

# Summary of R course by IME

## Basics

- Creating and modifying a vector

```
x <- seq(1,4,by = 1)
x[c(1,2,3)] = 5
x
```

```
## [1] 5 5 5 4
```

```
#or alternatively
```

```
x <- 1:4
x[1:3] = 5
x
```

```
## [1] 5 5 5 4
```

- Vector multiplication

```
x <- 1:5
y <- 6:10
a <- t(x) %*% y
```

- order() and sort()

```
#order() creates a permutation vector and can be used to sort data.frames
sort(x) == x[order(x)]
```

```
## [1] TRUE TRUE TRUE TRUE TRUE
```

```
rev(sort(x)) == x[order(-x)]
```

```
## [1] TRUE TRUE TRUE TRUE TRUE
```

- Factors

```
gender = factor(c("male", "female", "female", "male"))
```

```
# Look at it and make a summary table
gender
```

```
## [1] male   female female male
```

```
## Levels: female male
```

```
table(gender)
```

```
## gender
## female    male
##         2      2
#Find number of males
sum(gender == "male")

## [1] 2
```

- Matrices

```
#Creating matrices
A <- matrix(1:6, nrow = 2, ncol = 3, byrow = TRUE)

x1 <- 1:3
x2 <- c(7, 6, 6)
x3 <- c(12, 19, 21)

# Bind vectors x1, x2, and x3 column-wise into a matrix
C <- cbind(x1, x2, x3) # Bind vectors x1, x2, and x3 column-wise into a matrix

# Bind vectors x1, x2, and x3 row-wise into a matrix.
R = rbind(x1, x2, x3) # Bind vectors x1, x2, and x3 row-wise into a matrix.

# Here are some other useful matrix commands

dim(A) # get the dimensions of a matrix
nrow(A) # number of rows
ncol(A) # number of columns
apply(A, 1, sum) # apply the sum function to the rows of A
apply(A, 2, sum) # apply the sum function to the columns of A
sum(diag(A)) # trace of A

A = diag(1:3) # a 3 by 3 diagonal matrix with entries 1, 2, 3
solve(A) # inverse of A, in general solve(A,b) solves Ax=b wrt x
det(A) # determinant of A
```

## Plotting (ggplot)

ggplot2 is a package which offers an alternative way to plot data as opposed to the standard `plot()` function. What follows is an example of using ggplot with the dataset SLID.

```
#Setup
library(ggplot2)
library(car) #Contain SLID
SLID = na.omit(SLID) # We only use rows without missing values
```

- Scatterplots

```
ggplot(SLID, aes(education, wages)) + #aes(x,y) plots y against x.
  geom_point() +
  labs(title = "Scatterplot") +
  xlab("Education") +
```

```
ylab("Wages") +
theme_bw() +
facet_wrap(~language + sex) + #facet_wrap divides the dataset into language/sex pairs.
theme_minimal()
```

Scatterplot

