

Probability and Statistics (UCS410)

Experiment 3: Probability distributions

- (1) Roll 12 dice simultaneously, and let X denotes the number of 6's that appear. Calculate the probability of getting 7, 8 or 9, 6's using R. (Try using the function **pbinom**; If we set $S = \{\text{get a 6 on one roll}\}$, $P(S) = 1/6$ and the rolls constitute Bernoulli trials; thus $X \sim \text{binom}(\text{size}=12, \text{prob}=1/6)$ and we are looking for $P(7 \leq X \leq 9)$.
 - (2) Assume that the test scores of a college entrance exam fits a normal distribution. Furthermore, the mean test score is 72, and the standard deviation is 15.2. What is the percentage of students scoring 84 or more in the exam?
 - (3) On the average, five cars arrive at a particular car wash every hour. Let X count the number of cars that arrive from 10AM to 11AM, then $X \sim \text{Poisson}(\lambda = 5)$. What is probability that no car arrives during this time. Next, suppose the car wash above is in operation from 8AM to 6PM, and we let Y be the number of customers that appear in this period. Since this period covers a total of 10 hours, we get that $Y \sim \text{Poisson}(\lambda = 5 \times 10 = 50)$. What is the probability that there are between 48 and 50 customers, inclusive?
 - (4) Suppose in a certain shipment of 250 Pentium processors there are 17 defective processors. A quality control consultant randomly collects 5 processors for inspection to determine whether or not they are defective. Let X denote the number of defectives in the sample. Find the probability of exactly 3 defectives in the sample, that is, find $P(X = 3)$.
 - (5) A recent national study showed that approximately 44.7% of college students have used Wikipedia as a source in at least one of their term papers. Let X equal the number of students in a random sample of size $n = 31$ who have used Wikipedia as a source.
 - (a) How is X distributed?
 - (b) Sketch the probability mass function.
 - (c) Sketch the cumulative distribution function.
 - (d) Find mean, variance and standard deviation of X .
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