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Numer sprawozdania:	1
Data oddania:	3.04.2022
Prowadzący:	dr inż. Krzysztof Schiff

Probablistyka w zastosowaniach technicznych

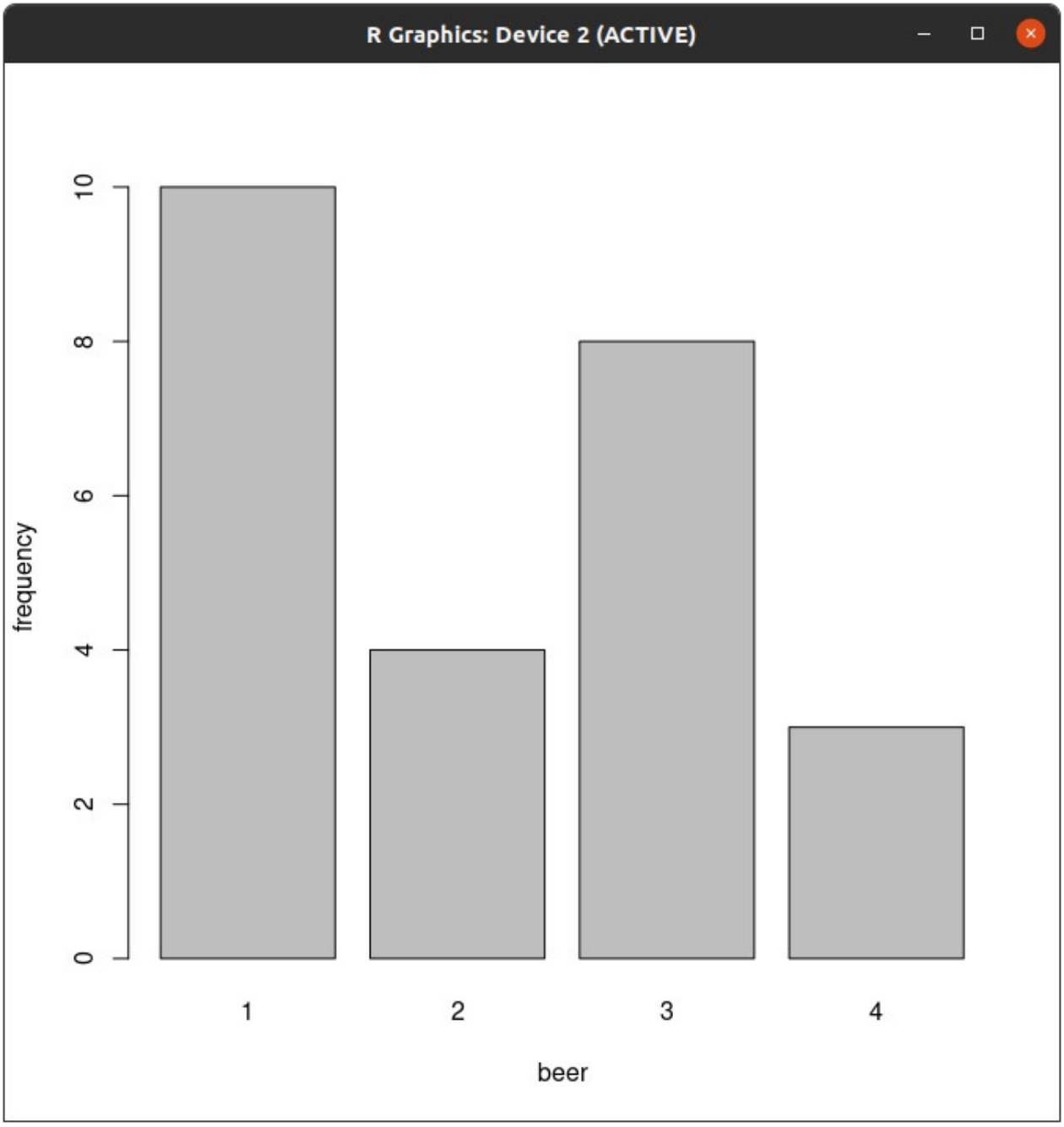
Kraków 2022

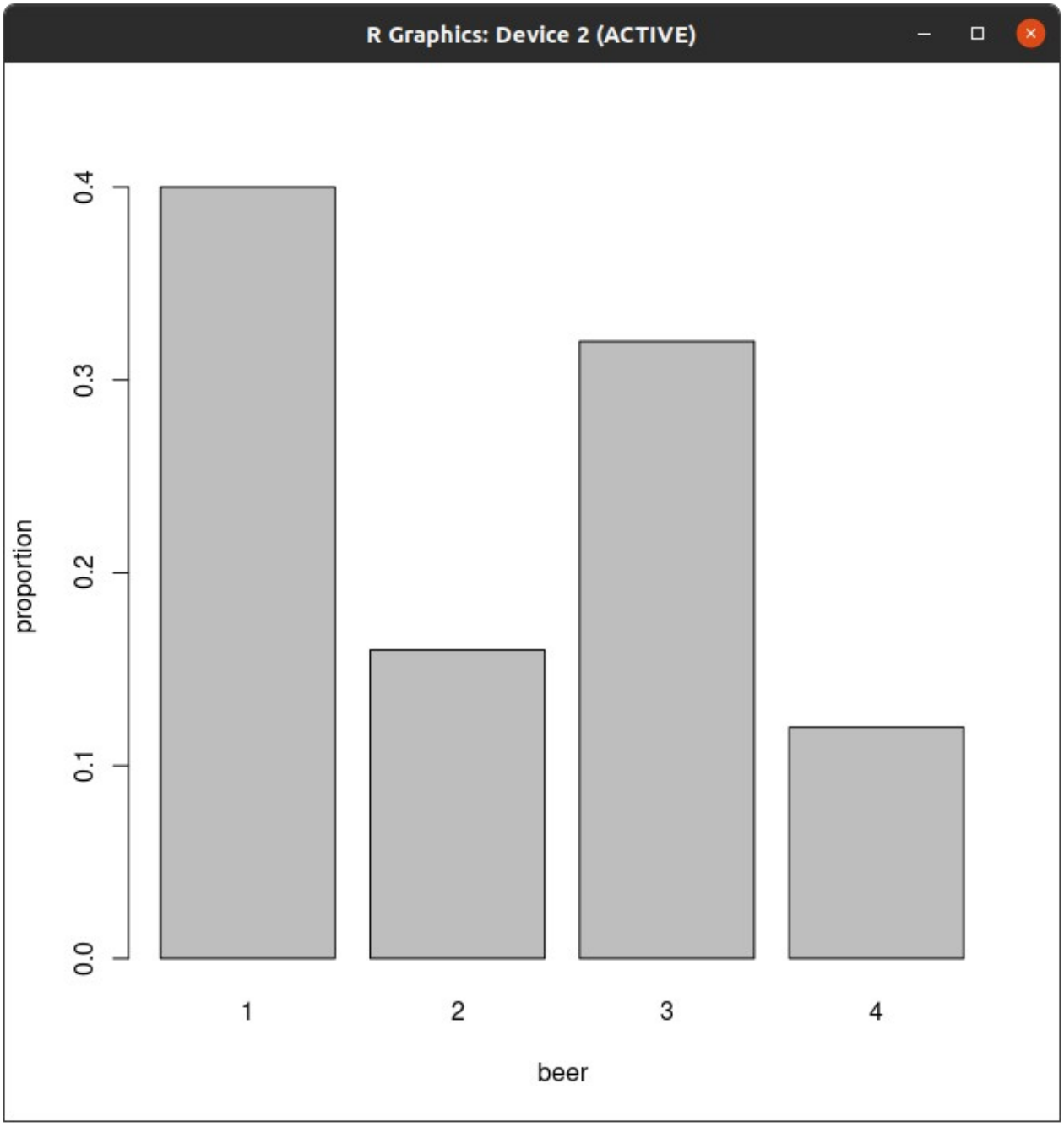
```
> whales = c(74, 122, 235, 111, 292, 111, 211, 133, 156, 79)
> whales
 [1]  74 122 235 111 292 111 211 133 156  79
>
```

```
> Simpsons = c("Homer", 'Marge', "Bart", "Lisa", "Maggie")
> names(Simpsons) = c("dad", "mom", "son", "daughter1", "daughter2")
> names(Simpsons)
[1] "dad"       "mom"       "son"       "daughter1" "daughter2"
> Simpsons
      dad       mom       son daughter1 daughter2
  "Homer"   "Marge"    "Bart"    "Lisa"  "Maggie"
>
```

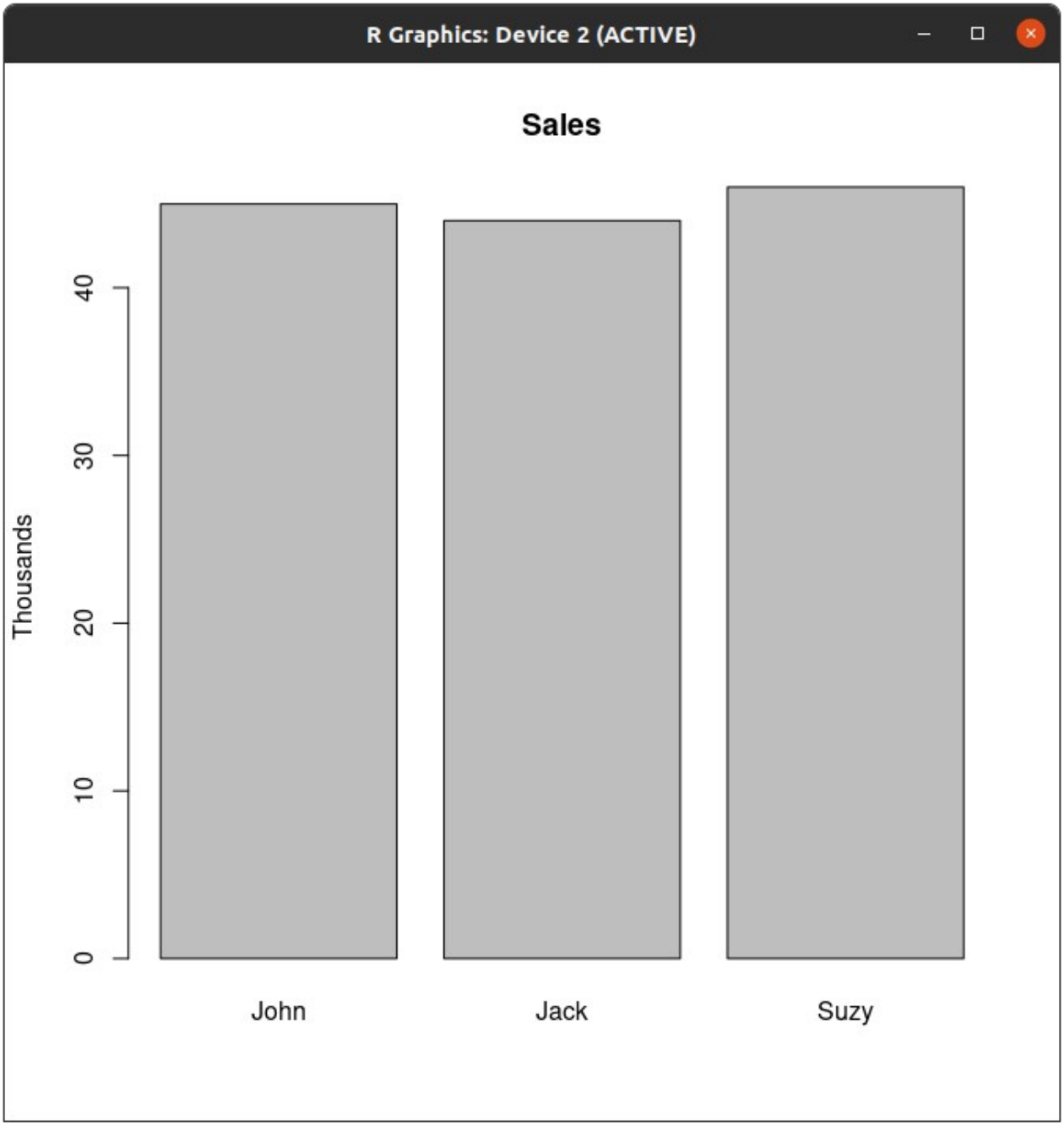
```
> x = c(2, 3, 5, 7, 11)
> xbar = mean(x)
> x-xbar
[1] -3.6 -2.6 -0.6  1.4  5.4
> (x-xbar)^2
[1] 12.96  6.76  0.36  1.96 29.16
> sum((x-xbar)^2)
[1] 51.2
> n = length(x)
> n
[1] 5
> sum((x-xbar)^2) / (n-1)
[1] 12.8
>
```

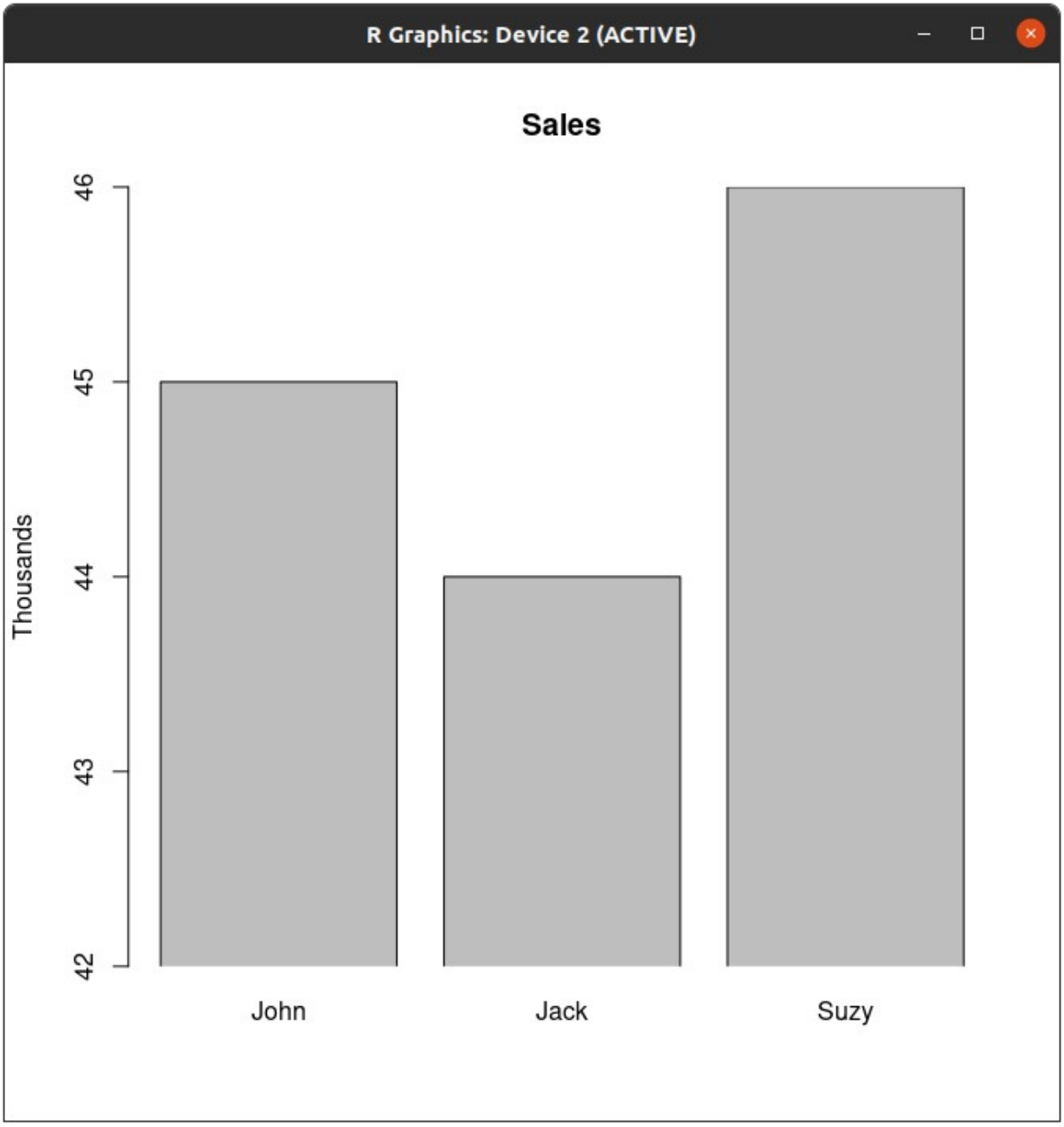
```
> beer = scan()
1: 3
2: 4
3: 1
4: 1
5: 3
6: 4
7: 3
8: 3
9: 1
10: 3
11: 2
12: 1
13: 2
14: 1
15: 2
16: 3
17: 2
18: 3
19: 1
20: 1
21: 1
22: 1
23: 4
24: 3
25: 1
26:
Read 25 items
> barplot(table(beer), xlab="beer", ylab="frequency")
> barplot(table(beer)/length(beer), xlab="beer", ylab="proportion")
>
```


R Graphics: Device 2 (ACTIVE)
frequency
0
2
4
6
8
10
1
2
3
4
beer

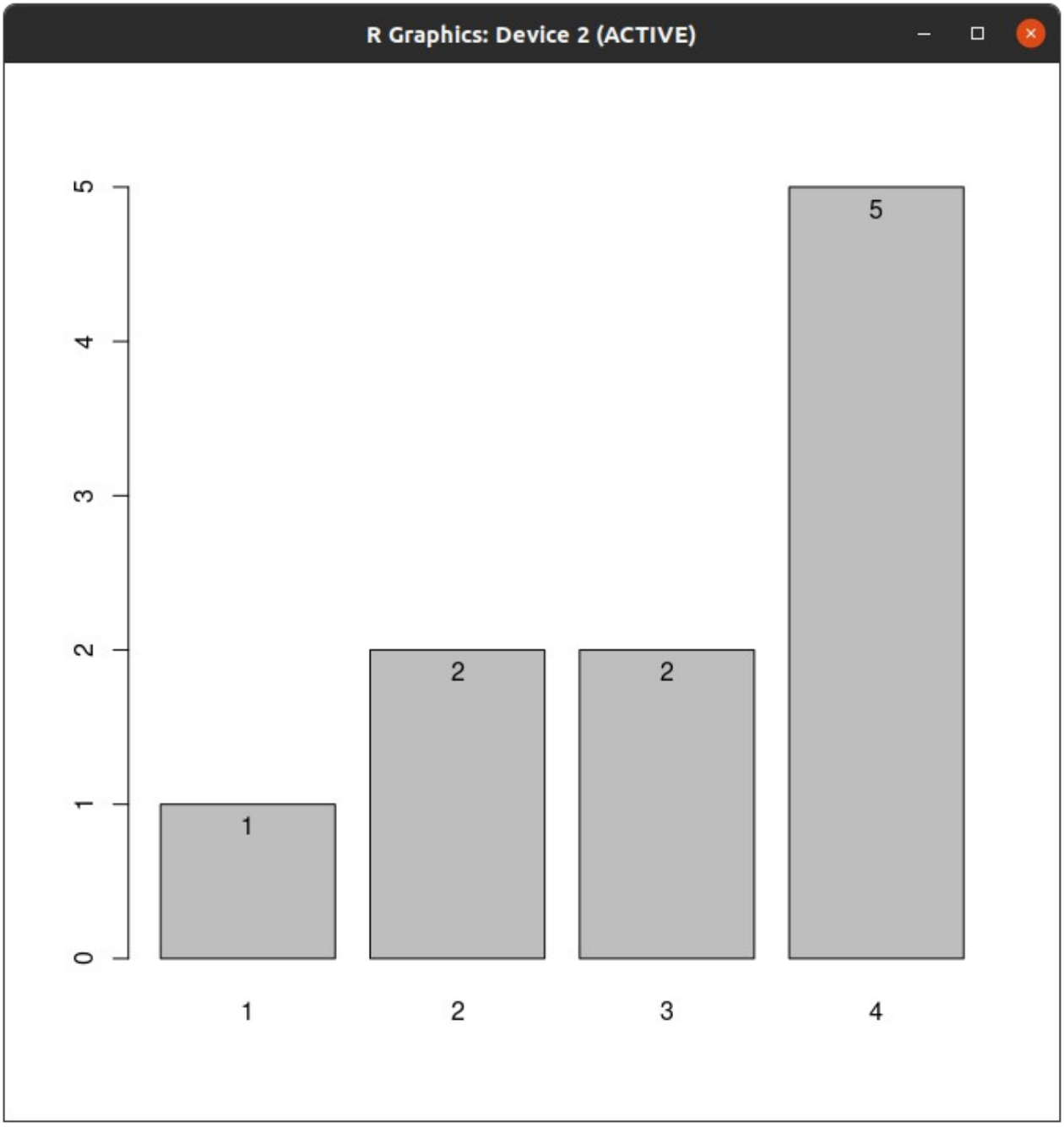



```
> sales = c(45, 44, 46)
> names(sales) = c("John", "Jack", "Suzy")
> barplot(sales, main="Sales", ylab="Thousands")
> barplot(sales, main="Sales", ylab="Thousands", ylim=c(42,46), xpd=FALSE)
>
```

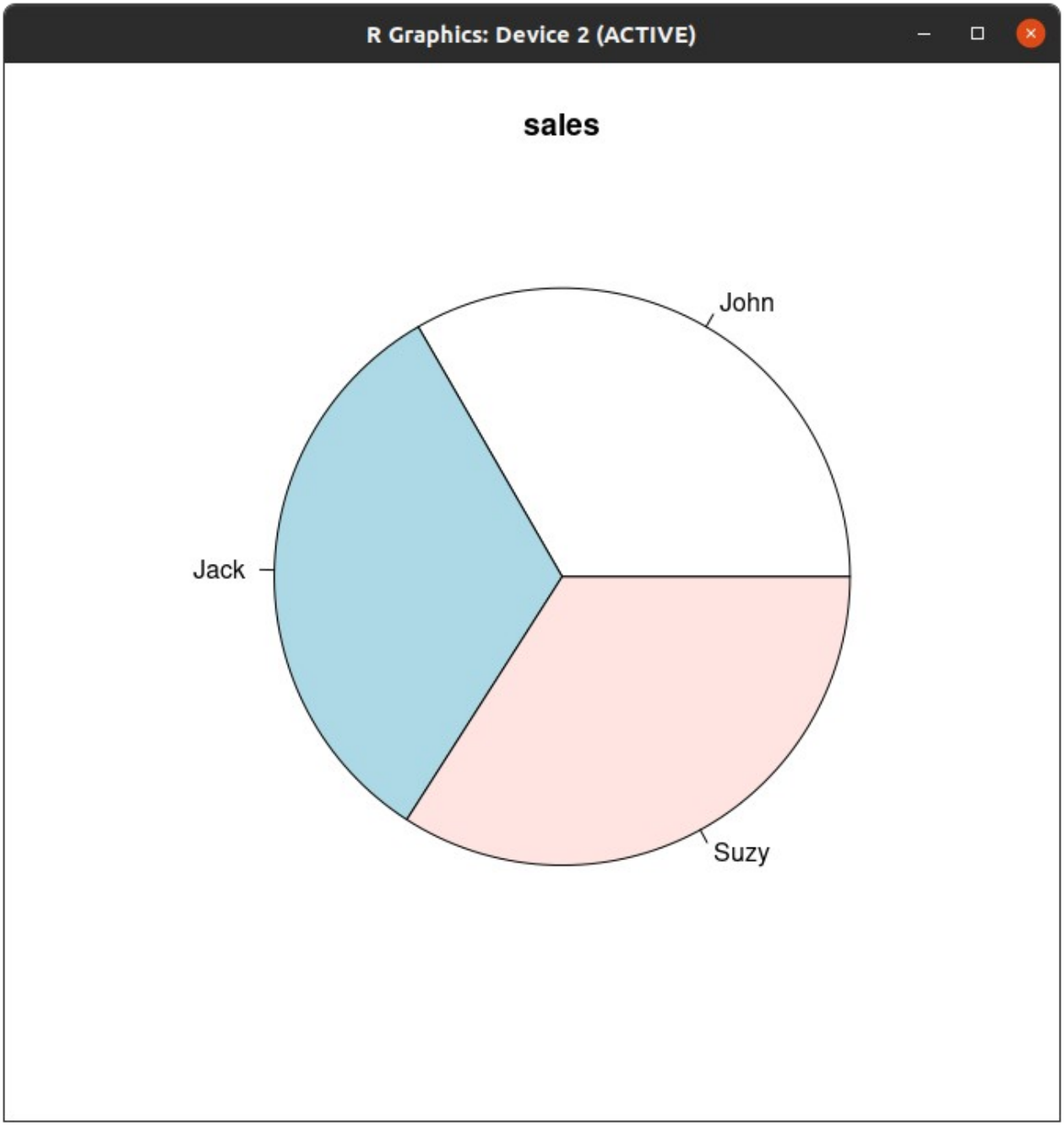

R Graphics: Device 2 (ACTIVE)
Sales
Thousands
0
10
20
30
40
John
Jack
Suzy



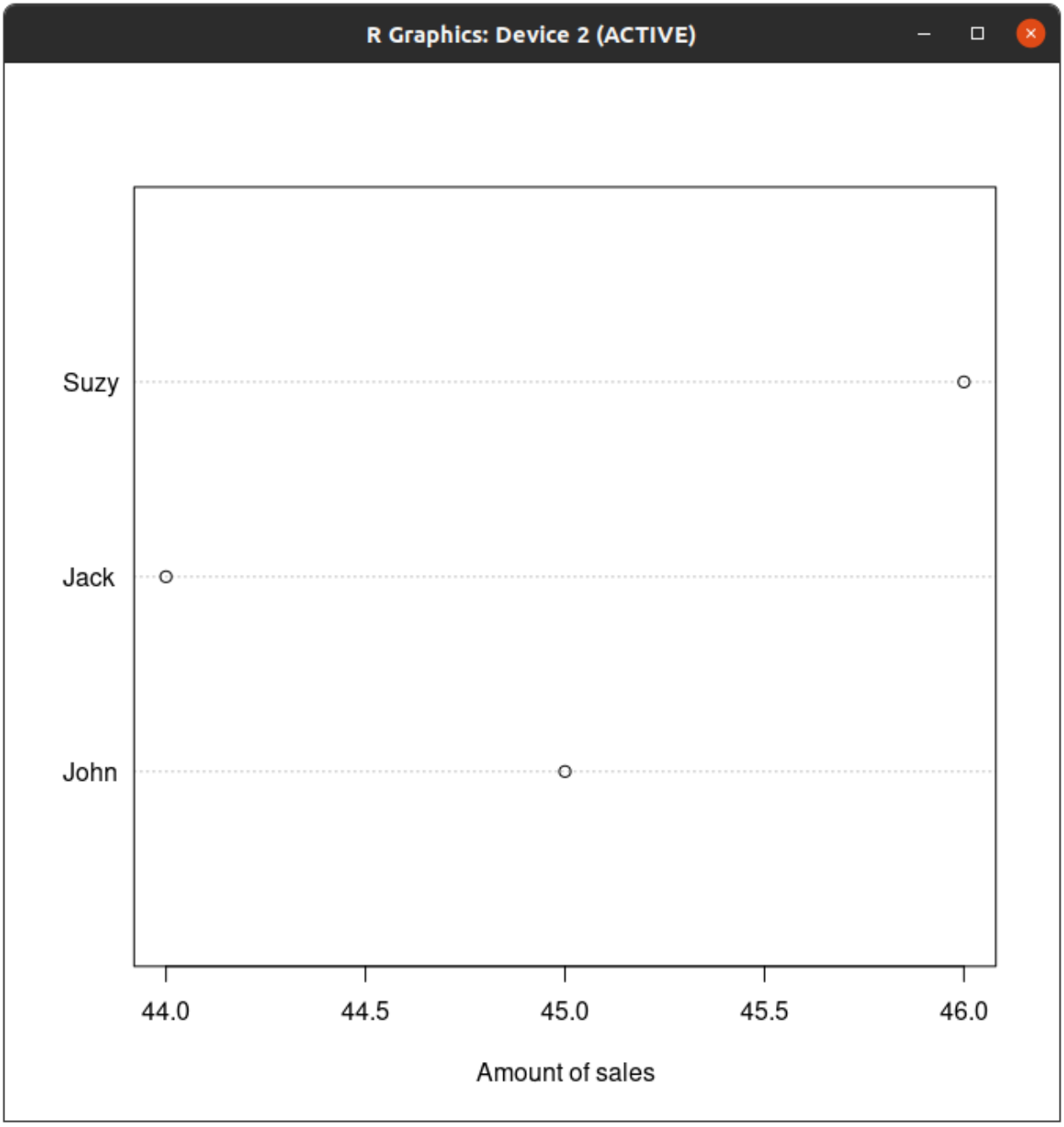

```
> our.data = c(1, 2, 2, 5); names(our.data) = 1:4
> bp = barplot(our.data)
> text(bp, our.data, labels = our.data, pos = 1)
>
```




```
> sales
John Jack Suzy
  45   44   46
> pie(sales, main="sales")
>
```



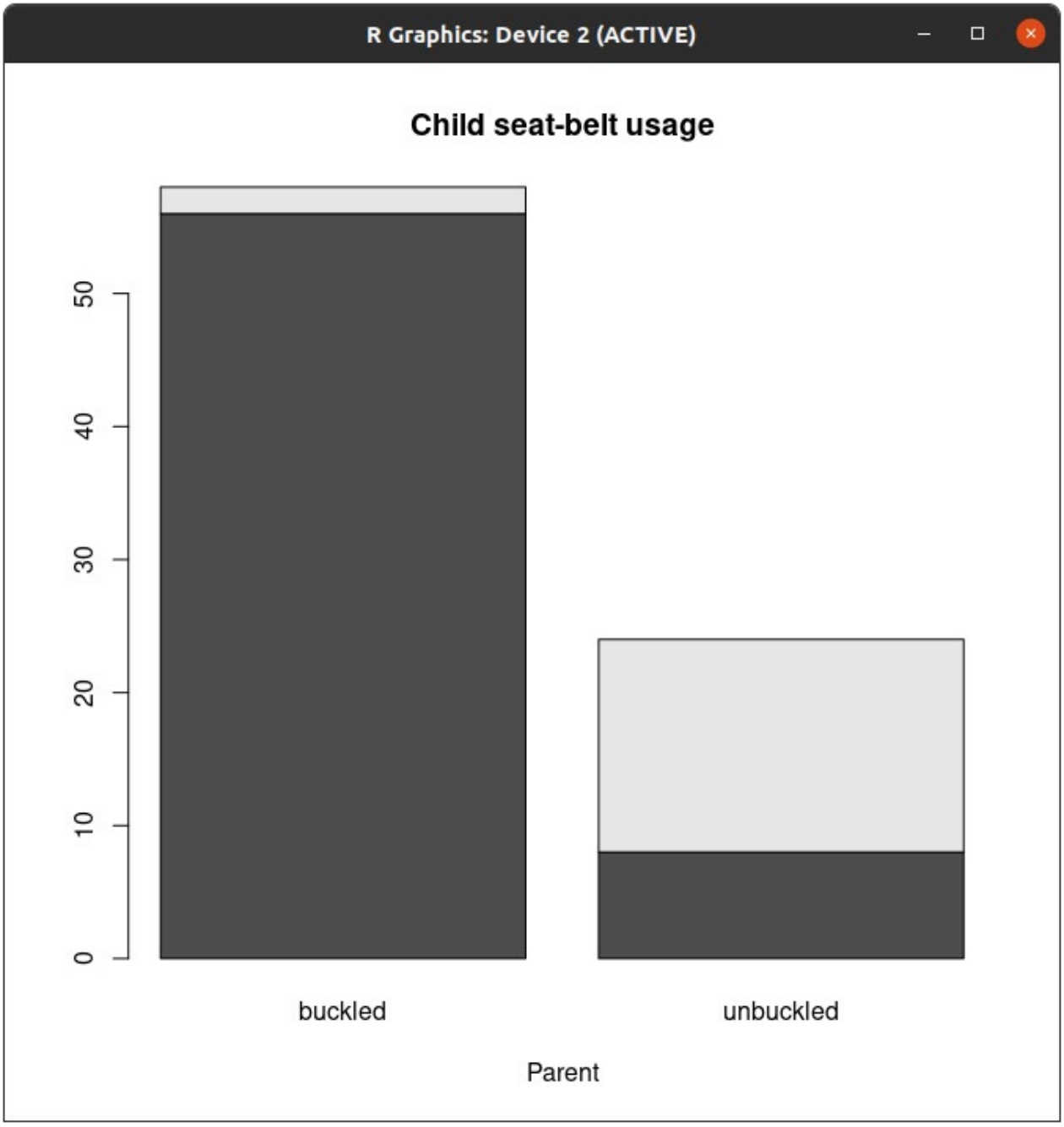

```
> dotchart(sales, xlab="Amount of sales")
>
```


R Graphics: Device 2 (ACTIVE)
Suzy
Jack
John
44.0
44.5
45.0
45.5
46.0
Amount of sales

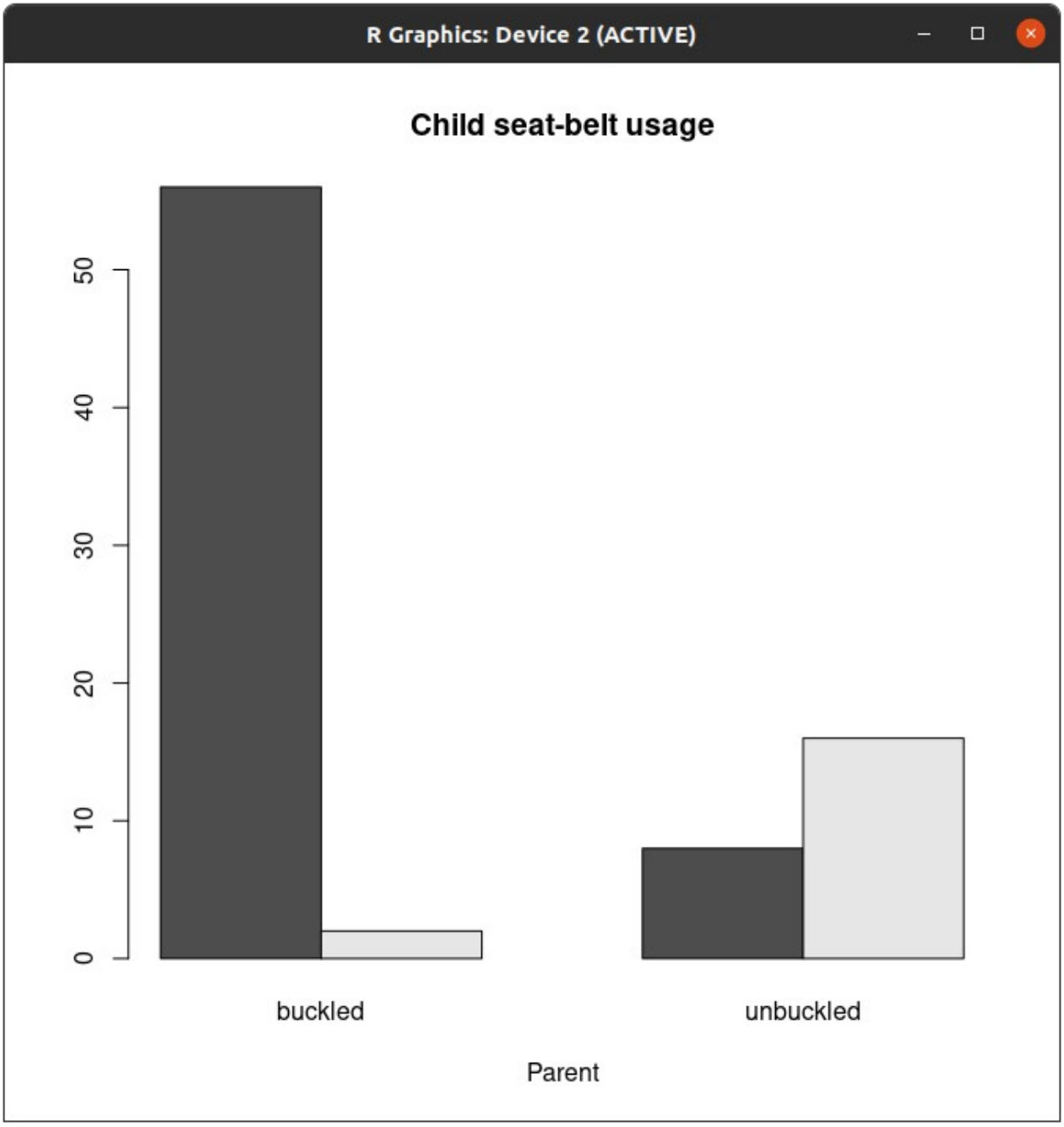
```
> rbind(c(56, 8), c(2, 16))
     [,1] [,2]
[1,]   56    8
[2,]    2   16
> cbind(c(56, 2), c(8, 16))
     [,1] [,2]
[1,]   56    8
[2,]    2   16
> x = matrix(c(56, 2, 8, 16), nrow=2)
> x
     [,1] [,2]
[1,]   56    8
[2,]    2   16
>
```

```
> rownames(x) = c("buckled", "unbuckled")
> colnames(x) = c("buckled", "unbuckled")
> x
          buckled unbuckled
buckled        56         8
unbuckled       2        16
>
```

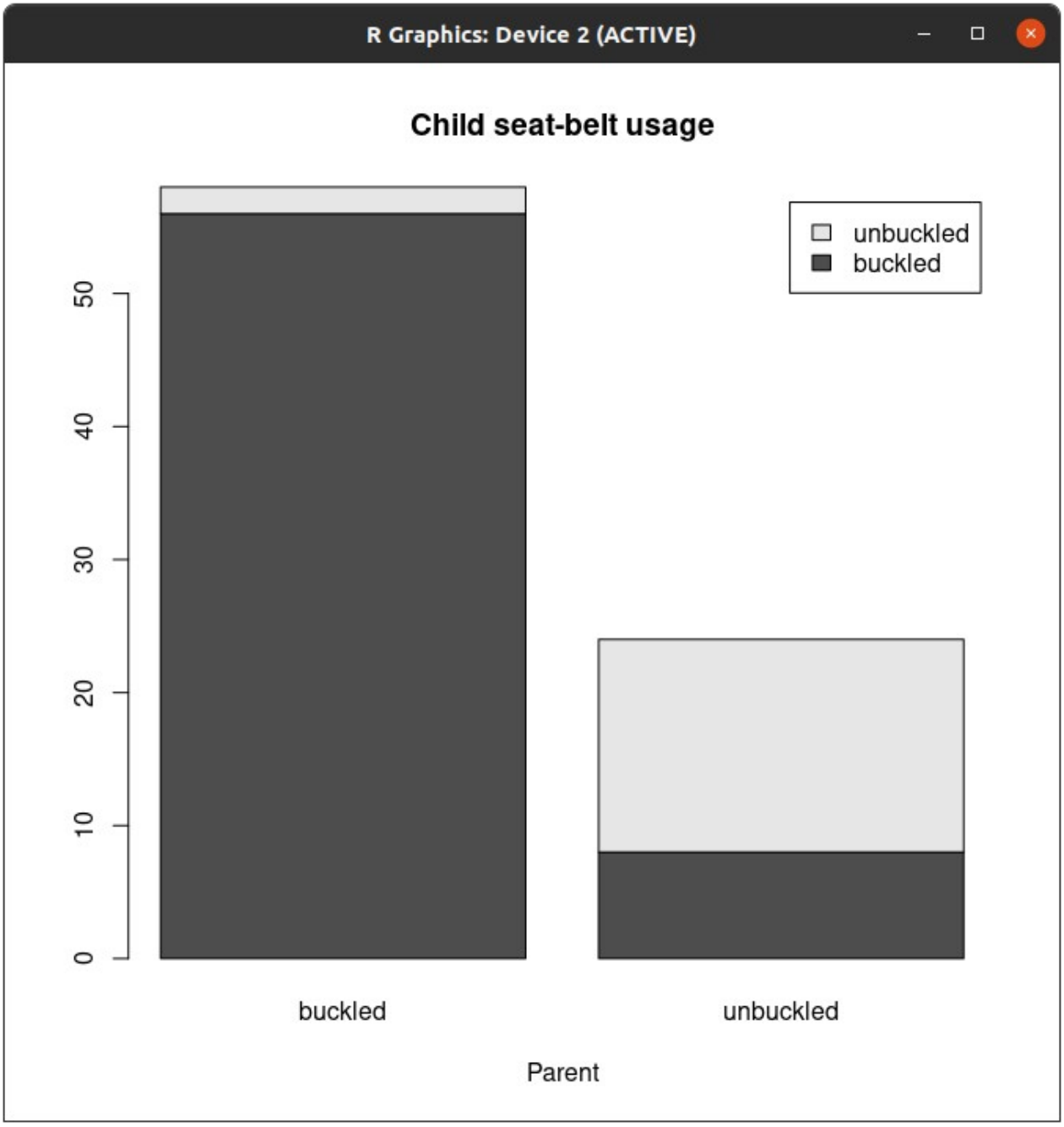
```
> barplot(x, xlab="Parent", main="Child seat-belt usage")
>
```



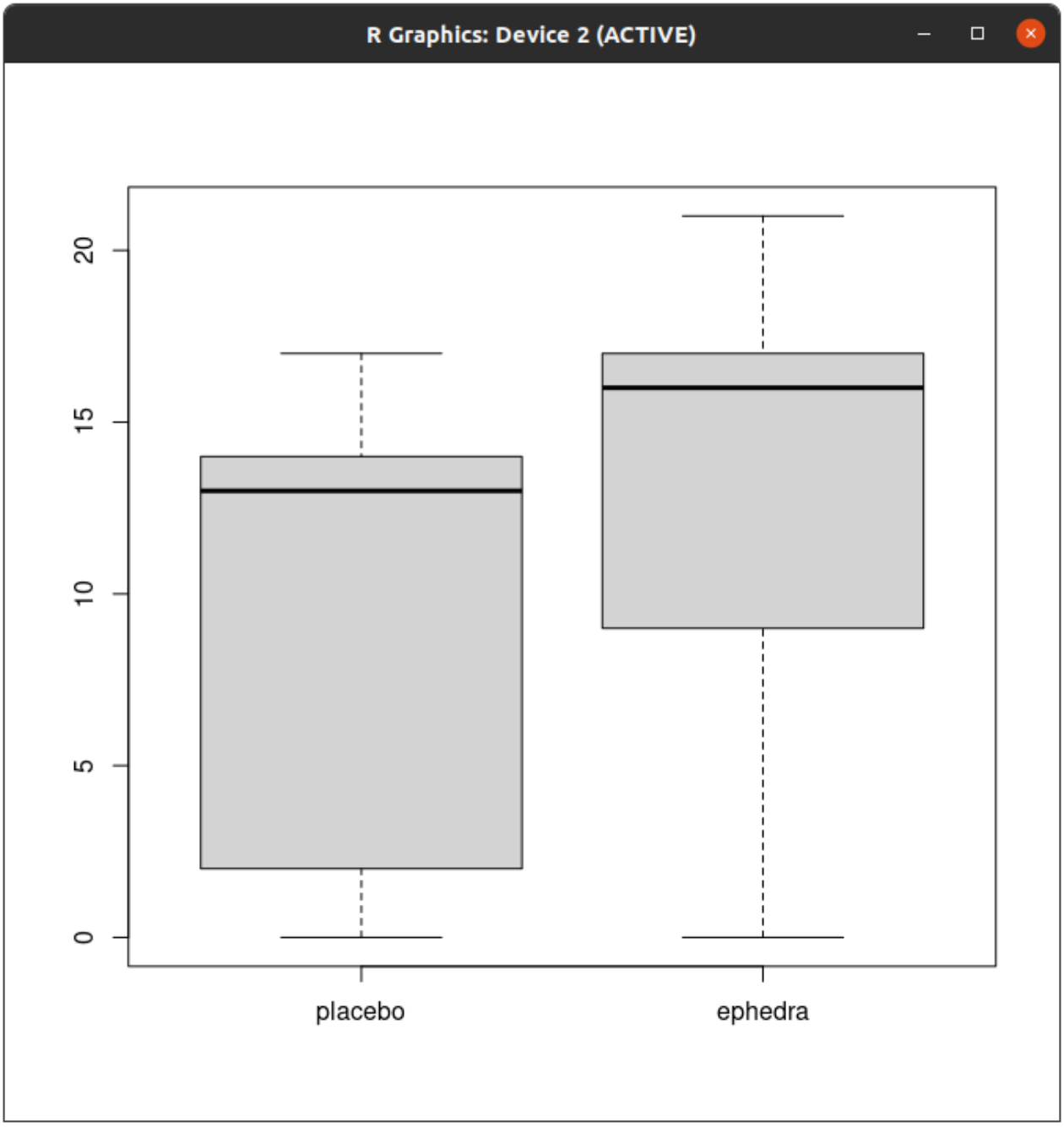

```
> barplot(x, xlab="Parent", main="Child seat-belt usage", beside=TRUE)
>
```



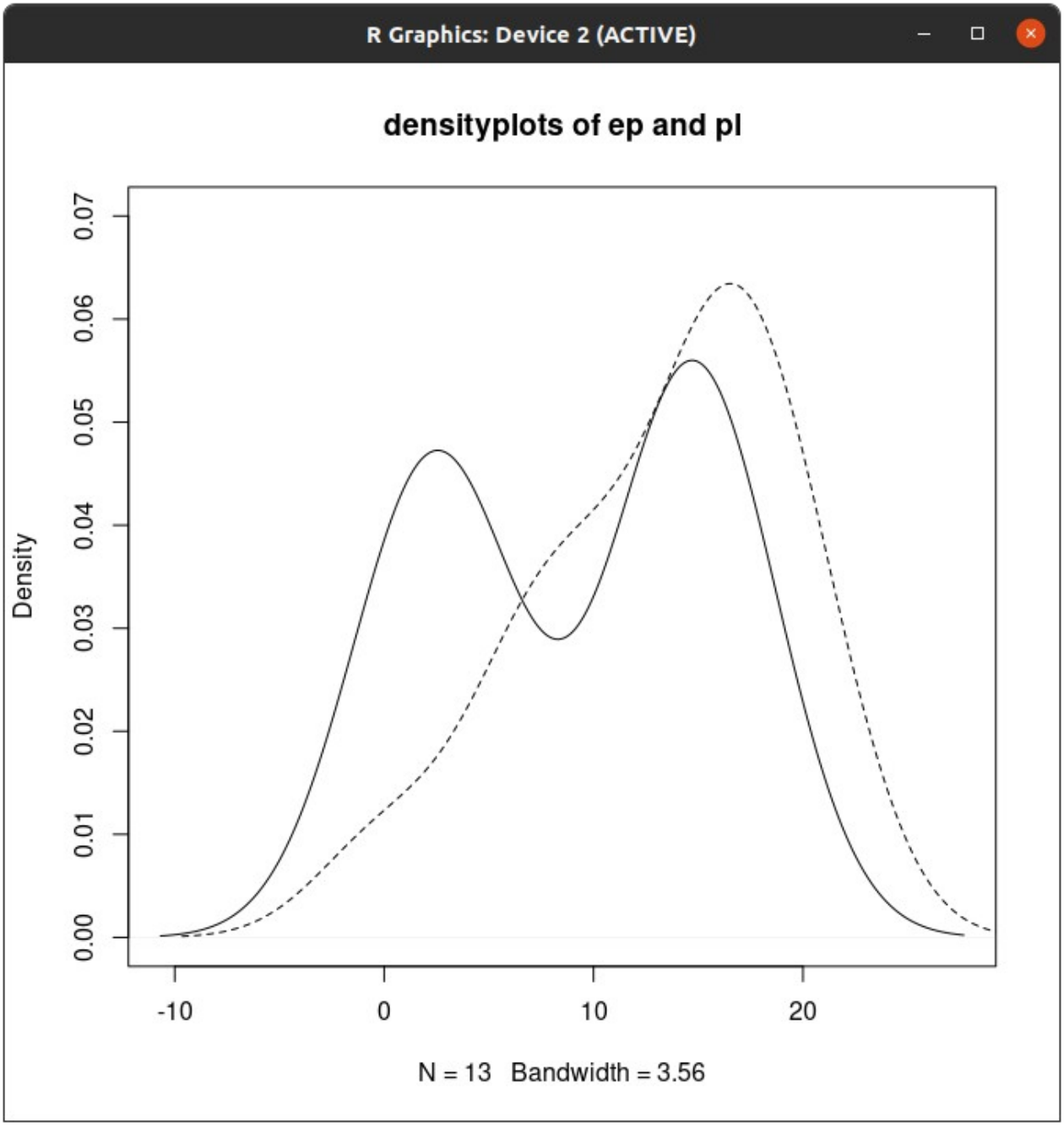

```
> barplot(x, xlab="Parent", main="Child seat-belt usage", legend.text=TRUE)
>
```



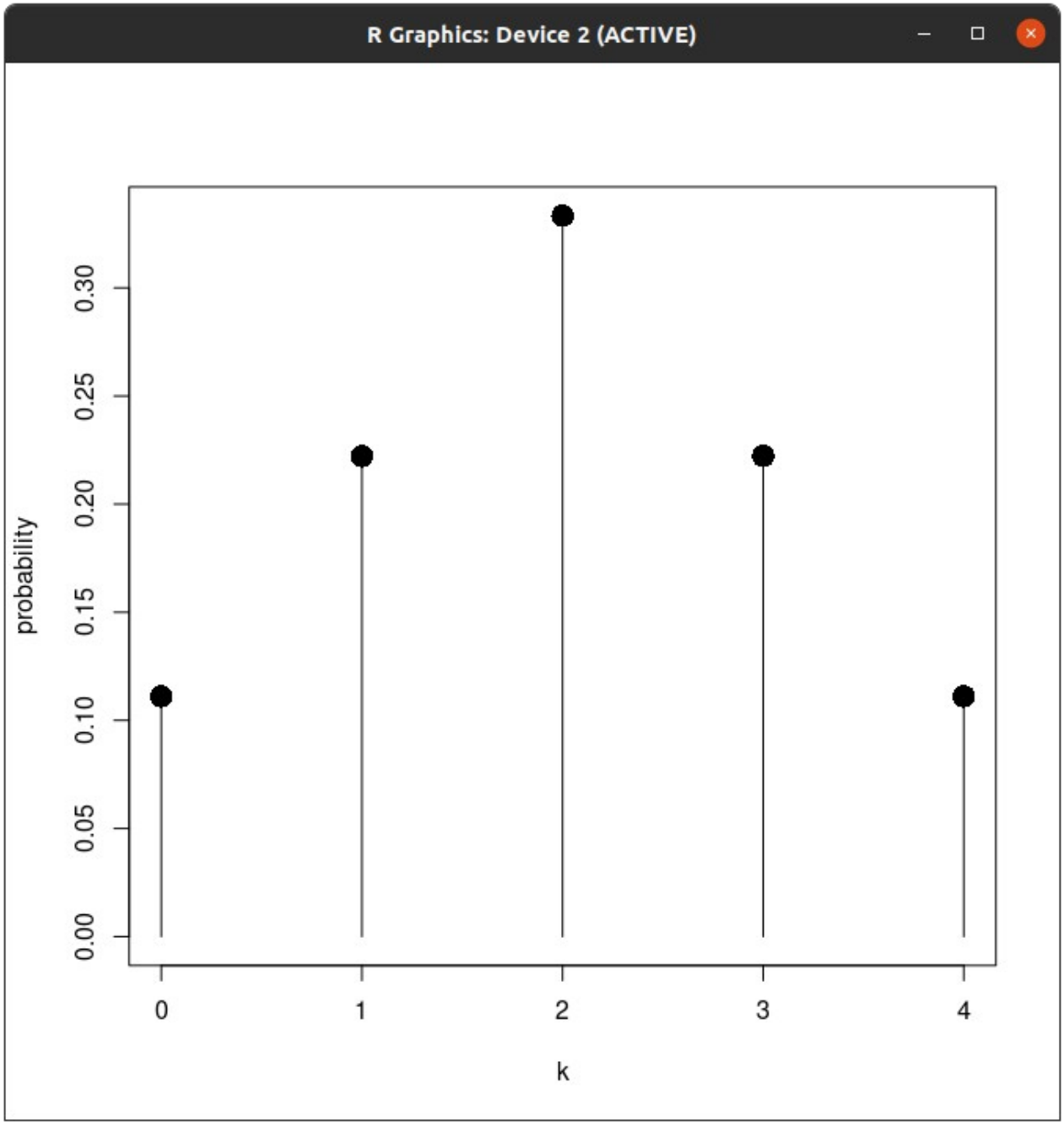

```
> pl = c(0, 2, 2, 2, 4, 5, 14, 14, 14, 13, 17, 17, 15)
> ep = c(0, 6, 7, 9, 11, 13, 16, 16, 16, 17, 18, 20, 21)
> boxplot(pl, ep, names=c("placebo", "ephedra"))
>
```




```
> plot(density(pl), ylim=c(0,0.07), main="densityplots of ep and pl")
> lines(density(ep), lty=2)
>
```



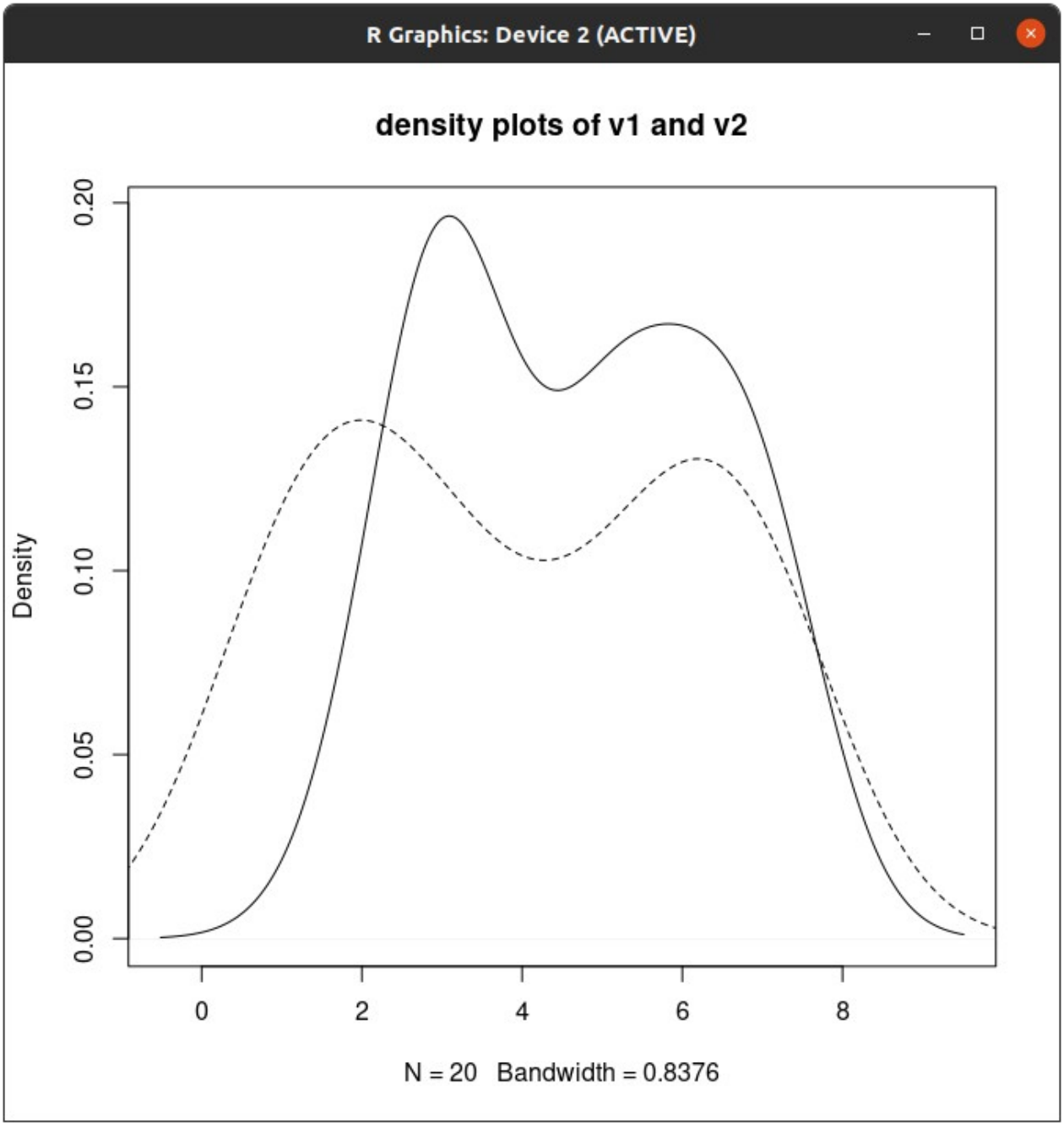

```
> k=0:4
> p=c(1, 2, 3, 2, 1)/9
> plot(k, p, type="h", xlab="k", ylab="probability", ylim=c(0, max(p)))
> points(k, p, pch=16, cex=2)
>
```


R Graphics: Device 2 (ACTIVE)
probability
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0
1
2
3
4
k

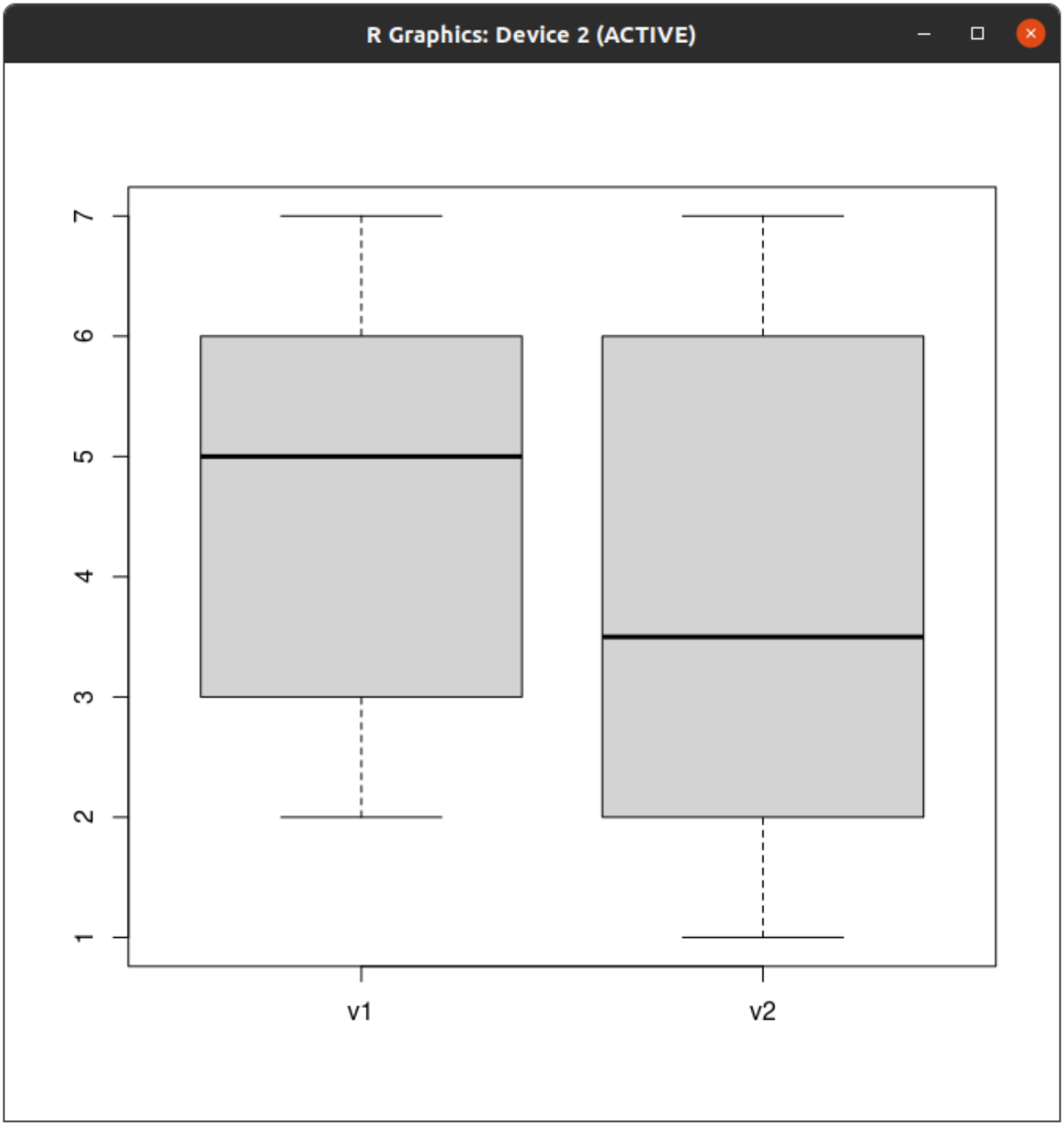
```
> k = 0:2
> p = c(1, 2, 1)/4
> sample(k, size=1, prob=p)
[1] 2
> sample(1:6, size=1) + sample(1:6, size=1)
[1] 7
> sample(0:1, size=10, replace=TRUE)
 [1] 0 1 1 0 1 0 1 1 0 0
> sample(1:6, size=10, replace=TRUE)
 [1] 3 2 1 2 5 2 2 4 4 6
> sample(1:6, size=10, replace=TRUE) + sample(1:6, size=10, replace=TRUE)
 [1]  8  8  9 12  8  9  8  9  9  5
> sample(rep(0:1, c(3200, 6800)), size=10, replace=T)
 [1] 1 0 1 1 1 1 1 1 1 0
> sample(0:1, size=10, replace=T, prob=c(1-.62, .62))
 [1] 1 1 0 1 0 0 1 1 1 0
>
```

```
> pnorm(1.5, mean=0, sd=1)
[1] 0.9331928
> pnorm(4.75, mean=4, sd=1/2)
[1] 0.9331928
>
```

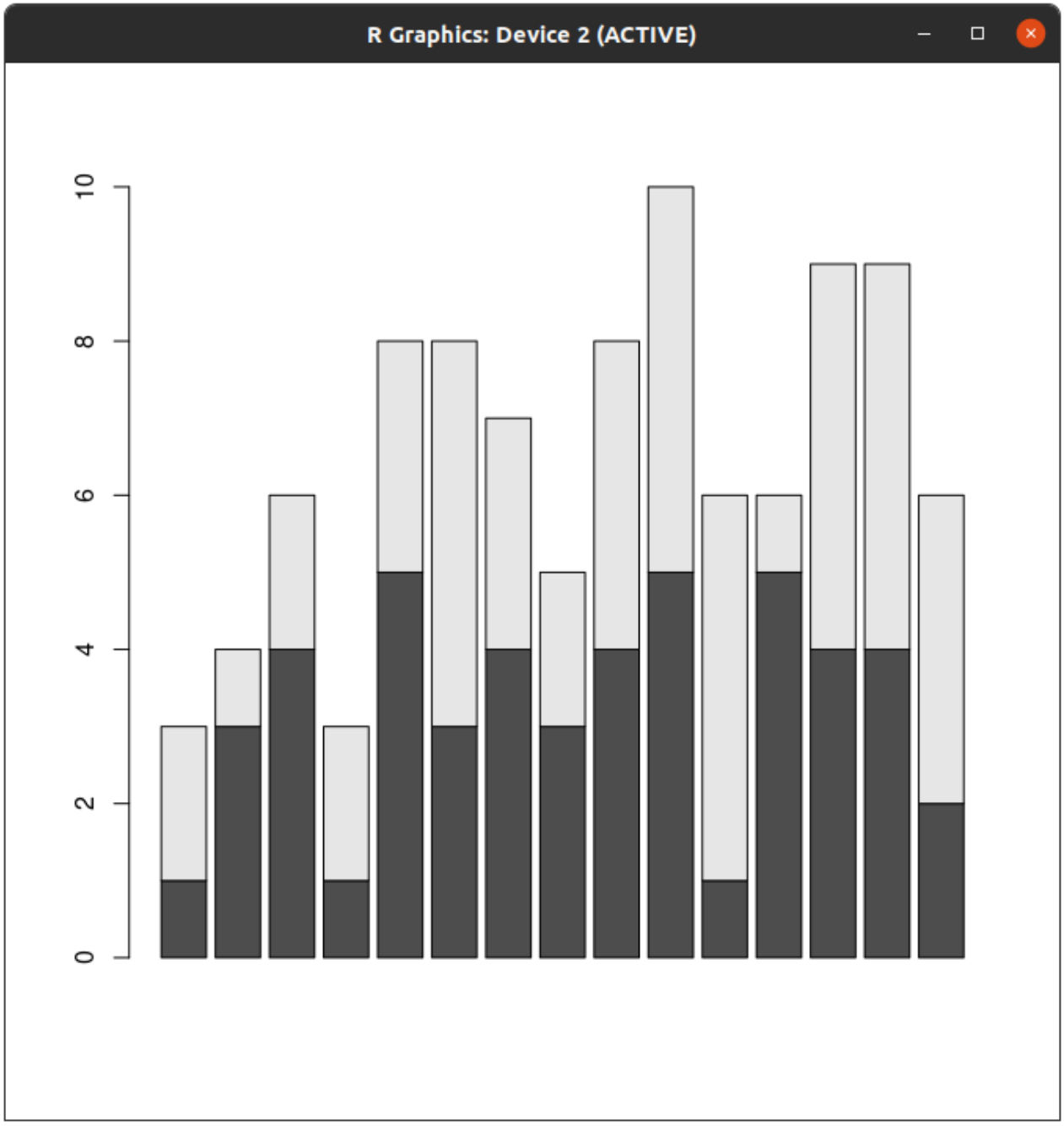
```
> v1 = sample(1:7, size=20, replace=TRUE)
> v2 = sample(1:7, size=20, replace=TRUE)
> v1
 [1] 5 7 6 5 2 3 7 6 5 6 7 3 3 3 4 3 7 5 3 3
> v2
 [1] 1 6 7 3 7 3 1 2 6 5 5 1 6 4 1 7 2 3 7 2
> density(v1)

Call:
        density.default(x = v1)

Data: v1 (20 obs.);     Bandwidth 'bw' = 0.8376

       x                y
 Min.   :-0.5129   Min.   :0.0002933
 1st Qu.: 1.9935   1st Qu.:0.0202307
 Median : 4.5000   Median :0.1241710
 Mean   : 4.5000   Mean   :0.0996115
 3rd Qu.: 7.0065   3rd Qu.:0.1625288
 Max.   : 9.5129   Max.   :0.1964273
> density(v2)

Call:
        density.default(x = v2)

Data: v2 (20 obs.);     Bandwidth 'bw' = 1.139

       x                y
 Min.   :-2.4185   Min.   :0.0008156
 1st Qu.: 0.7908   1st Qu.:0.0223355
 Median : 4.0000   Median :0.1028695
 Mean   : 4.0000   Mean   :0.0777816
 3rd Qu.: 7.2092   3rd Qu.:0.1221528
 Max.   :10.4185   Max.   :0.1409293
> plot(density(v1), main="density plots of v1 and v2")
> lines(density(v2), lty=2)
>
```


R Graphics: Device 2 (ACTIVE)
density plots of v1 and v2
Density
0.00
0.05
0.10
0.15
0.20
0
2
4
6
8
N = 20 Bandwidth = 0.8376

```
> v3 = sample(1:5, size=15, replace=TRUE)
> v3
 [1] 1 3 4 1 5 3 4 3 4 5 1 5 4 4 2
> v4 = sample(1:5, size=15, replace=TRUE)
> v4
 [1] 2 1 2 2 3 5 3 2 4 5 5 1 5 5 4
> v3_mean = mean(v3)
> v3_mean
[1] 3.266667
> v4_mean = mean(v4)
> v4_mean
[1] 3.266667
> boxplot(v1, v2, names=c("v1", "v2"))
>
```




```
> x = rbind(v3, v4)
> x
   [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12] [,13] [,14]
v3    1    3    4    1    5    3    4    3    4     5     1     5     4     4
v4    2    1    2    2    3    5    3    2    4     5     5     1     5     5
   [,15]
v3     2
v4     4
> barplot(x)
>
```


R Graphics: Device 2 (ACTIVE)
0
2
4
6
8
10