NAME OF THE STUDENT:
REGISTRATION NO OF STUDENT:

SLOT:

DATE:

LAB EXPERIMENT 3

RANDOM VARIABLE AND PROBABILITY DISTRIBUTION

AIM:
Conduction random experiments with probability concepts;

QUESTION:

1. Select 20 numbers at random from the set 1 to 100.

Code:

```
#q.1
print(sample(1:100,20))
print(sample(1:100,20,replace=TRUE))
```

Output:

```
> #q.1
> print(sample(1:100,20))
 [1] 24 38  9  4 26  3  2 12  1 58 73 84 87  6 13 53 80 32 60 63
> print(sample(1:100,20,replace=TRUE))
 [1] 25 21 66 53 47 17 69 35 12 57 88 15 15 24 97 26 57 73 69 26
```

2. Sampling with replacement is suitable for throwing a die.

Code:

```
#q.2
print(sample(1:6,6,replace=TRUE))
```

Output:

```
> #q.2
> print(sample(1:6,6,replace=TRUE))
[1] 6 5 5 5 3 4
```

3. Roll 2 dice and fine the product of the faces values when rolling two dice.

Code:

```
#q.3
print(as.vector(outer(1:6,1:6)))
```

Output:

```
> #q.3
> print(as.vector(outer(1:6,1:6)))
 [1]  1  2  3  4  5  6  2  4  6  8 10 12  3  6  9 12 15 18  4  8 12 16 20 24  5 10 15
[28] 20 25 30  6 12 18 24 30 36
```

4. Combination for nCr (assign values for n and r).

Code:

```
#q.4
n=12;r=3;
print(choose(n,r))
```

Output:

```
> #q.4
> n=12;r=3;
> print(choose(n,r))
[1] 220
```

5. Permutation (assign values for n and r).

Code:

```
#q.5
n=10;r=4;
print(factorial(n)/factorial(n-r))
```

Output:

```
> #q.5
> n=10;r=4;
> print(factorial(n)/factorial(n-r))
[1] 5040
```

6. To find the binomial co efficient of 8^{th} and 10^{th} terms.

Code:

```
#q.6
print(choose(10,8))
print(choose(10,10))
```

Output:

```
> #q.6
> print(choose(10,8))
[1] 45
> print(choose(10,10))
[1] 1
```

7. Pascal's triangle.

Code:

```
18  #q.7
19  for(n in 0:7) print(choose(n,0:n))
```

Output:

```
> #q.7
> for(n in 0:7) print(choose(n,0:n))
[1] 1
[1] 1 1
[1] 1 2 1
[1] 1 3 3 1
[1] 1 4 6 4 1
[1]  1  5 10 10  5  1
[1]  1  6 15 20 15  6  1
[1]  1  7 21 35 35 21  7  1
```

8. Tossing '3' coins with library 'prob'.

Code:

```
20  #q.8
21  library(prob)
22  tosscoin(3)
```

Output:

```
> tosscoin(3)
  toss1 toss2 toss3
1     H     H     H
2     T     H     H
3     H     T     H
4     T     T     H
5     H     H     T
6     T     H     T
7     H     T     T
8     T     T     T
```

9. Roll '4' dice with library 'prob'.

Code:

```
23  #q.9
24  rolldie(4)
```

Output:

```
> #q.9
> rolldie(4)
    X1 X2 X3 X4
1    1  1  1  1
2    2  1  1  1
3    3  1  1  1
4    4  1  1  1
5    5  1  1  1
6    6  1  1  1
7    1  2  1  1
8    2  2  1  1
9    3  2  1  1
10   4  2  1  1
11   5  2  1  1
12   6  2  1  1
13   1  3  1  1
14   2  3  1  1
15   3  3  1  1
16   4  3  1  1
17   5  3  1  1
18   6  3  1  1
19   1  4  1  1
20   2  4  1  1
21   3  4  1  1
22   4  4  1  1
23   5  4  1  1
24   6  4  1  1
25   1  5  1  1
26   2  5  1  1
27   3  5  1  1
28   4  5  1  1
29   5  5  1  1
30   6  5  1  1
31   1  6  1  1
32   2  6  1  1
33   3  6  1  1
34   4  6  1  1
35   5  6  1  1
36   6  6  1  1
37   1  1  2  1
38   2  1  2  1
39   3  1  2  1
40   4  1  2  1
41   5  1  2  1
42   6  1  2  1
43   1  2  2  1
44   2  2  2  1
45   3  2  2  1
46   4  2  2  1
47   5  2  2  1
48   6  2  2  1
49   1  3  2  1
50   2  3  2  1
51   3  3  2  1
52   4  3  2  1
53   5  3  2  1
54   6  3  2  1
55   1  4  2  1
56   2  4  2  1
57   3  4  2  1
58   4  4  2  1
59   5  4  2  1
60   6  4  2  1
61   1  5  2  1
62   2  5  2  1
63   3  5  2  1
64   4  5  2  1
65   5  5  2  1
66   6  5  2  1
67   1  6  2  1
68   2  6  2  1
69   3  6  2  1
70   4  6  2  1
71   5  6  2  1
72   6  6  2  1
73   1  1  3  1
74   2  1  3  1
75   3  1  3  1
76   4  1  3  1
77   5  1  3  1
78   6  1  3  1
79   1  2  3  1
80   2  2  3  1
81   3  2  3  1
82   4  2  3  1
83   5  2  3  1
84   6  2  3  1
85   1  3  3  1
86   2  3  3  1
87   3  3  3  1
88   4  3  3  1
89   5  3  3  1
90   6  3  3  1
91   1  4  3  1
92   2  4  3  1
93   3  4  3  1
94   4  4  3  1
95   5  4  3  1
96   6  4  3  1
97   1  5  3  1
98   2  5  3  1
99   3  5  3  1
100  4  5  3  1
101  5  5  3  1
102  6  5  3  1
103  1  6  3  1
104  2  6  3  1
105  3  6  3  1
106  4  6  3  1
107  5  6  3  1
108  6  6  3  1
109  1  1  4  1
110  2  1  4  1
111  3  1  4  1
112  4  1  4  1
113  5  1  4  1
114  6  1  4  1
115  1  2  4  1
116  2  2  4  1
117  3  2  4  1
118  4  2  4  1
119  5  2  4  1
120  6  2  4  1
121  1  3  4  1
122  2  3  4  1
123  3  3  4  1
124  4  3  4  1
125  5  3  4  1
126  6  3  4  1
127  1  4  4  1
128  2  4  4  1
129  3  4  4  1
130  4  4  4  1
131  5  4  4  1
132  6  4  4  1
133  1  5  4  1
134  2  5  4  1
135  3  5  4  1
136  4  5  4  1
137  5  5  4  1
138  6  5  4  1
139  1  6  4  1
140  2  6  4  1
141  3  6  4  1
142  4  6  4  1
143  5  6  4  1
144  6  6  4  1
145  1  1  5  1
146  2  1  5  1
147  3  1  5  1
148  4  1  5  1
149  5  1  5  1
150  6  1  5  1
151  1  2  5  1
152  2  2  5  1
153  3  2  5  1
154  4  2  5  1
155  5  2  5  1
156  6  2  5  1
157  1  3  5  1
158  2  3  5  1
159  3  3  5  1
160  4  3  5  1
161  5  3  5  1
162  6  3  5  1
163  1  4  5  1
164  2  4  5  1
165  3  4  5  1
```

166	4	4	5	1
167	5	4	5	1
168	6	4	5	1
169	1	5	5	1
170	2	5	5	1
171	3	5	5	1
172	4	5	5	1
173	5	5	5	1
174	6	5	5	1
175	1	6	5	1
176	2	6	5	1
177	3	6	5	1
178	4	6	5	1
179	5	6	5	1
180	6	6	5	1
181	1	1	6	1
182	2	1	6	1
183	3	1	6	1
184	4	1	6	1
185	5	1	6	1
186	6	1	6	1
187	1	2	6	1
188	2	2	6	1
189	3	2	6	1
190	4	2	6	1
191	5	2	6	1
192	6	2	6	1
193	1	3	6	1
194	2	3	6	1
195	3	3	6	1
196	4	3	6	1
197	5	3	6	1
198	6	3	6	1
199	1	4	6	1
200	2	4	6	1
201	3	4	6	1
202	4	4	6	1
203	5	4	6	1
204	6	4	6	1
205	1	5	6	1
206	2	5	6	1
207	3	5	6	1
208	4	5	6	1
209	5	5	6	1
210	6	5	6	1
211	1	6	6	1
212	2	6	6	1
213	3	6	6	1
214	4	6	6	1
215	5	6	6	1
216	6	6	6	1
217	1	1	1	2
218	2	1	1	2
219	3	1	1	2
220	4	1	1	2
221	5	1	1	2
222	6	1	1	2
223	1	2	1	2
224	2	2	1	2
225	3	2	1	2
226	4	2	1	2
227	5	2	1	2
228	6	2	1	2
229	1	3	1	2
230	2	3	1	2
231	3	3	1	2
232	4	3	1	2
233	5	3	1	2
234	6	3	1	2
235	1	4	1	2
236	2	4	1	2
237	3	4	1	2
238	4	4	1	2
239	5	4	1	2
240	6	4	1	2
241	1	5	1	2
242	2	5	1	2
243	3	5	1	2
244	4	5	1	2
245	5	5	1	2
246	6	5	1	2
247	1	6	1	2
248	2	6	1	2
249	3	6	1	2
250	4	6	1	2

[reached 'max' / getOption("max.print") -- omitted 1046 rows]

10. To find expectation and variance for Discrete Random Variable.

. A discrete random variable X has the following probability distribution:

x	13	18	20	24	27
$P(x)$	0.22	0.25	0.20	0.17	0.16

Compute expectation and variance.

Code:

```
#q.10
x=c(13,18,20,24,27)
px=c(0.22,0.25,0.20,0.17,0.16)
ex2=sum(x^2*px)
print(ex2)
mean=sum(x*px)
print(mean)
var=ex2-(mean)^2
print(var)
```

Output:

```
> #q.10
> x=c(13,18,20,24,27)
> px=c(0.22,0.25,0.20,0.17,0.16)
> ex2=sum(x^2*px)
> print(ex2)
[1] 412.74
> mean=sum(x*px)
> print(mean)
[1] 19.76
> var=ex2-(mean)^2
> print(var)
[1] 22.2824
```