

Assignment 5

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Probabilities Assignment

Choose independently two numbers B and C at random from the interval [0, 1] with uniform density. Prove that B and C are proper probability distributions. Note that the point (B,C) is then chosen at random in the unit square. Find the probability:

$$B + C < 0.5$$

```
set.seed(5)
n=10000
B = runif(n, min = 0, max = 1)
set.seed(6)
C = runif(n, min = 0, max = 1)

sum( (B+C)<0.5 )/n
```

```
## [1] 0.1262
```

The probability of a value sum being less than 0.5 is 12.6%.

$$B * C < 0.5$$

```
sum( (B*C)<0.5 )/n
```

```
## [1] 0.8375
```

The probability of a value product being less than 0.5 is 84%.

$$|B - C| < 0.5$$

```
sum( abs(B-C)<0.5 )/n
```

```
## [1] 0.7499
```

The probability of a value being less than 0.5 is 0.75%.

$\max(B,C) < 0.5$

```
count <- 0
for(i in 1:n){
  if(max(c(B[i],C[i])) < 0.5){
    count = count+1
  }
}
count/n
```

```
## [1] 0.2488
```

The probability of $\max(B,C)$ being less than 0.5 is 0.25%

$\min(B,C) < 0.5$

```
count <- 0
for(i in 1:n){
  if(min(c(B[i],C[i])) < 0.5){
    count = count+1
  }
}
count/n
```

```
## [1] 0.7483
```

The probability of $\min(B,C)$ being less than 0.5 is 0.75%