Q8.R

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```r
# Load necessary libraries
library(datasets)  # For the iris dataset
library(psych)     # For Varimax rotation
```

```
## Warning: package 'psych' was built under R version 4.3.3
```

```r
# Load the iris dataset
data(iris)

# Part a: Perform PCA on the first four variables of the iris dataset
iris_data <- iris[, 1:4]
pca_result <- prcomp(iris_data, scale. = TRUE)

# Display PCA results
summary(pca_result)
```

```
## Importance of components:
##                           PC1    PC2     PC3     PC4
## Standard deviation     1.7084 0.9560 0.38309 0.14393
## Proportion of Variance 0.7296 0.2285 0.03669 0.00518
## Cumulative Proportion  0.7296 0.9581 0.99482 1.00000
```

```r
# Part b: Compute the eigenvalues and interpret the PCA results using Kaiser's criterion
eigenvalues <- pca_result$sdev^2
eigenvalues
```

```
## [1] 2.91849782 0.91403047 0.14675688 0.02071484
```

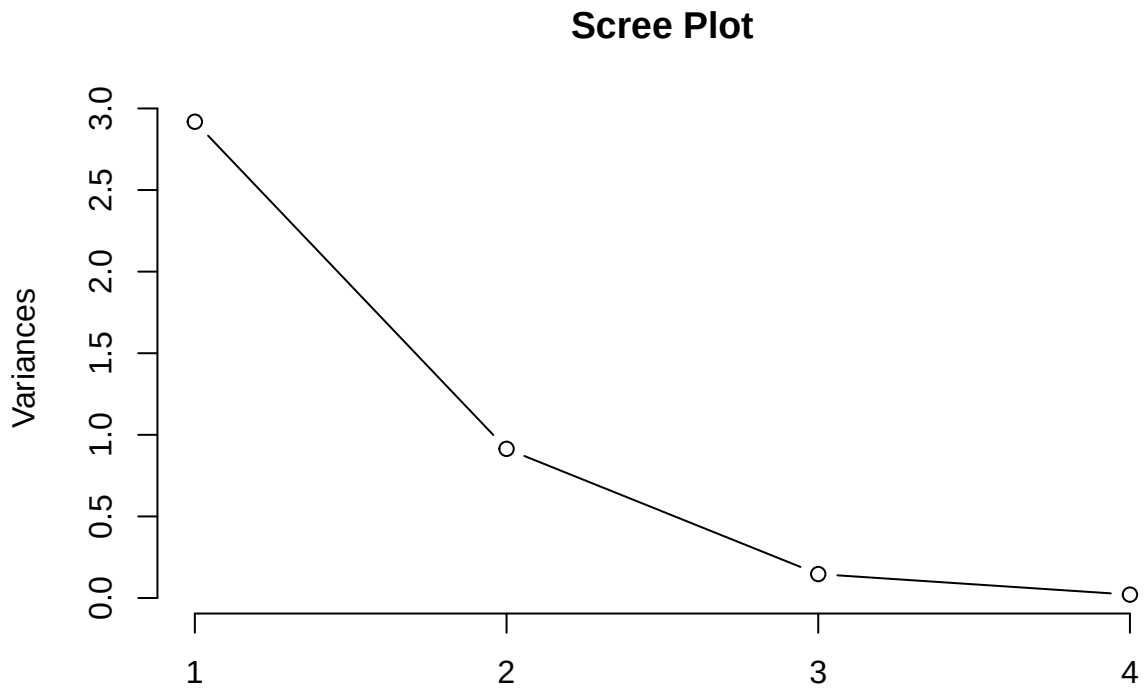
```r
# Kaiser's criterion: Keep components with eigenvalues > 1
kaiser_criterion <- eigenvalues > 1
kaiser_criterion
```

```
## [1]  TRUE FALSE FALSE FALSE
```

```r
# Interpretation of PCA results using Kaiser's criterion
num_components_kaiser <- sum(kaiser_criterion)
num_components_kaiser
```

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

```r
# Part c: Show the scree plot and decide on the number of components to retain
screeplot(pca_result, type = "lines", main = "Scree Plot")
```




```r
# Interpretation of the scree plot
# Look for the "elbow" point in the plot

# Part d: Revise the flower scale with 3 components using Varimax rotation and interpret the result
pca_result_rotated <- principal(iris_data, nfactors = 3, rotate = "varimax")
print(pca_result_rotated)
```

```
## Principal Components Analysis
## Call: principal(r = iris_data, nfactors = 3, rotate = "varimax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##                RC1   RC3   RC2   h2      u2 com
## Sepal.Length  0.55  0.84  0.01 1.00 0.00141 1.7
## Sepal.Width  -0.18 -0.03  0.98 1.00 0.00032 1.1
## Petal.Length  0.79  0.53 -0.28 0.99 0.01331 2.0
## Petal.Width   0.90  0.39 -0.20 0.99 0.00568 1.5
##
##                        RC1  RC3  RC2
## SS loadings           1.76 1.14 1.08
## Proportion Var        0.44 0.28 0.27
## Cumulative Var        0.44 0.72 0.99
## Proportion Explained  0.44 0.29 0.27
## Cumulative Proportion 0.44 0.73 1.00
```

```
##
## Mean item complexity =  1.6
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0
##  with the empirical chi square  0.03  with prob <  NA
##
## Fit based upon off diagonal values = 1
```