Worksheet: Binomial Distribution Problems

Problem

1. A manufacturer of electronics components produces precision resistors designed to have a tolerance of ±1%. From quality-control testing, the manufacturer knows that about one resistor in six is actually within just 0.3% of its nominal value. A customer needs two of these more precise resistors. What is the probability of finding exactly two such resistors among the first four tested?

2. Paula moves to an area with a different telephone exchange. Telephone numbers in the new exchange start with 753, and all combinations of the four remaining digits are equally likely.
   a) Calculate the probability that the last four digits in Paula's new telephone number are even.
   b) What is the expected number of even digits in her new telephone number?

3. The Choco-Latie Candies company makes candy-coated chocolates, 40% of which are red. The production line mixes the candies randomly and packages ten per box.
   a) What is the probability that less than four candies in a given box are red?
   b) What is the probability that at least four candies in a given box are red?
   c) Describe a second way of finding the answer to part b).

4. Prepare a table and a graph for a binomial probability distribution with $n = 5$ and $p = \dfrac{1}{2}$.

5. One type of jet engine has a 0.0001 probability of failure while in flight. For a jet that has four of these engines, what is the probability of at least two of them failing?

6. Suppose that 65% of the families in a town own computers, If ten families are surveyed at random,
   a) what is the probability that at least five own computers?
   b) what is the expected number of families that own computers?

7. Ninety percent of a country's population are right-handed.
   a) What is the probability that exactly 29 people in a group of 30 are right-handed?
   b) What is the expected number of right-handed people in a group of 30?
   c) Design a simulation to show that the expectation calculated in part b) is accurate.

8. Suppose that Bayanisthol, a new drug, is effective for 65% of the participants in clinical trials. If a group of fifteen patients take this new drug,
   a) what is the expected number of patients for whom the drug will be effective?
   b) what is the probability that the drug will be effective for less than half of them?

9. Jason knows that his favourite player on the Raptors basketball team scores on 83% of his free-throw attempts. Since $10 \times 0.83 = 8.3$, Jason expects that in ten attempts this player will score eight times.
   a) Is Jason's reasoning correct? Explain why or why not.
   b) Is the player more likely to score exactly eight times or not to score exactly eight times?

10. A student writes a five question multiple-choice quiz. Each question has four possible responses. The student guesses at random for each question. Calculate the probability for each possible score on the test from 0 to 5.

11. There are 10 members on a committee. The probability of any member attending a randomly chosen meeting is 0.9. The committee cannot do business if more than 3 members are absent. What is the probability that 7 or more members will be present on a given date?