Summary of R functions

2021-07

Simple arithmetics

Adding

```
> 17 + 4
[1] 21
```

Division

```
> 17 / 4
[1] 4.25
```

Subtraction

```
> 17 - 4
[1] 13
```

Integer Division

```
> 17 %/% 4
[1] 4
```

Multiplication

```
> 17 * 4
[1] 61
```

Modulus

```
> 17 %% 4
[1] 1
```

Exponentiation

```
> 17 ^ 4   or   17 ** 4
[1] 83521
```

Assignments, basic functions, local environment

Help

?<function> → show help text for function
Press "Q" in order return to command prompt

Declare and assign an object with value

```
var <- 10  ( or  10 -> var  )
```

List environment objects

```
ls()
```

Get information about an object

```
str(var)
```

Print (to console)

```
print("Text") print(a)
```

Numeric functions ("Scalar" / element-wise)

Exponential function

```
> exp(1)
[1] 2.718282
```

Square Root

```
> sqrt(4)
[1] 2
```

Trigonometric functions

```
> sin(0)  > cos(pi)  > tan(pi/4)
[1] 0     [1] -1     [1] 1
```

Absolute values

```
> abs(-40)
[1] 40
```

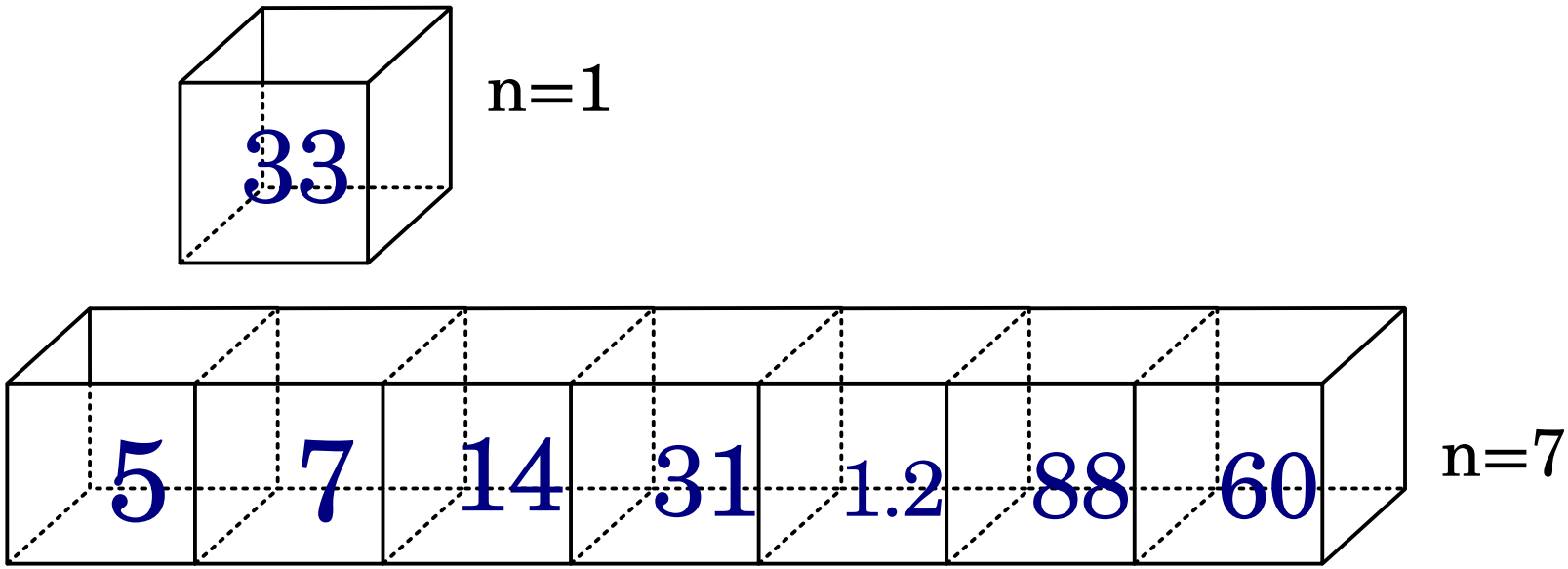
Logarithms

`> log(x)` natural

`> log10(x)` base of 10

`> log(x, base)` variable base

Data structures: `Vector`



Data structures: Vector generation

Combination

```
> vec <- c(1.2, 2.3, 4.5, 7, 9, 10)
> print(vec)
[1] 1.2 2.3 4.5 7.0 9.0 10.0
```

Dot operator (Integer sequence)

```
> vec <- 1:5
> print(vec)
[1] 1 2 3 4 5
```

General sequence

```
> seq(from = 2, to = 10, by = 2)
[1] 2 4 6 8 10
```

Data structures: Vector specific functions

Length of a vector

```
> vec <- 3:27
> length(vec) [1] 25
```

Sorting

```
> vec <- c(1, 63, 45, 27, 34)
> sort(vec)
[1] 1 27 34 45 63
```

Reversing

```
> vec <- 1:5
> rev(vec)
[1] 5 4 3 2 1
```

Data structures: `Vector` subsetting (I)

By single index

```
> vec <- seq(from = 10, to 50, by = 0,1)
> vec[5]
[1]
```

By index vector

```
> vec <- seq(from = 10, to 50, by = 0,1)
> vec[5:10]
[1] 10.4 10.5 10.6 10.7 10.8
```

All but ...

```
> vec <- seq(from = 10, to 50, by = 0,1)
> vec[-(3:4)]
[1] 10 10.1 10.4 10.5 10.6
```

Descriptive statistical parameters (I)


```
vec <- c(11:30, 15:40)
```

Arithmetic Mean

```
> mean(vec)
```

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i$$

Median

```
> median(vec)
```

$$\tilde{x} = \begin{cases} x_{m+1} & \forall \quad n = 2m+1 \\ \frac{x_m + x_{m+1}}{2} & \forall \quad n = 2m \end{cases}$$

Descriptive statistical parameters (II)

Variance of sample

```
> sd(vec)
```

$$s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

Variance of population

```
> var(vec) * n / (n-1)
```

$$\sigma^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

Standard deviation of sample

```
> sd(vec)
```

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

Standard deviation of population

```
> sd(vec) * sqrt( n / (n-1) )
```

$$\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

Descriptive statistical parameters (III)


```
vec.x <- 11:30
vec.y <- seq( from = 101, to = 139, by = 2 )
```

Covariance of 2 Vectors

```
> cov(vec.x, vec.y)
```

$$\mathrm{Cov}(X, Y) = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})$$

Correlation of 2 Vectors

```
> cor(vec)
```

$$r(X, Y) = \frac{\sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n} (x_i - \bar{x})^2 \sum_{i=1}^{n} (y_i - \bar{y})^2}}$$

Data types: Numeric & Character

Data structures: `List`

Data structures: `Data Frame`

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