(1) Use the command

```
runif(1)
```

to generate one a random number between 0 and 1. Modify the command to generate 10 random numbers between 0 and 1.

(2) Use the command

```
rnorm(1,mean=50,sd=10)
```

to generate 1 sample from a normal distribution with mean $\mu = 50$ and standard deviation $\sigma = 10$.

(3) Modify the command in (2) to generate 3 samples from a normal distribution with $\mu = 25$ and $\sigma = 10$.

(4) Generate 5 samples from a normal distribution with $\mu = 65$ and $\sigma = 10$.

(5) Generate a column named `c1` of 100 samples from the normal distribution with $\mu = 50$ and $\sigma = 10$ by using the command

```
c1=rnorm(100,mean=50,sd=10)
```

(6) Generate a column `c2` of 100 samples from the normal distribution with $\mu = 25$ and $\sigma = 10$. Similarly generate a column `c3` of 100 samples from the normal distribution with $\mu = 65$ and $\sigma = 10$.

(7) Generate histograms for all three columns of data and put them together. Below details how to accomplish this.

   (a) First assign the histograms to variables using

   ```
   p1 = hist(c1)
   ```

   and similarly assign `p2` to be the histogram of `c2` and `p3` to be the histogram of `c3`.

   (b) Plot the histogram `p1` in blue using the following code: (*note: the **`xlim`** attribute forces the x-axis to be "wide" enough for visualization purposes*)

   ```
   plot(p1,xlim=c(0,100),col='blue')
   ```

   (c) To add the histogram `p2` to the same plot (not a new plot) and color it red, use the command (*note: the **`add=T`** tells RStudio to add it to the existing plot*)

   ```
   plot(p2,xlim=c(0,100),col='red',add=T)
   ```

   (d) Add the histogram `p3` to the same plot and color it orange.

(8) Now, generate three columns of data in `c5`, `c6`, and `c7`: `c5` should be a normal with $\mu = 50$ and $\sigma = 10$. `c6` should have $\mu = 50$ and $\sigma = 5$, and `c7` should have $\mu = 50$ and $\sigma = 16$.

(9) Create histograms for `c5`, `c6`, and `c7` on the same plot using the same method as problem (7) (use any three different colors you want).

(10) Now we will use RStudio to calculate the area under the standard normal.

   (a) **BE AWARE**: The function `pnorm` always calculates the area to the left of a given value. The command

   ```
   pnorm(z, mean=0, sd=1)
   ```

   to calculate the probability $P(Z \leq z)$ – the area to the left of z in the standard normal distribution.

   (b) Modify the command above to calculate the area $P(Z \leq -0.3)$.

   (c) To calculate $P(Z > z)$ we have to use the complement and compute

   $$P(Z > z) = 1 - P(Z \leq z).$$

   So in code this would be

   ```
   1-pnorm(z,mean=0, sd=1)
   ```

(d) Calculate $P(Z > 2)$.

(e) The area between two values A and B (with $A < B$), i.e. $P(A < Z < B)$ is done by first finding the probability $P(Z < B)$ and subtracting from it the probability $P(Z < A)$. In code, this becomes

```
pnorm(B,mean=0,sd=1) - pnorm(A,mean=0,sd=1)
```

(f) Calculate $P(-0.4 < Z < 0.3)$.

(g) Finally, to reverse the procedure, we may use the `qnorm` function. This function can be used to find the z-score corresponding to a given area to the left of z (i.e. the area is actually a probability: call it P). This procedure is given by the command

```
qnorm(P, mean=0, sd=1)
```

(h) Find the z-score corresponding to the probability $P = 0.95$.