Exercise Sheet 7 - Lecture 7

1. Assume that IQ scores for a certain population are approximately $N(\mu, 100)$. To test $H_0 : \mu = 110$ against the one-sided alternative hypothesis $H_1 : \mu > 110$, we take a random sample of size $n = 16$ from this population and observe $\bar{x} = 113.5$. Do we accept or reject H_0 at the

   (a) 5% level?

   (b) 10% level?

   (c) What is the p-value of this test?

2. An experiment was done to measure the effects of ozone, a component of smog. A group of 22 70-day-old rats were kept in an environment containing ozone for 7 days. The average weight gain of these rats was 11.01g. Another group of 23 rats of a similar age were kept in an ozone-free environment for a similar time. The average weight gain of these rats was 24.54g. Assuming the standard deviation of weight gain in the two groups is 25g and 20g respectively, test the research hypothesis that ozone reduces weight gain in rats at the 5% level?

3. It was claimed that 75% of all dentists recommend a certain brand of gum for their gum-chewing patients. A consumer group doubted this claim and decided to test $H_0 : p = 0.75$ against the alternative hypothesis $H_1 : p < 0.75$, where p is the proportion of dentists who recommended this brand of gum. A survey of 390 dentists found that 273 recommended this brand of gum. Which hypothesis would you accept if the significance level is

   (a) 1%?

   (b) 5%?

4. For developing countries in Africa and the Americas, let p_1 and p_2 be the respective proportions of babies with a low birth weight (below 2500 grams). We shall test $H_0 : p_1 = p_2$ against the alternative hypothesis $H_1 : p_1 > p_2$. If random samples of sizes $n_1 = 900$ and $n_2 = 700$ yielded $y_1 = 135$ and $y_2 = 77$ babies with a low birth weight, would you reject the H_0 at the 1% level?