R: Introduction

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Workshop Materials

https://github.com/nuitrcs/r_intro_june2018

Instructions/Help

- Software installation: https://sites.northwestern.edu/summerworkshops/resources/software-installation
- Downloading from GitHub: https://sites.northwestern.edu/summerworkshops/resources/downloading-from-github/

Code Reference

Code snippets from select slides for reference

Arithmetic

```
2 + 2
5 %% 2
3.452 * 6
2^4
```

Comparisons

```
1 < 2
TRUE == FALSE
'a' != "Boy"
```

Logical Operators

```
TRUE & FALSE  # and
TRUE | FALSE  # or
!TRUE | FALSE  # ! is not
(2 > 1) & (3 > 2)  # use () for grouping
```

Vectors

Only one type of data allowed!

```
x <- c(1,2,3,4,5)  # good
x <- c(1, "cat", TRUE)  # bad, converts to strings
```

Vector Indexing

Indices start with 1

```
x<-c('a', 'b', 'c', 'd', 'e')
x[1]
```

```
## [1] "a"
```

You can take slices of vectors

```
x[1:3]
```

```
## [1] "a" "b" "c"
```

Or exclude values with a negative sign:

```
x[-1]
```

```
## [1] "b" "c" "d" "e"
```

You can use a vector of integers or booleans to select from a vector as well:

```
x[x<'c']
```

```
## [1] "a" "b"
```

```
x[c(1,3,5)]
```

```
## [1] "a" "c" "e"
```

Vectors: Checking Values

Check if a value is in a vector with `%in%`

```
'c' %in% x
```

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

Or get the first index position of a value with `match()`

```
match('b', x)
```

```
## [1] 2
```

Vectors with Functions

Some functions will apply to each element of a vector. Others take a vector as a parameter.

```
x <- 1:5
log(x)
```

```
## [1] 0.0000000 0.6931472 1.0986123 1.3862944
## [5] 1.6094379
```

```
var(x)
```

```
## [1] 2.5
```

Missing Data

```
tmp<-c(1, 2, 5, NA, 6, NA)
is.na(tmp)
```

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

```
sum(is.na(tmp))
```

```
## [1] 2
```

Lists

Can hold mixed types. Can name elements or not.

```
l1 <- list(1, "a", TRUE, 1+4i)
l2 <- list(title = "Research Bazaar",
           numbers = 1:10, data = TRUE )
```

Indexing Lists

```
l2[2]
```

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

```
l2$numbers
```

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

```
l2[[2]]
```

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

```
l2[[2]][1]
```

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

Matrices

```
matrix(c('a', 'b', 'c', 'd'), nrow=2)
```

```
##      [,1] [,2]
## [1,] "a"  "c"
## [2,] "b"  "d"
```

```
y<-matrix(1:25, nrow=5, byrow=TRUE)
y
```

```
##      [,1] [,2] [,3] [,4] [,5]
## [1,]    1    2    3    4    5
## [2,]    6    7    8    9   10
## [3,]   11   12   13   14   15
## [4,]   16   17   18   19   20
## [5,]   21   22   23   24   25
```

Indexing Matrices

```
matrix[row, column]
```

```
y[1,1]
```

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

```
y[1,]
```

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

```
y[,1]
```

```
## [1]  1  6 11 16 21
```

Multiple Rows/Columns

```
y[1:2,3:4]
```

```
##      [,1] [,2]
## [1,]    3    4
## [2,]    8    9
```

```
y[,c(1,4)]
```

```
##      [,1] [,2]
## [1,]    1    4
## [2,]    6    9
## [3,]   11   14
## [4,]   16   19
## [5,]   21   24
```