

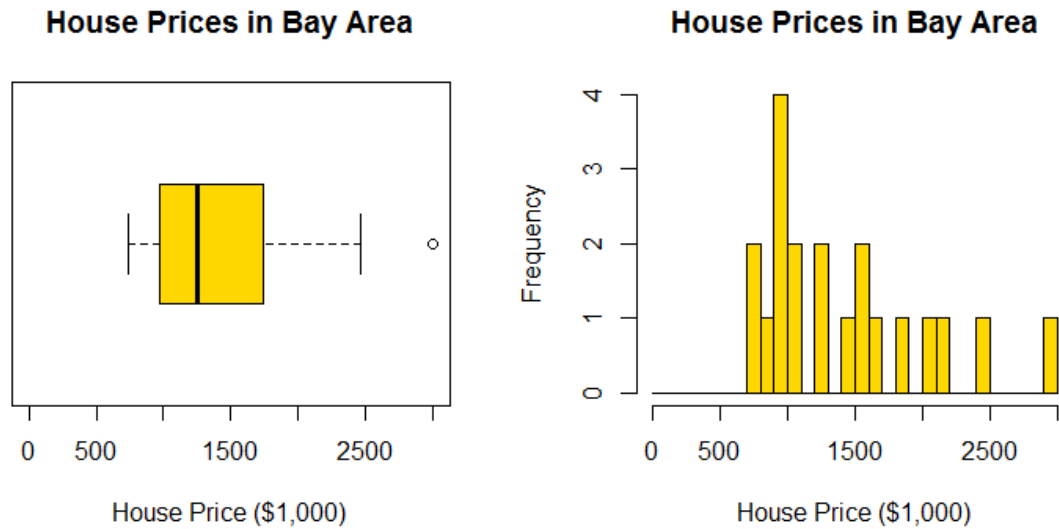
Part A: Instructions

- There is only one correct answer (unless specified).
- Each question has one point (unless specified).
- There is no partial credit in Part A.

Question A1. In a sample, an extremely unusual value is called:

- a. Minimum
- b. Maximum
- c. 95th percentile
- d. Outlier
- e. Standard error

Question A11 to Question A13 are based on the figure below. It is a sample of house prices in Bay Area.



Question A13. [CHALLENGING] What would be the best guess for the sample mean approximately? (Hint: We can approximate the mean from the histogram.)

- a. Below \$750,000
- b. Between \$750,000 and \$1,000,000
- c. Between \$1,000,000 and \$1,250,000
- d. Between \$1,250,000 and \$1,500,000
- e. Above \$1,500,000

Question A20. In hypothesis testing, when do we reject the null hypothesis?

- a. When a test statistic is positive.
- b. When a test statistic is negative.
- c. When a p-value is equal to a fixed significance level.
- d. When a p-value is greater than a fixed significance level.
- e. When a p-value is less than a fixed significance level.

Question A25. Which of the following cannot be a negative number?

- T-statistic
- Correlation
- Estimated slope (in linear regression)
- Sample mean of difference (in paired test)
- P-value

Part B: Instructions

- In Part B, you must show complete work to earn full credit.
- Each part has one point (unless specified).
- When your handwriting is not legible, you may receive no points.

Question B5. A massive multistate outbreak of food-borne illness was attributed to *Salmonella enteritidis*. Researchers hypothesized that the source of the illness was ice cream. They randomly sampled nine production runs from the ice cream company. The level of *Salmonella enteritidis* was measured in MPN/g (most probable number per gram). A level greater than 0.3 MPN/g is considered to be dangerous. The observed sample follows.

0.593, 0.142, 0.329, 0.691, 0.231, 0.793, 0.519, 0.392, 0.418

Let μ denote the population average level of *Salmonella enteritidis*, where the population is all production runs of the company. The researcher wanted to test whether the sample is sufficient evidence for a population average above the dangerous level. They fixed a probability 0.01 for falsely claiming that the population average is above the dangerous level 0.3 MPN/g. They set the null hypothesis as $H_0: \mu = 0.3$ MPN/g and the alternative hypothesis as $H_1: \mu > 0.3$ MPN/g. Assume the population distribution follows a normal distribution.

- The sample average is 0.456 MPN/g and the sample standard deviation is 0.213. Calculate the test statistic. (Round to three decimals.)
- From the T table, approximate the p-value.
- Do the researchers reject H_0 in favor of H_1 ? State the conclusion in the context of the problem.
- [CHALLENGING]** For a valid conclusion, we need to assume that the level of *Salmonella enteritidis* follows a normal distribution in the population. If the null hypothesis H_0 is true (i.e., $\mu = 0.3$ MPN/g), does it imply that the ice cream is acceptable for public safety? Justify. (2 points)

THANK YOU FOR PARTICIPATING IN MATHLETICS 2018.