Random Variable and Probability Distributions in RStudio

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Aim-Conducting random experiment with probability concept

Code-

```
sample(1:50,5)
sample(1:5,10)
sample(1:6,10,replace = TRUE)
dice_s=as.vector(outer(1:6,1:6,paste))
dice_s
dice_p=as.vector(outer(1:6,1:6))
dice_p
sample(c('H','T'),10,replace = TRUE)
sample(c("success","fail"),10,replace = T, prob =
c(0.9,0.1))
sample(c("success","fail"),10,replace = T)
n=5
r=2
choose(n,r)
n=10;k=4;
p=factorial(10)/factorial(10-4)
p
n=5
library(prob)
tosscoin(n)
prob::tosscoin(n)
tosscoin(n,makespace = TRUE)
n=3
rolldie(n)
m=3
rolldie(n,nsides = m)
rolldie(n,makespace = TRUE)
x=c(0,1,2,3)
p=c(1/8,3/8,3/8,1/8)
```

```
expectation_x=sum(x*p)
expectation_x
mean=expectation_x
mean
variance=sum((x^2*p)-(mean^2))
variance
```

Output-

```
> sample(1:50,5)
[1]  2 39 29 13 41
> sample(1:5,10)
Error in sample.int(length(x), size, replace,
prob) :
  cannot take a sample larger than the population
when 'replace = FALSE'
> sample(1:6,10,replace = TRUE)
 [1] 1 2 5 1 2 5 2 6 3 2
> dice_s=as.vector(outer(1:6,1:6,paste))
> dice_s
 [1] "1 1" "2 1" "3 1" "4 1" "5 1" "6 1" "1 2" "2 2"
 [9] "3 2" "4 2" "5 2" "6 2" "1 3" "2 3" "3 3" "4 3"
[17] "5 3" "6 3" "1 4" "2 4" "3 4" "4 4" "5 4" "6 4"
[25] "1 5" "2 5" "3 5" "4 5" "5 5" "6 5" "1 6" "2 6"
[33] "3 6" "4 6" "5 6" "6 6"
> dice_p=as.vector(outer(1:6,1:6))
> dice_p
 [1]  1  2  3  4  5  6  2  4  6  8 10 12  3  6  9 12
[17] 15 18  4  8 12 16 20 24  5 10 15 20 25 30  6 12
[33] 18 24 30 36
> sample(c('H','T'),10,replace = TRUE)
 [1] "H" "T" "H" "T" "H" "T" "T" "T" "T" "H"
> sample(c("success","fail"),10,replace = T, prob =
c(0.9,0.1))
 [1] "success" "success" "fail"    "success"
 [5] "success" "fail"    "success" "success"
 [9] "success" "success"
> sample(c("success","fail"),10,replace = T)
 [1] "success" "success" "fail"    "success"
 [5] "success" "fail"    "success" "fail"
 [9] "fail"    "success"
```

```
> n=5
> r=2
> choose(n,r)
[1] 10
> n=10;k=4;
> p=factorial(10)/factorial(10-4)
> p
[1] 5040
> n=5
> library(prob)
> tosscoin(n)
   toss1 toss2 toss3 toss4 toss5
1      H     H     H     H     H
2      T     H     H     H     H
3      H     T     H     H     H
4      T     T     H     H     H
5      H     H     T     H     H
6      T     H     T     H     H
7      H     T     T     H     H
8      T     T     T     H     H
9      H     H     H     T     H
10     T     H     H     T     H
11     H     T     H     T     H
12     T     T     H     T     H
13     H     H     T     T     H
14     T     H     T     T     H
15     H     T     T     T     H
16     T     T     T     T     H
17     H     H     H     H     T
18     T     H     H     H     T
19     H     T     H     H     T
20     T     T     H     H     T
21     H     H     T     H     T
22     T     H     T     H     T
23     H     T     T     H     T
24     T     T     T     H     T
25     H     H     H     T     T
26     T     H     H     T     T
27     H     T     H     T     T
28     T     T     H     T     T
```

```
29     H     H     T     T     T
30     T     H     T     T     T
31     H     T     T     T     T
32     T     T     T     T     T
> prob::tosscoin(n)
   toss1 toss2 toss3 toss4 toss5
1      H     H     H     H     H
2      T     H     H     H     H
3      H     T     H     H     H
4      T     T     H     H     H
5      H     H     T     H     H
6      T     H     T     H     H
7      H     T     T     H     H
8      T     T     T     H     H
9      H     H     H     T     H
10     T     H     H     T     H
11     H     T     H     T     H
12     T     T     H     T     H
13     H     H     T     T     H
14     T     H     T     T     H
15     H     T     T     T     H
16     T     T     T     T     H
17     H     H     H     H     T
18     T     H     H     H     T
19     H     T     H     H     T
20     T     T     H     H     T
21     H     H     T     H     T
22     T     H     T     H     T
23     H     T     T     H     T
24     T     T     T     H     T
25     H     H     H     T     T
26     T     H     H     T     T
27     H     T     H     T     T
28     T     T     H     T     T
29     H     H     T     T     T
30     T     H     T     T     T
31     H     T     T     T     T
32     T     T     T     T     T
> tosscoin(n,makespace = TRUE)
   toss1 toss2 toss3 toss4 toss5   probs
```

```
1       H      H      H      H      H 0.03125
2       T      H      H      H      H 0.03125
3       H      T      H      H      H 0.03125
4       T      T      H      H      H 0.03125
5       H      H      T      H      H 0.03125
6       T      H      T      H      H 0.03125
7       H      T      T      H      H 0.03125
8       T      T      T      H      H 0.03125
9       H      H      H      T      H 0.03125
10      T      H      H      T      H 0.03125
11      H      T      H      T      H 0.03125
12      T      T      H      T      H 0.03125
13      H      H      T      T      H 0.03125
14      T      H      T      T      H 0.03125
15      H      T      T      T      H 0.03125
16      T      T      T      T      H 0.03125
17      H      H      H      H      T 0.03125
18      T      H      H      H      T 0.03125
19      H      T      H      H      T 0.03125
20      T      T      H      H      T 0.03125
21      H      H      T      H      T 0.03125
22      T      H      T      H      T 0.03125
23      H      T      T      H      T 0.03125
24      T      T      T      H      T 0.03125
25      H      H      H      T      T 0.03125
26      T      H      H      T      T 0.03125
27      H      T      H      T      T 0.03125
28      T      T      H      T      T 0.03125
29      H      H      T      T      T 0.03125
30      T      H      T      T      T 0.03125
31      H      T      T      T      T 0.03125
32      T      T      T      T      T 0.03125
> n=3
> rolldie(n)
    X1 X2 X3
1    1  1  1
2    2  1  1
3    3  1  1
4    4  1  1
5    5  1  1
```

6	6	1	1
7	1	2	1
8	2	2	1
9	3	2	1
10	4	2	1
11	5	2	1
12	6	2	1
13	1	3	1
14	2	3	1
15	3	3	1
16	4	3	1
17	5	3	1
18	6	3	1
19	1	4	1
20	2	4	1
21	3	4	1
22	4	4	1
23	5	4	1
24	6	4	1
25	1	5	1
26	2	5	1
27	3	5	1
28	4	5	1
29	5	5	1
30	6	5	1
31	1	6	1
32	2	6	1
33	3	6	1
34	4	6	1
35	5	6	1
36	6	6	1
37	1	1	2
38	2	1	2
39	3	1	2
40	4	1	2
41	5	1	2
42	6	1	2
43	1	2	2
44	2	2	2
45	3	2	2

46	4	2	2
47	5	2	2
48	6	2	2
49	1	3	2
50	2	3	2
51	3	3	2
52	4	3	2
53	5	3	2
54	6	3	2
55	1	4	2
56	2	4	2
57	3	4	2
58	4	4	2
59	5	4	2
60	6	4	2
61	1	5	2
62	2	5	2
63	3	5	2
64	4	5	2
65	5	5	2
66	6	5	2
67	1	6	2
68	2	6	2
69	3	6	2
70	4	6	2
71	5	6	2
72	6	6	2
73	1	1	3
74	2	1	3
75	3	1	3
76	4	1	3
77	5	1	3
78	6	1	3
79	1	2	3
80	2	2	3
81	3	2	3
82	4	2	3
83	5	2	3
84	6	2	3
85	1	3	3

86	2	3	3
87	3	3	3
88	4	3	3
89	5	3	3
90	6	3	3
91	1	4	3
92	2	4	3
93	3	4	3
94	4	4	3
95	5	4	3
96	6	4	3
97	1	5	3
98	2	5	3
99	3	5	3
100	4	5	3
101	5	5	3
102	6	5	3
103	1	6	3
104	2	6	3
105	3	6	3
106	4	6	3
107	5	6	3
108	6	6	3
109	1	1	4
110	2	1	4
111	3	1	4
112	4	1	4
113	5	1	4
114	6	1	4
115	1	2	4
116	2	2	4
117	3	2	4
118	4	2	4
119	5	2	4
120	6	2	4
121	1	3	4
122	2	3	4
123	3	3	4
124	4	3	4
125	5	3	4

126	6	3	4
127	1	4	4
128	2	4	4
129	3	4	4
130	4	4	4
131	5	4	4
132	6	4	4
133	1	5	4
134	2	5	4
135	3	5	4
136	4	5	4
137	5	5	4
138	6	5	4
139	1	6	4
140	2	6	4
141	3	6	4
142	4	6	4
143	5	6	4
144	6	6	4
145	1	1	5
146	2	1	5
147	3	1	5
148	4	1	5
149	5	1	5
150	6	1	5
151	1	2	5
152	2	2	5
153	3	2	5
154	4	2	5
155	5	2	5
156	6	2	5
157	1	3	5
158	2	3	5
159	3	3	5
160	4	3	5
161	5	3	5
162	6	3	5
163	1	4	5
164	2	4	5
165	3	4	5

166	4	4	5
167	5	4	5
168	6	4	5
169	1	5	5
170	2	5	5
171	3	5	5
172	4	5	5
173	5	5	5
174	6	5	5
175	1	6	5
176	2	6	5
177	3	6	5
178	4	6	5
179	5	6	5
180	6	6	5
181	1	1	6
182	2	1	6
183	3	1	6
184	4	1	6
185	5	1	6
186	6	1	6
187	1	2	6
188	2	2	6
189	3	2	6
190	4	2	6
191	5	2	6
192	6	2	6
193	1	3	6
194	2	3	6
195	3	3	6
196	4	3	6
197	5	3	6
198	6	3	6
199	1	4	6
200	2	4	6
201	3	4	6
202	4	4	6
203	5	4	6
204	6	4	6
205	1	5	6

```
206  2  5  6
207  3  5  6
208  4  5  6
209  5  5  6
210  6  5  6
211  1  6  6
212  2  6  6
213  3  6  6
214  4  6  6
215  5  6  6
216  6  6  6
> m=3
> rolldie(n,nsides = m)
    X1 X2 X3
1    1  1  1
2    2  1  1
3    3  1  1
4    1  2  1
5    2  2  1
6    3  2  1
7    1  3  1
8    2  3  1
9    3  3  1
10   1  1  2
11   2  1  2
12   3  1  2
13   1  2  2
14   2  2  2
15   3  2  2
16   1  3  2
17   2  3  2
18   3  3  2
19   1  1  3
20   2  1  3
21   3  1  3
22   1  2  3
23   2  2  3
24   3  2  3
25   1  3  3
26   2  3  3
```

```
27  3  3  3
> rolldie(n,makespace = TRUE)
    X1 X2 X3      probs
1    1  1  1 0.00462963
2    2  1  1 0.00462963
3    3  1  1 0.00462963
4    4  1  1 0.00462963
5    5  1  1 0.00462963
6    6  1  1 0.00462963
7    1  2  1 0.00462963
8    2  2  1 0.00462963
9    3  2  1 0.00462963
10   4  2  1 0.00462963
11   5  2  1 0.00462963
12   6  2  1 0.00462963
13   1  3  1 0.00462963
14   2  3  1 0.00462963
15   3  3  1 0.00462963
16   4  3  1 0.00462963
17   5  3  1 0.00462963
18   6  3  1 0.00462963
19   1  4  1 0.00462963
20   2  4  1 0.00462963
21   3  4  1 0.00462963
22   4  4  1 0.00462963
23   5  4  1 0.00462963
24   6  4  1 0.00462963
25   1  5  1 0.00462963
26   2  5  1 0.00462963
27   3  5  1 0.00462963
28   4  5  1 0.00462963
29   5  5  1 0.00462963
30   6  5  1 0.00462963
31   1  6  1 0.00462963
32   2  6  1 0.00462963
33   3  6  1 0.00462963
34   4  6  1 0.00462963
35   5  6  1 0.00462963
36   6  6  1 0.00462963
37   1  1  2 0.00462963
```

38	2	1	2	0.00462963
39	3	1	2	0.00462963
40	4	1	2	0.00462963
41	5	1	2	0.00462963
42	6	1	2	0.00462963
43	1	2	2	0.00462963
44	2	2	2	0.00462963
45	3	2	2	0.00462963
46	4	2	2	0.00462963
47	5	2	2	0.00462963
48	6	2	2	0.00462963
49	1	3	2	0.00462963
50	2	3	2	0.00462963
51	3	3	2	0.00462963
52	4	3	2	0.00462963
53	5	3	2	0.00462963
54	6	3	2	0.00462963
55	1	4	2	0.00462963
56	2	4	2	0.00462963
57	3	4	2	0.00462963
58	4	4	2	0.00462963
59	5	4	2	0.00462963
60	6	4	2	0.00462963
61	1	5	2	0.00462963
62	2	5	2	0.00462963
63	3	5	2	0.00462963
64	4	5	2	0.00462963
65	5	5	2	0.00462963
66	6	5	2	0.00462963
67	1	6	2	0.00462963
68	2	6	2	0.00462963
69	3	6	2	0.00462963
70	4	6	2	0.00462963
71	5	6	2	0.00462963
72	6	6	2	0.00462963
73	1	1	3	0.00462963
74	2	1	3	0.00462963
75	3	1	3	0.00462963
76	4	1	3	0.00462963
77	5	1	3	0.00462963

78	6	1	3	0.00462963
79	1	2	3	0.00462963
80	2	2	3	0.00462963
81	3	2	3	0.00462963
82	4	2	3	0.00462963
83	5	2	3	0.00462963
84	6	2	3	0.00462963
85	1	3	3	0.00462963
86	2	3	3	0.00462963
87	3	3	3	0.00462963
88	4	3	3	0.00462963
89	5	3	3	0.00462963
90	6	3	3	0.00462963
91	1	4	3	0.00462963
92	2	4	3	0.00462963
93	3	4	3	0.00462963
94	4	4	3	0.00462963
95	5	4	3	0.00462963
96	6	4	3	0.00462963
97	1	5	3	0.00462963
98	2	5	3	0.00462963
99	3	5	3	0.00462963
100	4	5	3	0.00462963
101	5	5	3	0.00462963
102	6	5	3	0.00462963
103	1	6	3	0.00462963
104	2	6	3	0.00462963
105	3	6	3	0.00462963
106	4	6	3	0.00462963
107	5	6	3	0.00462963
108	6	6	3	0.00462963
109	1	1	4	0.00462963
110	2	1	4	0.00462963
111	3	1	4	0.00462963
112	4	1	4	0.00462963
113	5	1	4	0.00462963
114	6	1	4	0.00462963
115	1	2	4	0.00462963
116	2	2	4	0.00462963
117	3	2	4	0.00462963

118	4	2	4	0.00462963
119	5	2	4	0.00462963
120	6	2	4	0.00462963
121	1	3	4	0.00462963
122	2	3	4	0.00462963
123	3	3	4	0.00462963
124	4	3	4	0.00462963
125	5	3	4	0.00462963
126	6	3	4	0.00462963
127	1	4	4	0.00462963
128	2	4	4	0.00462963
129	3	4	4	0.00462963
130	4	4	4	0.00462963
131	5	4	4	0.00462963
132	6	4	4	0.00462963
133	1	5	4	0.00462963
134	2	5	4	0.00462963
135	3	5	4	0.00462963
136	4	5	4	0.00462963
137	5	5	4	0.00462963
138	6	5	4	0.00462963
139	1	6	4	0.00462963
140	2	6	4	0.00462963
141	3	6	4	0.00462963
142	4	6	4	0.00462963
143	5	6	4	0.00462963
144	6	6	4	0.00462963
145	1	1	5	0.00462963
146	2	1	5	0.00462963
147	3	1	5	0.00462963
148	4	1	5	0.00462963
149	5	1	5	0.00462963
150	6	1	5	0.00462963
151	1	2	5	0.00462963
152	2	2	5	0.00462963
153	3	2	5	0.00462963
154	4	2	5	0.00462963
155	5	2	5	0.00462963
156	6	2	5	0.00462963
157	1	3	5	0.00462963

158	2	3	5	0.00462963
159	3	3	5	0.00462963
160	4	3	5	0.00462963
161	5	3	5	0.00462963
162	6	3	5	0.00462963
163	1	4	5	0.00462963
164	2	4	5	0.00462963
165	3	4	5	0.00462963
166	4	4	5	0.00462963
167	5	4	5	0.00462963
168	6	4	5	0.00462963
169	1	5	5	0.00462963
170	2	5	5	0.00462963
171	3	5	5	0.00462963
172	4	5	5	0.00462963
173	5	5	5	0.00462963
174	6	5	5	0.00462963
175	1	6	5	0.00462963
176	2	6	5	0.00462963
177	3	6	5	0.00462963
178	4	6	5	0.00462963
179	5	6	5	0.00462963
180	6	6	5	0.00462963
181	1	1	6	0.00462963
182	2	1	6	0.00462963
183	3	1	6	0.00462963
184	4	1	6	0.00462963
185	5	1	6	0.00462963
186	6	1	6	0.00462963
187	1	2	6	0.00462963
188	2	2	6	0.00462963
189	3	2	6	0.00462963
190	4	2	6	0.00462963
191	5	2	6	0.00462963
192	6	2	6	0.00462963
193	1	3	6	0.00462963
194	2	3	6	0.00462963
195	3	3	6	0.00462963
196	4	3	6	0.00462963
197	5	3	6	0.00462963

```
198   6   3   6 0.00462963
199   1   4   6 0.00462963
200   2   4   6 0.00462963
201   3   4   6 0.00462963
202   4   4   6 0.00462963
203   5   4   6 0.00462963
204   6   4   6 0.00462963
205   1   5   6 0.00462963
206   2   5   6 0.00462963
207   3   5   6 0.00462963
208   4   5   6 0.00462963
209   5   5   6 0.00462963
210   6   5   6 0.00462963
211   1   6   6 0.00462963
212   2   6   6 0.00462963
213   3   6   6 0.00462963
214   4   6   6 0.00462963
215   5   6   6 0.00462963
216   6   6   6 0.00462963
> x=c(0,1,2,3)
> p=c(1/8,3/8,3/8,1/8)
> expectation_x=sum(x*p)
> expectation_x
[1] 1.5
> mean=expectation_x
> mean
[1] 1.5
> variance=sum((x^2*p)-(mean^2))
> variance
[1] -6
```