

# XJTLU Library R Training

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This document is used for XJTLU Library R Training session practice

## 1. Basic mathematics

```
1+1
## [1] 2
3*(3+1)+4+5
## [1] 21
3^2
## [1] 9
2^0.5
## [1] 1.414214
sqrt(2)
## [1] 1.414214
```

Note that functions are followed by brackets.

Some parameters have already been defined

```
pi
## [1] 3.141593
3*pi
## [1] 9.424778
```

Try exponential / logarithmic calculation

```
exp(3)
## [1] 20.08554
log(100) #Here by default the base is "e"
```

```
## [1] 4.60517
  log(100,base=10) #Change the base as you want
## [1] 2
```

Derivation and integration

```
f <- expression(x^2+5*x+1)
D(f,"x") #derivation

## 2 * x + 5

f2 <- function(x){1/((x+1)*sqrt(x))}
integrate(f2, lower = 0, upper = Inf) #Integration

## 3.141593 with absolute error < 2.7e-05
```

Extension: you can find the derivation and anti-derivation function from the package "mosaicCalc", by function D() and antiD()

## 2.Data import

Vector

```
x <- 1
x

## [1] 1

y <- 1:10
y

## [1] 1 2 3 4 5 6 7 8 9 10

z <- c(1,4,6,8)
z

## [1] 1 4 6 8
```

Matrix

```
z1 <- c(1,4,6,8)
z2 <- c(2,3,4,9)
z3 <- cbind(z1, z2)
z3

##      z1 z2
## [1,]  1  2
## [2,]  4  3
```

```
## [3,] 6 4
## [4,] 8 9
```

Data frame

```
d1 <- c(1,4,6,8)
d2 <- c("a","b","c","d")
d3 <- data.frame(d1, d2)
d3

##   d1 d2
## 1  1  a
## 2  4  b
## 3  6  c
## 4  8  d
```

### 3. Read data from a file

```
#Dat <- read.table("Register_Dat2023.txt",header=T,sep='\t')#Read txt file
Dat <- read.csv("Register_Dat2023.csv")#Read CSV file
str(Dat)#Check the data structure

## 'data.frame':   66 obs. of  5 variables:
## $ First.Name   : chr  "liuqi" "Hanyan" "Jaclysse" "Junyue" ...
## $ Last.Name    : chr  "wang" "Hu" "Mayoma" "Zhou" ...
## $ Booking.Date: chr  "2023-11-03" "2023-11-03" "2023-11-03" "2023-11-03"
## ...
## $ Booking.Time: chr  "08:38:00" "17:11:00" "17:20:00" "20:30:00" ...
## $ School       : chr  "School of Humanities and Social Sciences" "XJTU
Wisdom Lake Academy of Pharmacy" "School of Humanities and Social Sciences"
"School of Science" ...
```

Generate a new column. Merge the first name and last name together as “Name”

```
Dat$Name <- paste(Dat$First.Name,Dat$Last.Name)
```

Note the use of “\$”.

Data output

```
write.table(Dat,"NewDat.txt",sep='\t',quote=F)#Export txt file
#write.csv(Dat,"NewDat.csv") #Export CSV file
```

Now check your working folder; a new file named “NewDat.csv” appears. You can also use write.table() function.

## 4. Loop

Let's do a Lottery, find the lucky people

```
sample(Dat$Name,1) #sample() function to randomly sample from the pool
```

### Find the most unfortunate people

There are 67 people registered in this session. Let's try to find those who are not selected after 150 times lottery

```
People <- vector() #Create an empty vector and store the results
for ( i in 1:150)
{
  People[i] <- sample(Dat$Name,1)
  plot.new() #Plot the name in the screen
  text(x=0.5,y=0.5,People[i],cex=4)
  Sys.sleep(0.2)
}

table(People) #table() function to check the frequency of each people

setdiff(Dat$Name,People) #setdiff() function to find elements belong to x
but not to y

## [1] "Yitong Liu"      "Binglin Liu"      "Kexin Li"        "Xiaotong Niu"
## [5] "xinyi kong"       "Yuxiang Cai"     "Yiwei Xu"        "Hongzhong Chen"
## [9] "Hua Wen"
```

\*\*Find the help of sample() function to get an easier way for the loop

```
sample(Dat$Name,200,replace=T) #Sample with replacement
```

## 5. Inatall package and make a QR code

```
## install.packages("qrcode")
library(qrcode)
plot(qr_code("https://www.xjtlu.edu.cn"))
```



## 6. Function

Let's create a function to calculate the square sum of two values

```
ss <- function(x,y){x^2 + y ^2}
```

Now we have the function named ss, let's try it

```
ss(2,3)
## [1] 13
```

## 7. Plots

Run the following codes

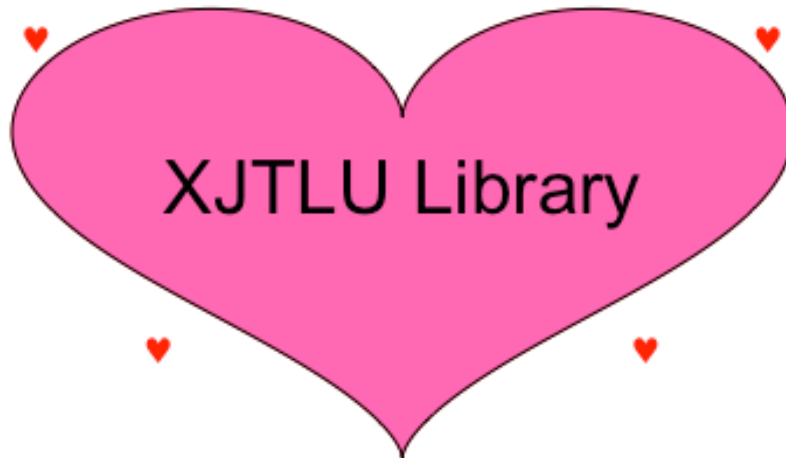
```
#Creat a data frame
Dt<- data.frame(t=seq(0, 2*pi, by=0.02) ) #Try to change the 0.2 to 0.02
```

```

fx <- function(x) {16*sin(x)^3} #Function 1
fy <- function(x) {13*cos(x)-5*cos(2*x)-2*cos(3*x)-cos(4*x)} #Function 2
Dt$x <- fx(Dt$t)
Dt$y <- fy(Dt$t)

plot(Dt$x,Dt$y, type="l",col="red",xlab='',ylab='',axes=F,xaxt='n',ann=F)
polygon(Dt$x,Dt$y, col="hotpink")
text(0,0,"XJTLU Library",cex=2) # You can change the name
points(c(10,-10, -15, 15), c(-10, -10, 10, 10), pch=169,
font=5,col="red",bg="red")

```



Save the plot as a pdf file

```

dev.copy(pdf,"Plot.pdf",width=6,height=6)
dev.off()

```

Now check your working folder; a plot named Plot.pdf appears.

Enjoy!