Objective:

- Understand and apply discrete probability distributions using R.
- Learn to use R functions to compute probabilities, cumulative probabilities, and simulate random values for discrete distributions.

Code for installing packages:

install.packages(e1071)

Code to load and use package:

library(e1071)

library(distr)

Code to remove package after use:

detach("stats", unload = TRUE)

Syntax for working with discrete data is as follows:

ddiscrete(x, probs, values = 1:length(probs))
pdiscrete(q, probs, values = 1:length(probs))
qdiscrete(p, probs, values = 1:length(probs))
rdiscrete(n, probs, values = 1:length(probs), ...)

where

x, q vector or array of quantiles.

p vector or array of probabilities.

n number of observations.

probs probabilities of the distribution.

values values of the distribution.

... ignored (only there for backwards compatibility)

These functions provide information about the discrete distribution where the probability of the elements of values is proportional to the values given in probs, which are normalized to sum up to 1. ddiscrete gives the density, pdiscrete gives the distribution function, qdiscrete gives the quantile function and rdiscrete generates random deviates.

X=c(0,1,2,3,4) P=c(0.1,0.15,0.2,0.55) XP=X*P data.frame(X,P,XP) mean=sum(XP)

TO FIND THE MISSING VALUE IN A PROBABILITY DISTRIBUTION

convert the question of solving the equation to finding the root of a function and use the following steps:

For example to find root for 0.6+6x=1, use the following code:

f <- function(x) (0.6+6*x-1)

uniroot(f, lower=0, upper=1)\$root

TO FIND THE DISTRIBUTION OF A NEW VARIABLE GIVEN AS A FUNCTION OF RANDOM VARIABLE:

x=c(-1,0,1,2)

y=x*x+1

у

prob=rep(1/4,4)

tapply(prob,y,sum)

EXERCISE (Programing and problem solving)

1. PDF of random variable X is:

Х	1	2	3	4	5	6	7
P(X)	k	2k	3k	k ²	k ² +k	$2k^2$	4k ²
Find $k, P(X < 5), P(1 \le X \le 5)$							

Write a R program for the above problem. Write R program to plot probability distribution and cumulative distribution.

2. A random variable X has the following pdf

Х	-2	-1	0	1	2	3
P(X)	0.1	k	0.2	2k	0.3	3k
Find k, P(X <2), c.d.f.						

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Write a R program for the above problem. Also write a R program to plot cumulative distribution function.

3. A RV X has the following probability distribution:							
Х	-2	-1	0	1	2		
P(X=x)	1/5	1/5	2/5	2/15	1/15		

Find the probability distribution of $V = X^2 + 1$.

Write a R program for the above problem. Write R program to plot probability distribution and cumulative distribution.

4. Given the following distribution:

х	-3	-2	-1	0	1	2
P(X=x)	0.05	0.1	0.2	0.3	0.2	0.15

Find Mean and Variance.

Write a R program for the above problem. Write R program to plot probability distribution and cumulative distribution.

5.

- The pmf of a RV X is zero except at the points X=0, 1, 2. At these points $P(0) = 3c^3$, $P(1) = 4c 10c^2$, P(2) = 5c 1. Determine
 - i. c ii. Find $P(X < 1), P(1 < X \le 2), P(0 < X \le 2)$

1/3,1/9,2/3,8/9