

Q2 - Custom Multi-statement Distribution

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Observation

The shape of the Uniform distribution is symmetric, so the probability of drawing a sample from either side of 0.5 is 50%.

Distribution

$$Z = \begin{cases} X & u \leq 0.5 \\ Y & u > 0.5 \end{cases}$$

Algorithm

1. Draw a sample u from Uniform(0, 1)
2. Draw a sample from $N(0, 1)$ if $u \leq 0.5$; Draw a sample from $N(1, 1)$ otherwise.

```
[1]: generate_rv <- function() {  
  sample <- runif(1)  
  if (sample <= 0.5)  
    return(rnorm(1, 0, 1))  
  else  
    return(rnorm(1, 1, 1))  
}  
  
# generate 5 random variates  
n <- 5  
rvs <- rep(0, n)  
  
for (i in 1:n) {  
  rvs[i] <- generate_rv()  
}  
  
print(rvs)
```

```
[1] 0.06341426 1.23004697 1.15044554 2.71757488 1.58444789
```

```
[2]: mean(rvs)
```

1.34918590865904