# 1 R

## 1.1 Data Types

### 1.1.1 Vectors

```
  c(1,2,3,4,5)
```

```
## [1] 1 2 3 4 5
```

```
1:5
```

```
## [1] 1 2 3 4 5
```

```
seq(1,9,2)
```

```
## [1] 1 3 5 7 9
```

### 1.1.2 Matrices

```
  matrix(1:6, nrow = 2, ncol = 3, byrow = TRUE)
```

```
##      [,1] [,2] [,3]
## [1,]    1    2    3
## [2,]    4    5    6
```

### 1.1.3 Data Frames

```
  data.frame(
    id = 1:3,
    name = c('Tom', 'Mary', 'Peter'),
    age = c(26,30,25),
    marital_status = c('married','divorced','single'),
    stringsAsFactors = TRUE
  )
```

```
##   id  name age marital_status
## 1  1   Tom  26        married
## 2  2  Mary  30       divorced
## 3  3 Peter  25         single
```

## 1.2 Logical Vectors

```
  random_permutation_one_to_ten <- sample(1:10, 10, replace=FALSE)
random_permutation_one_to_ten

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

random_permutation_one_to_ten > 5

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

## 1.3 Logical Operators

| A | B | A **AND** B | A **OR** B |
|---|---|---|---|
| TRUE | TRUE | TRUE | TRUE |
| TRUE | FALSE | FALSE | TRUE |
| FALSE | TRUE | FALSE | TRUE |
| FALSE | FALSE | FALSE | FALSE |

| A | **NOT** A |
|---|---|
| TRUE | FALSE |
| FALSE | TRUE |

### 1.3.1 Logical Operators in R

| Operator | Description |
|---|---|
| & | Element-wise AND |
| \| | Element-wise OR |
| && | First element AND |
| \|\| | First element OR |
| ! | NOT |

## 1.4 Conditionals

### 1.4.1 Conditional Statements

```
  x <- 10
if (x > 20) {
  print('x is bigger than 20')
} else if (x > 10) {
  print('x is bigger than 10')
} else {
  print('x is smaller than or equal to 10')
}
```

```
## [1] "x is smaller than or equal to 10"
```

## 1.5 Reading CSV Files

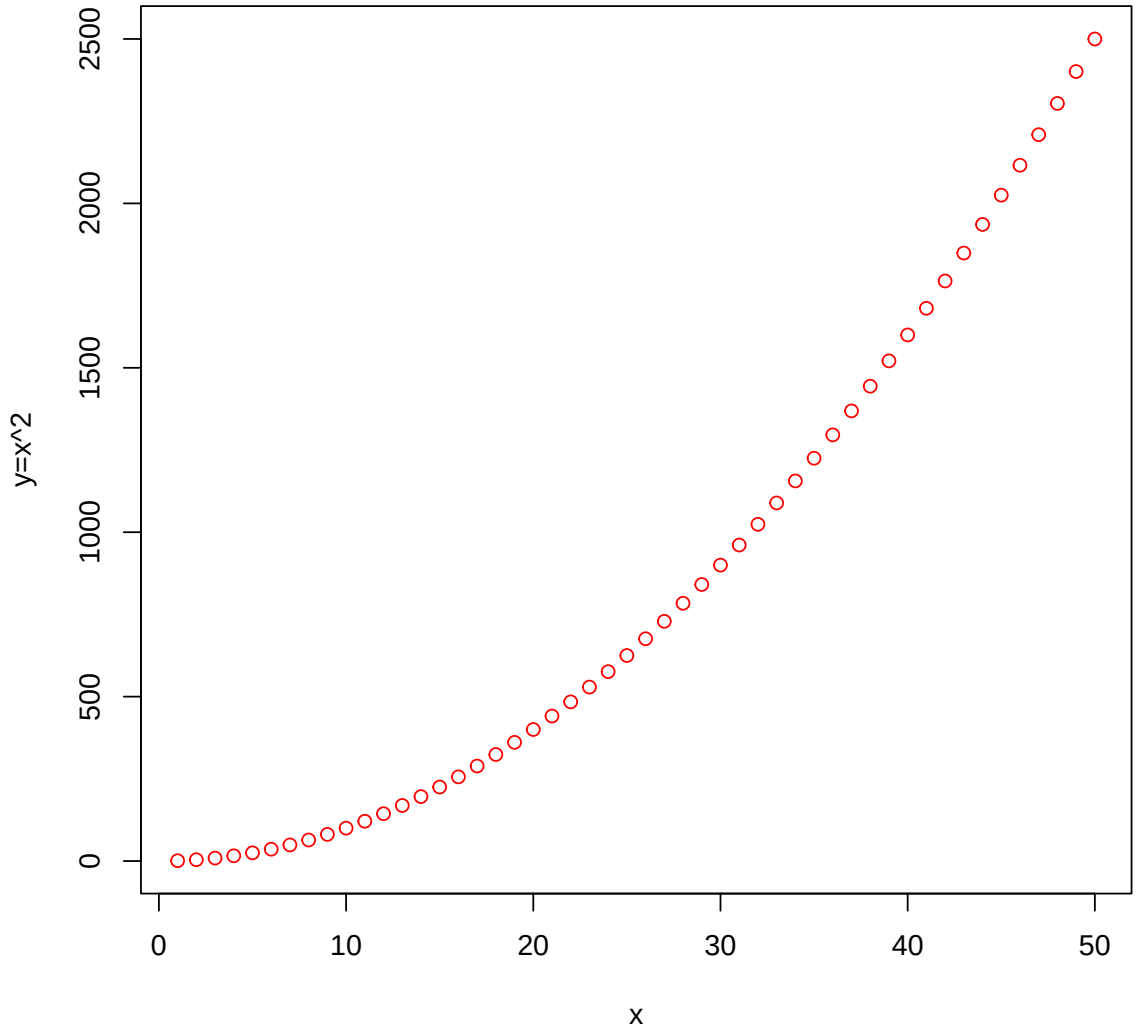
```
  read.csv('data.csv', header = TRUE, sep = ',', dec = '.',
           stringsAsFactors = TRUE)

##   id   name age occupation
## 1  1  James  28    Fireman
## 2  2 Evelyn  27 Technician
## 3  3  Laura  34    Teacher
```

## 1.6 Data Visualisation

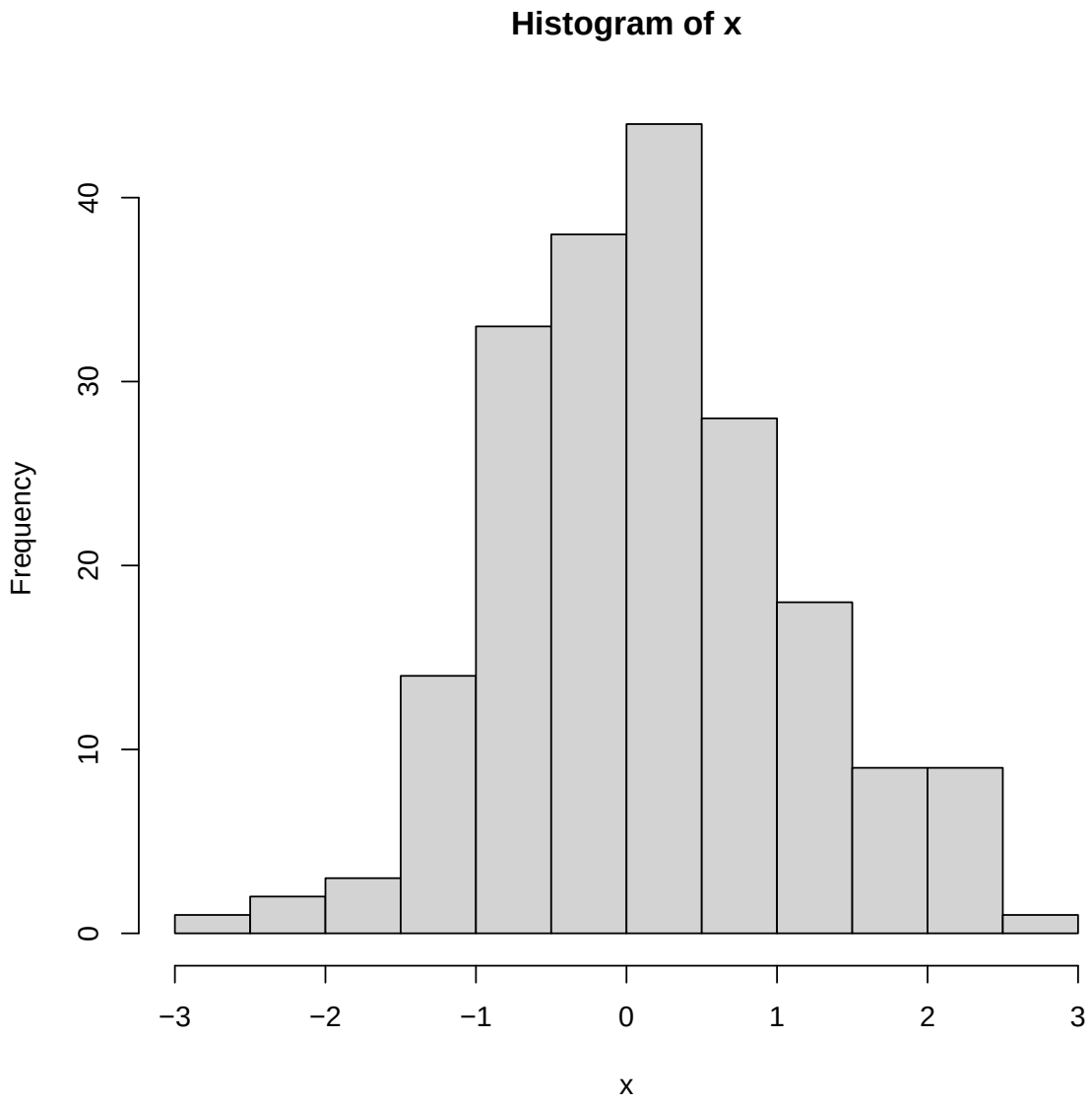
### 1.6.1 Scatter Plots

```
  x <- 1:50
y <- x^2
plot(x = x, y = y, xlab = 'x', ylab = 'y=x^2', col = 'red')
```




### 1.6.2 Histogram

```
  n <- 200
x <- rnorm(n)
hist(x = x, breaks = ceiling(sqrt(n)), col = 'lightgray')
```




## 1.7 Iteration

### 1.7.1 For Loop

```
  for (i in 1:5) {
    print(i)
  }
```

```
## [1] 1
## [1] 2
## [1] 3
## [1] 4
```

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

### 1.7.2 While Loop

```
  i = 1
while (i <= 5) {
  print(i)
  i <- i + 1
}

## [1] 1
## [1] 2
## [1] 3
## [1] 4
## [1] 5
```

### 1.7.3 Repeat Loop

```
  i = 1
repeat {
  print(i)
  i <- i + 1
  if (i == 6) break
}

## [1] 1
## [1] 2
## [1] 3
## [1] 4
## [1] 5
```