**Revision – Ch 4,5,6**

1. A batch of 10 rocket cover gaskets contains 4 defective gaskets. If we draw samples of size 3 without replacement, from a batch of 10, find the probability that a sample contains 2 defective gaskets
2. The director of a courier service has become concerned about the number of first-class letters lost by his firm. He has broken down the lost letters for the last one year into those lost from trucks and those lost from air-planes. If he decides to investigate the division with the highest expected number of lost letters per month, which will he investigate?

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Month | J | F | M | A | M | J | J | A | S | O | N | D |
| Truck | 4 | 5 | 2 | 3 | 2 | 1 | 3 | 5 | 4 | 7 | 0 | 1 |
| Airplane | 5 | 6 | 0 | 2 | 1 | 3 | 4 | 2 | 4 | 7 | 4 | 0 |

1. Most consumers don’t know on which day their car is manufactured. Assuming a 5-week production week, for a consumer taking a car at random from a dealer’s lot,
2. What is the chance of getting a car made on a Monday?
3. What is a chance of getting a car made on a Monday or Friday?
4. What is a chance of getting a car made on a Tuesday through Thursday?
5. What type of probability estimated are these?
6. The decision to choose an automobile was the one with the best mileage. The test of the automobiles produced the following result

|  |  |  |
| --- | --- | --- |
|  | Average mileage | Standard Deviation |
| Automobile A | 42 | 4 |
| Automobile B | 38 | 7 |

The purchasing agent was uncomfortable with the standard deviations, so she set her own decision criterion for the car that would be more likely to get more than 45 miles per gallon.

1. Using the data provided in combination with the purchasing agent’s decision criterion, which car should she choose?
2. If the purchasing criterion was to reject the automobile that more likely obtained less than 39 miles per gallon, which car should she buy?
3. An air traffic controller must divert one of the two airplanes if the probability of the aircraft’s colliding exceeds 0.025. The controller has 2 inbound aircraft scheduled to arrive 10 minutes apart on the same runway. She knows that Flight 100, scheduled to arrive first has a history of being on time, 5 min late, 10 min late 95%, 3%, 2% of the time, respectively. Further she knows that Flight 200, scheduled to arrive second has a history of being on time, 5 min early, 10 min early 97%, 2%, 1% of the time, respectively. The flights timings are independent of each other.
4. Must the controller divert one of the planes, based on this information?
5. If she finds out that flight 100 definitely will be 5 minutes late, must the controller divert one the airplanes?
6. If she finds out that flight 200 definitely will be 5 minutes early, must the controller divert one the airplanes?
7. The director of quality control is conducting his monthly spot check of automatic transmissions. In this procedure, 10 transmissions are removed from the pool of components and are checked for manufacturing defects. 12% of the transmissions have such flaws.
8. What is the probability that the sample contains more than 2 manufacturing flaws?
9. What is the probability that none have manufacturing flaws?
10. What is the expected value and standard deviation?
11. George, Richard, Paul, and John play the following game. Each man takes one of four balls numbered 1 through 4 from an urn. The man who draws ball 4 loses. The other three return their balls to the urn and draw again. Now the one who draws ball 3 loses. The other two return their balls to the urn and draw again. The man who draws ball 1 wins the game.

(a) What is the probability that John does not lose in the first two draws?

(b) What is the probability that Paul wins the game?

1. On the average, a certain computer part lasts 10 years. The length of time the computer part lasts is exponentially distributed.
2. What is the probability that a computer part lasts more than 7 years?
3. 80% of computer parts last at most how long?
4. What is the probability that a computer part lasts between 9 and 11 years?
5. A binomial random variable x has n = 12

a) Given that P(x=0) = 0.05, find the value of p

b) Given that the variance of x is 1.92, find the possible values of p

1. Martin Coleman, credit manager for Beck's, knows that the company uses three methods to encourage collection of delinquent accounts. From past collection records, he learns that 70 percent of the accounts are called on personally, 20 percent are phoned, and 10 percent are sent a letter. The probabilities of collecting an overdue amount from an account with the three methods are 0.75, 0.60, and 0.65 respectively. Mr. Coleman has just received payment from a past-due account. What is the probability that this account:

(a) Was called on personally?

(b) Received a phone call?

(c) Received a letter?

1. A new automated production process averages 1.5 breakdowns per day. Because of the cost associated with a breakdown, management is concerned about the possibility of having three or more breakdown during a day. What is the probability of having three or more breakdown during a day?
2. The manager of a small postal substation is trying to quantify the variation in the weekly demand for mailing tubes. She has decided to assume that this demand is normally distributed. She knows that on average 100 tubes are purchased weekly and 90% of the time, weekly demand is below 115.
   1. What is the standard deviation of this distribution?
   2. What is the probability that 110 tubes are purchased in a week?
   3. The manager wants to stock enough tubes each week so that the probability of running out of tubes is no higher than 0.05. What is the lowest such stock level?
3. A school site committee is to be chosen randomly from six men and five women. If the committee consists of four members chosen randomly, what is the probability that two of them are men?
4. Accidents occur with a Poisson distribution at an average of 4 per week.
5. Calculate the probability of more than 5 accidents in any one week
6. What is the probability that at least two weeks will elapse between accident?
7. On the basis of past experience, automobile inspectors have noticed that 5% of all cars coming in for annual inspection fail to pass. Find the probability that between 7 and 18 of the next 200 cars to enter the inspection station will fail the inspection.
8. Union shop steward has drafted a set of wage and benefit demands to be presented to management. To get an idea of worker support for the package, he randomly polls the two largest groups of workers at his plant, the machinists (M) and the inspectors (I). He polls 30 of each group with the following results:

|  |  |  |
| --- | --- | --- |
| **Opinion of Package** | **M** | **I** |
| Strongly support | 9 | 10 |
| Mildly support | 11 | 3 |
| Undecided | 2 | 2 |
| Mildly oppose | 4 | 8 |
| Strongly oppose | 4 | 7 |
| **Total** | **30** | **30** |

1. What is the probability that a machinist randomly selected from the polled group mildly supports the package?
2. What is the probability that an inspector randomly selected from the polled group is undecided about the package?
3. What is the probability that a worker (machinist or inspector) randomly selected from the polled group strongly or mildly supports the package?
4. What types of probability estimates are these?
5. A company is considering upgrading its computer system, and a major portion of the upgrade is a new operating system. The company has asked an engineer for an evaluation of the operating system. Suppose the probability of a favorable evaluation is 0.65. If the probability the company will upgrade its system given a favorable evaluation is 0.85 what is the probability that the company will upgrade and receive a favorable evaluation?
6. A business executive, transferred from Chicago to Atlanta, needs to sell her house in

Chicago quickly. The executive’s employer has offered to buy the house for $210,000, but

the offer expires at the end of the week. The executive does not currently have a better offer

but can afford to leave the house on the market for another month. From conversations with her realtor, the executive believes the price she will get by leaving the house on the market

for another month is uniformly distributed between $200,000 and $225,000.

a) If she leaves the house on the market for another month, what is the mathematical expression for the probability density function of the sales price?

b) If she leaves it on the market for another month, what is the probability she will get at

least $215,000 for the house?

c) If she leaves it on the market for another month, what is the probability she will get

less than $210,000?

d) Should the executive leave the house on the market for another month? Why or why not?

Answers

(1) 0.3

(2) E(truck ) = 3.08 E(airplane) = 3.167 investigate airplane

(3) 1/5 , 2/5, 3/5, classical

(4) P(x>=45) = 0.2266 for A,0.1586 for B, Choose A P(x<=39)=0.22 for A , 0.556 for B, Reject B

(5) a) P = 0.0295 b)P(collion|5 late) = 0.002 c) P(collision|5 early) = 0.03

(6) a) 0.1087 b) 0.2785 c) 1.2, 1.03

(7) a) ½ b) ¼

(8) a) 0.4965 b) 16.1 c) 0.0737

(9) a) 0.2209 b) p = 0.2 or 0.8

(10) a) 0.7394 b) 0.169 c) 0.0915

(11) 0.1912

(12) a) 11.718 b) 0.80 c) 80.66

(13) 0.4545

(14) a) 0.214 b) 0.9996

(15) 0.87

(16) a) 11/30 b)1/15 c) 11/20 d) Relative frequency

(17) 0.5525

(18) b) 0.4 c) 0.4