Stat 1040
Review 2

1. Three draws are made at random from the box [3, 4, 4, 5, 5, 5].

a) If the draws are made with replacement, find the probability that a "4" is drawn each time.

b) If the draws are made without replacement, find the probability that a "5" is drawn each time.

c) If the draws are made without replacement, find the probability that a "3" is drawn at least once.

2. Suppose that 60% of all people who are eligible for jury duty in a large city are in favor of capital punishment. We are interested in how this fact might affect the composition of a jury in a murder trial. Suppose a jury of 12 is to be randomly selected from all who are eligible for jury duty in that city.

a) What is the chance that none of the 12 jurors selected favors capital punishment?

b) If the jury were selected at random, would you be surprised if none of the 12 jurors selected favored capital punishment? Explain.

3. Shaquille O'Neal has a lifetime 53% chance of making a free throw. He says he can't shoot free throws because he fell out of a tree as a child and broke both his wrists. You may assume that this chance is constant and that all of his free-throws are independent of each other. Shaq takes 10 free- throws.

a) What is the chance that he makes none of the 10 shots?

b) What is the chance that he makes exactly 7 of the 10 shots?

4. In one play of a game, a nickel, dime, and quarter are tossed. If all three come up "heads", then you win $ 15 ; otherwise, you lose $ 3 . You repeat this game 100 times.

a) What is the probability of getting "three heads" in one play of the game?

b) Find an appropriate box model for determining your total winnings after 100 plays.

5. Find the chance of getting four aces in a hand of five cards.

6. A gambler is going to play roulette 25 times, putting a dollar on a *split* each time, say *11 or 12*. If either number comes up, the gambler gets the dollar back, together with winnings of $17, otherwise he loses the dollar. So a *split* pays 17 to 1 . Build a box model for the gambler's net gain.

7. The Heart Association claims that only 10% of adults over 30 years of age in the country can pass the minimum fitness requirements established by the President's Physical Fitness Commission. Suppose that 100 adults over 30 years of age are randomly selected and all are given the fitness test. Assuming the Heart Association's claim is true, find the probability that at least 16% of them will pass the minimum fitness requirements.

8. A box contains five tickets: two 2's, two 3's, and one 4. We draw from this box with replacement. Fill in the blanks and explain:

a) As the number of draws gets larger and larger, the data histogram of the draws will look more and more like _____.

b) As the number of draws gets larger and larger, the probability histogram for the average of the draws (when put in standard units) will look more and more like _____.

9. Draw 100 times with replacement from the box [1 , 3 , 7 , 13].

a) How small can the sum of the draws be? How large?

b) How many times do you expect to draw a "7"?

c) What do you expect the sum of the draws to be?

d) Find the probability that the sum of the draws is larger than 650.

10. Over 200,000 Utah adults are employed part-time and about 4 times as many are employed full-time. To estimate the percentage of citizens who lack health insurance, the state government wants to take a simple random sample. In each case, if all other things are similar, which is more accurate or are they about the same?

i. A simple random sample of 1000 part-time employed adults.
ii. A simple random sample of 1000 full-time employed adults.

i. A simple random sample of 1000 part-time employed adults.
ii. A simple random sample of 4000 full-time employed adults.

i. A simple random sample of 2% of the population of the part-time employed.
ii. A simple random sample of 2% of the population of the full-time employed.

11. In a simple random sample of 500 Cache Valley drivers, 346 claim that they always wear a seatbelt. Find a 95% confidence interval for the percentage of *all* Cache Valley drivers who always wear a seatbelt.

12. Lake Taupo is a New Zealand lake with only two types of fish; brown trout and rainbow trout. A wildlife expert takes a simple random sample of 250 fish from the lake and finds that 47 of them are brown trout. Find a 90% confidence interval for the percentage of brown trout in the lake. (You may assume the number of fish in the lake is very large.)

13. Sixty four randomly selected high school seniors from the school district are given the math portion of the ACT test with the following results: AV = 22 , SD = 4 .

a) Construct the 95% confidence interval for the average ACT score of all seniors in the school district.

b) If you wanted a 95% confidence interval with half the length of the interval in part a), you would _____.

c) About 95% of the seniors have an IQ in the interval _____.

14. The women's center at a local hospital has a record of all deliveries in the last 10 years (about 12,000). They take a simple random sample of 500 of these deliveries and find that the average gestation time is 266 days with an SD of 16 days.

a) Find an approximate 95% confidence interval for the average gestation time for all 12,000 deliveries in the last 10 years.

b) The gestation time is not normal; it has a long left tail and cuts off quite sharply on the right. Does this mean that your confidence interval is incorrect? Would it be valid to use the normal curve to figure out what percentage of the gestation times were longer than 282 days?