x<-c(1:10)  
y<-c(11:20)#this is the 2D matrix .  
k<- 2  
center1<- c(x[1],y[1])  
center2<-c(x[2],y[2])  
dis<-matrix(nrow=length(x),ncol=k+1)  
colnames(dis)<-c('dis\_cen1',"dis\_cen2","class")  
c(x[3],y[3])

## [1] 3 13

while(TRUE){  
 for(i in 1:length(x)){  
 #calculate each value distance one by one and judge which center is shotest center  
 dis[i,1]<- sqrt((x[i]-center1[1])^2+(y[i]-center2[2])^2)  
 dis[i,2]<- ((x[i]-center2[1])^2+(y[i]-center2[2])^2)^0.5  
 dis[i,3]<-which.min(dis[i,1:2])  
 }  
 dis  
 #print("return boolean value")  
 dis[,3]==1#return boolean value  
 #print("find the new center1 and center2")  
 (center1new<-c(mean(x[dis[,3]==1]),mean(y[dis[,3]==1])))  
 (center2new<-c(mean(x[dis[,3]==2]),mean(y[dis[,3]==2])))  
 if(sum(center1==center1new)+sum(center2==center2new)==4){  
 break  
 }  
 center1<- center1new  
 center2<- center2new  
   
}

a<-c(1,2,3,4,5)  
b<-c(1,1,1,1,1)  
a<b

## [1] FALSE FALSE FALSE FALSE FALSE

we can apply function in a libaray to directly implement this effect

iris2<- iris  
iris2$Species<- NULL  
iris2

## Sepal.Length Sepal.Width Petal.Length Petal.Width  
## 1 5.1 3.5 1.4 0.2  
## 2 4.9 3.0 1.4 0.2  
## 3 4.7 3.2 1.3 0.2  
## 4 4.6 3.1 1.5 0.2  
## 5 5.0 3.6 1.4 0.2  
## 6 5.4 3.9 1.7 0.4  
## 7 4.6 3.4 1.4 0.3  
## 8 5.0 3.4 1.5 0.2  
## 9 4.4 2.9 1.4 0.2  
## 10 4.9 3.1 1.5 0.1  
## 11 5.4 3.7 1.5 0.2  
## 12 4.8 3.4 1.6 0.2  
## 13 4.8 3.0 1.4 0.1  
## 14 4.3 3.0 1.1 0.1  
## 15 5.8 4.0 1.2 0.2  
## 16 5.7 4.4 1.5 0.4  
## 17 5.4 3.9 1.3 0.4  
## 18 5.1 3.5 1.4 0.3  
## 19 5.7 3.8 1.7 0.3  
## 20 5.1 3.8 1.5 0.3  
## 21 5.4 3.4 1.7 0.2  
## 22 5.1 3.7 1.5 0.4  
## 23 4.6 3.6 1.0 0.2  
## 24 5.1 3.3 1.7 0.5  
## 25 4.8 3.4 1.9 0.2  
## 26 5.0 3.0 1.6 0.2  
## 27 5.0 3.4 1.6 0.4  
## 28 5.2 3.5 1.5 0.2  
## 29 5.2 3.4 1.4 0.2  
## 30 4.7 3.2 1.6 0.2  
## 31 4.8 3.1 1.6 0.2  
## 32 5.4 3.4 1.5 0.4  
## 33 5.2 4.1 1.5 0.1  
## 34 5.5 4.2 1.4 0.2  
## 35 4.9 3.1 1.5 0.2  
## 36 5.0 3.2 1.2 0.2  
## 37 5.5 3.5 1.3 0.2  
## 38 4.9 3.6 1.4 0.1  
## 39 4.4 3.0 1.3 0.2  
## 40 5.1 3.4 1.5 0.2  
## 41 5.0 3.5 1.3 0.3  
## 42 4.5 2.3 1.3 0.3  
## 43 4.4 3.2 1.3 0.2  
## 44 5.0 3.5 1.6 0.6  
## 45 5.1 3.8 1.9 0.4  
## 46 4.8 3.0 1.4 0.3  
## 47 5.1 3.8 1.6 0.2  
## 48 4.6 3.2 1.4 0.2  
## 49 5.3 3.7 1.5 0.2  
## 50 5.0 3.3 1.4 0.2  
## 51 7.0 3.2 4.7 1.4  
## 52 6.4 3.2 4.5 1.5  
## 53 6.9 3.1 4.9 1.5  
## 54 5.5 2.3 4.0 1.3  
## 55 6.5 2.8 4.6 1.5  
## 56 5.7 2.8 4.5 1.3  
## 57 6.3 3.3 4.7 1.6  
## 58 4.9 2.4 3.3 1.0  
## 59 6.6 2.9 4.6 1.3  
## 60 5.2 2.7 3.9 1.4  
## 61 5.0 2.0 3.5 1.0  
## 62 5.9 3.0 4.2 1.5  
## 63 6.0 2.2 4.0 1.0  
## 64 6.1 2.9 4.7 1.4  
## 65 5.6 2.9 3.6 1.3  
## 66 6.7 3.1 4.4 1.4  
## 67 5.6 3.0 4.5 1.5  
## 68 5.8 2.7 4.1 1.0  
## 69 6.2 2.2 4.5 1.5  
## 70 5.6 2.5 3.9 1.1  
## 71 5.9 3.2 4.8 1.8  
## 72 6.1 2.8 4.0 1.3  
## 73 6.3 2.5 4.9 1.5  
## 74 6.1 2.8 4.7 1.2  
## 75 6.4 2.9 4.3 1.3  
## 76 6.6 3.0 4.4 1.4  
## 77 6.8 2.8 4.8 1.4  
## 78 6.7 3.0 5.0 1.7  
## 79 6.0 2.9 4.5 1.5  
## 80 5.7 2.6 3.5 1.0  
## 81 5.5 2.4 3.8 1.1  
## 82 5.5 2.4 3.7 1.0  
## 83 5.8 2.7 3.9 1.2  
## 84 6.0 2.7 5.1 1.6  
## 85 5.4 3.0 4.5 1.5  
## 86 6.0 3.4 4.5 1.6  
## 87 6.7 3.1 4.7 1.5  
## 88 6.3 2.3 4.4 1.3  
## 89 5.6 3.0 4.1 1.3  
## 90 5.5 2.5 4.0 1.3  
## 91 5.5 2.6 4.4 1.2  
## 92 6.1 3.0 4.6 1.4  
## 93 5.8 2.6 4.0 1.2  
## 94 5.0 2.3 3.3 1.0  
## 95 5.6 2.7 4.2 1.3  
## 96 5.7 3.0 4.2 1.2  
## 97 5.7 2.9 4.2 1.3  
## 98 6.2 2.9 4.3 1.3  
## 99 5.1 2.5 3.0 1.1  
## 100 5.7 2.8 4.1 1.3  
## 101 6.3 3.3 6.0 2.5  
## 102 5.8 2.7 5.1 1.9  
## 103 7.1 3.0 5.9 2.1  
## 104 6.3 2.9 5.6 1.8  
## 105 6.5 3.0 5.8 2.2  
## 106 7.6 3.0 6.6 2.1  
## 107 4.9 2.5 4.5 1.7  
## 108 7.3 2.9 6.3 1.8  
## 109 6.7 2.5 5.8 1.8  
## 110 7.2 3.6 6.1 2.5  
## 111 6.5 3.2 5.1 2.0  
## 112 6.4 2.7 5.3 1.9  
## 113 6.8 3.0 5.5 2.1  
## 114 5.7 2.5 5.0 2.0  
## 115 5.8 2.8 5.1 2.4  
## 116 6.4 3.2 5.3 2.3  
## 117 6.5 3.0 5.5 1.8  
## 118 7.7 3.8 6.7 2.2  
## 119 7.7 2.6 6.9 2.3  
## 120 6.0 2.2 5.0 1.5  
## 121 6.9 3.2 5.7 2.3  
## 122 5.6 2.8 4.9 2.0  
## 123 7.7 2.8 6.7 2.0  
## 124 6.3 2.7 4.9 1.8  
## 125 6.7 3.3 5.7 2.1  
## 126 7.2 3.2 6.0 1.8  
## 127 6.2 2.8 4.8 1.8  
## 128 6.1 3.0 4.9 1.8  
## 129 6.4 2.8 5.6 2.1  
## 130 7.2 3.0 5.8 1.6  
## 131 7.4 2.8 6.1 1.9  
## 132 7.9 3.8 6.4 2.0  
## 133 6.4 2.8 5.6 2.2  
## 134 6.3 2.8 5.1 1.5  
## 135 6.1 2.6 5.6 1.4  
## 136 7.7 3.0 6.1 2.3  
## 137 6.3 3.4 5.6 2.4  
## 138 6.4 3.1 5.5 1.8  
## 139 6.0 3.0 4.8 1.8  
## 140 6.9 3.1 5.4 2.1  
## 141 6.7 3.1 5.6 2.4  
## 142 6.9 3.1 5.1 2.3  
## 143 5.8 2.7 5.1 1.9  
## 144 6.8 3.2 5.9 2.3  
## 145 6.7 3.3 5.7 2.5  
## 146 6.7 3.0 5.2 2.3  
## 147 6.3 2.5 5.0 1.9  
## 148 6.5 3.0 5.2 2.0  
## 149 6.2 3.4 5.4 2.3  
## 150 5.9 3.0 5.1 1.8

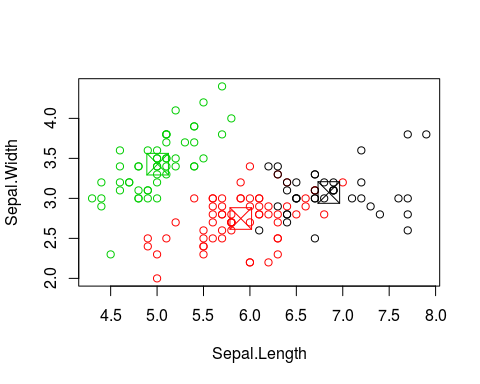
(kmeans\_result<-kmeans(iris2,3))

## K-means clustering with 3 clusters of sizes 38, 62, 50  
##   
## Cluster means:  
## Sepal.Length Sepal.Width Petal.Length Petal.Width  
## 1 6.850000 3.073684 5.742105 2.071053  
## 2 5.901613 2.748387 4.393548 1.433871  
## 3 5.006000 3.428000 1.462000 0.246000  
##   
## Clustering vector:  
## [1] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3  
## [36] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2  
## [71] 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 1 1 1  
## [106] 1 2 1 1 1 1 1 1 2 2 1 1 1 1 2 1 2 1 2 1 1 2 2 1 1 1 1 1 2 1 1 1 1 2 1  
## [141] 1 1 2 1 1 1 2 1 1 2  
##   
## Within cluster sum of squares by cluster:  
## [1] 23.87947 39.82097 15.15100  
## (between\_SS / total\_SS = 88.4 %)  
##   
## Available components:  
##   
## [1] "cluster" "centers" "totss" "withinss"   
## [5] "tot.withinss" "betweenss" "size" "iter"   
## [9] "ifault"

table(iris$Species,kmeans\_result$cluster)

##   
## 1 2 3  
## setosa 0 0 50  
## versicolor 2 48 0  
## virginica 36 14 0

plot(iris2[c("Sepal.Length","Sepal.Width")],col=kmeans\_result$cluster)  
points(kmeans\_result$centers[,c("Sepal.Length","Sepal.Width")],col=1:3,pch=7,cex=3)



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  
## 7 4.6 3.4 1.4 0.3 setosa  
## 8 5.0 3.4 1.5 0.2 setosa  
## 9 4.4 2.9 1.4 0.2 setosa  
## 10 4.9 3.1 1.5 0.1 setosa  
## 11 5.4 3.7 1.5 0.2 setosa  
## 12 4.8 3.4 1.6 0.2 setosa  
## 13 4.8 3.0 1.4 0.1 setosa  
## 14 4.3 3.0 1.1 0.1 setosa  
## 15 5.8 4.0 1.2 0.2 setosa  
## 16 5.7 4.4 1.5 0.4 setosa  
## 17 5.4 3.9 1.3 0.4 setosa  
## 18 5.1 3.5 1.4 0.3 setosa  
## 19 5.7 3.8 1.7 0.3 setosa  
## 20 5.1 3.8 1.5 0.3 setosa  
## 21 5.4 3.4 1.7 0.2 setosa  
## 22 5.1 3.7 1.5 0.4 setosa  
## 23 4.6 3.6 1.0 0.2 setosa  
## 24 5.1 3.3 1.7 0.5 setosa  
## 25 4.8 3.4 1.9 0.2 setosa  
## 26 5.0 3.0 1.6 0.2 setosa  
## 27 5.0 3.4 1.6 0.4 setosa  
## 28 5.2 3.5 1.5 0.2 setosa  
## 29 5.2 3.4 1.4 0.2 setosa  
## 30 4.7 3.2 1.6 0.2 setosa  
## 31 4.8 3.1 1.6 0.2 setosa  
## 32 5.4 3.4 1.5 0.4 setosa  
## 33 5.2 4.1 1.5 0.1 setosa  
## 34 5.5 4.2 1.4 0.2 setosa  
## 35 4.9 3.1 1.5 0.2 setosa  
## 36 5.0 3.2 1.2 0.2 setosa  
## 37 5.5 3.5 1.3 0.2 setosa  
## 38 4.9 3.6 1.4 0.1 setosa  
## 39 4.4 3.0 1.3 0.2 setosa  
## 40 5.1 3.4 1.5 0.2 setosa  
## 41 5.0 3.5 1.3 0.3 setosa  
## 42 4.5 2.3 1.3 0.3 setosa  
## 43 4.4 3.2 1.3 0.2 setosa  
## 44 5.0 3.5 1.6 0.6 setosa  
## 45 5.1 3.8 1.9 0.4 setosa  
## 46 4.8 3.0 1.4 0.3 setosa  
## 47 5.1 3.8 1.6 0.2 setosa  
## 48 4.6 3.2 1.4 0.2 setosa  
## 49 5.3 3.7 1.5 0.2 setosa  
## 50 5.0 3.3 1.4 0.2 setosa  
## 51 7.0 3.2 4.7 1.4 versicolor  
## 52 6.4 3.2 4.5 1.5 versicolor  
## 53 6.9 3.1 4.9 1.5 versicolor  
## 54 5.5 2.3 4.0 1.3 versicolor  
## 55 6.5 2.8 4.6 1.5 versicolor  
## 56 5.7 2.8 4.5 1.3 versicolor  
## 57 6.3 3.3 4.7 1.6 versicolor  
## 58 4.9 2.4 3.3 1.0 versicolor  
## 59 6.6 2.9 4.6 1.3 versicolor  
## 60 5.2 2.7 3.9 1.4 versicolor  
## 61 5.0 2.0 3.5 1.0 versicolor  
## 62 5.9 3.0 4.2 1.5 versicolor  
## 63 6.0 2.2 4.0 1.0 versicolor  
## 64 6.1 2.9 4.7 1.4 versicolor  
## 65 5.6 2.9 3.6 1.3 versicolor  
## 66 6.7 3.1 4.4 1.4 versicolor  
## 67 5.6 3.0 4.5 1.5 versicolor  
## 68 5.8 2.7 4.1 1.0 versicolor  
## 69 6.2 2.2 4.5 1.5 versicolor  
## 70 5.6 2.5 3.9 1.1 versicolor  
## 71 5.9 3.2 4.8 1.8 versicolor  
## 72 6.1 2.8 4.0 1.3 versicolor  
## 73 6.3 2.5 4.9 1.5 versicolor  
## 74 6.1 2.8 4.7 1.2 versicolor  
## 75 6.4 2.9 4.3 1.3 versicolor  
## 76 6.6 3.0 4.4 1.4 versicolor  
## 77 6.8 2.8 4.8 1.4 versicolor  
## 78 6.7 3.0 5.0 1.7 versicolor  
## 79 6.0 2.9 4.5 1.5 versicolor  
## 80 5.7 2.6 3.5 1.0 versicolor  
## 81 5.5 2.4 3.8 1.1 versicolor  
## 82 5.5 2.4 3.7 1.0 versicolor  
## 83 5.8 2.7 3.9 1.2 versicolor  
## 84 6.0 2.7 5.1 1.6 versicolor  
## 85 5.4 3.0 4.5 1.5 versicolor  
## 86 6.0 3.4 4.5 1.6 versicolor  
## 87 6.7 3.1 4.7 1.5 versicolor  
## 88 6.3 2.3 4.4 1.3 versicolor  
## 89 5.6 3.0 4.1 1.3 versicolor  
## 90 5.5 2.5 4.0 1.3 versicolor  
## 91 5.5 2.6 4.4 1.2 versicolor  
## 92 6.1 3.0 4.6 1.4 versicolor  
## 93 5.8 2.6 4.0 1.2 versicolor  
## 94 5.0 2.3 3.3 1.0 versicolor  
## 95 5.6 2.7 4.2 1.3 versicolor  
## 96 5.7 3.0 4.2 1.2 versicolor  
## 97 5.7 2.9 4.2 1.3 versicolor  
## 98 6.2 2.9 4.3 1.3 versicolor  
## 99 5.1 2.5 3.0 1.1 versicolor  
## 100 5.7 2.8 4.1 1.3 versicolor  
## 101 6.3 3.3 6.0 2.5 virginica  
## 102 5.8 2.7 5.1 1.9 virginica  
## 103 7.1 3.0 5.9 2.1 virginica  
## 104 6.3 2.9 5.6 1.8 virginica  
## 105 6.5 3.0 5.8 2.2 virginica  
## 106 7.6 3.0 6.6 2.1 virginica  
## 107 4.9 2.5 4.5 1.7 virginica  
## 108 7.3 2.9 6.3 1.8 virginica  
## 109 6.7 2.5 5.8 1.8 virginica  
## 110 7.2 3.6 6.1 2.5 virginica  
## 111 6.5 3.2 5.1 2.0 virginica  
## 112 6.4 2.7 5.3 1.9 virginica  
## 113 6.8 3.0 5.5 2.1 virginica  
## 114 5.7 2.5 5.0 2.0 virginica  
## 115 5.8 2.8 5.1 2.4 virginica  
## 116 6.4 3.2 5.3 2.3 virginica  
## 117 6.5 3.0 5.5 1.8 virginica  
## 118 7.7 3.8 6.7 2.2 virginica  
## 119 7.7 2.6 6.9 2.3 virginica  
## 120 6.0 2.2 5.0 1.5 virginica  
## 121 6.9 3.2 5.7 2.3 virginica  
## 122 5.6 2.8 4.9 2.0 virginica  
## 123 7.7 2.8 6.7 2.0 virginica  
## 124 6.3 2.7 4.9 1.8 virginica  
## 125 6.7 3.3 5.7 2.1 virginica  
## 126 7.2 3.2 6.0 1.8 virginica  
## 127 6.2 2.8 4.8 1.8 virginica  
## 128 6.1 3.0 4.9 1.8 virginica  
## 129 6.4 2.8 5.6 2.1 virginica  
## 130 7.2 3.0 5.8 1.6 virginica  
## 131 7.4 2.8 6.1 1.9 virginica  
## 132 7.9 3.8 6.4 2.0 virginica  
## 133 6.4 2.8 5.6 2.2 virginica  
## 134 6.3 2.8 5.1 1.5 virginica  
## 135 6.1 2.6 5.6 1.4 virginica  
## 136 7.7 3.0 6.1 2.3 virginica  
## 137 6.3 3.4 5.6 2.4 virginica  
## 138 6.4 3.1 5.5 1.8 virginica  
## 139 6.0 3.0 4.8 1.8 virginica  
## 140 6.9 3.1 5.4 2.1 virginica  
## 141 6.7 3.1 5.6 2.4 virginica  
## 142 6.9 3.1 5.1 2.3 virginica  
## 143 5.8 2.7 5.1 1.9 virginica  
## 144 6.8 3.2 5.9 2.3 virginica  
## 145 6.7 3.3 5.7 2.5 virginica  
## 146 6.7 3.0 5.2 2.3 virginica  
## 147 6.3 2.5 5.0 1.9 virginica  
## 148 6.5 3.0 5.2 2.0 virginica  
## 149 6.2 3.4 5.4 2.3 virginica  
## 150 5.9 3.0 5.1 1.8 virginica

(centers<- kmeans\_result$centers[kmeans\_result$cluster,])

## Sepal.Length Sepal.Width Petal.Length Petal.Width  
## 3 5.006000 3.428000 1.462000 0.246000  
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## 3 5.006000 3.428000 1.462000 0.246000  
## 3 5.006000 3.428000 1.462000 0.246000  
## 2 5.901613 2.748387 4.393548 1.433871  
## 2 5.901613 2.748387 4.393548 1.433871  
## 1 6.850000 3.073684 5.742105 2.071053  
## 2 5.901613 2.748387 4.393548 1.433871  
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(distance<-sqrt(rowSums((iris2-centers)^2)))

## [1] 0.14135063 0.44763825 0.41710910 0.52533799 0.18862662 0.67703767  
## [7] 0.41518670 0.06618157 0.80745278 0.37627118 0.48247280 0.25373214  
## [13] 0.50077939 0.91322505 1.01409073 1.20481534 0.65420180 0.14415270  
## [19] 0.82436642 0.38933276 0.46344363 0.32860310 0.64029681 0.38259639  
## [25] 0.48701129 0.45208406 0.20875823 0.21536016 0.21066561 0.40838707  
## [31] 0.41373905 0.42565244 0.71552778 0.91977171 0.34982853 0.35039977  
## [37] 0.52685861 0.25686572 0.76077592 0.11480418 0.18541845 1.24803045  
## [43] 0.66901420 0.38675574 0.60231221 0.48205809 0.41034132 0.47199576  
## [49] 0.40494444 0.14959947 1.22697525 0.68414100 1.01903626 0.73153652  
## [55] 0.63853451 0.26937898 0.76452634 1.58388575 0.75582717 0.85984838  
## [61] 1.53611907 0.32426175 0.80841374 0.39674141 0.87269542 0.87306498  
## [67] 0.41229163 0.53579956 0.63676390 0.71254917 0.70937310 0.46349013  
## [73] 0.69373966 0.43661144 0.54593856 0.74313017 0.98798453 0.84636259  
## [79] 0.21993519 1.02437260 0.86396528 0.97566381 0.55763082 0.73395781  
## [85] 0.57500396 0.68790275 0.92700552 0.61459444 0.50830256 0.62911910  
## [91] 0.48790256 0.38266958 0.49185351 1.54856350 0.38560870 0.44284695  
## [97] 0.34498790 0.37241653 1.66064034 0.38393196 0.77731871 0.85382472  
## [103] 0.30610139 0.65293923 0.38458885 1.14225684 1.07101875 0.78573677  
## [109] 0.65454939 0.84355960 0.74552218 0.75289837 0.25958095 0.88917352  
## [115] 1.20227628 0.68288333 0.50991553 1.47791217 1.52971038 0.82617494  
## [121] 0.26952816 0.81891975 1.31149299 0.74269596 0.27627819 0.52766931  
## [127] 0.62526165 0.70228926 0.54629196 0.59428255 0.73126650 1.43802246  
## [133] 0.56055720 0.81536685 1.12133058 0.95311851 0.73306362 0.57903109  
## [139] 0.61011676 0.34794609 0.38934920 0.68403844 0.85382472 0.30952112  
## [145] 0.50939919 0.61173881 0.89747884 0.65334214 0.83572418 0.83452741

(outliers<-order(distance,decreasing = T)[1:5])

## [1] 99 58 94 61 119

print (outliers)

## [1] 99 58 94 61 119

print(iris2[outliers,])

## Sepal.Length Sepal.Width Petal.Length Petal.Width  
## 99 5.1 2.5 3.0 1.1  
## 58 4.9 2.4 3.3 1.0  
## 94 5.0 2.3 3.3 1.0  
## 61 5.0 2.0 3.5 1.0  
## 119 7.7 2.6 6.9 2.3