PROBLEMS

1. Heights of U.S. males are known to be distributed with a mean $\mu=0.70$ inch and a standard deviation σ of 2 inches. An anthropologist is inquiring as to whether heights of Bora-Bora males are distributed with a variance different from that of U.S. males. A sample of seven Bora-Bora males yields the following heights (in inches):

69 68 68 67 70 71 69

Can the anthropologist reject the hypothesis that heights of Bora-Bora males is distributed with the same variance as the heights of U.S. males?

2. Freshco-Cola sales are distributed over days with a mean of 82,000 bottles per day and a standard deviation of 1500 bottles. It is in Freshco-Cola's interest to reduce this standard deviation because that would make marketing more efficient. Hence, a new advertising technique is introduced with this goal. The first 10 days of using the technique yield the following sales:

Day	Number of Sales	Day	Number of Sales
1	81,752	6	82,033
2	83,812	7	81,925
3	82,104	8	81,599
4	82,529	9	82,730
5	82,620	10	81,885

a. Has the new advertising technique been effective in reducing the standard deviation of sales over days?

b. Does the variance over the first five days using the technique differ from the variance over the last five days?

3. Joe Smith is working for the U.S. Mint. His job is to ensure that new coins are fair—that is, that they have an equal chance of coming up heads or tails when tossed. The government has issued a new coin known as the Nixon nickel, with a portrait of Richard Nixon on the head side and a horse's tail on the tail side. To test the fairness of the Nixon nickel, Joe flips 100 Nixon nickels, and 61 of them turn up tails. Test the following hypotheses:

 H_0 : The probability of a Nixon nickel coming up heads is 0.50.

 H_1 : The probability of a Nixon nickel coming up heads is not 0.50.

Do not use a binomial or a z-test.

4. An anthropologist has a hypothesis that 80% of the inhabitants of Clodovia will be left-handed. From a sample of 200 Clodovians, 140 turn out to be left-handed.

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nts of Clodovia turn out to be a. Perform a z-test to test the following hypotheses:

 H_0 : 80% of Clodovians are left-handed.

 H_1 : The percentage of left-handed Clodovians is something other than 80%.

b. Use a χ^2 -test to test the same hypotheses.

- 5. Two-thirds of the books in Ralph's science fiction shop supposedly involve time travel, whereas the other third are robot-oriented. Joe Smith goes in and buys 180 books, which he selects randomly off the shelf. Upon arriving home, he sorts them, to discover that 50 are about robots and the other 130 are about time travel. Joe suspects that Ralph has altered the ratio of time travel to robot books in the store. Is this suspicion justified?
- 6. Using the data from Chapter 5, problem 11, evaluate the occultist's hypothesis using a χ^2 -test.
- 7. Baskin-Sunshine has introduced four new flavors of ice cream: plasti-freeze, bubble gum, antiestablish-mint, and zirconium. To see if there are any differences in preferences for the four flavors, 40 people at random are given a choice of one of the four. The preferences are as follows:

five people preferred plasti-freeze.

twenty people preferred bubble gum.

fifteen people preferred antiestablish-mint.

zero people preferred zirconium.

Test the hypothesis that there are no differences in preference among the population.

8. Joe Smith keeps track of all dice roll totals during a marathon game of Monopoly. (Each roll involves the throw of two dice.) He finds the following frequencies of dice totals.

Total	Frequency	Total	Frequency
2	122	7	580
3	204	8	560
4	319	9	401
5	399	10	321
6	502	11	210
		12	98

- a. Compute an expected probability distribution and an expected frequency distribution for these data.
- b. Would you conclude that the dice are fair dice? Or are they biased in some way?
- 9. IQ scores in the United States are normally distributed with a mean $\mu = 100$ and a variance $\sigma^2 = 225$. A random sample of 242 people from New York showed the following distribution of IQ scores:

IQ	Frequency of People
<55 55–70 71–85 86–100 101–115	20 17 29 52
116–130 131–145 >145	63 42 13 14

Would you say that New Yorkers are representative of the U.S. population in terms of their IQ scores?

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