**5.29** A homeowner plants 6 bulbs selected at random from a box containing **5** tulip bulbs شتلة الخزامى and 4 daffodil bulbs شتلة النرجس البري. What is the probability that he planted 2 daffodil bulbs and 4 tulip bulbs?

X: number of tulip bulbs.

X~H(N=9, n=6, k=5)

**5.31** A random committee of size 3 is selected from 4 doctors and 2 nurses. Write a formula for the probability distribution of the random variable X representing the number of doctors on the committee. Find P(2 ≤ X ≤ 3).

X: number of doctors on the committee. N=4+2=6

X~H(N=6, n=3, k=4)

**5.32** From a lot of 10 missiles, 4 are selected at random and fired. If the lot contains 3 defective missiles that will not fire, what is the probability that

X: number of defective missiles.

X~H(N=10, n=4, k=3)

1. all 4 will fire?

(b) at most 2 will not fire?

**5.40** It is estimated that 4000 of the 10,000 voting residents of a town are against a new sales tax. If 15 eligible voters are selected at random and asked their opinion, what is the probability that at most 7 favor the new tax?

NOTE: If **n** is small compared to **N**, then a binomial distribution **B(n; p = K/N)** can be used to approximate the hypergeometric distribution **h(N;K; n).** The approximation is good when **n/N ≤ 0.05.**

Since

We can use Binomial as approximation to Hypergeometric.

X: number of voters who favor the new tax.

**5.56** On average, 3 traffic accidents per month occur at a certain intersection. What is the probability that in any given month at this intersection

, X: number of accident per month.

X~ Poisson (3)

(a) exactly 5 accidents will occur?

(b) fewer than 3 accidents will occur?

(c) at least 2 accidents will occur?

**5.67** The number of customers arriving per hour at a certain automobile service facility is assumed to follow a Poisson distribution with mean **λ = 7**.

, X: number of customers arriving per hour.

 X~ Poisson (7)

(a) Compute the probability that more than 10 customers will arrive in a 2-hour period.

 X: number of customers arriving in two hours.

(b) What is the mean number of arrivals during a 2-hour period?

**3.6** The shelf life, in days, for bottles of a certain prescribed medicine is a random variable having the density function

Find the probability that a bottle of this medicine will have a shell life of

 (a) at least 200 days;

P(X>200)=

let u=x+100 , x=u-100 , dx=du , 200 <x < >> 300 < u <

P(X>200)=

1. anywhere from 80 to 120 days.

P(80<X<120)=

**3.7** The total number of hours, measured in units of 100 hours, that a family runs a vacuum cleaner over a period of one year is a continuous random variable **X** that has the density function

Find the probability that over a period of one year, a family runs their vacuum cleaner

1. less than 120 hours;

P(X < 1.20)=

(b) between 50 and 100 hours.

P(0.5 <X< 1)=

**3.9** The proportion of people who respond to a certain mail-order solicitation is a continuous random variable **X** that has the density function

1. Show that P(0 < X < 1) = 1.

P(0 <X< 1)=

(b) Find the probability that more than 1/4 but fewer than 1/2 of the people contacted will respond to this type of solicitation.

**3.12** An investment firm offers its customers municipal bonds that mature after varying numbers of years.

Given that the cumulative distribution function of T, the number of years to maturity for a randomly selected bond, is

Find

1. P(T = 5);
2. P(T > 3);
3. P(1.4 < T < 6);
4. P(T ≤ 5 | T ≥ 2).

**#Note:**

Discrete random variables

Continuous random variables

**3.14** The waiting time, in hours, between successive speeders spotted by a radar unit is a continuous random variable with cumulative distribution function:

Find the probability of waiting less than 12 minutes between successive speeders:

To convert from minute to the hours: 12/60 =1/5 =0.2 h , P(x< 0.2)

1. using the cumulative distribution function of X;

P(X< 0.2) = P(X 0.2) = F(0.2)= = 0.7981

1. using the probability density function of X.

***3.17*** A continuous random variable X that can assume values between **x = 1** and **x = 3** has a density function given by ***f(x) = 1/2.***

(a) Show that the area under the curve is equal to 1.

 .

1. Find P(2 < X < 2.5).
2. Find P(X ≤ 1.6).

**4.50** For a laboratory assignment, if the equipment is working, the density function of the observed outcome *X* is

Find the variance and standard deviation of X.