

Name: \_\_\_\_\_

Economics 300  
Summer 2010  
June 25, 2010

### Test #2

Each problem is weighted equally. Write your answers on the test; continue answers on the back if additional space is needed. In order to get full credit, you must show the calculations used to arrive at your answers.

(1) Suppose that the distribution of passenger weights on EZ-Fly Airline has a mean of 180 pounds and a standard deviation of 30 pounds. EZ-Fly's aircraft has a total passenger weight limit of 12,000 pounds and has a seat configuration allowing it to have at most 60 passengers per flight.

a. If the airline fully books a flight, what is the probability that it will be overloaded on the flight?

b. What proportion of seats should the airline book in order to have a 96% chance of staying below the weight limit? [note. consider the fact that a seat cannot be partially booked—there is an integer constraint on the number of booked seats—in formulating your answer]

(2) A surveyor is trying to estimate the area of a rectangular field. His assistants took repeated measurements of length (L) and width (W), but their measurements are not exact, instead following the (independent) distributions:

<u>L</u>	<u>p(L)</u>	<u>W</u>	<u>p(W)</u>
10	.20	4	.20
15	.50	5	.60
20	.30	6	.20

a. If the true length is 15 and the true width is 5, are L and W unbiased estimators of the true length and true width respectively?

b. What is the MSE of L?

c. For these data,  $\text{Mode}(L) \cdot \text{Mode}(W)$  provides a better estimate of area than  $E(L) \cdot E(W)$  does. What about these data cause this to be the case? Why would we not generally want to use sample modes as estimators instead of using sample means?

(3) The president of the Crooked Arrow City Bank wants to test whether 60 percent of the bank's loans are made to persons who reside in the city where the bank is located. He wants to detect either positive or negative departures from this figure. The bank's statistician chooses a random sample of 200 of the people to whom the bank has made loans and finds that 52 percent reside in the city.

- a. If a 5 percent significance level is used, should this hypothesis be rejected? What about at the 1 percent significance level? Use a t ratio to answer these questions.

- b. What is the p-value of this test?

(4) Suppose that a five-sided die is to be tested for fairness. On a whim, the inspector decides to toss it 25 times, count the number of threes that show up, and reject the die if the number of threes is either less than 3 or more than 7.

a. Briefly explain why looking only at the number of threes is not a very complete check of fairness.

b. Now put aside your doubts raised in **a**; in other words, briefly explain why the scheme for deciding whether or not to reject the die, although somewhat arbitrary, is reasonable.

c. Find  $\alpha$ .

d. Find  $\beta$  if the actual probability of getting a three is  $\frac{3}{10}$ .

(5) An economist collects the following data on 5 countries:

<u>Country</u>	<u>Infant mortality rate (per 10,000 births)</u>	<u>GDP per capita (in \$000s)</u>
Albenia	40	7
Botswana	50	8
Caneda	12	22
Denmerk	10	25
Eretrea	150	6

a. Calculate the appropriate regression line. What null hypothesis are you implicitly getting ready to test?

b. For a country with GDP per capita of \$10,000, what is the predicted infant mortality rate? Are there any cautions you would want to give someone who is counting on this prediction being correct?