Statistics 13   Instructor: Nicolas Christou

Binomial and normal distribution

Problem 1
Use R to draw the probability distribution of $X \sim b(10, 0.5)$.

Problem 2
Use R to compute the following probabilities:

  a. Let $X \sim b(20, 0.3)$. Compute

      1. $P(X \leq 4)$.
      2. $P(X \geq 8)$.
      3. $P(X > 5)$.
      4. $P(X < 3)$.
      5. $P(2 < X < 7)$.

  b. Let $X \sim N(13, 2.5)$. Compute

      1. $P(X \geq 16.5)$.
      2. $P(X > 16.1)$.
      3. $P(X \leq 13.5)$.
      4. $P(12 < X < 15)$.
      5. Find b such that $P(X > b) = 0.61$.

Problem 3
The admissions office of a small, selective liberal-arts college will only offer admission to applicants who have a certain mix of accomplishments, including a high SAT score. Based on past records, the head of the admissions feels that the probability is 0.58 that an admitted applicant will come to the college. Based on financial considerations, the college would like a class of size 310 or more. Find the smallest n, number of people to admit, for which the probability of getting 310 or more to come to the college is at least 0.95. Use R to find the answer.

Problem 4
The diameters of apples from the Milo Farm have diameters that follow the normal distribution with mean 3 inches and standard deviation 0.3 inch. Apples can be size-sorted by being made to roll over a mesh screens. First the apples are rolled over a screen with mesh size 2.5 inches. This separates out all the apples with diameters < 2.5 inches. Second, the remaining apples are rolled over a screen with mash size 3.2 inches. Use R to find the proportion of apples with diameters < 2.5 inches, between 2.5 and 3.2 inches, and greater than 3.2 inches.

Problem 5
An airline, believing that 5% of passengers fail to show up for flights, overbooks (sells more tickets than there are seats). Suppose a plane will hold 265 passengers, and the airline sells 275 seats. Let X be the number of passengers that show up.

  a. Write an expression for the *exact* probability that the airline will not have enough seats for the passengers that show up.

  b. *Approximate* the above probability using the normal distribution.