FA6 Geometric Distribution

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I. Geometric Distribution. Provide an R code for the geometric distribution. The geometric distribution is a probability distribution that models the number of trials required to achieve the first success in a sequence of Bernoulli trials, where each trial has a constant probability of success.

```
p <- 0.2
```

1. Set the probability of success: p <- 0.2

```
x <- rgeom(1000, p)
```

2. Generate 1000 random variables from the geometric distribution.

```
mean_x <- mean(x)
var_x <- var(x)
sd_x <- sd(x)

skew_x <- moments::skewness(x)
kurt_x <- moments::kurtosis(x)
```

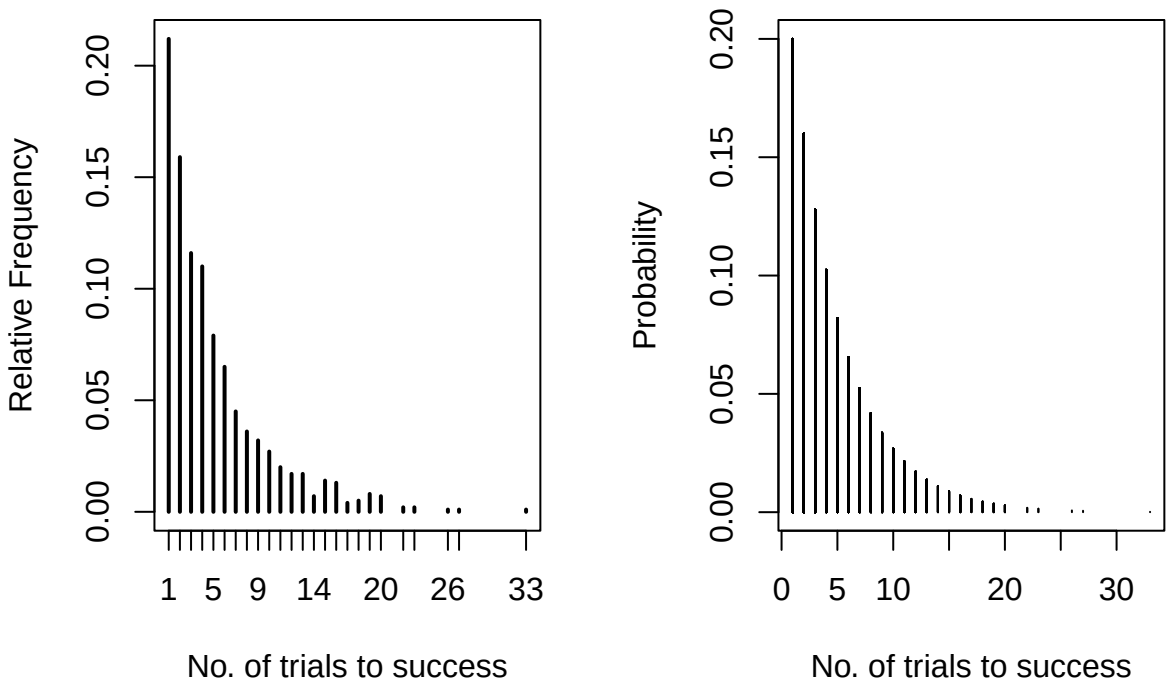
3. Calculate some basic statistics: mean_x <- mean(x), var_x <- var(x), sd_x <- sd(x)

4. Print the results in item 3 with the following output (string):

```
## [1] "Number of trials required to achieve first success:  5"

## [1] "Mean: 4.05"

## [1] "Variance: 20.85"

## [1] "Standard Deviation: 4.57"

## [1] "Skewness: 1.75"

## [1] "Kurtosis: 6.65"
```

```r
par(mfrow = c(1,2))

plot(table(x+1)/1000,
     xlab = "No. of trials to success",
     ylab = "Relative Frequency",
     type = "h")
plot(x+1, dgeom(x, p, log = FALSE),
     xlab = "No. of trials to success",
     ylab = "Probability",
     type = "h")
```

5. Plot the histogram of the results.



II.Hypergeometric Distribution. Consider a plant manufacturing IC chips of which 10% are expected to be defective. The chips are packed in boxes for export. Before transportation, a sample is drawn from each box. Estimate the probability that the sample contains more than 10% defectives, when:

```r
p <- 0.10
n <- 10
```

```
N <- 40
M <- p*N
m <- p*M

prob_N40 <- 1- phyper(1, M, N-M, n)
prob_N40
```

1. A sample of 10 is selected from a box of 40;

```
## [1] 0.2558814
```

```
N2 <- 5000
M2 <- p*N2
m2 <- p*M2

prob_N5000 <- 1- phyper(1, M2, N2-M2, n)

prob_N5000
```

2. A sample of 10 is selected from a box of 5000.

```
## [1] 0.2638622
```