Descriptive Statistics

```
install.packages("moments")
install.packages("e1071")
install.packages("actuar")
```

```
all.moments(x, order.max=4)
```

```
raw2central()
```

```
central2raw()
```

Example

```
install.packages("moments")
```

```
library(moments)
```

```
x=c(0,1,2,3)
```

```
p=c(0.1,0.2,0.3,0.4)
```

```
m0=1
```

```
m1=sum(x*p)
```

```
m2=sum(x*x*p)
```

```
m3=sum(x*x*x*p)
```

```
m4=sum(x*x*x*x*p)
```

```
m=c(m0,m1,m2,m3,m4)
```

```
m
```

```
raw2central(m)
```

Problem

Find the mean, median and mode of the eruption duration in the data set faithful.

Solution

We apply the median function to compute the median value of eruptions.

```
duration = faithful$eruptions
```

```
mean(duration)
```

```
median(duration)
```

```
# Import the library
```

```
library(modeest)
```

```
mode = mfv(duration)
```

```
print(mode)

#Other method

y <- table(duration)

names(y)[which(y==max(y))]
```

Problem

Find the third central moment of eruption duration in the data set faithful.

Solution

We apply the function moment from the e1071 package. As it is not in the core R library, the package has to be installed and loaded into the R workspace.

```
> library(e1071)

> duration = faithful$eruptions

> moment(duration, order=3, center=TRUE)
```

Problem

Find the skewness of eruption duration in the data set faithful.

Solution

We apply the function skewness from the e1071 package to compute the skewness coefficient of eruptions. As the package is not in the core R library, it has to be installed and loaded into the R workspace.

```
> library(e1071)

> duration = faithful$eruptions

> skewness(duration)
```

Note: The normal distribution has zero excess kurtosis and thus the standard tail shape. It is said to be mesokurtic. Negative excess kurtosis would indicate a thin-tailed data distribution, and is said to be platykurtic. Positive excess kurtosis would indicate a fat-tailed distribution, and is said to be leptokurtic.

Problem

Find the excess kurtosis of eruption duration in the data set faithful.

Solution

We apply the function kurtosis from the e1071 package to compute the excess kurtosis of eruptions. As the package is not in the core R library, it has to be installed and loaded into the R workspace.

```
> library(e1071)

> duration = faithful$eruptions

> kurtosis(duration)
```

Exercise

1. A random variable X has the following probability distribution

   X=x :   0   1   2

   P(X=x):   1/3   1/3   1/3,
   Find the moment generating function, first four raw moments and the first four central moment.
   Write a R program for above problem.
2. The first three moments of the distribution about the value 3 of the random variable are 2, 10, -30 respectively. Find mean variance and skewness.
   Write a R program for above problem.
3. A random variable X has the probability distribution

   $P(X = x) = \dfrac{1}{8} \, {}^{3}C_X, \ X = 0,1,2,3$, Find the moment generating function

   of X and then find mean and variance.
   Write a R program for above problem.
4. Find the first four moments about mean of the random variable X whose probability mass function is given by
      X: -2   3   1
   P(X):   1/3   1/2   1/6
    Write a R program for above problem.