choose which juice he or she preferred, and the results were recorded.

**Scoring:**

- (a) Let  $p$  represent the population proportion of consumers who prefer Citrus Fresh. In terms of  $p$ , state the hypotheses that Sunshine Farms is interested in testing.

- (b) One might consider using a one-proportion z-test to test the hypotheses in part (a). Explain why this would not be a reasonable procedure for this sample.

# E P I

- (c) Let  $X$  represent the number of consumers in the sample who prefer Citrus Fresh. Assuming there is no difference in consumer preference, find the probability for each possible value of  $X$ . Record the  $x$ -values and the corresponding probabilities in the table below.

$x$	$p(x)$

(d) When testing the hypotheses in part (a), Sunshine Farms will conclude that there is a consumer preference if too many or too few individuals prefer Citrus Fresh. Based on your probabilities in part (c), is it possible for the significance level (probability of rejecting the null hypothesis when it is true) for this test to be exactly 0.05? Justify your answer.

**E P I**

(e) The preference data for the 8 randomly selected consumers are given in the table below.

Individual	Juice Preference
1	Tropical Taste
2	Citrus Fresh
3	Tropical Taste
4	Tropical Taste
5	Tropical Taste
6	Citrus Fresh
7	Tropical Taste
8	Tropical Taste

Based on these preferences and your previous work, test the hypotheses in part (a).

**E P I**

(f) Sunshine Farms plans to add one of these two new juices - Citrus Fresh or Tropical Taste - to its production schedule. A follow-up study will be conducted to decide which of the two juices to produce. Make one recommendation for the follow-up study that would make it better than the initial study. Provide a statistical justification for your recommendation in the context of the problem.

**E P I**

**Total: \_\_/4**