Homework 3.

(Due Sep. 22)

3.1.12 A multiple-choice quiz consists of ten questions, each with five possible answers of which only one is correct. A student passes the quiz if seven or more correct answers are obtained. What is the probability that a student who guess blindly at all of the questions will pass the quiz? What is the probability of passing the quiz if, on each question, a student can eliminate three incorrect answers and then guesses between the remaining two?

3.2.10 When a fisherman catches a fish, it is a young one with a probability of 0.23 and it is returned to the water. On the other hand, an adult fish is kept to be eaten later.

(a) What is the expected number of fish caught by the fisherman before an adult fish is caught?

(b) What is the probability that the fifth fish caught is the first young fish?

Suppose that the fisherman wants three fish to eat for lunch.

(a) What is the probability that the first time the fisherman can stop for lunch is immediately after the sixth fish has been caught?

(b) If the fisherman catches eight fish, what is the probability that there are sufficient fish for lunch?

3.3.8 A plate has 15 cupcakes on it, of which 9 are chocolate and 6 are strawberry. A child randomly selects 5 of the cupcakes and eats them. What is the probability that the number of chocolate cupcakes remaining on the plate is between 5 and 7 inclusive?

3.4.8 In a scanning process, the number of misrecorded pieces of information has a Poisson distribution with parameter $\lambda = 9.2$.

(a) What is the probability that there are between six and ten misrecorded pieces of information?

(b) What is the probability that there are no more than four misrecorded pieces of information?

3.5.4 A fair die is rolled 15 times. Calculate the probability that there are:

(a) Exactly three 6s and three 5s

(b) Exactly three 6s, three 5s, and four 4s

(c) Exactly two 6s

What is the expected number of 6s obtained?

3.8.4 A compacy's toll-free complaints line receives an average of about 40 calls per hour. Use the Poisson distribution to estimate the probability that in one minute there are

(a) no calls

(b) exactly one call

(c) three or more calls

3.8.10 In a typical sports playoff series, two teams play a sequence of games until one team, the eventual winner, has won four games. Suppose that in each game team A beats team B with a probability of 0.55, and that the results of different games are independent.

(a) Explain how the negative binomial distribution can be used to analyze this problem.

(b) What is the probability that team A wins the series in game seven?

(c) What is the probability that team A wins the series in game six?

(d) What is the probability that the series is over after game five?

(e) What is the probability that team A wins the series?

3.8.14 A biologist has a culture consisting of 13 cells. In a period of 1 hour, independent of the other cells, there is a probability of 0.4 that each of theses cells splits into 2 cells. What is the probability that after 1 hour the biologist has at least 16 cells? What is the expected number of cells after 1 hour?