Homework Problems

In each of the following situations, X is a count. Does X have a binomial distribution? Explain.

1. You observe the gender of the next 40 children born in a hospital. X is the number of boys born.

2. You decide that you will have children until you have a boy or have a maximum of 5 children. X is the number of boys born.

3. I roll 10 dice. X is the number of 6's.

4. I roll 2 dice and add them. I continue to roll until I get a 7. X is the number of 7's I get.

5. It is estimated that 43% of people sleep regularly with a nightlight in their room. I take a sample of 35 people. X is the number of people who sleep regularly with a nightlight.

6. In a classroom of 15 students, 10 of them wear glasses or contacts. I choose 6 students. X is the number of them wearing glasses or contacts.

7. In an office building of 1,500 workers, 1,000 of them wear glasses or contacts. I choose 6 workers. X is the number of them wearing glasses or contacts.

8. Only 12% of people like pineapple pizza. I choose 25 people and give pizza with pineapple. Participants are allowed to take the pineapple off the pizza if they wish. X is the number of people who like the pizza.

9. An ice hockey player scores on 5.5% of his shots. In a particular game he gets 8 shots on goal. X is the number of goals he scores in the game.

10. When a paperback book is published, the probability that it has defects is .03%. A sample of 100 books are examined. X is the number of defective books in the sample.

Problems on Binomial Distributions

For each problem, be sure that the situation fits the criteria for binomial distributions. If so, answer the questions (show the formula) and then find the mean and standard deviation of the distribution.

1) 80% of the graduates of Northeast High who apply to Penn State University are admitted. Last year, there were 6 graduates from Northeast who applied to Penn State. What is the probability that

   a) 4 were admitted   b) more than 4 were admitted

   Mean of distribution: _____   Standard deviation of distribution: _____

2) Tires from the Apex Tire Corp. are traditionally 5% defective. A truck carries 10 tires, 8 in use and 2 spares. If 10 tires are chosen from Apex, what is the probability that not more than two defective tires are chosen.

   Mean of distribution: _____   Standard deviation of distribution: _____

3) Studies indicate that in 70% of the families of Blue Bell, both the husband and wife work. If 7 families are randomly selected from Blue Bell, what is the probability that

   a) exactly 4 of them work.   b) more than 4 work

   Mean of distribution: _____   Standard deviation of distribution: _____

4) According to the National Institute of Health, 32% of all women will suffer a hip fracture because of osteoporosis by the age of 90. If 10 women aged 90 are selected at random, find the probability that

   a) 2 or more of them suffer/will suffer a hip fracture   b) none of them suffer/will suffer a hip fracture

   Mean of distribution: _____   Standard deviation of distribution: _____

5) According to the Internal Revenue Service, the chances of your tax return being audited are 3 in 100 if your income is $60,000 or less and 8 in 100 if your income is more than $60,000. 8 tax payers are chosen

   a. earning less than $60,000. Find the probability that none will be audited.

   b. earning more than $60,000. Find the probability that 4 or more are audited.

Mean of distribution: _____   Standard deviation of distribution: _____

6) According to FBI statistics, only 52% of all rape cases are reported to the police. If 10 rape cases are randomly selected, what is the probability that at least one is reported to the police?

Mean of distribution: _____   Standard deviation of distribution: _____

7) In a school, typically only $\frac{1}{10}$ of the student body returns surveys. 20 students are chosen randomly to receive a survey. What is the probability that

a) they get no surveys back.   b) they get more 4 or more surveys back.

Mean of distribution: _____   Standard deviation of distribution: _____

8) The probability that a driver making a gas purchase will pay by credit card is $\frac{3}{5}$. If 50 cars pull up to the station to buy gas, what is the probability that at least half of the drivers will pay by credit card?

Mean of distribution: _____   Standard deviation of distribution: _____

9) Light bulbs work out of the box 99.6% of the time. A contractor buys 50 bulbs. What is the probability that no more than two fail?

Mean of distribution: _____   Standard deviation of distribution: _____

10) in Lansdale, 44% of all fire alarms are false alarms. On a certain day, there were 12 fire alarms. Find the probability that

    a) none is a false alarm   b) there are at least 2 false alarms.

Mean of distribution: _____   Standard deviation of distribution: _____

11) An ice hockey player scores on 5.5% of his shots. In a particular game he gets 8 shots on goal. Find the probability he scores 3 or more goals.

Mean of distribution: _____   Standard deviation of distribution: _____

12) An insurance company sells flood insurance to 1,000 customers. Statistics show that the probability of a flood in these homes in the coming year is 2.6%. What is the probability that they will have to pay a flood claim on

    a) 20 or more homes   b) 40 or more homes

Mean of distribution: Standard deviation of distribution: