1. **Binomial Distribution:** The inbuilt R-function `rbinom(m,n,p)` returns `m` random samples from the Binomial(n, p) distribution (See `help(rbinom)` for more information). In R, n is referred to as given `size` and probability of success p as `prob`.

   (a) **Simulation:** The below code generates 10 samples from Binomial (20, 0.75)

   ```
   > rbinom(10,20,0.75)
   ```

   Modify the above code to generate 1000 samples from Binomial$(35, 0.3)$

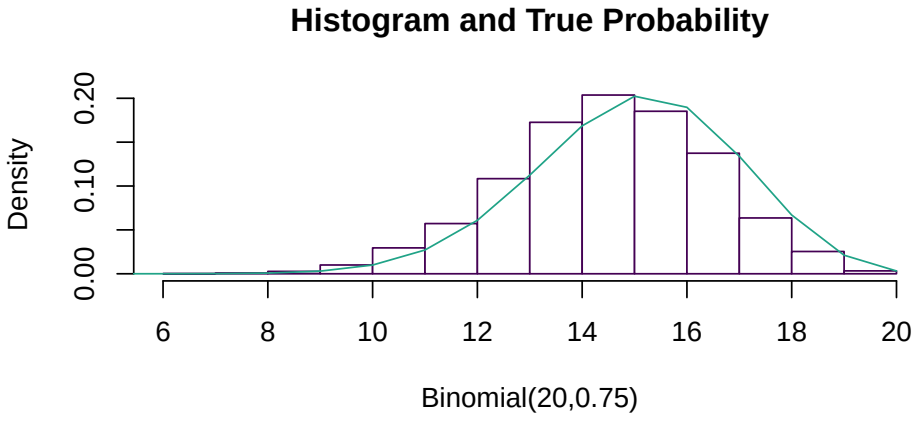
   (b) **Sample versus True: (Mean and Variance)** The below code generates 10000 samples from Binomial (20, 0.75) and computes the sample mean, and sample variance.

   ```
   > set.seed(sample(1:100,1))
   > #__(Refer to https://r-coder.com/set-seed-r/ for more information)
   > mean(rbinom(10000,20,0.75))
   > #__(calculating the sample mean)
   >
   > var(rbinom(10000,20,0.75))
   > #__(calculating the sample variance)
   ```

   Compute the above in R and see how they relate to the true population mean and variance[1].

   (c) **Histogram versus True Probability:** The below code generates 10000 samples from Binomial (20, 0.75) and plots a histogram of relative frequency along with a lineplot of the true Binomial probabilities[2].

   ```
   > hist(rbinom(10000,20,0.75),freq = FALSE,xlab='Binomial(20,0.75)',
   +      main='Histogram and True Probability', border='#440154FF',
   +      col='white')
   > #__(Plots a histogram of the given data. )
   > #__(See help(hist) for more information and other options.)
   >
   > lines(0:20,dbinom(0:20,20,0.75),col='#20A387FF')
   > #__(Plots line of the true Binomial probabilities.)
   ```



[1] which are $20 * 0.75 = 15$ and $20 * 0.75 * 0.25 = 3.75$, respectively.
[2] i.e. $f(k) = \binom{20}{k}(0.75)^k(0.25)^{20-k}$ for $k = 0, 1, \ldots, 20$.

2. **Geometric Distribution:** The inbuilt R-function `rgeom(m,prob)` returns `m` random samples from the Geometric distribution of the given probability `prob`.

   (a) **Simulation:** The below code generates 10 samples from Geometric(0.1)

   ```
   > rgeom(10,0.1)
   ```

   Modify the above code to generate 1000 samples from Geometric(0.3).

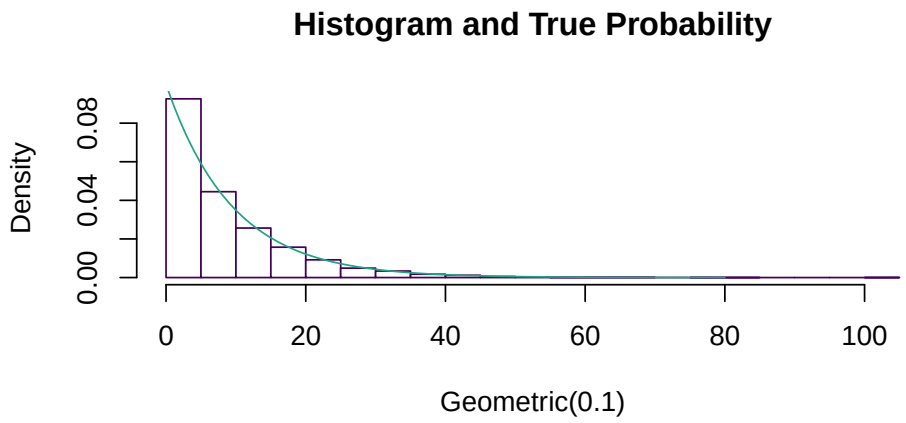
   (b) **Sample versus True: (Mean and Variance)** The below code generates 10000 samples from Geometric(0.1) and computes the sample mean, and sample variance.

   ```
   > set.seed(sample(1:100,1))
   > #__(Refer to https://r-coder.com/set-seed-r/ for more information)
   >
   > mean(rgeom(10000,0.1))
   > #__(calculating the sample mean)
   >
   > var(rgeom(10000,0.1))
   > #__(calculating the sample variance)
   ```

   Compute the above in R and see how they relate to the true population mean and variance[3].

   (c) **Histogram versus True Probability:** The below code generates 10000 samples from Geometric(0.1) and plots a histogram of relative frequency along with a lineplot of the true Geometric probabilities[4].

   ```
   > hist(rgeom(10000,0.1),freq = FALSE,xlab='Geometric(0.1)',
   +      main='Histogram and True Probability',  border='#440154FF',
   +      col='white')
   > #__(Plots a histogram of the given data. )
   > #__(See help(hist) for more information and other options.)
   >
   > lines(0:80,dgeom(0:80,0.1), col='#20A387FF')
   > #__(Plots line of the true Geometric probabilities.)
   ```



[3] which are 10 and 90, respectively.
[4] i.e. $f(k) = (0.9)^{k-1}(0.1)$ for $k = 1, \ldots,$.