**MAT1372 Review for exam #2**

Notation: **P(A ∪ B) means P(A or B); P(A ∩ B) means P(A and B)**

Addition rule of probability: **P(A ∪ B) = P(A) + P(B) – P(A ∩ B)**

Multiplication rule of probability for independent events A and B: **P(A ∩ B) = P(A)\*P(B)**

Multiplication rule of probability for dependent events (conditional probability):

**P(A ∩ B) = P(A)\*P(B|A)**

For questions 1 and 2, first determine whether to use the **multiplication rule** or the **addition rule** of probability. Then find the probability using the corresponding formula.

1. A bag contains 12 balls each has one of the numbers 1, 2, 3, …, 12 written on it.
2. If **one** ball is selected at random, what is the probability that the ball has a number that is even or less than or equal to 6 ?
3. **Two** balls are selected at random **without** replacement. What is the probability that they both have even numbers on them?

Definition 1: Two events A and B are disjoint if **P(A ∩ B)=∅**

Definition 2: Two events A and B are independent if **P(A ∩ B) = P(A)\*P(B)**

1. a) If P(A)= 0.3 and P(B) = 0.6, and events A and B are independent, find P(A **∩** B)
2. If P(A)= 0.3 and P(B) = 0.6, and events A and B are disjoint, find P(A **∪** B)
3. If P(A)= 0.3 and P(B) = 0.6, and P(A **∩** B) = 0.2, find P(A ∪ B)
4. Page 160 #11
5. Draw a Venn diagram which represents the situation in #11
6. Find the probability that the picnic will be postponed.
7. Find the probability that the picnic will not be postponed.

4. Page 205 #21

**General Formula for Expected Value and Variance:**

 

1. Let X be a random variable with p(x) given in the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| X | 1 | 2 | 3 | 4 |
| p(x) | 0.4 | 0.3 | ? | 0.1 |

1. Find p(3)
2. Find 
3. 
4. Page 236 #8

**The Binomial Probability Distribution:**

X=number of successes in *n* trials Possible values for X: {0, 1, 2, …, n}

 

 

**\*EXCEL command: BINOMDIST (i, n, p, true/false for cumulative)**

**The Poisson Probability Distribution: Poisson (λ)**

X=number of occurrences in an interval Possible values for X: {0, 1, 2, … }

  

**\*EXCEL command: POISSON (i, mean, true/false for cumulative)**

1. Research has shown that 30% of all persons afflicted by a certain illness will recover. Research has also shown that if 10 people with the illness are randomly selected and received a particular medication, 9 people recovered shortly thereafter. Let X be the random variable which represents the number of people recovered from the illness.
2. What are the possible values for X.
3. What is the assumed distribution? What is (are) the parameter(s)?
4. Show by probability why you think the medication is (or isn’t) effective.
5. What is the expected value of recovery if no medication is administered?
6. Find the variance.
7. Suppose an airline company finds that 10% of the people who make reservations do not show up (90% do show up). The airline sells 140 tickets for a flight with 125 seats. What is the probability that the airline company needs to offer refunds (if more than 125 people show up?)
8. You will receive on average two telemarketing phone calls in one day. Let X be the number of telemarketing phone calls you receive in one day.
9. What are the possible values for X?
10. What is the assumed distribution? What is (are) the parameter(s)?
11. What is the probability that you will receive 1 telemarketing phone call?
12. What is the expected value for the number of phone calls you receive?
13. The mean number of cars arriving at a toll booth is 80 cars per hour. The attendant makes a one-minute phone call. Let X be the random variable which represents the number of cars arriving at the toll booth during the one-minute phone call.
14. What are the possible values for X?
15. What is the assumed distribution? What is (are) the parameter(s)?
16. What is the probability that **at least** 1 car arrives during the call?
17. What is the expected value for the number of cars arriving per minute?