

Instructions: *Please include all relevant work to get full credit. Encircle your final answers.*

1. In a study of drying time for paints, the time to dry is found be normally distributed with $\sigma = 9$. To test the null hypothesis $H_0 : \mu = 75$, where μ denotes the mean drying time of paints in minutes, versus the alternative that $H_1 : \mu > 75$, a random sample of size $n = 25$ observations are tested.

a. Specify the appropriate test statistic to use and define your rejection rule using a level of significance of $\alpha = 0.05$. [4]

b. If $\bar{x}_{\text{obs}} = 77.7$, what is your conclusion? [6]

c. Compute the p -value if $\bar{x}_{\text{obs}} = 77.7$. [5]

d. Compute the probability of committing a type I error, if you decide to reject H_0 when $\bar{x}_{\text{obs}} > 81$. [6]

e. If $\bar{x}_{\text{obs}} = 77.7$, construct and interpret a 95% confidence interval for μ . [7]

f. How large a sample should you get in order for the margin of error in part (e) to be no more than 2? [5]

2. A random sample of seven measurements gave $\bar{x} = 9.4$ and $s^2 = 1.94$.

a. What assumptions must you make concerning the population in order to test a hypothesis about σ^2 ? [2]

b. Suppose the assumptions in part (a) are satisfied. Test the null hypothesis, $\sigma^2 = 0.8$, against the alternative hypothesis that $\sigma^2 > 0.8$. Use $\alpha = 0.05$. [8]

3. In a winter of an epidemic flu, babies were surveyed by a well-known pharmaceutical company to determine if the company's new medicine was effective after two days. Among 120 babies who had the flu and were given the medicine, 29 were cured within two days. Among 280 babies who had the flu but were not given the medicine, 56 were cured within two days.

a. Formulate the most appropriate null and alternative hypotheses. Define clearly the parameters you use in your hypotheses. [4]

b. Specify the most appropriate test statistic and define your rejection rule using a level of significance of $\alpha = 0.05$. [4]

c. Test the company's claim of the effectiveness of the medicine. Write a practical conclusion. [9]

d. Compute the p-value of this sample. [5]

e. Construct and interpret a 99% confidence interval for $(p_1 - p_2)$. [9]

4. To test the claim that the resistance of electric wire can be reduced by alloying, 21 values obtained for alloyed wire yielded $\bar{x}_1 = 0.083$ ohm and $s_1 = 0.03$ ohm, and 21 values obtained for standard wire yielded $\bar{x}_2 = 0.136$ ohm and $s_2 = 0.02$ ohm. Assume that the true variances are equal.
- a. Formulate the most appropriate null and alternative hypotheses to test the claim. Define clearly the parameters you use in your hypotheses. [5]

- b. Specify the most appropriate test statistic and define your rejection rules using $\alpha = 0.01$. [5]

- c. Test the claim using $\alpha = 0.01$, then write a practical conclusion. [10]

- d. Construct and interpret a 99% confidence interval for $(\mu_1 - \mu_2)$. [8]