Assignment # 4
Test of Hypotheses for one parameter

1] Scientists have labeled benzene, a chemical solvent commonly used to synthesize plastics, as a possible cancer-causing agent. Studies have shown that people who work with benzene more than 5 years have 20 times the incidence of leukemia than the general population. As a result, the federal government has lowered the maximum allowable level of benzene in the workplace from 10 parts per million (ppm) to 1 ppm. Suppose a steel manufacturing plant, which exposes its workers to benzene daily, is under investigation by the Occupational Safety and Health Administration (OSHA). Twenty air samples, collected over a period of 1 month and examined for benzene content, yielded the data in Table (1).

(a) Test the hypothesis that the mean level of benzene at the steel manufacturing plant is greater than 1 ppm. Use a 0.05 level of significance.

(b) Test the hypothesis that the standard deviation of benzene at the steel manufacturing plant is less than 1.7 ppm. Use a 0.05 level of significance.

0.21	1.44	2.54	2.97	0.00	3.91	2.24	2.41	4.50	0.15
5.03	0.00	2.89	4.71	0.85	2.60	1.26	4.50	0.36	0.30

Table (1): Benzene Content for 20 Air Samples

2] A builder claims that heat pumps are installed in 70% of all homes being constructed today in the city of Richmond. Would you agree with this claim if a random survey of new homes in this city shows that 8 out of 15 had heat pumps installed? Use a 0.01 level of significance.

3] Annual survey of computer crimes. The Computer Security Institute (CSI) conducts an annual survey of computer crime at United States businesses. CSI sends survey questionnaires to computer security personnel at all U.S. corporations and government agencies. A total of 351 organizations responded to the 2010 CSI survey. Of these, 144 admitted unauthorized use of computer systems at their firms during the year. (CSI Computer Crime and Security Survey, 2010/2011.) Let p represent the true proportion of U.S. organizations that experience unauthorized use of computer systems at their firms.

(a) Test the hypothesis that the value of p differs from 0.35. Use $\alpha = 0.05$.

(b) Find the p-value of the test and confirm that the conclusion based on the p-value agrees with the conclusion in part **(a)**

4] A wiki is a web information depository with content that can be updated and edited through a web browser. Engineering faculty at a university in Portugal investigated the degree to which wiki tools are accepted in an academic environment (Computer Applications in Engineering Education, Vol. 20, 2012). An online survey was made available to both professors and students that were involved in engineering courses that make use of a wiki-based tool. A total of 136 students responded to the survey. One of the survey questions

asked, “Have you ever edited content in a wiki-based tool?” Of the 136 respondents, 72 answered “yes”.

(a) Do the survey results support the claim that more than half of engineering students edit content in wiki-based tools? Use $\alpha = 0.1$.

(b) Find the p-value of the test and confirm that the conclusion based on the p-value agrees with the conclusion in part **(a)**

5] For safety reasons, calf dehorning has become a routine practice at dairy farms. A 2009 report by Europe’s Standing Committee on the Food Chain and Animal Health (SANKO) stated that 80% of European dairy farms carry out calf dehorning. A later study, published in the Journal of Dairy Science (Vol. 94, 2011), found that in a sample of 639 Italian dairy farms, 515 dehorn calves. Does the Journal of Dairy Science study support or refute the figure reported by SANKO? Explain.
