

# OPERATORS AND BUILTIN FUNCTIONS

## Basic Statistics Functions

> **x = c(3,3,3,4,5,5,8,12)**

Q: Find the **length**, **sum**, **mean**, **median** and **std dev.** of **x**

> **length(x)** # length of x

[1] 8

> **sum(x)** # the sum of x or  $\sum x$

[1] 43 > **mean(x)** # the average or mean of x, or  $\bar{x} = \frac{\sum x}{n}$

[1] 5.375

> **median(x)** # the median of x

[1] 4.5

> **sd(x)** # the sample standard deviation of  $x = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$

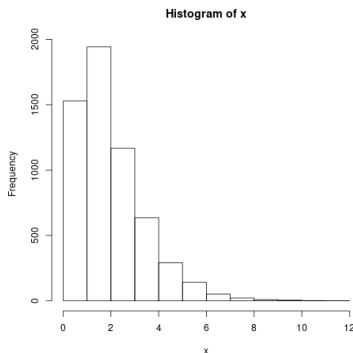
[1] 3.159453

> **sqrt( sum((x-mean(x))^2)/(length(x)-1) )**

[1] 3.159453

## Histogram of $x$ distribution

- > `x = c(rgamma(5800, 2))` # generate a random population
- > `hist(x)` # plot the histogram of  $x$

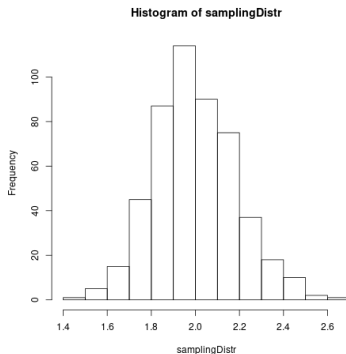


## Histogram of the sampling distribution

### The R script to generate the sampling distribution from $x$

```
samplingDistr = c() # creates a new empty list
for (i in 1:500) {
  temp = sample(x, 50, replace=F);
  samplingDistr = c(samplingDistr, mean(temp));
}
hist(samplingDistr) # histogram of the sampling distribution
```

## Histogram of the sampling distribution



## Names, Assignment

```
> a = 12
> A = 'MATH 2510'
> a
[1] 12
> A
[1] "MATH 2510"
> # a & A are different! case sensitive!
```

> — the beginning of an input  
[1] — the beginning of an output  
# — comment – R will ignore anything after #

## Names, Assignment

```
> a <- 12          # same as a = 12
> 12 -> a          # same as a = 12
> A = "Jack"       # same as A = 'Jack'
> A <- "Jack"      # same as A = 'Jack'
> "Jack" -> A      # same as A = 'Jack'
```

## Names, Assignment

```
> 12 <- a      # not allowed!  
Error in 12 <- a : invalid (do_set) left-hand s  
> a = a + 12 # Is it OK?  
  
> a  
[1] 24          # current value of a is 24  
  
> a = a + 12 # what is a equal to?  
  
> a  
[1] 36          # current value of a is 36
```

## Vector, List, or Array

```
> a = c(4,29,2019) # a vector with 3 components
> a
[1]      4     29    2019

> names = c("Alice","Bob","Chris")
> Names   # what's going to happen if type this?
Error: object 'Names' not found

> names
[1] "Anna"  "Bob"   "Chris"
```

**R object names are case sensitive!**



## Vector, List, or Array

```
> a  
[1] 4 29 2019
```

Q: insert 10 before vector *a* and assign it to *b*

```
> b = c(10, a)  
> b  
[1] 10 4 29 2019
```

```
> c = 2:5  
> c  
[1] 2 3 4 5
```

Q: insert 10 between *a* & *c* and assign it to *b*.

## Vector, List, or Array

Q: insert 10 between  $a$  &  $c$  and assign it to  $b$ .

```
> a
```

```
[1]      4      29 2019
```

```
> b
```

```
[1]     10      4      29 2019
```

```
> c
```

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

```
b = c(a, 10, b)
```

```
> b
```

```
[1]      4      29 2019     10     10      4      29 2019
```

$b$  is overwritten!