

EXERCISE – 4.3**GEOMETRIC AND NEGATIVE BINOMIAL DISTRIBUTION**

1. If X has a geometric distribution with parameter $p = 0.7$, calculate:

A. $P(X = 4)$	B. $P(X = 1)$
C. $P(X \leq 5)$	D. $P(X \geq 8)$

(Ans : 0.0189, 0.7, 0.9976, 0.0002)
2. If X has a negative binomial distribution with parameters $p = 0.6$ and $r = 3$, calculate:

A. $P(X = 5)$	B. $P(X = 8)$
C. $P(X \leq 7)$	D. $P(X \geq 7)$

(Ans : 0.2074, 0.0464, 0.9037, 0.1792)
3. Find the probability that a person flipping a coin gets
(a) the third head on the seventh flip;
(b) the first head on the fourth flip.
(Ans : 0.1172, 1/16)
4. The probability that a student pilot passes the written test for a private pilot's license is 0.7. Find the probability that a given student will pass the test
(a) on the third try;
(b) before the fourth try
(Ans : 0.0630, 0.9730)
5. The probability that a person living in a certain city owns a dog is estimated to be 0.3. Find the probability that the tenth person randomly interviewed in that city is the fifth one to own a dog.
(Ans : 0.0515)
6. Suppose the probability that any given person will believe a tale about the transgressions of a famous actress is 0.8. What is the probability that
(a) the sixth person to hear this tale is the fourth one to believe it?
(b) the third person to hear this tale is the first one to believe it?
(Ans : 0.1638, 0.032)
7. According to a study published by a group of University of Massachusetts sociologists, about two thirds of the 20 million persons in this country who take Valium are women. Assuming this figure to be a valid estimate, find the probability that on a given day the fifth prescription written by a doctor for Valium is
(a) the first prescribing Valium for a woman;
(b) the third prescribing Valium for a woman.
(Ans : 2/243, 16/81)

8. An archer hits a bull's-eye with a probability of 0.09, and the results of different attempts can be taken to be independent of each other

(a) If the archer shoots a series of arrows, what is the probability that the *first* bull's-eye is scored with the fourth arrow?

(b) What is the probability that the *third* bull's-eye is scored with the tenth arrow?

(c) What is the expected number of arrows shot before the *first* bull's-eye is scored?

(d) What is the expected number of arrows shot before the *third* bull's-eye is scored?

(Ans : 0.0678, 0.0136, $E(X) = 11.11$, $E(Y) = 33.33$)

9. Cards are chosen randomly from a pack of cards with replacement. Calculate the probability that:

(a) The first heart is obtained on the third drawing.

(b) The fourth heart is obtained on the tenth drawing.

(c) What is the expected number of cards drawn before the fourth heart is obtained?

(Ans : 0.1406, 0.0584, $E(X) = 16$)

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.

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

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

(Ans : 1.299, 0.0809, 0.0555, 0.9973)