 Identifying binomial random variables

Consider a list of random experiments and determine if the random variable in each is distributed binomially. Where it is binomial, determine the values for $n$ and $p$ and write the information using the notation $X\~Bin\left(n,p\right)$. Where it is not binomial, explain why it is not.

Examples

1. 31% of Australians have a Bachelor degree or above. From a random sample of 100 Australians,$ X$ is the number who have a Bachelor degree or above.
2. A fair coin is flipped 12 times, and students need to calculate the probability that exactly two heads are obtained.
3. A fair coin is flipped 20 times. $X$ represents the number of heads.
4. A fair die is rolled 50 times. $X$ represents the number of times you get a six.
5. A fair die is rolled repeatedly. $X$ is the number of rolls it takes to get a six.
6. Three cards are drawn from a pack of four cards containing one club, one diamond, one spade and one heart. They are drawn one after the other without replacement. $X$ is the number of diamonds selected.
7. Three cards are drawn from a pack of four cards containing one club, one diamond, one spade and one heart. They are drawn one after the other with replacement. $X$ is the number of diamonds selected.
8. Approximately 1 in every 20 children has a specified illness. $X$ is the number of children with the illness out of a random sample of 100 children. It is assumed we are sampling from such a vast population that the selections are virtually independent.
9. The probability of having blood type B is 0.1. Choose 4 people at random. $X$ is the number with blood type B.
10. A student answers 10 quiz questions completely at random. The first five are true/false answers, and the second five are multiple choice, with four options each. $X$ represents the number of correct answers.

Solutions

1. Yes, $X\~Bin\left(100, \frac{31}{100}\right)$ or $X\~Bin(100, 0.31)$
2. No random variable is identified. If $X$ was the number of heads obtained, then the binomial distribution could be defined i.e. $X\~Bin\left(12, \frac{1}{2}\right) $or $X\~Bin(12, 0.5)$
3. Yes, $X\~Bin\left(20, \frac{1}{2}\right)$ or $X\~Bin(20, 0.5)$
4. Yes, $X\~Bin\left(50, \frac{1}{6}\right)$
5. No. You are not given the number of trials.
6. No. The cards are not replaced, which means the events are not independent.
7. Yes, $X\~Bin\left(3, \frac{1}{4}\right)$ or $X\~Bin(4, 0.25)$
8. Yes, $X\~Bin\left(100, \frac{1}{20}\right)$ or $X\~Bin\left(100, 0.05\right)$
9. Yes, $X\~Bin\left(4, 0.1\right)$
10. No, the value of $p$ changes between the first 5 and last 5 questions.