Z vs. T Distributions Mixed Practice

Use a separate sheet of paper. You must show all work and all steps must be clearly labeled. Submitting just answers will result in a grade of 0! All unexplained numbers will be ignored and final answers must be written in complete sentences.

1. Manufacturers make claims about their products and usually try to convince you that their product is better than that of a competitor. Most brands of paper towels claim to pick up more liquid than any other brand. A random sample of 16 of each type of towel was tested for absorbency. The mean number of mL for Brand A was 15.625 mL with a standard deviation of 3.12 mL while for Brand B the mean was 14 mL with a standard deviation of 2.53 mL. How much of a difference, on average, can be expected between Brand A and Brand B?

2. A recent study of 1000 randomly chosen residents in each of two randomly selected states indicated that the percent of people living in those states who were born in foreign countries was 6.5% for State A and 1.7% for State B. Find a 99% confidence interval for the difference between the proportions of foreign-born residents for these two states.

3. It is a common belief that women tend to live longer than men. Random samples from the death records for men and women in Montgomery County were taken, and age at the time of death was recorded. The average age of the 48 males was 68.33 years with a standard deviation of 12.49 years, while the average age of the 40 females was 78.7 years with a standard deviation of 16.43 years. Do women in this county tend to live longer than men? Give appropriate statistical evidence to support your answer.

4. In a given year, 13.5% of employed people in the United States reported belonging to a union. Officials from a large city contacted a random sample of 2000 city workers and 240 claimed union membership. Is there sufficient evidence to conclude that the proportion of workers in this city who are union member is different from the national rate?

5. Over the ten-year period 1990 – 2000, the unemployment rates for Australia and the United Kingdom were reported as follows:

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Australia	7.3	9.6	10.7	10.9	9.7	8.5	8.6	8.6	8	7.2	6
UK	6.9	8.8	10.1	10.5	9.7	8.7	8.2	7	6.4	6	5.5

   Find a 90% confidence interval for the mean difference in unemployment rates for Australia and the United Kingdom.

6. The 2005 SAT Verbal scores for 15 randomly selected high school in urban and suburban areas in the United States are given below.

Urban	565	550	549	536	535	535	522	516	504	497	495	489	445	444	435
Suburban	575	563	540	529	528	507	504	498	482	476	472	463	431	412	375

   Is there a statistically significant difference in the average 2005 SAT Verbal scores for these two areas?

7. Owners of a very large private lake recently stocked the lake with bass and proudly proclaimed that 80% of the bass caught in the lake meet the required 15-inch minimum length (smaller fish must be thrown back). At the lake, 10 fishermen caught 51 bass, of which they were allowed to keep 27.
   a. Do they have evidence to show that the lake's proportion of bass that meet the required 15-inch minimum length is different from the owners' claim?
   b. Find a 95% confidence interval for the proportion of bass that meet the required 15-inch minimum length.
   c. Use your confidence interval to justify your decision in part (a).

8. In a recent national survey, 16,262 students in 151 schools, completed questionnaires about physical activity. Male students (55.5%) were more likely than female students (42.3%) to have played on sports teams run by their school during the 12 months preceding the survey. Find a 99% confidence for the true difference in proportions.

9. At Bunker Hill, near Boston, in one of the first battles of the American Revolution, 2400 British troops were engaged, of which 1054 were wounded. Of the 1054 wounded, 226 died. Out of 1500 American participants in the battle, losses were estimated at 140 kills and an additional 271 wounded who didn't die of their wounds. Can we conclude that the proportion of British troops wounded is higher than the American troops?

10. A famous medical experiment was conducted by the Nobel Laureate Linus Pauling who believed that vitamin C prevents colds. His subjects were 279 French skiers who were randomly assigned to receive vitamin C or a placebo. Of the 139 given vitamin C, 17 got a cold. Of the 140 given the placebo, 31 got a cold. Find and interpret a 95% confidence interval for the difference of two proportions.

11. Jack and Jill have opened a water-bottling factory. The machine that fills the bottles is fairly precise. The distribution of the number of ounces of water in the bottles is approximately normal. Jack and Jill take a random sample of 10 bottles from today's production and weigh the water in each. The weights are
    15.91 16.08 16.08 15.94 16.02 15.94 15.96 16.03 15.82 15.96
    Find a 96% confidence interval for the mean weight of the water.

12. The Current Population Survey (CPS) is the monthly government sample survey of 60,000 households that provides data on employment in the United States. A study of child-care workers drew a sample from the CPS data tapes. We can consider this sample to be an SRS from the population of child-care workers. Out of 2455 child-care workers in private households, 7% were black. Of 1191 non-household child-care workers, 14% were black. Is the difference statistically significant for $\alpha = .01$?

13. A study of the pay of corporate CEOs examined the cash compensation, adjusted for inflation, of the CEOs of 104 corporations over the period 1977 to 1988. Among the data are the average annual pay increases for each of the 104 CEO's. The mean percent increase in pay was 6.9%. The data showed great variation, with a standard deviation of 17.4%. The distribution was strongly skewed to the right. Give a 99% confidence interval for the mean increase in pay for all corporate CEOs.

14. In a study of the effectiveness of a weight-loss program, 47 subjects who were at least 20% overweight took part in the program for 10 weeks. Private weighing determined each subject's weight at the beginning of the program and 6 months after the program's end. The paper reporting the study said "The subjects lost a significant amount of weight over time, $t(46) = 4.68$, $p < .01$." What test did they need to use to obtain the information in the report?

15. The NCAA requires colleges to report the graduation rates of their athletes. One Big Ten university reported that the graduation rates for a specific year were 21 of 28 females athletes and 24 of 46 male athletes. Is there evidence that a smaller proportion of male athletes than of female athletes graduate?