

# Sumulación Variables Aleatorias Discretas

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**Ejemplo:** Tengo una caja con 3 bolitas azules y 5 rojas. El experimento es sacar 3 bolitas sin reposición.  $X$  mide la cantidad de bolitas azules que sacamos.

$$P(X = 0) = p_X(0) = \frac{10}{56}$$

$$P(X = 1) = p_X(1) = \frac{30}{56}$$

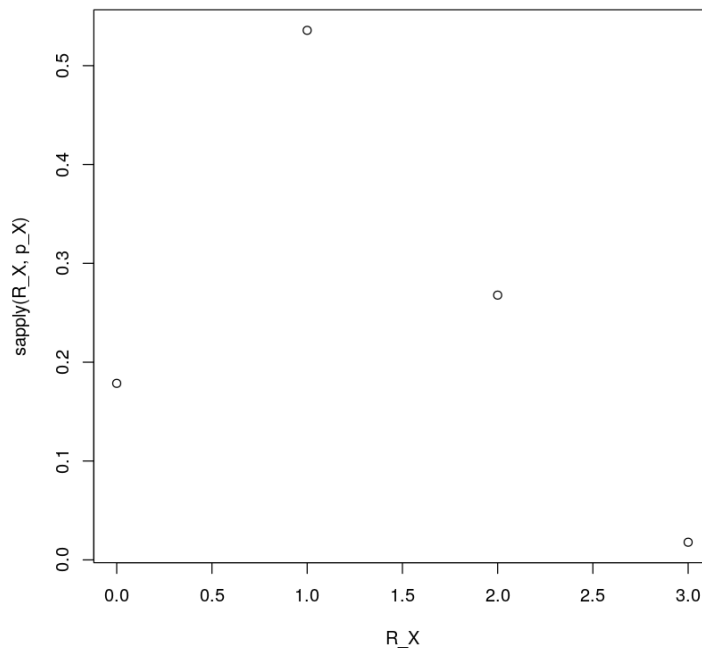
$$P(X = 2) = p_X(2) = \frac{15}{56}$$

$$P(X = 3) = p_X(3) = \frac{1}{56}$$

```
[58]: p_X <- function(x)
      {
        ans <- 0
        if (x==0) ans <- 10/56
        if (x==1) ans <- 30/56
        if (x==2) ans <- 15/56
        if (x==3) ans <- 1/56
        ans
      }
```

```
[91]: R_X <- 0:3
```

```
[152]: plot(R_X, sapply(R_X, p_X))
```



$$F_X(x) = \begin{cases} 0 & \text{si } x < 0 \\ \frac{10}{56} & \text{si } 0 \leq x < 1 \\ \frac{40}{56} & \text{si } 1 \leq x < 2 \\ \frac{55}{56} & \text{si } 2 \leq x < 3 \\ 1 & \text{si } 3 \leq x \end{cases}$$

```
[93]: F_X <- function(x){
  acum = 0
  for (i in 0:3)
  {
    if (x>= i & x<i+1) acum <- sum(sapply(0:i, p_X))
  }
  if (x>3)
    acum <-1
  acum
}
```

```
[94]: print(F_X(3.1))
```

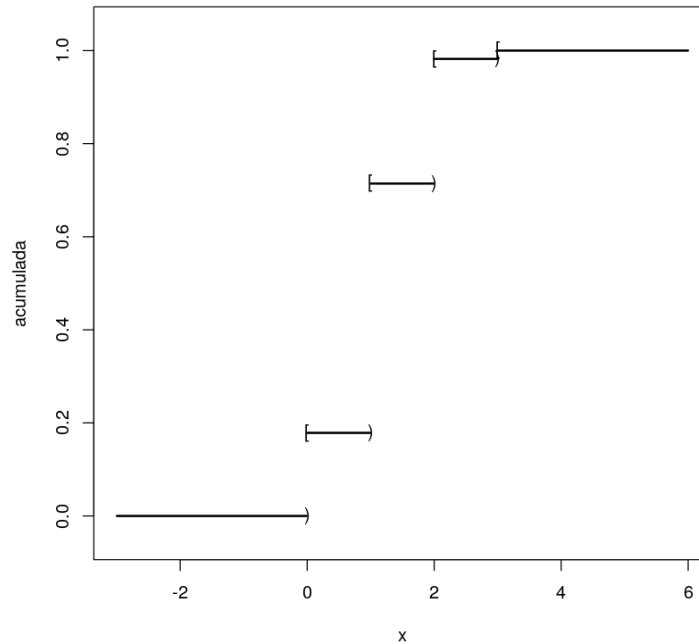
```
[1] 1
```

```
[96]: x <- seq(-3,6, length = 1000)
acumulada <- sapply(x, F_X)
```

```

plot(x, acumulada, ylim = c(-0.05,1.05), cex=0.1)
for (x in R_X)
{
  text(x,F_X(x), "[")
  text(x,F_X(x-0.01), ")")
}

```



Si queremos simular X

```
[153]: sample(R_X, 1)
```

2

```
[155]: R_X
```

1.0 2.1 3.2 4.3

```
[154]: sapply(R_X, p_X)
```

1. 0.178571428571429 2. 0.535714285714286 3. 0.267857142857143 4. 0.0178571428571429

```
[160]: x <- sample(R_X, 1, prob = sapply(R_X, p_X))
x
```

1

Calculamos  $E(X)$

```
[147]: set.seed(1234)

n_rep = seq(10,100000, length = 100)

simulacion <- rep(NA, 100)

for (i in 1:100)
{
  simulacion[i] <- mean(replicate(n_rep[i], sample(R_X, 1,prob = supply(R_X,
↪p_X))))
}

[151]: plot(n_rep, simulacion)
abline(h=63/56,col="red")
```

