

**Math 221: Statistics Practice Problems**

Week #14

- (1) In a large industrial complex, the maintenance department has been instructed to replace light bulbs before they burn out. It is known that the life of light bulbs is normally distributed with a mean life of 900 hours of use and a standard deviation of 75 hours. When should the light bulbs be replaced so that no more than 10% of them will burn out while in use?
- (2) A doctor knows from experience that 10% of the patients to whom he gives a certain drug will have undesirable side effects. Find the probabilities that among the ten patients to whom he gives the drug,
  - (a) at most two will have undesirable side effects.
  - (b) at least two will have undesirable side effects.
- (3) An automobile manufacturer wants to estimate the mean gasoline mileage that its customers will obtain with its new compact model. How many sample runs must be performed in order that the estimate be accurate to within 0.3 mpg at 95% confidence? (Assume that  $\sigma = 1.5$ )
- (4) Find the probability that a piece of data picked at random from a normal population will have a standard score ( $z$ ) that lies between the following pairs of  $z$ -values:
  - (a)  $z = -2.75$  to  $z = 1.38$
  - (b)  $z = 0.67$  to  $z = 2.95$
  - (c)  $z = -2.95$  to  $z = -1.18$
- (5) A natural gas utility is considering a contract for purchasing tires for its fleet of service trucks. The decision will be based on expected mileage. For a sample of 100 tires tested, the mean mileage was 36,000 and the standard deviation was 2000 miles. Estimate the mean mileage that the utility should expect from these tires using a 98% confidence interval.
- (6) According to the 1994 *World Almanac*, the average speed of winds in Honolulu, Hawaii, equals 11.4 miles per hour. Assume that wind speeds are approximately normally distributed with a standard deviation of 3.5 miles per hour.
  - (a) Find the probability that the wind speed of any one reading will exceed 13.5 miles per hour.
  - (b) Find the probability that the mean of a random sample of 9 readings exceeds 13.5 miles per hour.

- (7) Find the mean and standard deviation of  $x$  for each of the following binomial random variables:
- the number of tails seen in 50 tosses of a quarter.
  - the number of aces seen in 100 draws from a well-shuffled bridge deck (with replacement).
  - the number of cars found to have unsafe tires among the 400 cars stopped at a roadblock for inspection. Assume that 6% of all cars have one or more unsafe tires.
  - the number of melon seeds that germinate when a package of 50 seeds is planted. The package states that the probability of germination is 88%.
- (8) In a large supermarket the customer's waiting time to check out is approximately normally distributed with a standard deviation of 2.5 min. A sample of 24 customer waiting times produced a mean of 10.6 min. Is this evidence sufficient to reject the supermarket's claim that its customer checkout time averages no more than 9 min? Complete this hypothesis test using the 0.02 level of significance.
- (9) The marketing research department of an instant-coffee company conducted a survey of married men to determine the proportion of married men who preferred their brand. Twenty of the 100 in the random sample preferred the company's brand. Use a 95% confidence interval to estimate the proportion of all married men who prefer this company's brand of instant coffee.
- (10) The weights of full boxes of a certain kind of cereal are normally distributed with a standard deviation of 0.27 oz. A sample of 18 randomly selected boxes produced a mean weight of 9.87 oz.
- Find the 95% confidence interval for the true mean weight of a box of this cereal.
  - Find the 99% confidence interval for the true mean weight of a box of this cereal.
  - What effect did the increase in the level of confidence have on the width of the confidence interval?
- (11) It has been suggested that abnormal male children tend to occur more in children born to older-than-average parents. Case histories of 20 abnormal males were obtained, and the ages of the 20 mothers were

31	21	29	28	34	45	21	41	27	31
43	21	39	38	32	28	37	28	16	39

The mean age at which the mothers in the general population give birth is 28.0 years.

- Calculate the sample mean and standard deviation.
- Does the sample give sufficient evidence to support the claim that abnormal male children have older-than-average mothers? Use  $\alpha = 0.05$ . Assume ages have a normal distribution.