

Probability & Statistics
Math 3403
Exam II, Oct 12, 2001
Due date: Post marked: Thursday, November 15, 2001

1. A historian examining British colonial records for the Gold Coast in Africa suspects that the death rate was higher among African minors than among European minors. In the year 1936, there were 223 death among 3,809 African minors and 7 deaths among 1541 European minors in the Gold Coast.

Consider this year as a sample from the pre-war era in Africa. Is there a good evidence that the proportion of African minors who died during a year was higher than the European minors who died? (State hypotheses, calculate the test statistic, give a P -value as exact as the table in the text allows, and state your conclusion in words.)

2. An agricultural researcher reasons as follows: A heavy application of potassium fertilizer to grasslands in the spring seems to cause lush early growth but depletes the potassium before the growing season ends. So spreading the same amount of potassium over the growing season might increase yields. He therefore compares two treatments: 100 pound per acre of potassium in the spring (Treatment 1) and 50, 25, and 25 pounds per acre applied in the spring, early summer, and late summer (Treatment 2). The experiment is continued over several years, because growing condition may vary from year to year.

The table below gives the yields in pounds of dry matter per acre. It is known from long experience that yields vary roughly normally.

Treatment	Year 1	Year 2	Year 3	Year 4	Year 5
1	3902	4281	5135	5350	5746
2	3970	4271	5440	5490	6028

a) Do the data give good evidence that Treatment 2 leads to higher average yields? (State hypotheses , carry out a test, give a P -value as exact as the tables in the text allows, and state your conclusion in words.)

b) Give a 98% confidence interval for the mean increase in yield due to the spreading potassium applications over the growing season.

3. Prior to an intensive TV advertising campaign, the producers of Nike athletic shoes find that 29 of a random sample of 200 upper-income adults are aware of their new leisure shoe line. A second random sample of 300 such adults is taken after the campaign. Now 96 of the persons sampled can identify the new line.

Give a 99% confidence interval for the increase in the proportion of upper income adults showing brand awareness.

4. Answer the following question. (No explanation is needed - just a short answer)

(a) You are reading an article in your field that reports several statistical analyses. The article says that the P -value for a significance test is 0.045. Is this result significant at 5% significant level?

(b) Is the result with P -value 0.045 significant at 1% significant level?

(c) For another significance test, the article says only that the result was significant at the 1% level. Are such results always, sometimes, or never significant at the 5% level?

(d) The reaction time of a subject to a stimulus are strongly skewed to the right because of a few a few slow reaction times. You wish to test

$$H_0 : \mu_1 = \mu_2$$

Where μ_1 is the mean reaction time for Stimulus 1, and μ_2 for Stimulus 2. You have two independent samples, 8 observations for Stimulus 1 and 10 for Stimulus 2. Which, if any, of the tests you have studied can be used to test this?

(e) You read an article that contains a 95% confidence interval. Would the margin of error in a 99% confidence interval computed from the same data be less, the same, or greater?

5. In a coin tossing game you can toss a coin a maximum of 4 times. You will win and the game is over if you toss two heads.

a) Draw a tree diagram of the possible outcomes.

b) What is the probability of not winning at all.

6. A boy likes colors brown, green, yellow, and red of m&m candy equally the same. He asks his mother for 3 of these m&m's.

a) Find the probability that 1 yellow, 1 brown, and 1 red is asked for.

b) Find the probability that at least 1 red is asked for.

c) Find the probability that 2 of the same color are asked for.

d) Find the probability exactly 2 reds are asked for.

7. A carton of eggs has 1 bad and 9 good eggs.

a) If an omelette is made of 3 eggs randomly selected from the carton, what is the probability that there is no bad eggs in the omelette?

b) What is the probability of having at least 1 bad egg in the omelette?

c) What is the probability of having exactly 2 bad egg in the omelette?