Name: _____ Date: _____ AP Statistics

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.

Inference for Two Proportions, Chp 12

1. In the late 70's there were intensive antismoking campaigns sponsored by both federal and private agencies. Suppose that the American Cancer Society randomly sampled 1,500 adults in 1979 and then sampled 2,000 adults in 1981 to determine whether there was evidence that the percentage of smokers had decreased. *(See Chp 12 powerpoint online for answer.)*

	1979	1981
Sample Size	1500	2000
Number Who Smoke	576	652

   a. Give a 90% confidence interval for the difference between the proportion of smokers in 1979 and the proportion of smokers in 1981. Interpret the interval.
   b. Do these data indicate that the proportion of smokers decreased over this 2-year period? $\alpha = .01$

2. A new insect spray is to be compared with a spray that is currently in use. Two rooms of equal size are sprayed with the same amount of the designated spray. Two hundred fifty insects are released into each room and after 1 hour, the numbers of dead insects are counted. The new insect spray kill 60% of the insects while of current spray killed 45%.
   a. Do the data provide sufficient evidence to indicate that the new spray is more effective than the current spray in controlling the insects? $\alpha = .05$
   b. Find a 98% confidence interval for the difference in the rates of kill for the two sprays. Interpret the interval.
   c. Interpret the level of confidence.

3. A study of small-business failures looked at 148 randomly selected food-and-drink businesses in central Indiana. Of these, men headed 106 and 42 were headed by women. During a three-year period, 15 of the men's businesses and 7 of the women's businesses failed. Is there a significant difference between the rate at which businesses headed by men and women fail? Use $\alpha = .025$

4. A series of experiments has been conducted to compare the amount of hemoglobin (proportion of the total volume) in the blood of men and women who are between the ages of 20 and 30 years. In random samples of twenty-five women and twenty men, all between the ages of 20 and 30 years, the researcher recorded the 19 of the women and 17 of the men had healthy hemoglobin amounts. Give an 80% confidence interval for the difference in the proportion of men and women with healthy hemoglobin amounts.

5. *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.

6. *A researcher wants to know whether there is a difference in AP* Statistics exam failure rates between rural and suburban students. She randomly selects 107 rural students and 143 suburban students who took the exam. Thirty rural students failed to pass their exam while 45 suburban students failed to pass. Is there a significant difference in failure rates for these two groups?

7. **The elderly fear crime more than younger people, even though they are less likely to be victims of crime. One of the few studies that looked at older blacks recruited random samples of 56 black women and 63 black men over the age of 65 from Atlantic City, New Jersey. Of the women, 27 said the "felt vulnerable" to crime; 46 of the men said this.
    a. What proportion of women in the sample feel vulnerable? Of men? (Note: Men are victims of crime more often than women, so we expect a higher proportion of men to feel vulnerable.)
    b. Construct and interpret a 95% confidence interval for the difference. (*Note: You will not always be given the order of subtraction so you must be sure to define it in every problem. Here you can perform your test using men – women or women – men. They are both correct, but you must state which you are choosing.)*

8. **In 2002 the Supreme Court ruled that schools could require random drug testing of students participating in competitive after-school activities such as athletics. Does drug testing reduce use of illegal drugs? A study compared two similar high schools in Oregon. Wahtonka High School tested athletes at random and Warrenton High School did not. In a confidential survey, 7 of 135 athletes at Wahtonka and 27 of 141 athletes at Warrenton said they were using drugs. Regard these athletes as simple random samples from the population of athletes at similar schools with and without drug testing. Do the data give good reason to think that drug use among athletes is lower in schools that test for drugs? Carry out an appropriate test to help answer this question. *(Note: You will no longer be told which test to carry out. You must be able to distinguish a one sample proportion from a two sample proportion. Eventually you must be able to distinguish all tests/intervals from one another. It is very important that you state which type of test/interval you decide to run with each problem.)*

9. **The drug AZT was the first drug that seemed effective in delaying the onset of AIDS. Evidence for AZT's effectiveness came from a large randomized comparative experiment. The subjects were 1300 volunteers who were infected with HIV, the virus that causes AIDS, but did not yet have AIDS. The study assigned 435 of the subjects at random to take 500 milligrams of AZT each day, and another 435 to take a placebo. (The others were assigned to a third treatment, a high dose of AZT. We will compare only two groups.) At the end of the study, 38 of the placebo subject and 17 of the AZT subjects had developed AIDS. We want to test the claim that taking AZT lowers the proportion of infected people who will develop AIDS in a given period of time.
    a. Why is it important to use a placebo in this setting?
    b. How significant is the evidence that AZT is effective?
    c. The experiment was double-blind. Explain what this means.
    d. Describe a type I and type II error in this setting, and give the consequences of each. Which is more serious?

* Carroll, Carver, Peters, and Ricks. *Stats: Modeling the World, AP* Test Prep Series.*
** Yates, Moore, & Starnes. *The Practice of Statistics, 3rd Edition*