

# AMS 310 - Practice Final

Monday, May 9, 2005

- In a sample of 100 ceramic pistons made for an experimental diesel engine, 18 were cracked.
  - Construct a 95% confidence interval for the true proportion of cracked pistons.
  - Test the null hypothesis  $p = 0.2$  v.s. the alternative  $p < 0.2$  at the 0.05 level.
- It has been claimed that more than 40% of all shoppers can identify a highly advertised trademark. If, in a random sample, 10 of 18 shoppers were able to identify the trademark, test at the 0.05 level of significance whether the null hypothesis  $p = 0.4$  can be rejected against the alternative hypothesis  $p > 0.4$ .
- In a random sample of 160 workers exposed to a certain amount of radiation, 24 experienced some ill effects.
  - Construct a 99% confidence interval for the true percentage.
  - Test the null hypothesis  $p = 0.18$  v.s. the alternative hypothesis  $p \neq 0.18$  at the 0.01 level.
- If 4 of 20 patients suffered serious side effects from a new medication, test the null hypothesis  $p = 0.5$  against the alternative hypothesis  $p \neq 0.5$  at the 0.05 level of significance. Here  $p$  is the true proportion of patients suffering serious side effects from new medication.
- An experiment is performed to determine whether the average nicotine content of one kind of cigarette exceeds that of another kind by 0.2 milligram. If  $n_1 = 50$  cigarettes of the first kind had an average nicotine of  $\bar{x}_1 = 2.61$  milligrams with a standard deviation of  $s_1 = 0.12$  milligram, whereas  $n_2 = 40$  cigarettes of other kind had average nicotine content of  $\bar{x}_2 = 2.38$  milligrams with standard deviation of  $s_2 = 0.14$  milligram, test the null hypothesis  $\mu_1 - \mu_2 = 0.2$  against the alternative hypothesis  $\mu_1 - \mu_2 \neq 0.2$  at the 0.05 level of significance.
- pg. 268, example (conducting a paired test).
- A random sample of size 64 is to be used to test the null hypothesis that for certain age group the mean score on an achievement test (the mean of a normal population with  $\sigma^2 = 256$ ) is less than or equal to 40 against the alternative that it is greater than 40. If the null hypothesis is to be rejected if and only if the mean of the random sample exceeds 43.5, find
  - the probability of type I error when  $\mu = 38$ ;
  - the probability of type II error when  $\mu = 42$ ;
- A construction firm has recently sent in bid for 3 jobs worth (in profits) 10, 20, and 40 (thousands) dollars. If its probabilities of winning the jobs are respectively 0.2, 0.8, and 0.3, what is the firm's expected total profit?

9. Given the joint probability density

$$f(x, y) = \begin{cases} \frac{2}{3}(x + 2y) & \text{for } 0 < x < 1, 0 < y < 1 \\ 0 & \text{elsewhere} \end{cases}$$

find  $P(X \leq 0.5 | Y = 0.5)$ .

**10,11,12,13.** Practice test II, 4, 5, 6, 7.

**14.** It has been established that the number of defective stereos produced daily at a certain plant is Poisson distributed with mean 4. Over a 2-day span, what is the probability that the number of defective stereos does not exceed 3?

**15.** Midterm I, 1.

**16.** A total of 600 of the 1,000 people in a retirement community classify themselves as Republicans, while the others classify themselves as Democrats. In a local election in which everyone voted, 60 Republicans voted for the Democratic candidate, and 50 Democrats voted for the republican candidate. If a randomly chosen community member voted for the Republican, what is the probability that she or he is a Democrat?