# Dzień 2 - Bazowa grafika - ciąg dalszy

## Spis treści



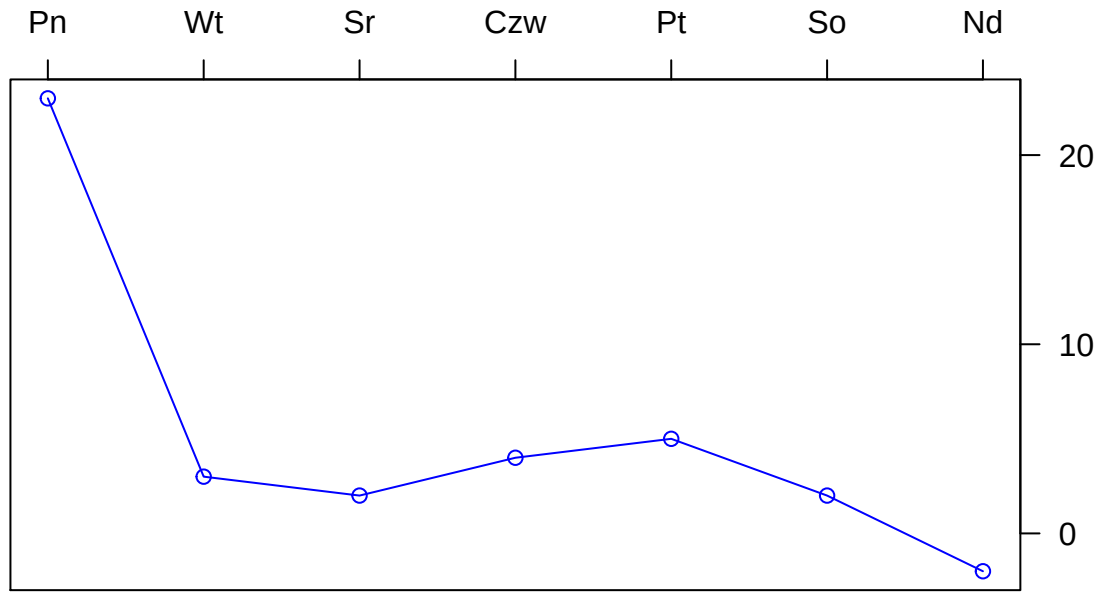
Wersja pdf

## Bazowa grafika - ciąg dalszy

### Funkcja `axis`

Komentarz: pierwszy parametr `axis` określa położenie osi: 1- dół, 2- lewa strona, 3 - góra, 4 - prawa strona.

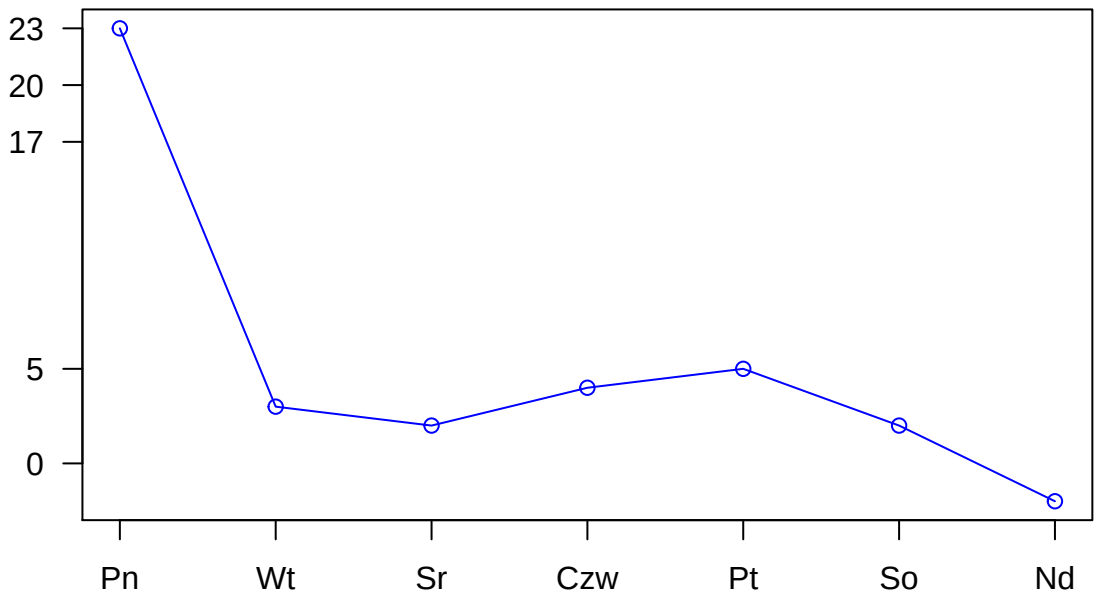
```
a<-c(1,2,3,4,5,6,7)
b<-c(23,3,2,4,5,2,-2)
plot(a,b,axes=FALSE,type="o",col="blue",ann=FALSE)
axis(4, las=1, at=10*0:range(b)[2])
axis(3, at=1:7, lab=c("Pn","Wt","Śr","Czw","Pt","So","Nd"))
box()
```




### Parametr `at` - kontrola nad podziałką

Jeśli w parametrze `at` chcemy mieć kontrolę nad tym co będzie, możemy dodać tam ręcznie konkretny wektor. Ale musimy pamiętać o marginesach.

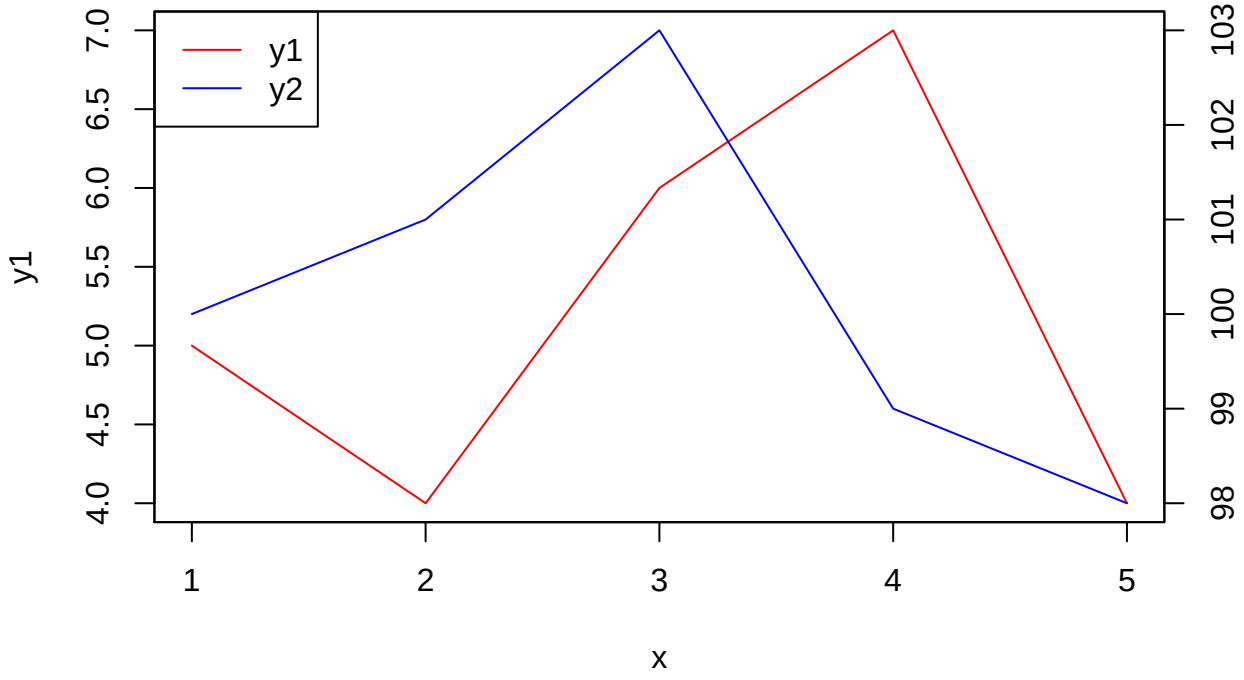
```
a<-c(1,2,3,4,5,6,7)
b<-c(23,3,2,4,5,2,-2)
plot(a,b,axes=FALSE,type="o",col="blue",ann=FALSE)
axis(2, las=1, at=c(0,5,17,20,23))
axis(1, at=1:7, lab=c("Pn","Wt","Śr","Czw","Pt","So","Nd"))
box()
```




### Wykresy dwuosiowe

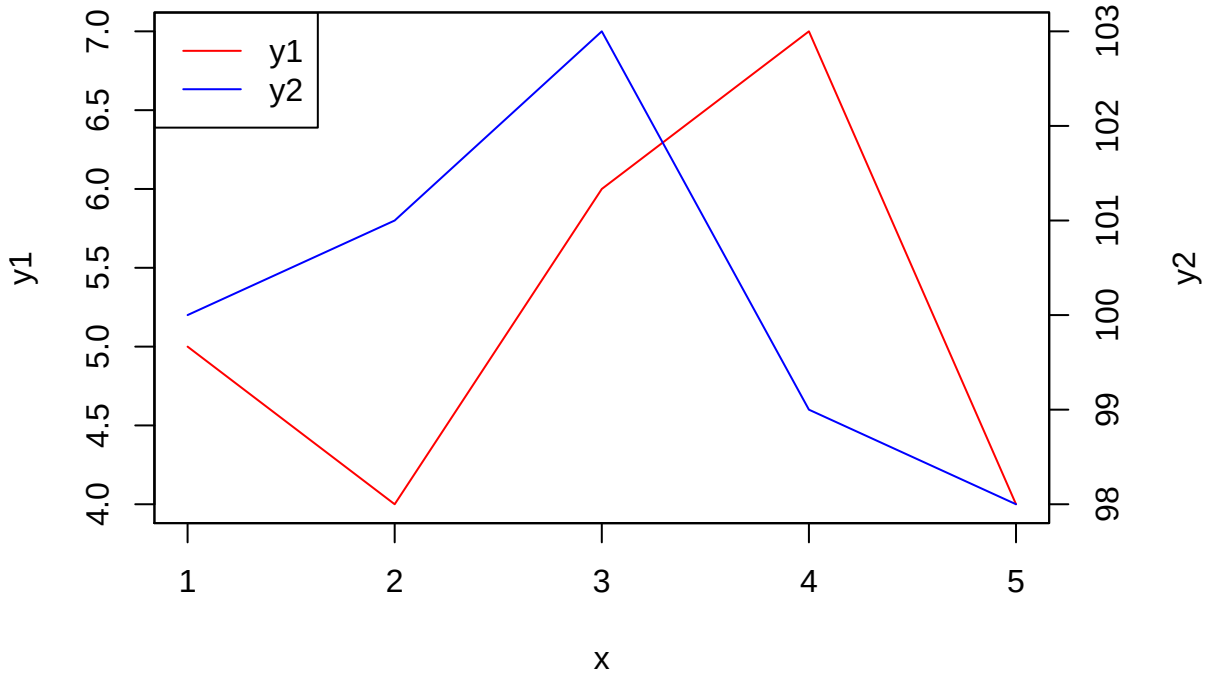
Wykresy dwuosiowe należy stosować z dużą rozwagą. Najprościej użyć parametru `new` ustawionego na `TRUE`. Parametry `xaxt` i `yaxt` dotyczą odpowienich podziałek na osiach. Przykładowo:

```
x<-c(1,2,3,4,5)
y1<-c(5,4,6,7,4)
y2<-c(100,101,103,99,98)
plot(x,y1,type="l",col="red")
par(new=TRUE)
plot(x, y2,,type="l",col="blue",xaxt="n", yaxt="n",xlab="",ylab="")
axis(4)
legend("topleft",col=c("red","blue"),lty=1,legend=c("y1","y2"))
```




A jak dodać etykietę prawej osi y?

```
old_par <- par(no.readonly = TRUE)
par(mar=c(5,4,4,5)+.1)
x<-c(1,2,3,4,5)
y1<-c(5,4,6,7,4)
y2<-c(100,101,103,99,98)
plot(x,y1,type="l",col="red")
par(new=TRUE)
plot(x, y2,,type="l",col="blue",xaxt="n", yaxt="n",xlab="",ylab="")
axis(4)
legend("topleft",col=c("red","blue"),lty=1,legend=c("y1","y2"))
mtext("y2",side=4,line=3)
```

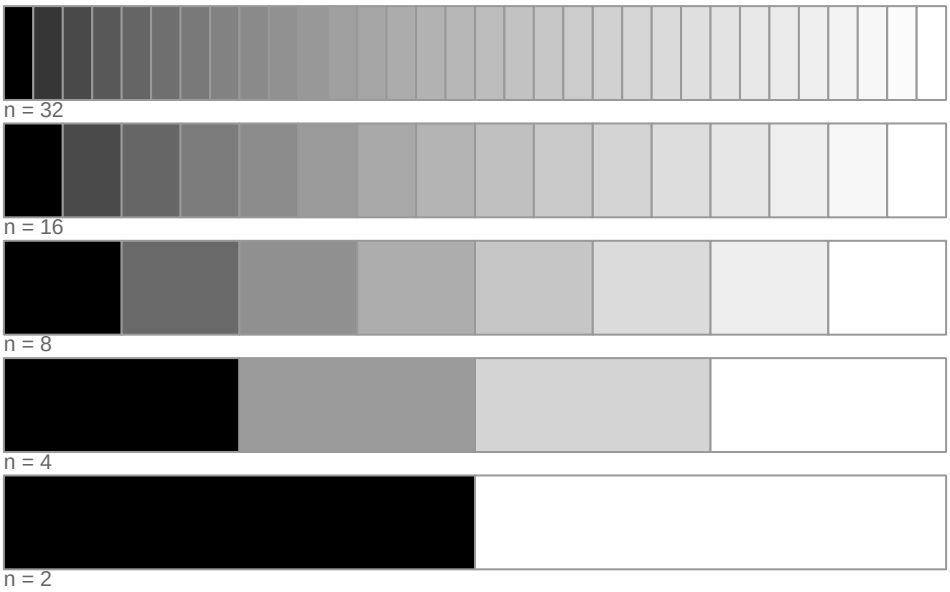



```
par(old_par)
```

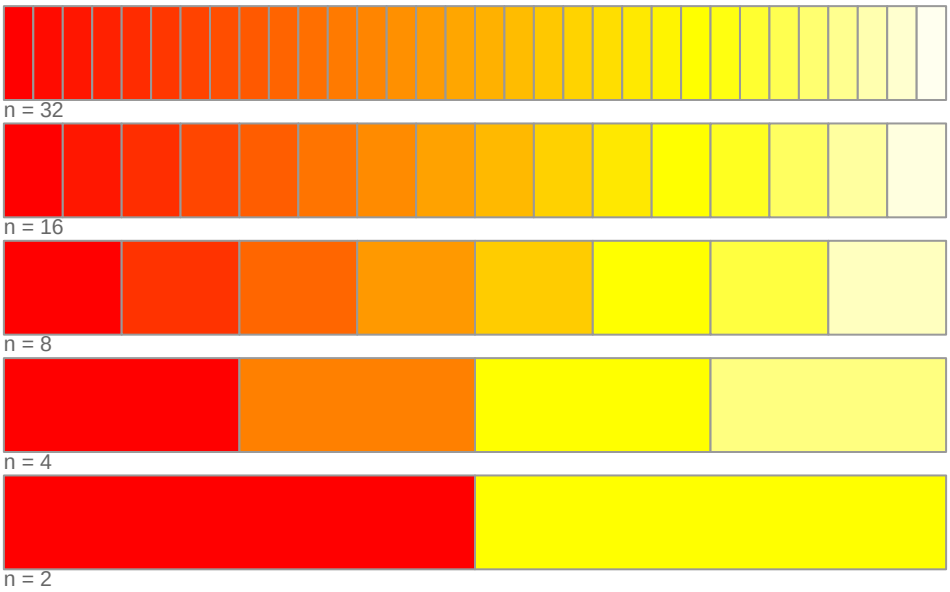
### Kolory - jeszcze raz

Składnia: `gray.colors(num_colors, start=value, end=value, gamma=value)`.

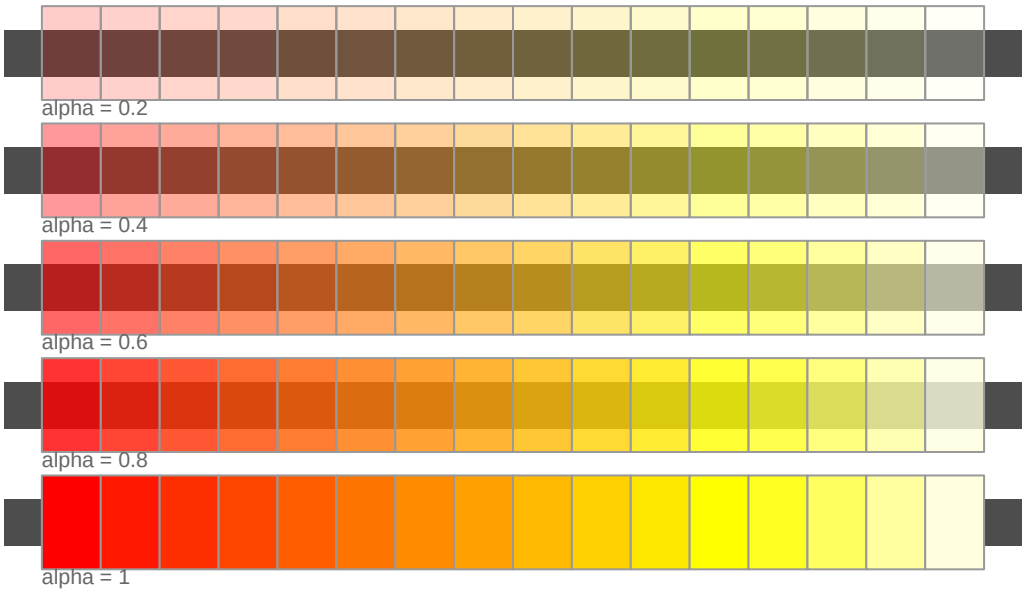
0 = czerń i 1 = biel (domyślnie start=0.3 i end=0.9).




Składnia: `heat.colors(num_colors, alpha=value)`.



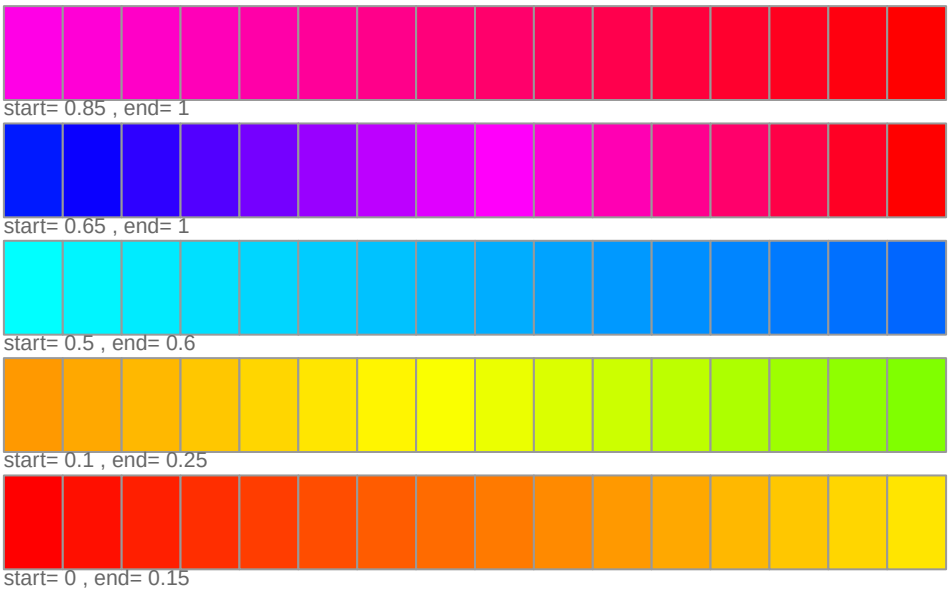

Z przezroczystością:



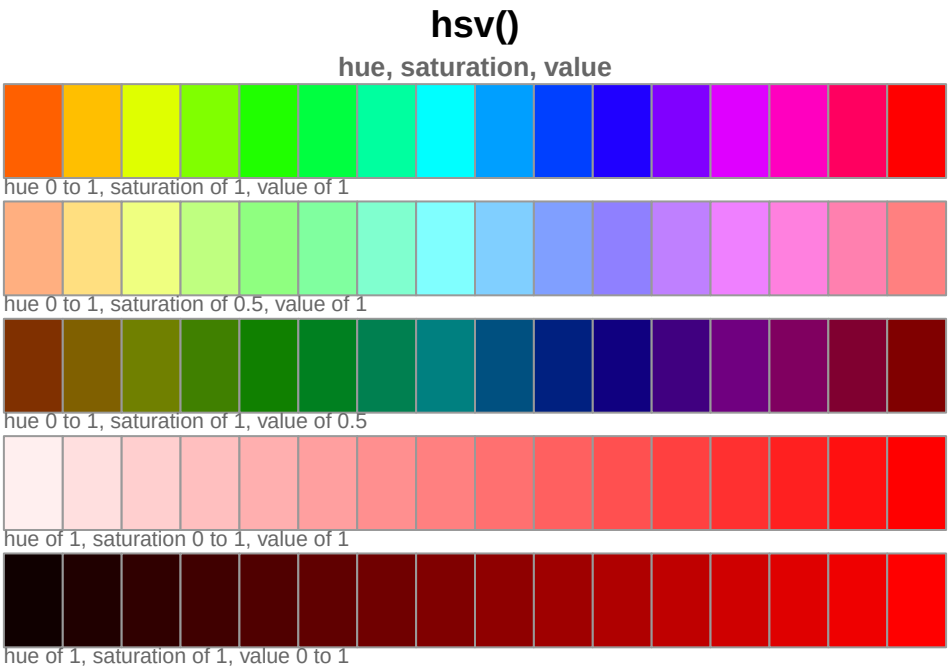

Pozostałe możliwości:


`rainbow` z określonym początkiem i końcem:

## rainbow(16) z podzakresem

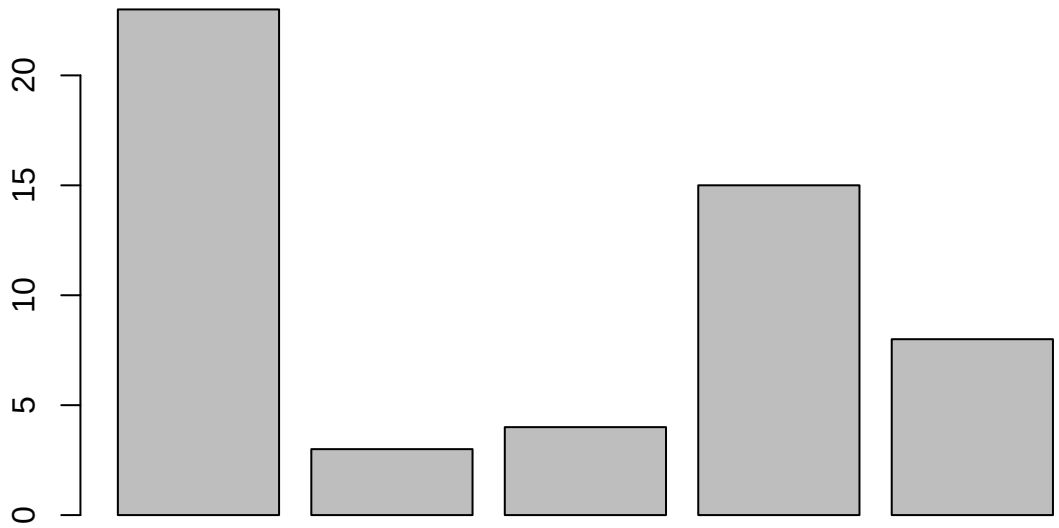



Składnia: `hsv(h=value, s=value, v=value, gamma=value, alpha=value)`. Opis na wiki - link.



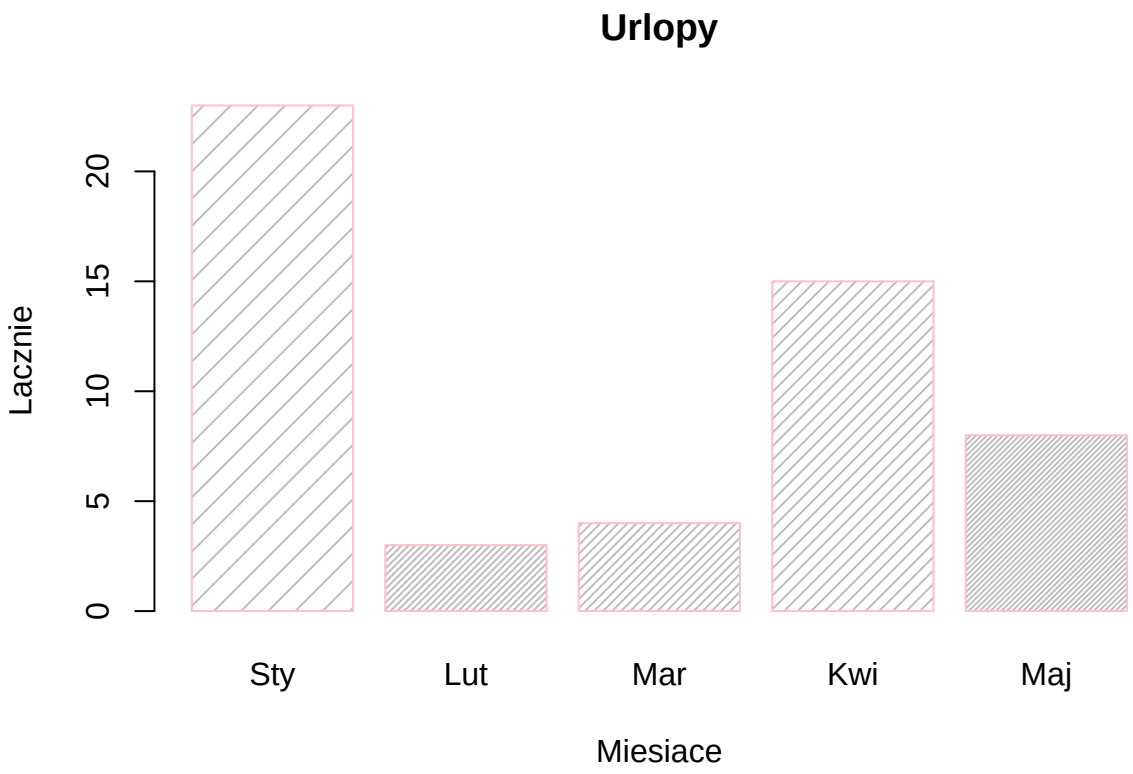

### Wykres słupkowy - barplot

```
urlopy<- c(23,3,4,15,8)
barplot(urlopy)
```



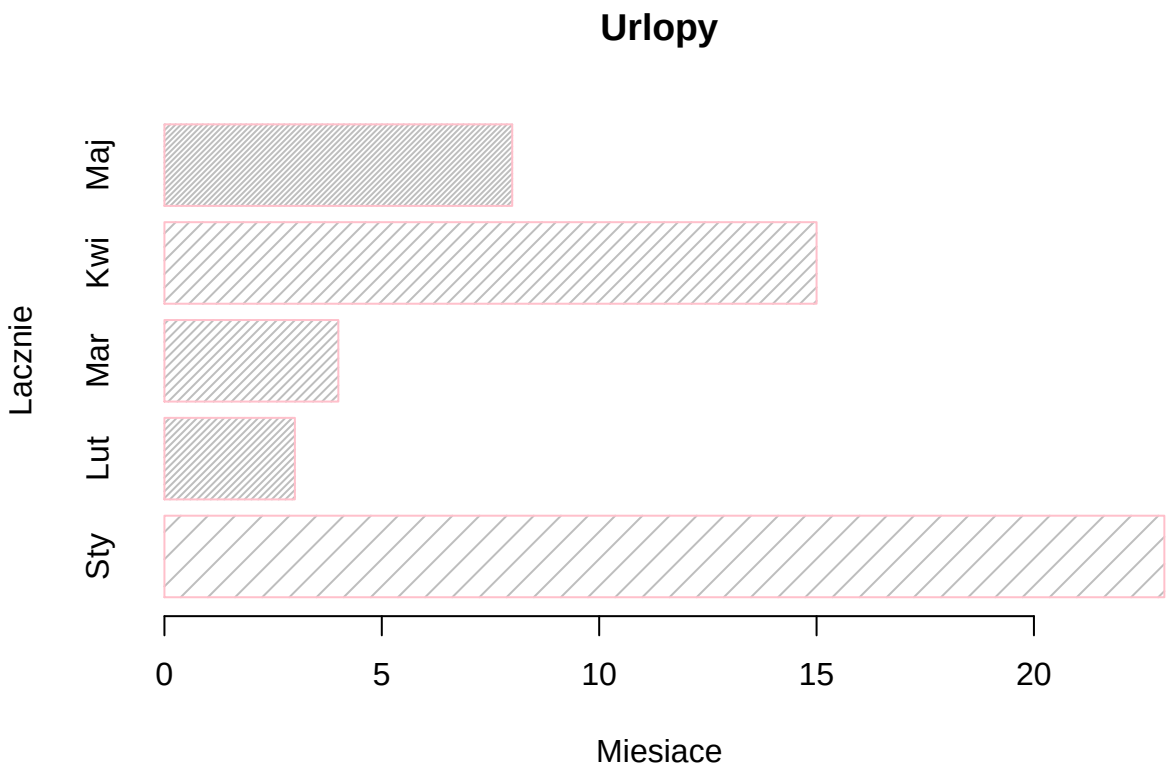

Parametry: `names.arg` - nazwy argumentów, `border` - kolor brzegu, `density` - wypełnienie.

```
barplot(urlopy, main="Urlopy", xlab="Miesiące",
   ylab="Łącznie", names.arg=c("Sty","Lut","Mar","Kwi","Maj"),
   border="pink", density=c(10,40,30,20,50))
```




Parametr `horiz=TRUE` zmienia orientację na poziomą.

```
barplot(urlopy, main="Urlopy", xlab="Miesiące",
   ylab="Łącznie", names.arg=c("Sty","Lut","Mar","Kwi","Maj"),
   border="pink", density=c(10,40,30,20,50), horiz=TRUE)
```

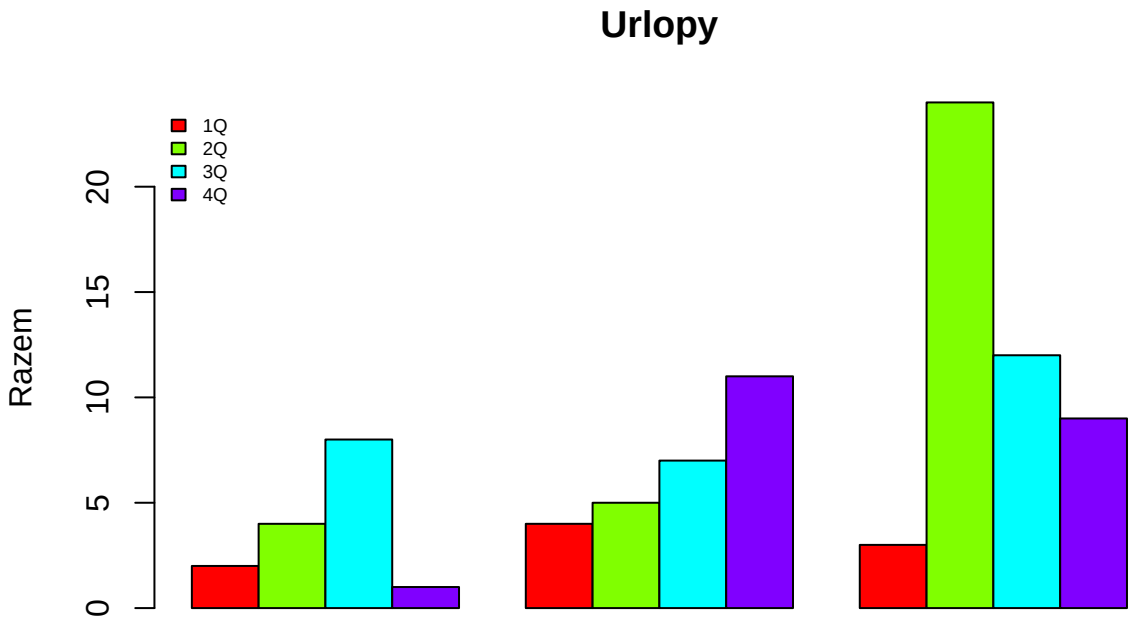



Parametr `beside=TRUE` dodaje grupowanie danych (w tym wypadku po kolumnach). `bty` - typ obramowania (tutaj legendy, `n`-brak, `o`- dookoła).

```
urlopy<- matrix( c(2, 4, 8, 1,4, 5, 7,11,3,24,12,9), nrow=4, ncol=3)
urlopy
```

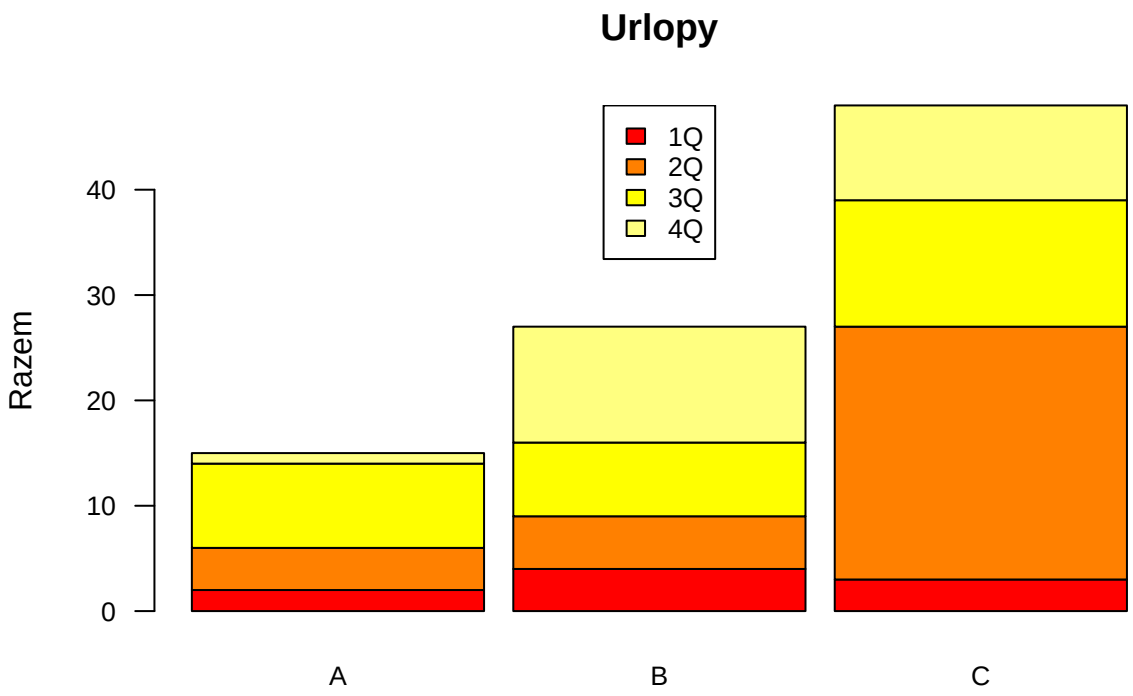
```
##      [,1] [,2] [,3]
## [1,]    2    4    3
## [2,]    4    5   24
## [3,]    8    7   12
## [4,]    1   11    9
```

```
barplot(urlopy, main="Urlopy", ylab= "Razem",
   beside=TRUE, col=rainbow(4))
legend("topleft", c("1Q","2Q","3Q","4Q"), cex=0.6,
   bty="n", fill=rainbow(4))
```



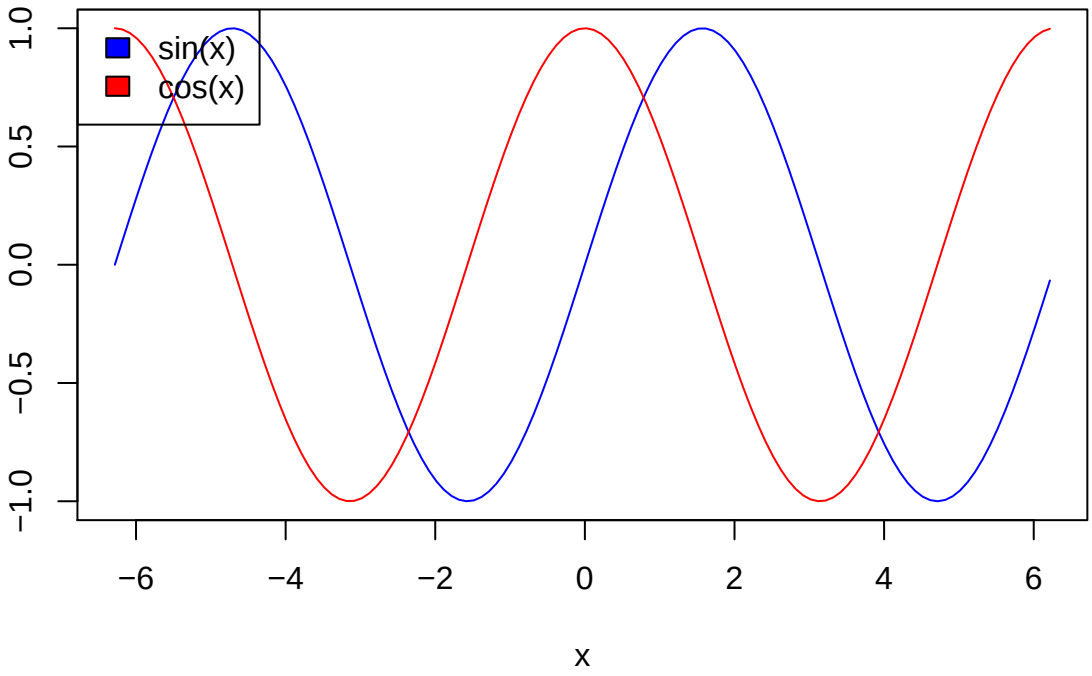

Wykres słupkowy na podstawie macierzy. `space` - odstęp między słupkami.

```
barplot(urlopy, main="Urlopy", ylab="Razem",
   col=heat.colors(4), space=0.1, cex.axis=0.8, las=1,
   names.arg=c("A","B","C"), cex=0.8)
legend("top", c("1Q","2Q","3Q","4Q"), cex=0.8, fill=heat.colors(4));
```



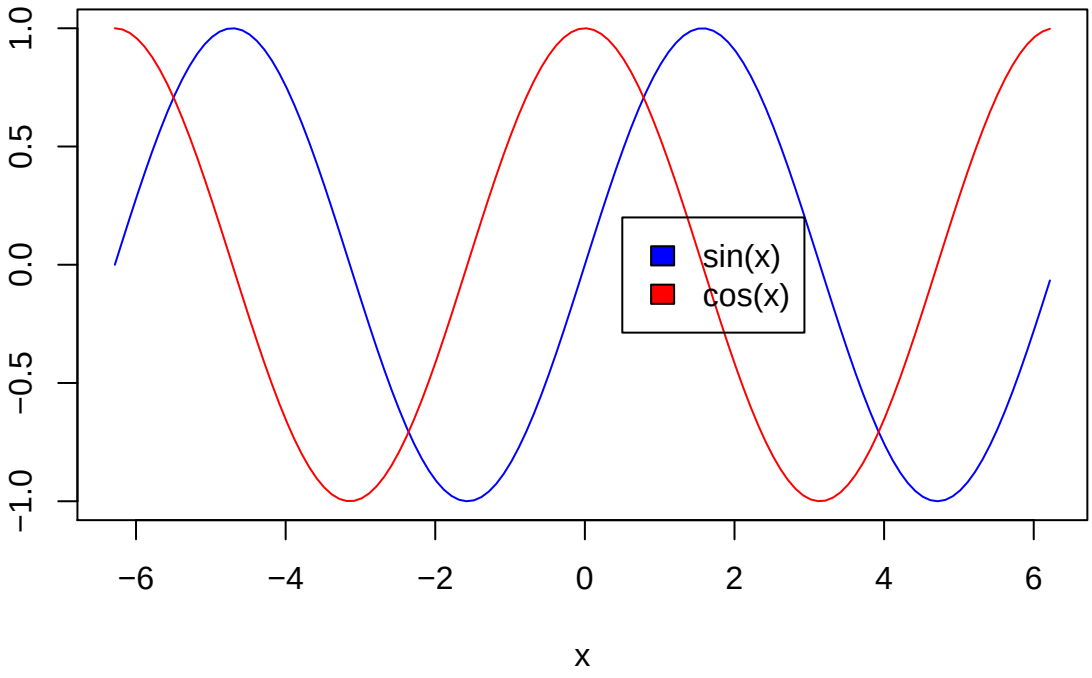

### Legenda - jeszcze raz

```
x <- seq(-2*pi,2*pi,0.1)
plot(x, sin(x),ylab="",type="l",col="blue")
lines(x,cos(x), col="red")
legend("topleft",c("sin(x)","cos(x)"),fill=c("blue","red"))
```



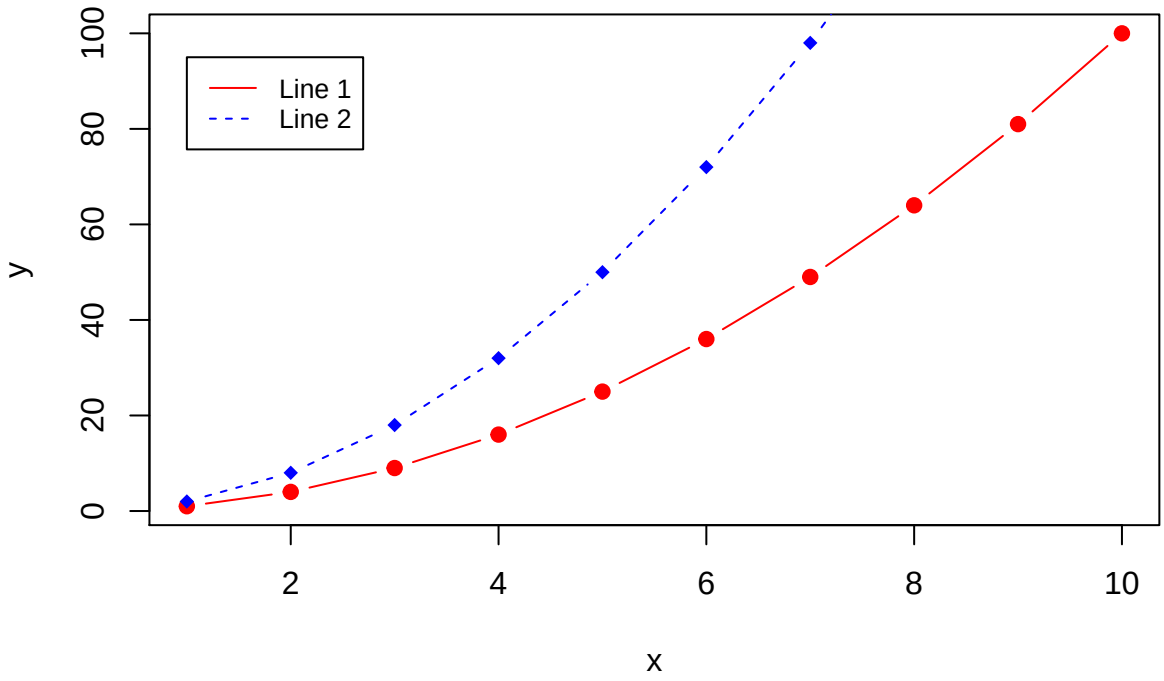

Mozna też określić współrzędne. Ale musimy być ostrożni, aby nie wypaść poza obszar wykresu.

```
x <- seq(-2*pi,2*pi,0.1)
plot(x, sin(x),ylab="",type="l",col="blue")
lines(x,cos(x), col="red")
legend(0.5,0.2,c("sin(x)","cos(x)"),fill=c("blue","red"))
```

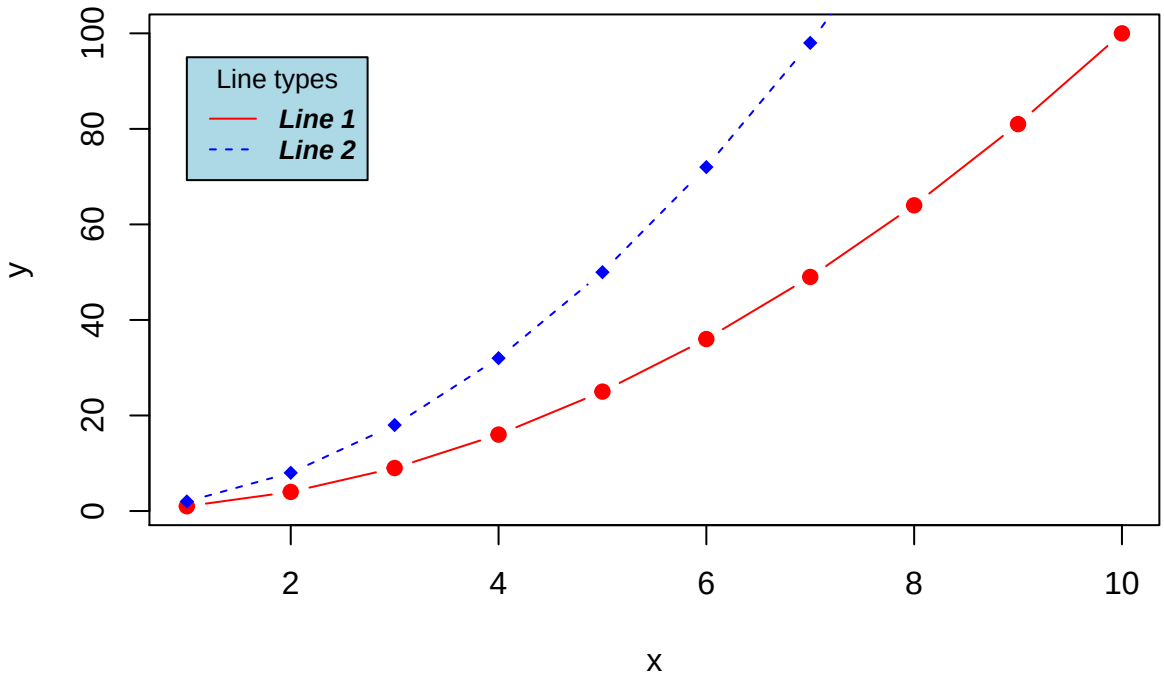



Inne przykłady:

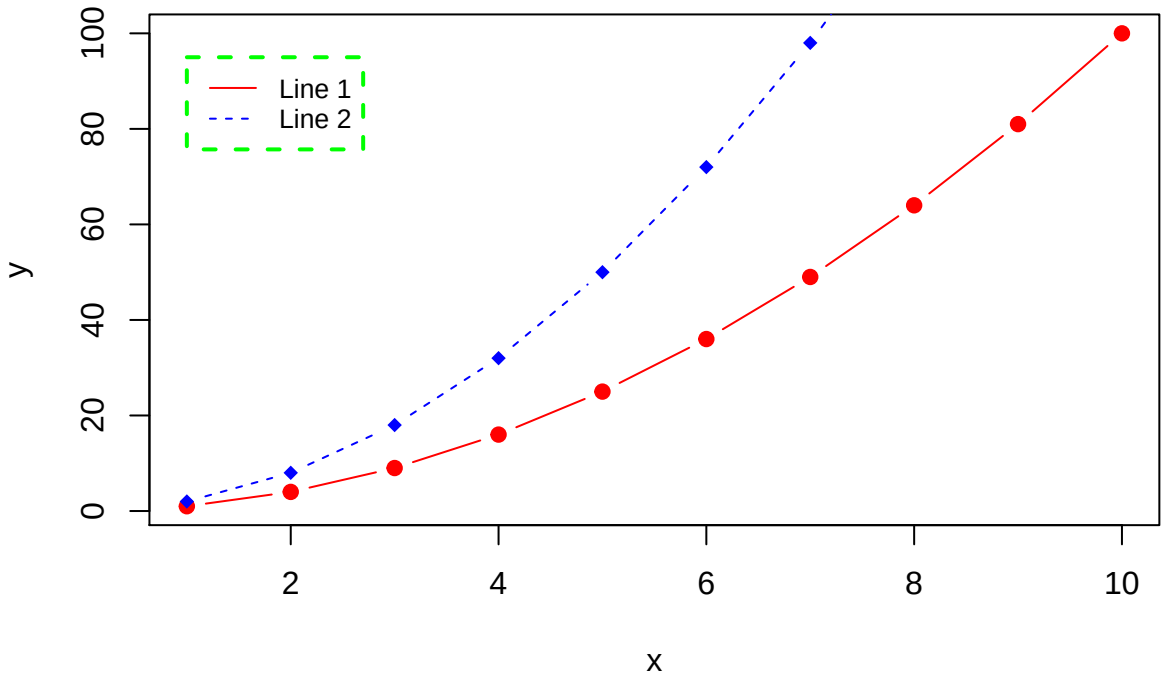
```
x<-1:10; y1=x*x; y2=2*y1
plot(x, y1, type="b", pch=19, col="red", xlab="x", ylab="y")
lines(x, y2, pch=18, col="blue", type="b", lty=2)
legend(1, 95, legend=c("Line 1", "Line 2"),
       col=c("red", "blue"), lty=1:2, cex=0.8)
```



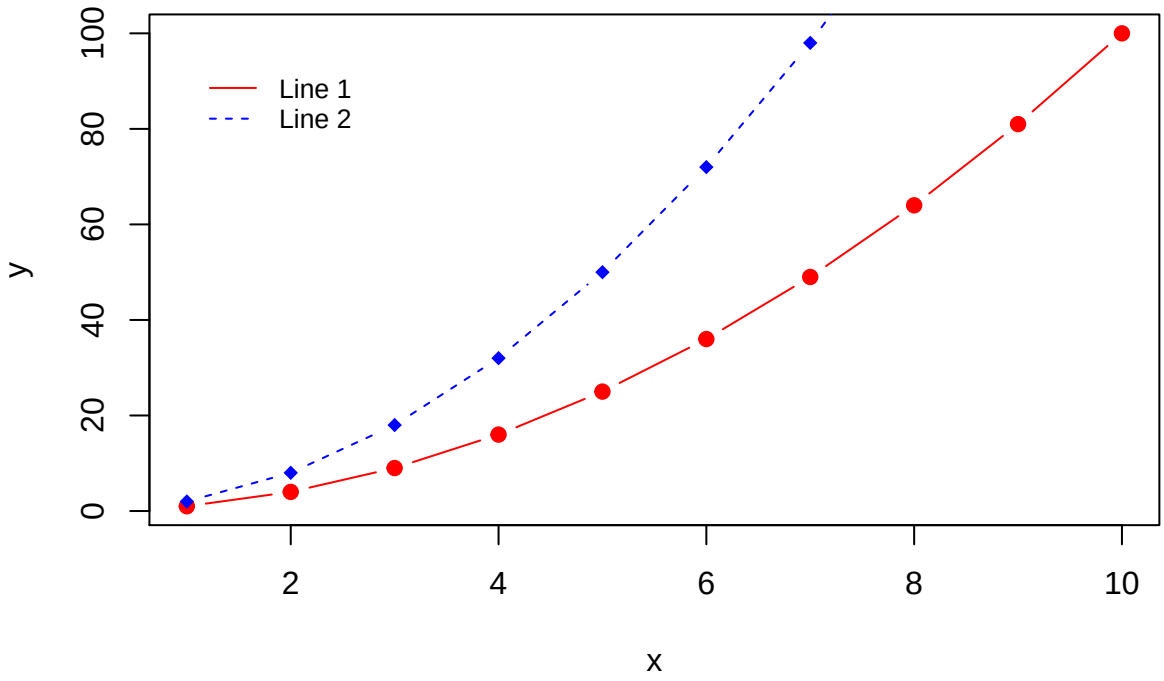

```
x<-1:10; y1=x*x; y2=2*y1
plot(x, y1, type="b", pch=19, col="red", xlab="x", ylab="y")
lines(x, y2, pch=18, col="blue", type="b", lty=2)
legend(1, 95, legend=c("Line 1", "Line 2"),
       col=c("red", "blue"), lty=1:2, cex=0.8,
       title="Line types", text.font=4, bg='lightblue')
```




```
x<-1:10; y1=x*x; y2=2*y1
plot(x, y1, type="b", pch=19, col="red", xlab="x", ylab="y")
lines(x, y2, pch=18, col="blue", type="b", lty=2)
legend(1, 95, legend=c("Line 1", "Line 2"),
       col=c("red", "blue"), lty=1:2, cex=0.8,
       box.lty=2, box.lwd=2, box.col="green")
```

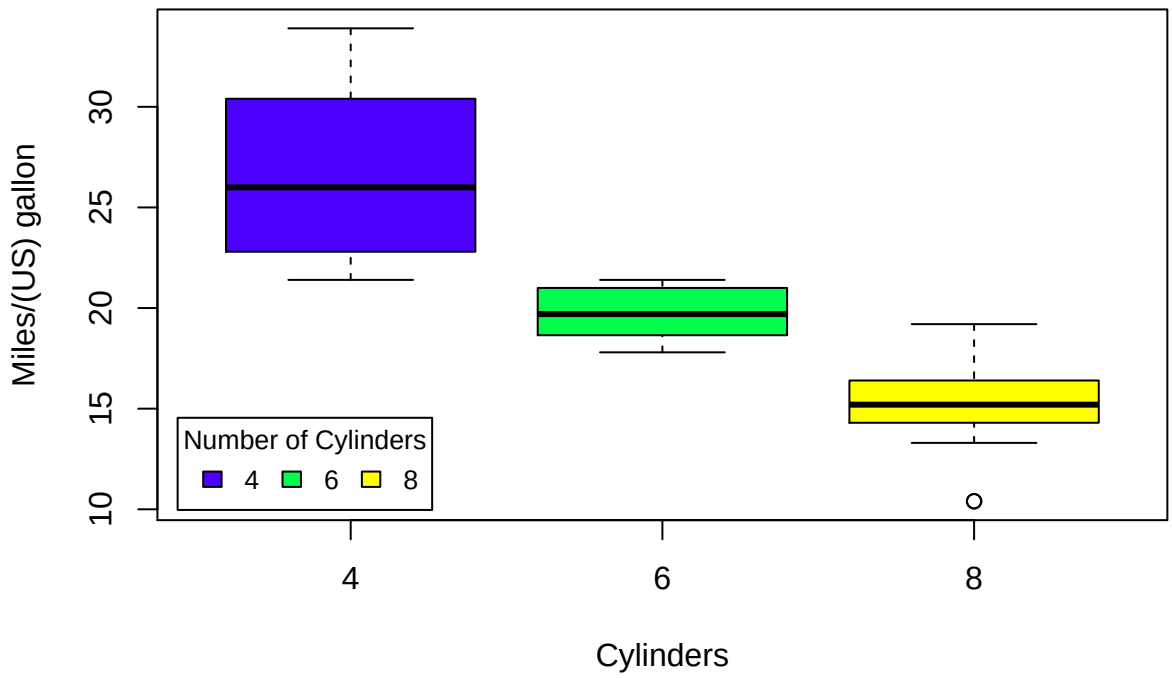



```
x<-1:10; y1=x*x; y2=2*y1
plot(x, y1, type="b", pch=19, col="red", xlab="x", ylab="y")
lines(x, y2, pch=18, col="blue", type="b", lty=2)
legend(1, 95, legend=c("Line 1", "Line 2"),
       col=c("red", "blue"), lty=1:2, cex=0.8,
       box.lty=0)
```




```
boxplot(mtcars$mpg~mtcars$cyl,
        xlab="Cylinders", ylab="Miles/(US) gallon",
        col=topo.colors(3))

legend("bottomleft", inset=.02, title="Number of Cylinders",
   c("4","6","8"), fill=topo.colors(3), horiz=TRUE, cex=0.8)
```



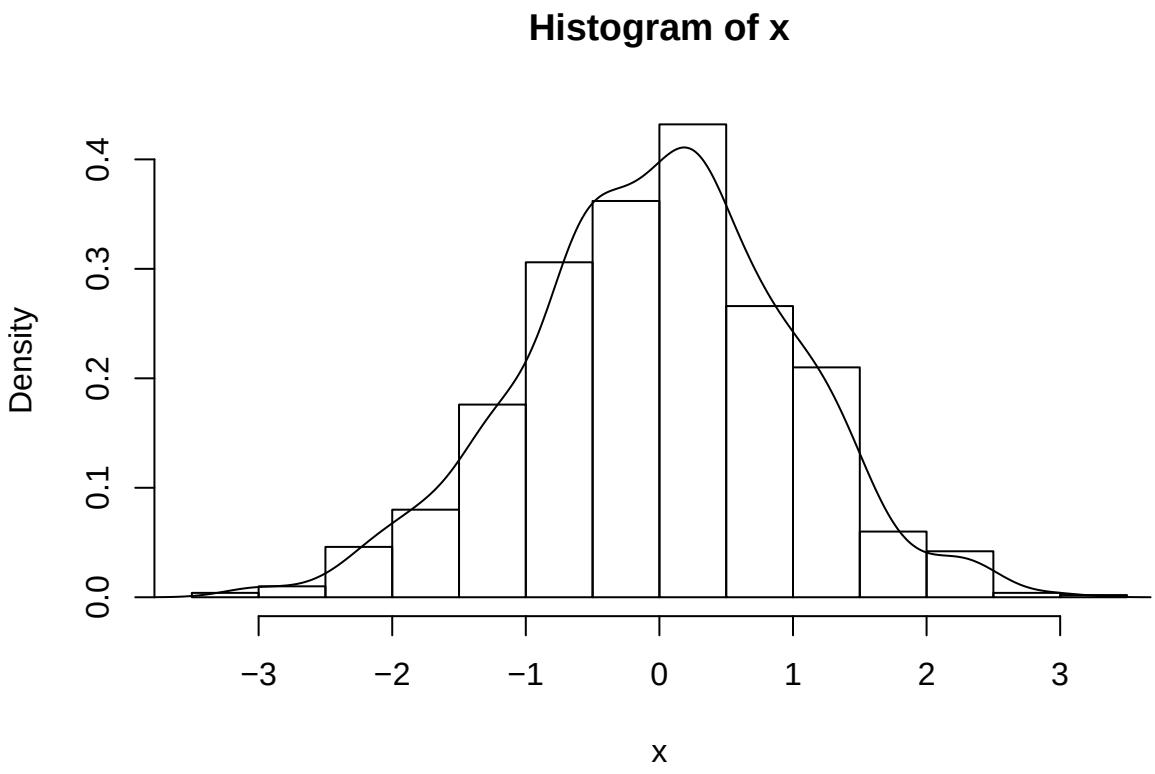

### Generowanie rozkładu normalnego

Składnia: `rnorm(n, mean = 0, sd = 1)`. Jako wynik otrzymujemy wektor `n` obserwacji.

### Histogram i wykres gęstości

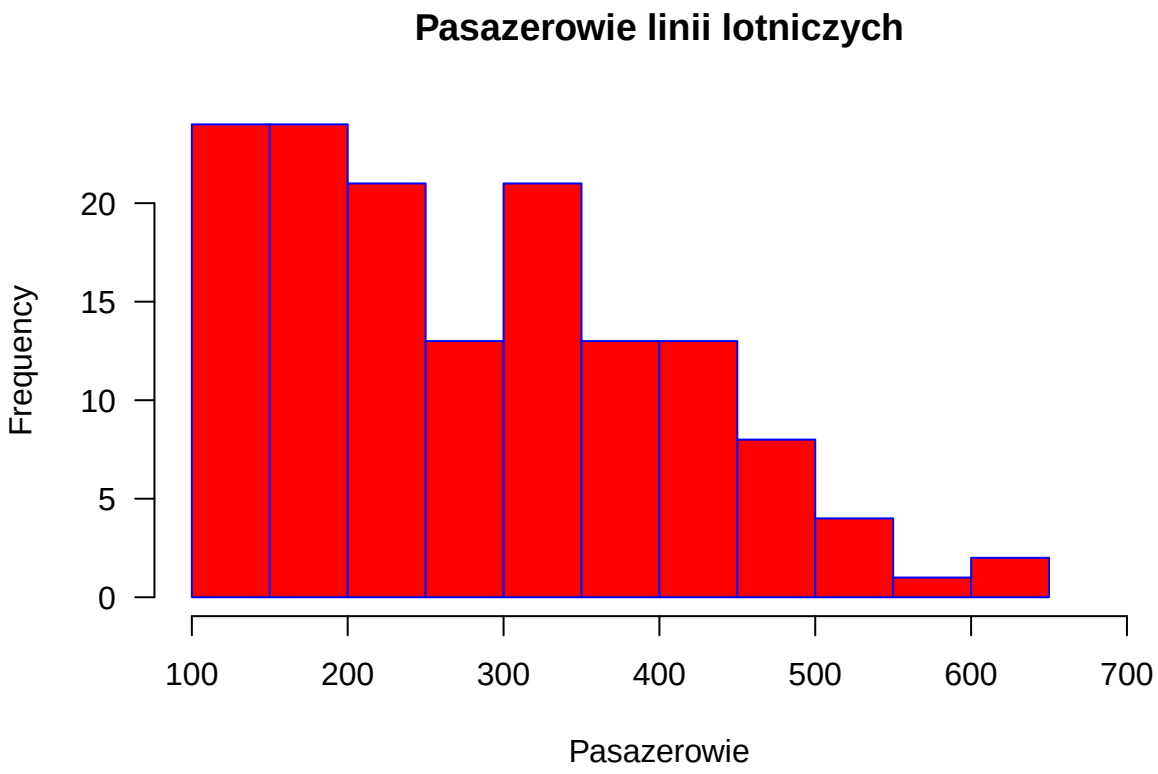
Parametr `prob = TRUE` odpowiada za wyświetlanie gęstości a nie liczebności.

```
x<-rnorm(1000)
hist(x, prob = TRUE)
lines(density(x), xlab="", ylab="", main="")
```



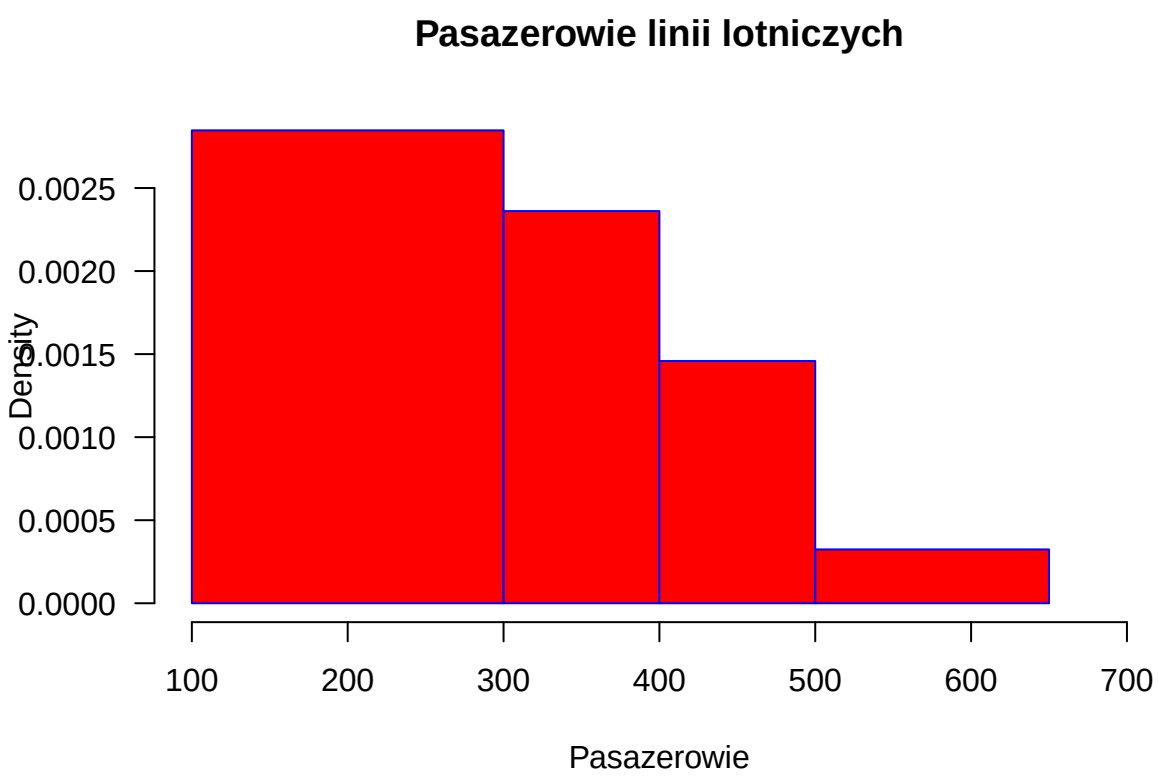

`breaks` określa punkty podziałów. Może być liczbą (ale zaokrąglenie do "piątek").

```
hist(AirPassengers, main="Pasażerowie linii lotniczych", xlab="Pasażerowie",
     border="blue", col="red", xlim=c(100,700), las=1,
     breaks=9)
```

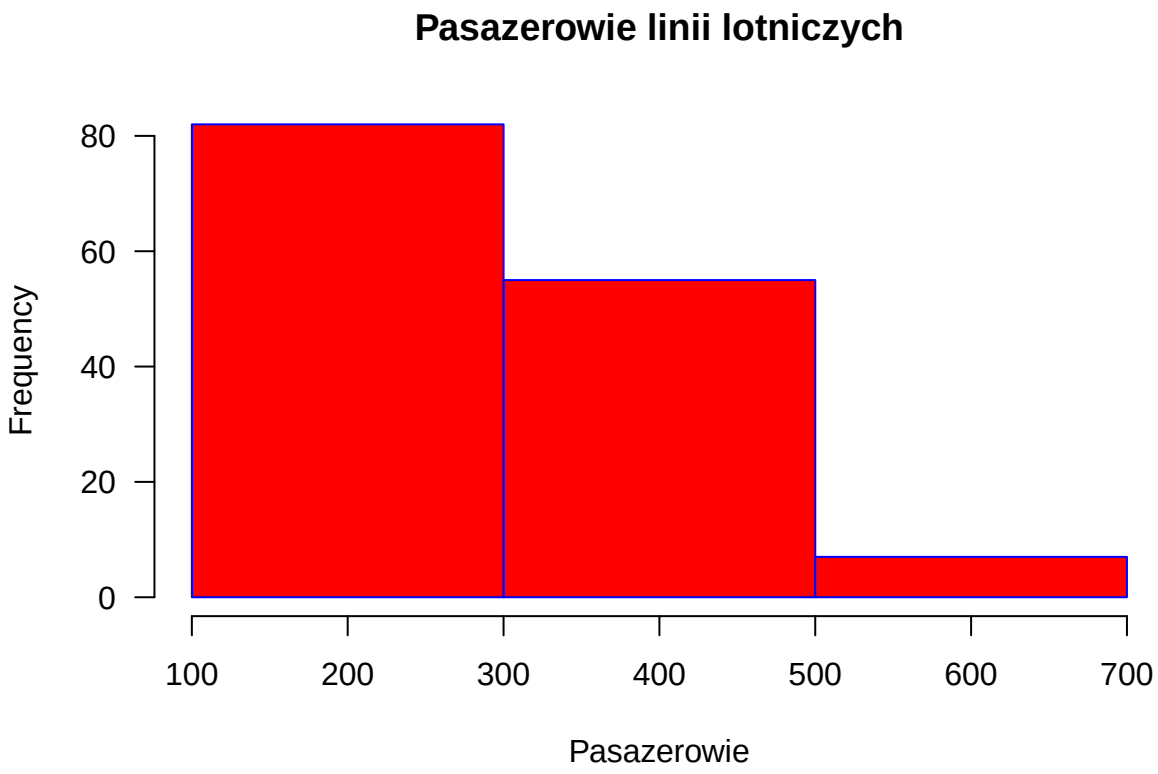



Druga opcja to podanie wektora. Ale ostrożnie.

```
hist(AirPassengers, main="Pasażerowie linii lotniczych", xlab="Pasażerowie",
     border="blue", col="red", xlim=c(100,700), las=1,
     breaks=c(100,300,400,500,650))
```

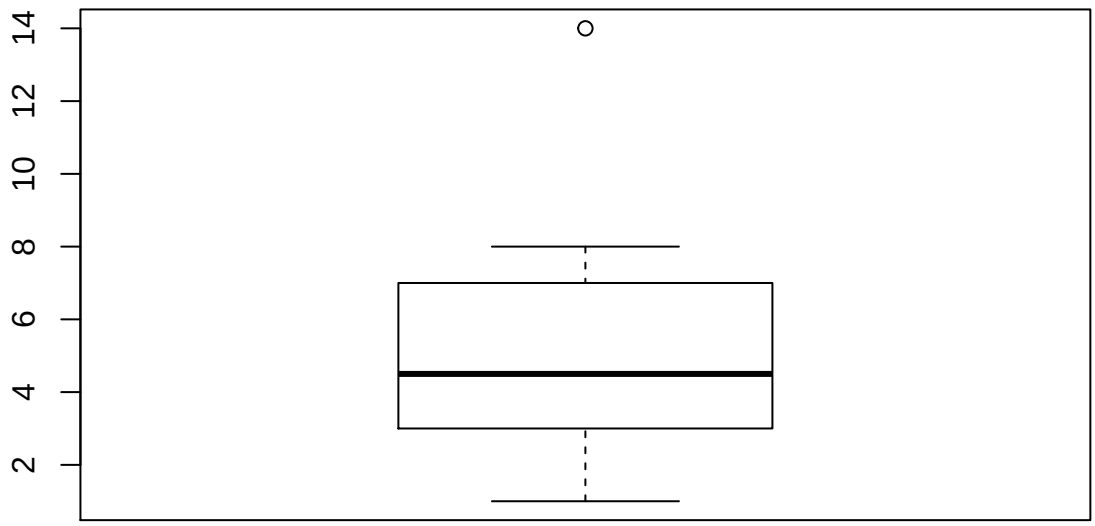



```
hist(AirPassengers, main="Pasażerowie linii lotniczych", xlab="Pasażerowie",
     border="blue", col="red", xlim=c(100,700), las=1,
     breaks=c(100,300,500,700))
```



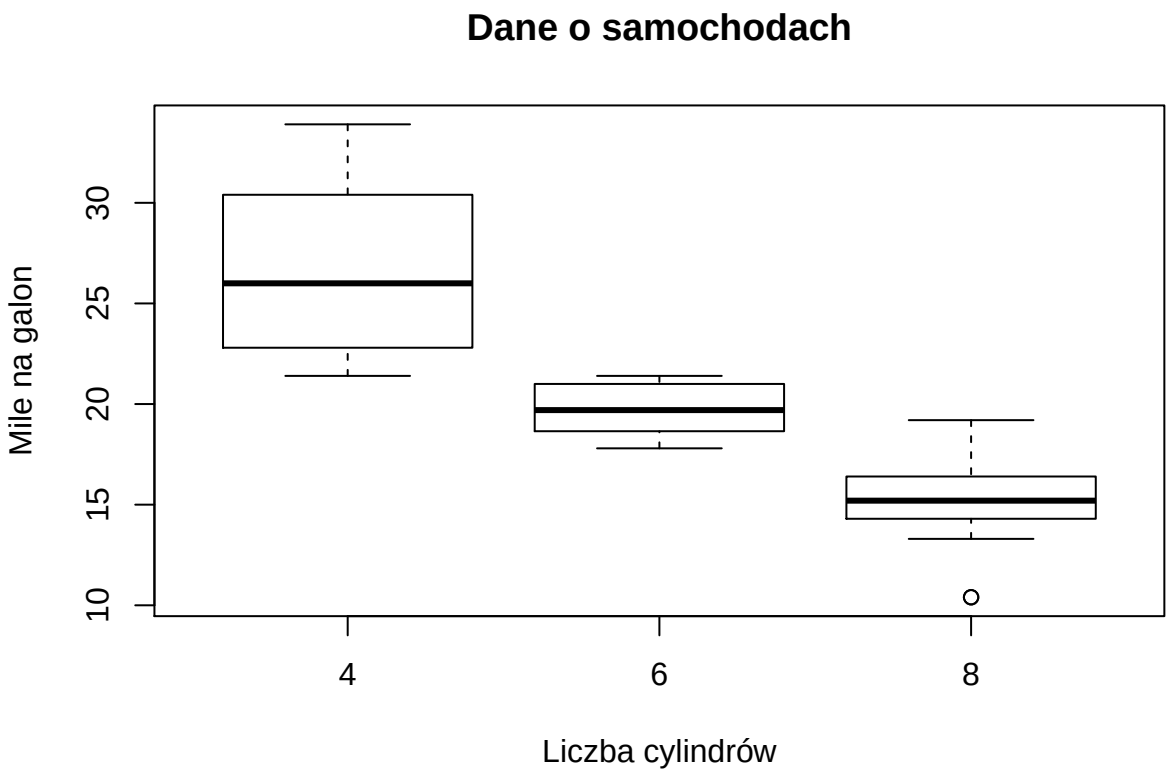

### Wykres pudełkowy - `boxplot`

```
x<-c(3,4,5,6,7,8,1,2,3,14)
boxplot(x)
```



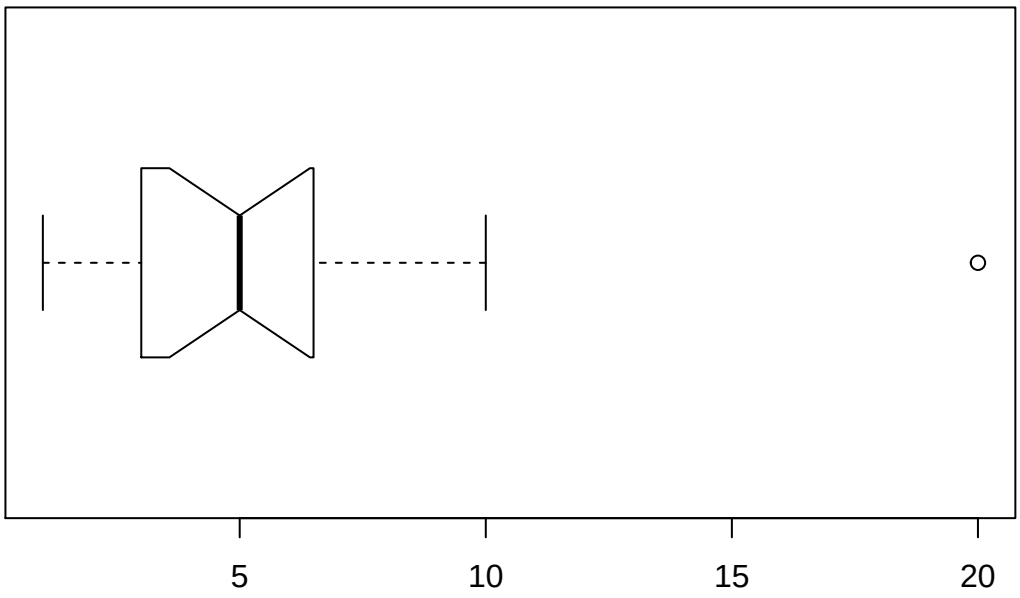

Przy dwóch zmiennych możemy użyć poniższej składni:

```
boxplot(mpg~cyl,data=mtcars, main="Dane o samochodach",
    xlab="Liczba cylindrów", ylab="Mile na galon")
```



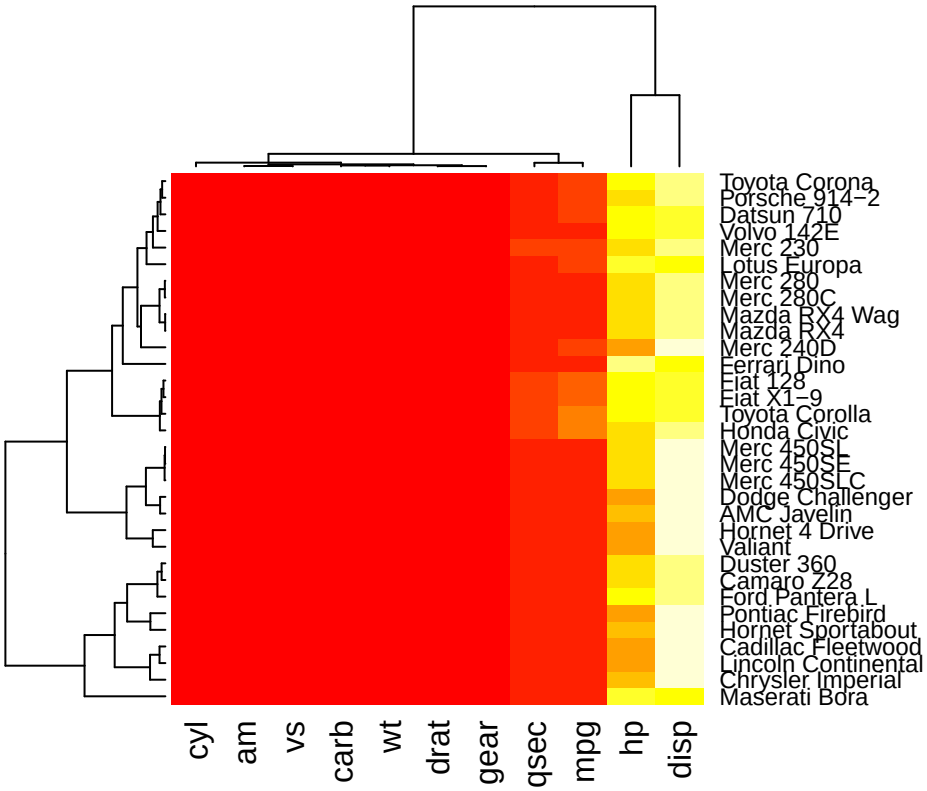

Parametr `horizontal=TRUE` zmienia orientację na poziomą. `notch`- dodaje "zwężenie".

```
x<-c(3,4,5,6,7,3,5,6,7,3,1,2,10,3,20)
boxplot(x, horizontal = TRUE, notch=TRUE)
```

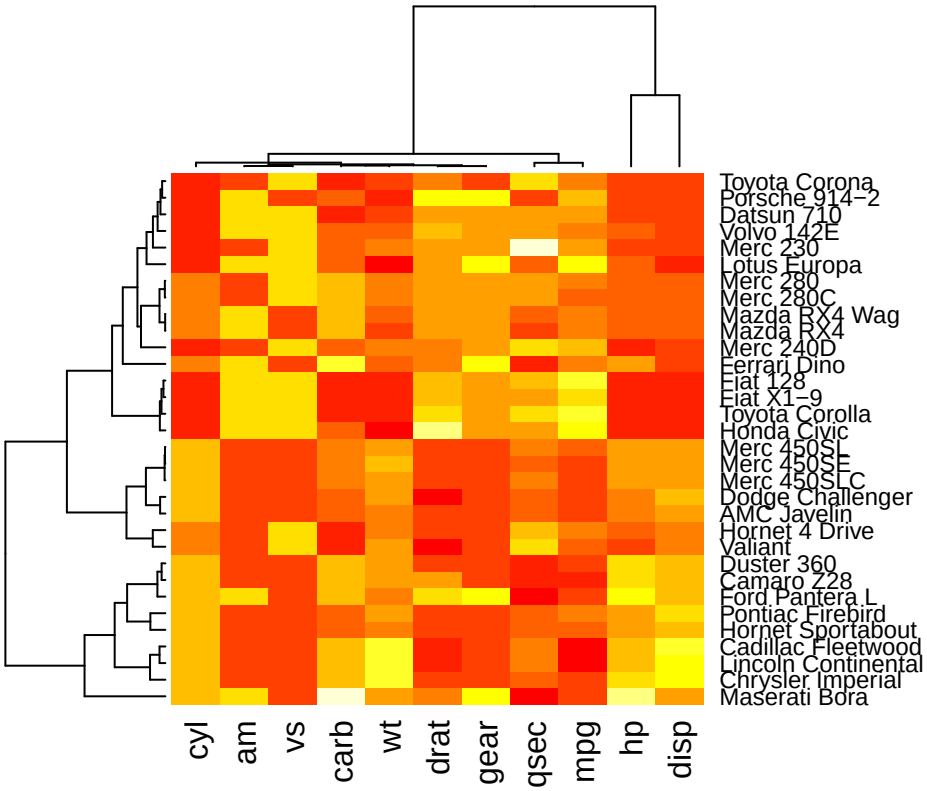



### Mapy ciepła

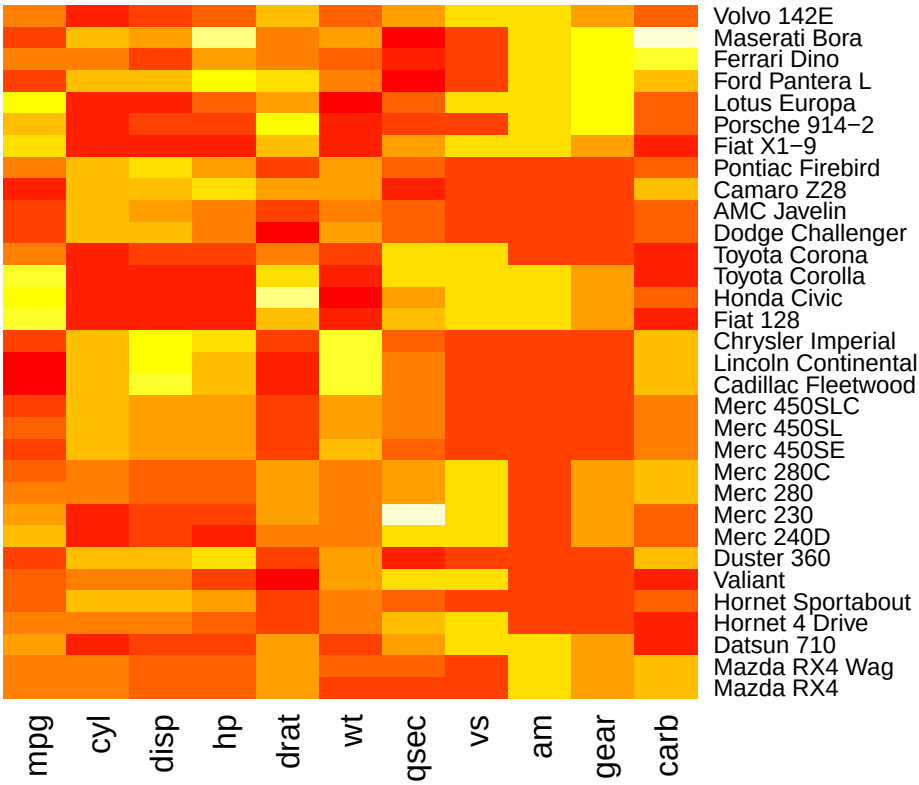
```
data=as.matrix(mtcars)
heatmap(data)
```




```
heatmap(data, scale="column")
```




```
heatmap(data, Colv = NA, Rowv = NA, scale="column")
```



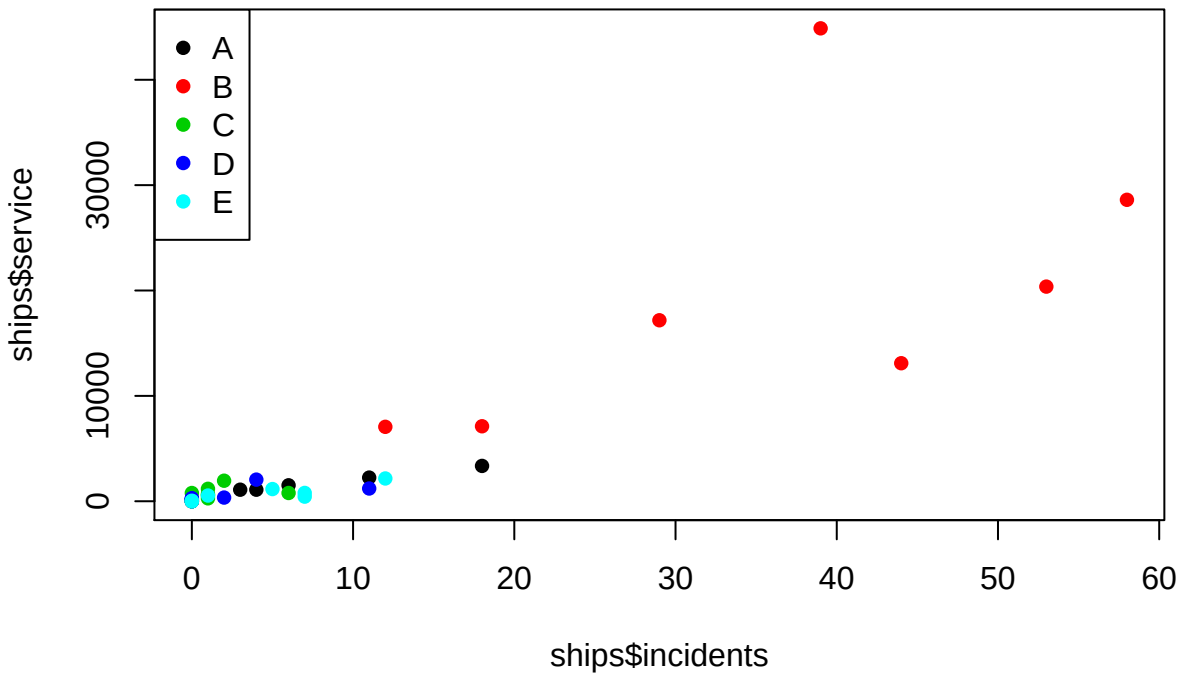

## Wykres punktowy dla trzech zmiennych

Uwaga: warto zwrócić uwagę na parametry kolorów.

```
library(MASS)
head(ships)
```

```
##   type year period service incidents
## 1    A   60     60     127         0
## 2    A   60     75      63         0
## 3    A   65     60    1095         3
## 4    A   65     75    1095         4
## 5    A   70     60    1512         6
## 6    A   70     75    3353        18
```

```
plot(ships$incidents,ships$service,col=ships$type, pch=16)
legend("topleft",legend = levels(ships$type), col = c(1:5), pch=16)
```

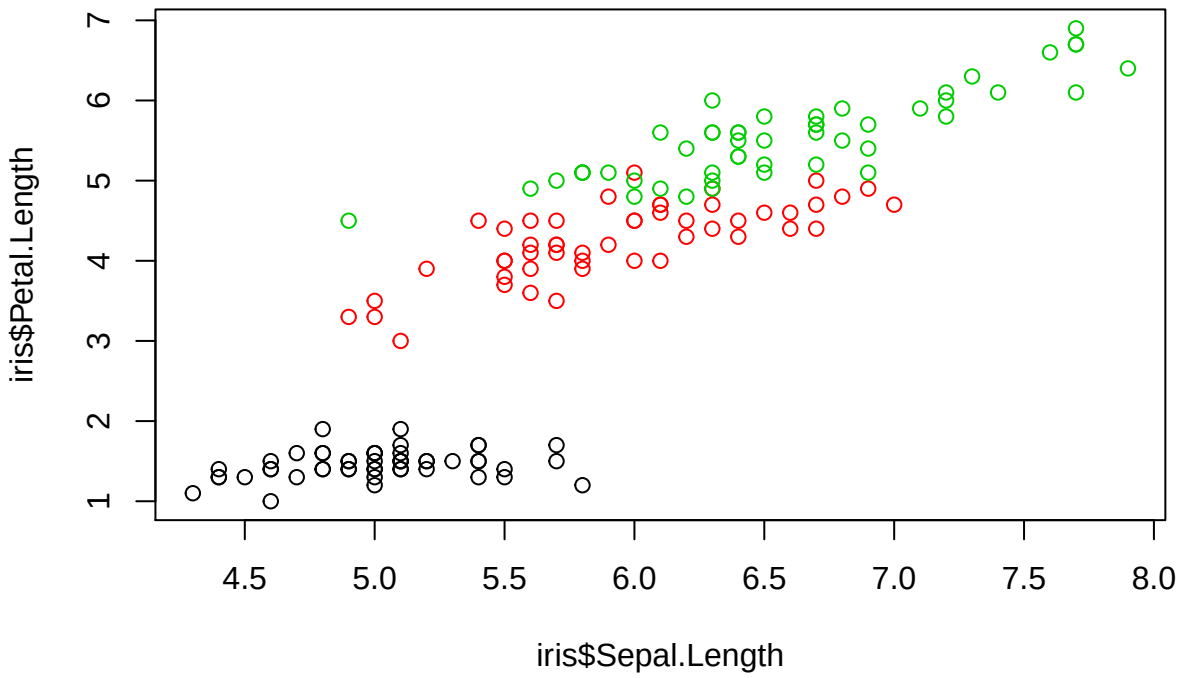



### Baza `iris`

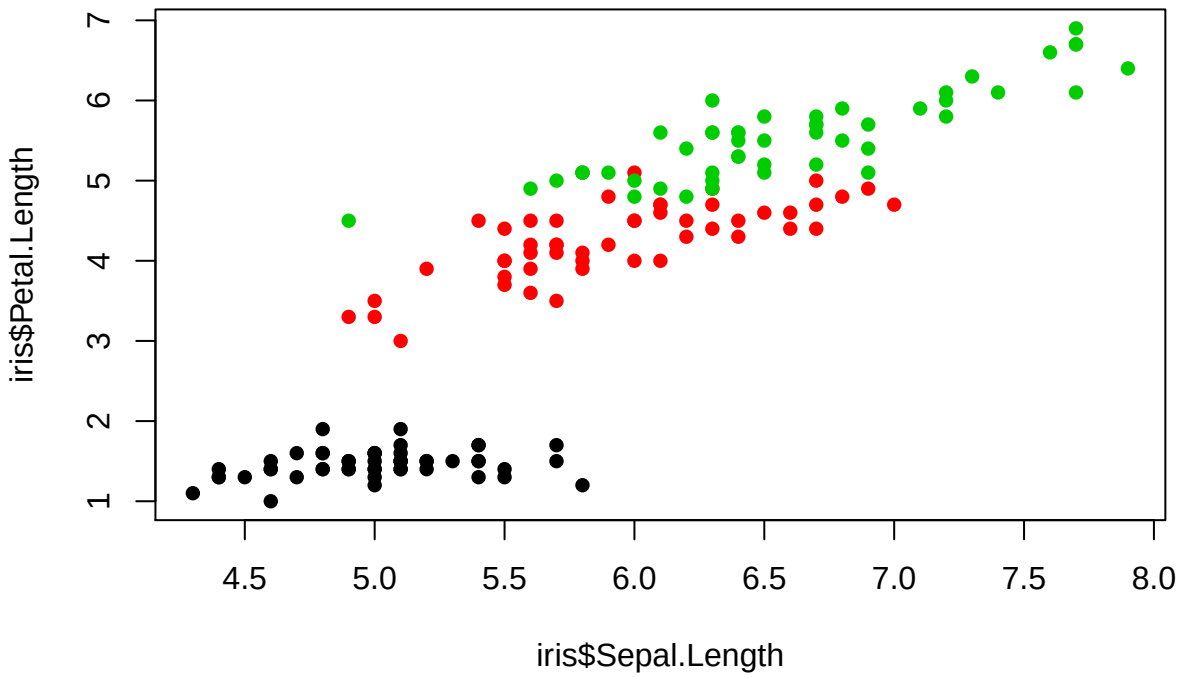
```
data(iris)
head(iris)
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1          5.1         3.5          1.4         0.2  setosa
## 2          4.9         3.0          1.4         0.2  setosa
## 3          4.7         3.2          1.3         0.2  setosa
## 4          4.6         3.1          1.5         0.2  setosa
## 5          5.0         3.6          1.4         0.2  setosa
## 6          5.4         3.9          1.7         0.4  setosa
```

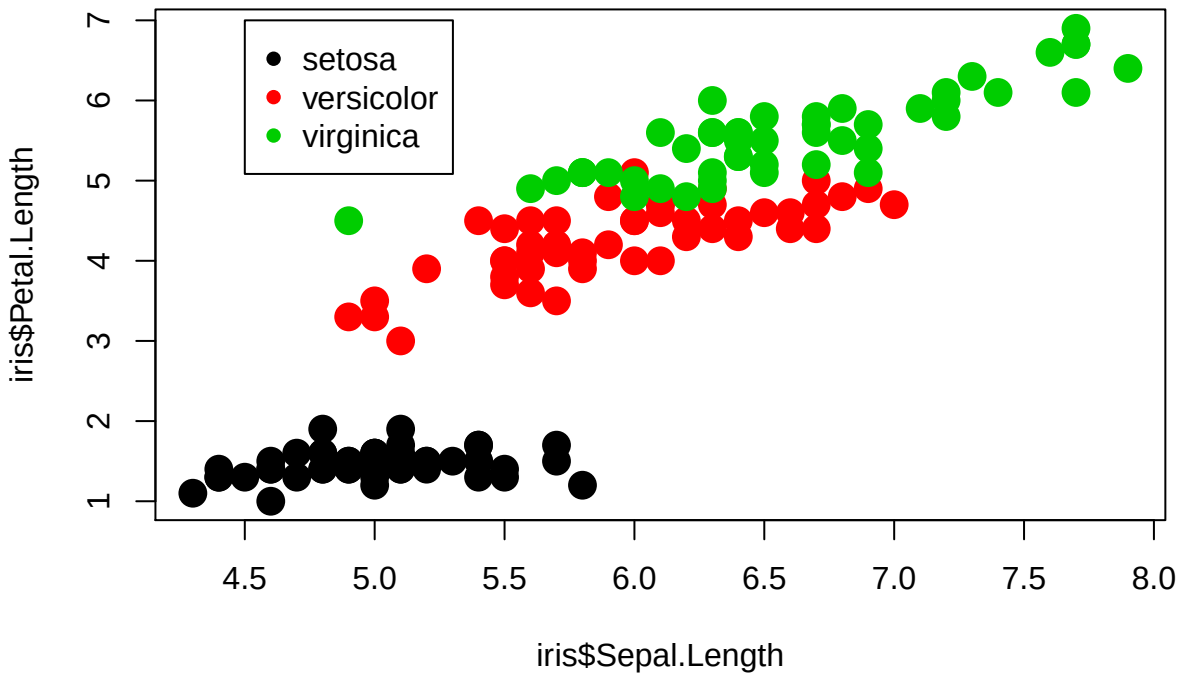
```
plot(iris$Sepal.Length, iris$Petal.Length, col = iris$Species)
```



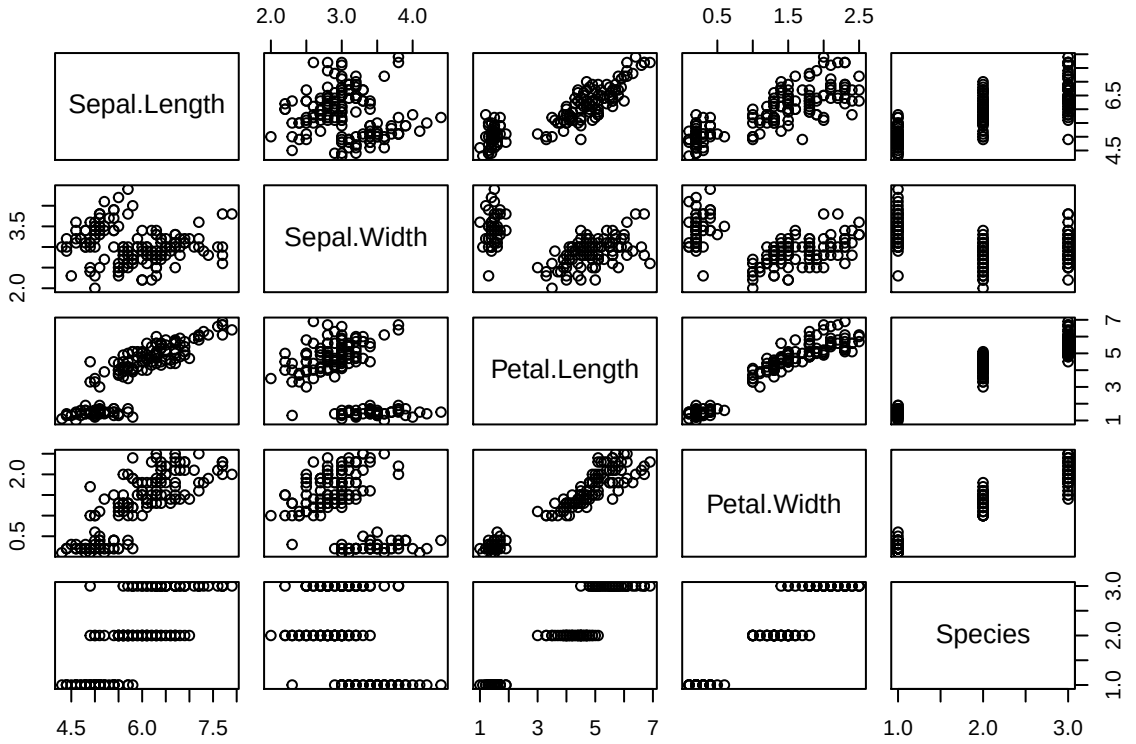

```
plot(iris$Sepal.Length, iris$Petal.Length, col = iris$Species, pch = 16)
```




```
plot(iris$Sepal.Length, iris$Petal.Length,
     col = iris$Species,
     pch = 16,
     cex = 2)
legend(x = 4.5, y = 7, legend = levels(iris$Species), col = c(1:3), pch = 16)
```


setosa
versicolor
virginica
iris$Petal.Length
iris$Sepal.Length
1
2
3
4
5
6
7
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0

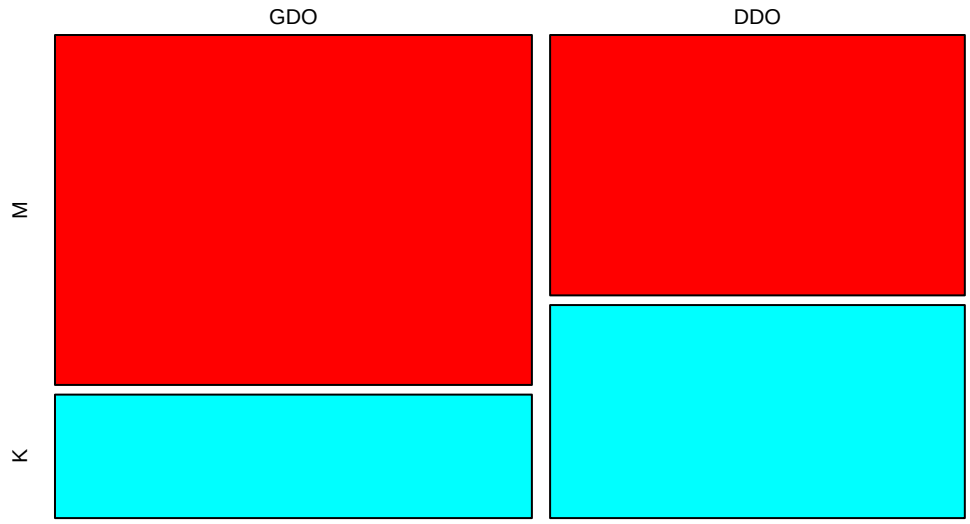
```
pairs(iris)
```



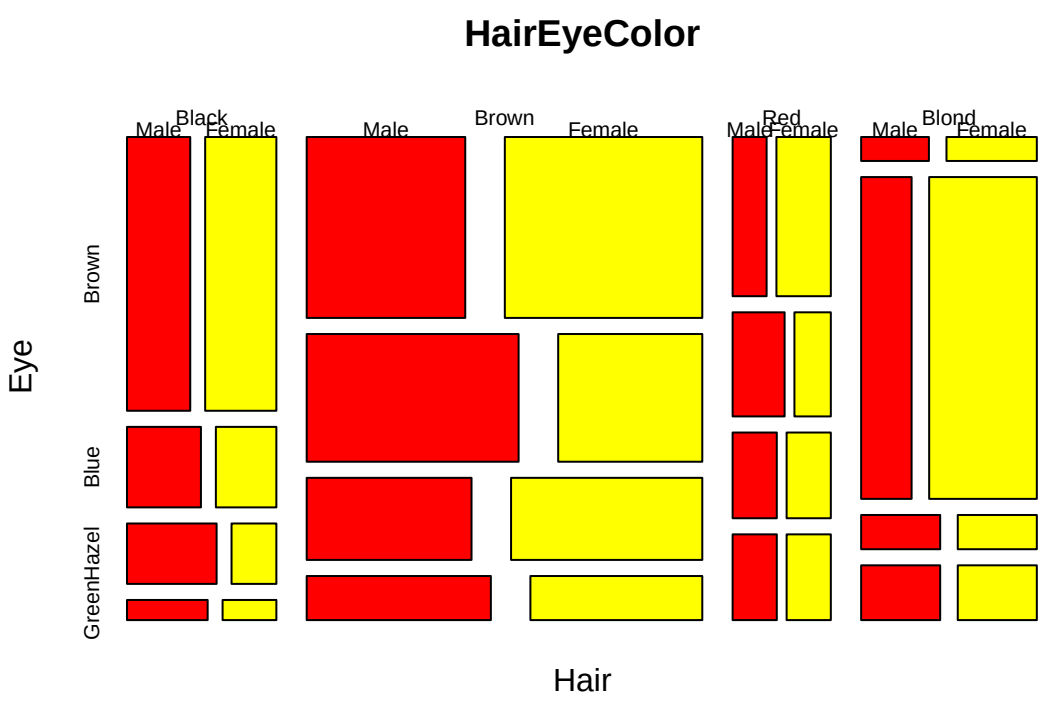

## Wykres mozaikowy

W tym typie wykresu podtrzebujemy zwykle macierzy/tabeli.

```
choroby<-matrix(c(34,12,22,18),ncol=2,byrow=TRUE)
colnames(choroby) <- c("M","K")
rownames(choroby)<- c("GDO", "DDO")
mosaicplot(choroby, color = rainbow(2))
```

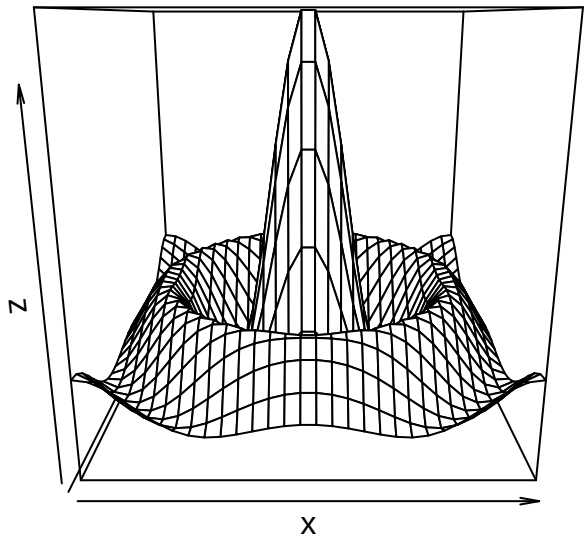



```
mosaicplot(HairEyeColor, col=heat.colors(2))
```




### Wykres w perspektywie

```
x <- seq(-10, 10, length = 30)
y <- x
f <- function(x, y) {r <- sqrt(x ^ 2 + y ^ 2); 10 * sin(r) / r}
z <- outer(x, y, f)
persp(x, y, z)
```




## Mapy - cd.

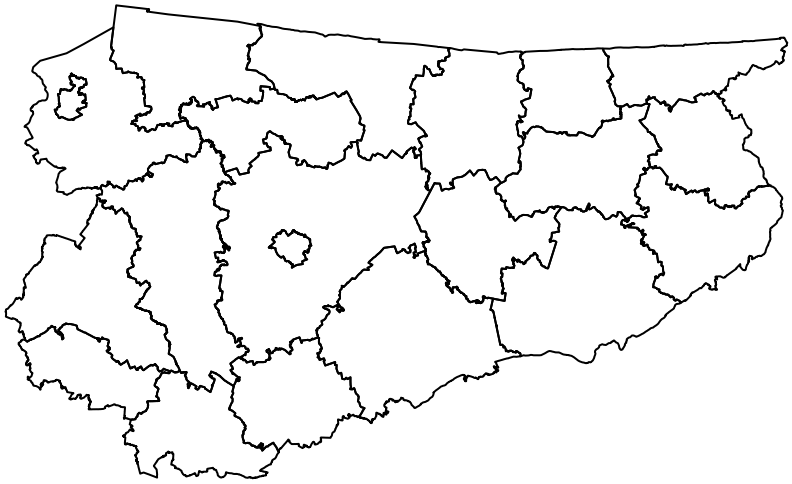
```
library(raster)
```

```
## Loading required package: sp
```

```
##
## Attaching package: 'raster'
```

```
## The following objects are masked from 'package:MASS':
##
##     area, select
```

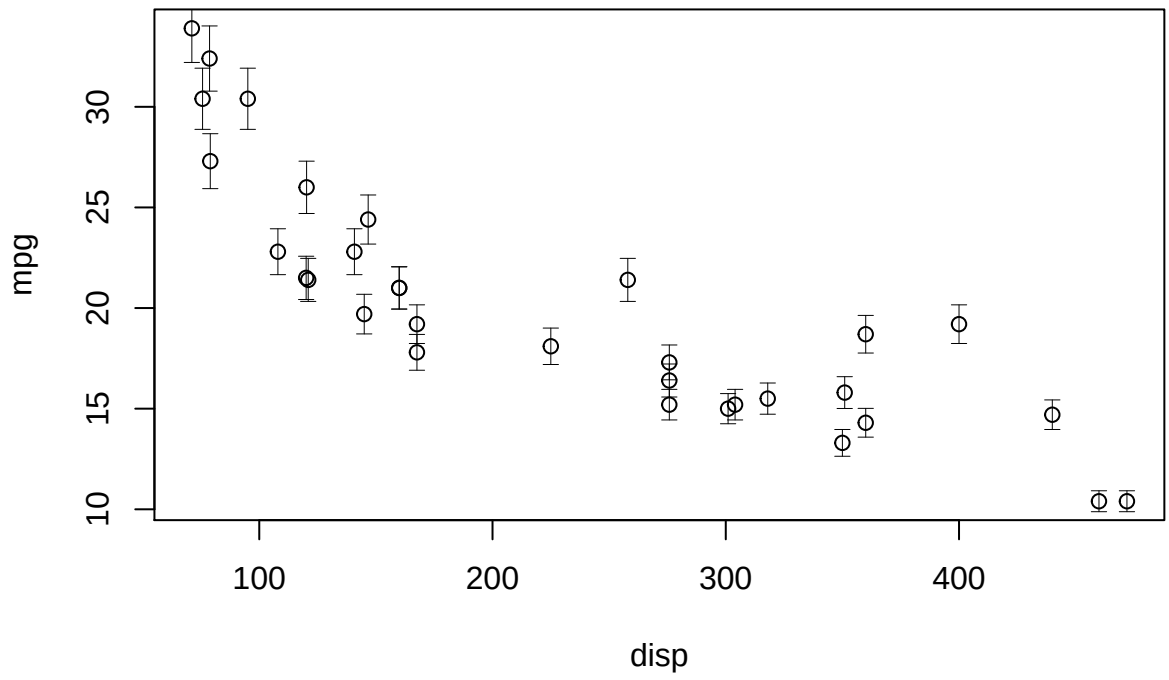
```
library(sp)
map1<- getData('GADM', country='POL', level=2)
map2 <- map1[map1$NAME_1=="Warmińsko-Mazurskie",]
plot(map2)
```



### Strzałki i wykresy z błędami

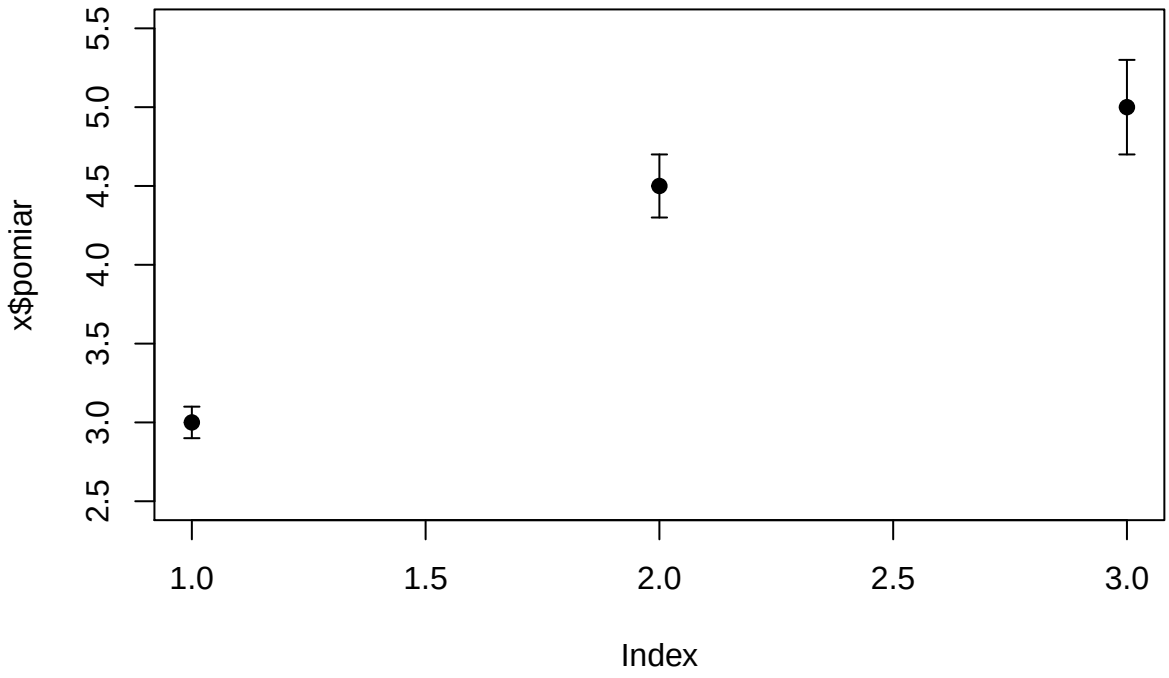
Arrows - link do dokumentacji - link.

```
plot(mpg~disp,data=mtcars)
arrows(x0=mtcars$disp,
       y0=mtcars$mpg*0.95,
       x1=mtcars$disp,
       y1=mtcars$mpg*1.05,
       angle=90,
       code=3,
       length=0.04,
       lwd=0.4)
```




```
a<-c(3,4.5,5)
b<-c(0.1,0.2,0.3)
x<-data.frame(a,b)
colnames(x)<-c("pomiar","blad")
plot(x$pomiar, pch=19, ylim=c(2.5,5.5))

arrows( 1:dim(x)[1],x$pomiar-x$blad,1:dim(x)[1], x$pomiar+x$blad,
       angle=90, code=3,
       length=0.04)
```


x$pomiar
2.5
3.0
3.5
4.0
4.5
5.0
5.5
1.0
1.5
2.0
2.5
3.0
Index