

## Chapter VII

### Some Special Discrete Distribution Functions

#### Exercises

**7. 1.**

A test for impurities commonly found in drinking water from private wells showed that 30% of all wells in a particular country have impurity A.

If a random sample of 5 wells is selected from the large number of wells in the country, what is the probability that

1. exactly 3 will have impurity A?
2. at least 3?
3. fewer than 3?

**7. 2.**

Fifty items are submitted for acceptance. It is known that there are 4 defective items in the lot

1. What is the probability of finding exactly 1 defective item in a sample of 5?
2. What is the probability of finding less than 2 defective items in a sample of 5?

**7. 3.**

A certain drug cures 90% of cases of hookworm in children. Suppose that 20 children suffering from hookworm are to be treated. and that the children can be regarded as a random sample from the population. Find the probability that

- a) all 20 will be cured
- b) all but one will be cured
- c) exactly 90% will be cured.

**7. 4.**

The sex ratio of newborn human infants is about 105 males:100 females. If 4 infants are chosen at random, what is the probability that

- a) 2 are male and 2 are female?
- b) all four all male?
- c) all four are the same sex?

**7. 5.**

There are 50 misprints in a book which has 250 pages. Find the probability that page 100 has no misprints.

**7. 6.**

A department store sells biros in packets of 10. It is known that 5% of biros are defective on average.

Find the probability that there are

1. less than 3
2. at least 3

defective biros in a packet.

**7. 7.**

The Secret Service monitors the number of death threats that are made on the President of the United States. A report suggests that the number of death threats made on the President averages four per week.

Identify the type of variable that Secret Service must monitor and the specific distribution that could most likely be used to model the number of death threats received.

**7. 8.**

Suppose that we are investigating the safety of a dangerous intersection. Past police records indicate a mean of 5 accidents per month at this intersection. Suppose the number of accidents is distributed according to a Poisson distribution.

Calculate the probability in any month of exactly 0, 1, ... or 12 accidents.

**7. 9.**

A firm employs 50 people in the Assembly Department. Forty of the employees belong to a trade union and ten do not. Five employees are selected at random to form a committee to meet with management regarding shift starting times.

What is the probability that four of the five selected for the committee belong to a trade union?

**7. 10.**

There are five flights daily from Berlin to Leipzig. Suppose the probability that any flight arrives late in Leipzig is 0.20.

1. What is the probability that none of the flights are late today?
2. What is the average number of late flights?
3. What is the variance of the number of late flights?

**7. 11.**

Suppose a bank knows that on average 60 customers arrive in a certain service hour. Using a *time interval of 1 minute*, calculate the probability of

1. exactly one customer
2. no customers
3. exactly three customers
4. more than three customers

arriving in a given one minute interval within that hour.

**7. 12.**

On average, a ship arrives at a certain dock every second day. What is the probability that two or more ships will arrive on a randomly selected day?

**7. 13.**

An Internal Revenue Service inspector is to select 3 corporations from a list of 15 for tax audit purposes. Of the 15 corporations, 6 earned profits and 9 incurred losses during the year for which the tax returns are to be audited.

If the IRS inspector selects 3 corporations randomly, find the probability that the number of corporations in these 3 that incurred losses during the year for which the tax returns are to be audited is

1. exactly 2
2. none
3. at most 1.

**7. 14.**

A survey reported that 70% of all U.S. households have cellular phones. If you randomly selected 11 households, what is the probability that

1. each of the 11 households has a cellular phone?
2. more than four households have a cellular phone?
3. fewer than five households have a cellular phone?
4. more than seven households do not have a cellular phone?

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