

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 2 girls. X is the number of children born.
3. I roll 10 dice. X is the number of 6's that I roll.
4. I roll 2 dice and add them. I continue to roll until I get a 7. X is the # of rolls it takes to get a 7.
5. 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.

In each of the following situations, use binomial distribution probability to answer each question.

6. Suppose you flip a fair coin 8 times. Define the random variable X as the number of heads.
 - a. What is the probability that you will get exactly 3 heads?
 - b. Calculate and interpret $P(X \leq 3)$
 - c. Calculate and interpret the mean of X .
7. Sophie is a dog who loves to play catch. Unfortunately, she isn't very good at it, and the $P(\text{she catches a ball}) = 0.1$. You will toss 5 balls to Sophie. Define $X = \#$ of balls Sophie catches.
 - a. Calculate and interpret $P(X = 2)$
 - b. Calculate and interpret $P(X \leq 2)$
 - c. Calculate and interpret the mean of X
8. According to a recent government report, 73% of drivers use seat belts regularly. Suppose a police officer at a road check randomly stops 4 cars to check for seat belt usage. Find the complete probability distribution for $X =$ the number of drivers using seat belts.

X	0	1	2	3	4
$P(X)$					

9. The Los Angeles Times (Dec. 13, 1992) reported that 80% of airline passengers prefer to sleep on long flights rather than watch movies, read, etc. Consider randomly selecting 25 passengers from a particular long flight. Define a random variable X and answer the following questions.
 - a. Calculate and interpret $P(X = 15)$
 - b. Calculate and interpret $P(X \geq 20)$
 - c. Calculate and interpret the mean of X
10. According to the U.S. Census Bureau, 16% of residents do not have health insurance. You are to randomly select 10 U.S. residents. Let $X =$ the number who do not have health insurance.
 - a. Calculate and interpret $P(X \leq 1)$
 - b. Calculate and interpret $P(X > 1)$
 - c. What do you observe about the answers from parts a and b ? Why did that happen?