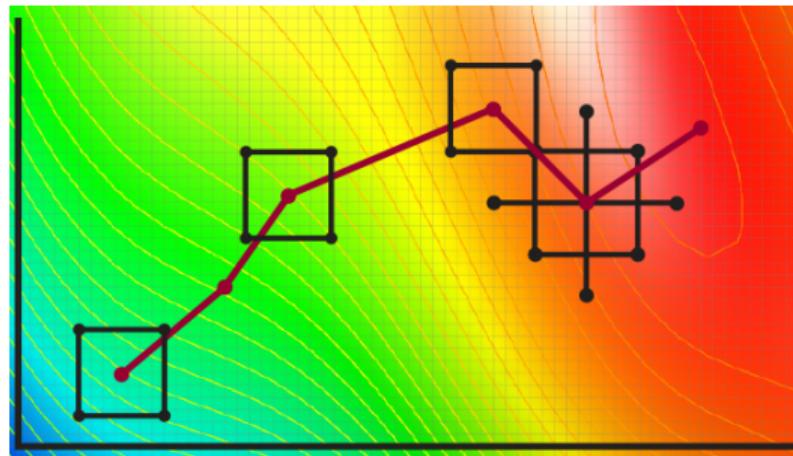


Experimentation for Improvement



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Design and Analysis of Experiments

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Software installation required for this course

Step one



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The Comprehensive R Archive Network

Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows** and **Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

Source Code for all Platforms

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (2015-06-18, World-Famous Astronaut) [R-3.2.1.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before

<http://yint.org/R>

The above links will redirect to the most up-to-date website. Alternatively, please search for “R project” and “RStudio”.

Step two



Go to...

A few of our professional fans.

RStudio is an active member of the R community. We believe free and open source data analysis software is a foundation for innovative and important work in science, education, and industry. The many customers who value our professional software capabilities help us contribute to this community.



<http://yint.org/RStudio>

Software alternatives to R

- ▶ Excel
- ▶ Python
- ▶ Minitab
- ▶ MATLAB
- ▶ SAS
- ▶ JMP

RStudio

Untitled1* | Go to file/function | Project: (None)

```

1 A <- c(-1, +1, -1, +1)
2 B <- c(-1, -1, +1, +1)
3 y <- c(52, 74, 62, 80)
4 popped_corn <- lm(y ~ A + B + A*B)

```

Environment | History | Import Dataset | Global Environment | List

Values

A	num [1:4] -1 1 -1 1
B	num [1:4] -1 -1 1 1

3:22 | (Top Level) | R Script

Console ~ /

Type `?<topic>` for basic help, `help(<topic>)` for on-line help,
`'help.start()'` for an HTML browser interface to help.
Type `'q()'` to quit R.

```

> c(1, 2, 3, 4)
[1] 1 2 3 4
> C(1, 2, 3, 4)
Error in C(1, 2, 3, 4) : object not interpretable as a fc
> help(c)
> help(C)
> popped_corn <- lm(y ~ A + B + A*B)
Error in eval(expr, envir, enclos) : object 'y' not found
> A <- c(-1, +1, -1, +1)
> B <- c(-1, -1, +1, +1)
> A
[1] -1 1 -1 1
> B
[1] -1 -1 1 1
>

```

Standard order	Actual order	A = time	B = corn	Outcome
1	2	-	-	52
2	4	+	-	74
3	1	-	+	62
4	3	+	+	80

RStudio

popcorn.R*

```
1 A <- c(-1, +1, -1, +1)
2 B <- c(-1, -1, +1, +1)
3 y <- c(52, 74, 62, 80)
4 popped_corn <- lm(y ~ A + B + A*B)
5 summary(popped_corn)
6
7 popped <- lm(y ~ A*B)
```

7:1 (Top Level) R Script

Console ~ /

```
> summary(popped_corn)
Call:
lm(formula = y ~ A * B)

Residuals:
ALL 4 residuals are 0: no residual degrees of freedom!

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 67 NA NA NA
A 10 NA NA NA
B 4 NA NA NA
A:B -1 NA NA NA

Residual standard error: NaN on 0 degrees of freedom
Multiple R-squared: 1, Adjusted R-squared: NaN
F-statistic: NaN on 3 and 0 DF, p-value: NA
```

> popped <- lm(y ~ A*B)

Type this:
> summary(popped)

Run

Environment History

Import Dataset

Global Environment

Values

A	num [1:4] -1 1 -1 1
B	num [1:4] -1 -1 1 1
popped	List of 12
popped_corn	List of 12
y	num [1:4] 52 74 62 80

File Plots Packages Help Viewer

R: Combine Values into a Vector or List Find in Topic

c {base}

R Documentation

Combine Values into a Vector or List

Description

This is a generic function which combines its arguments.

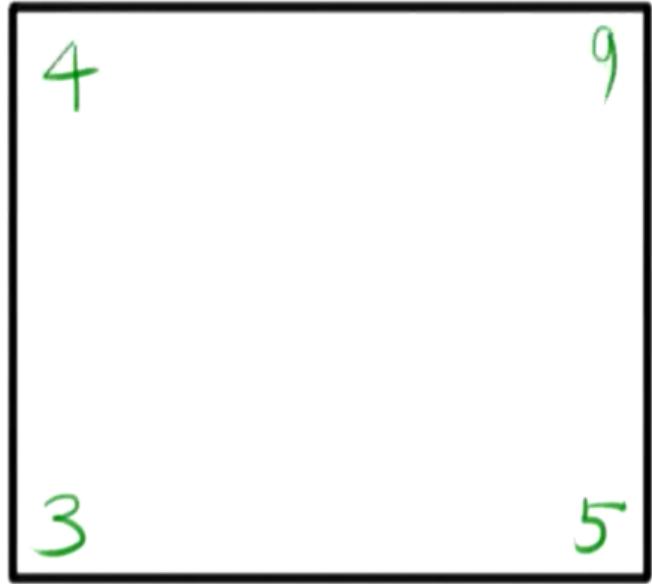
The default method combines its arguments to form a vector. All arguments are coerced to a common type which is the type of the returned value, and all attributes except names are removed.

Usage

Molasses

B = sugar type

Honey



A = baking time

8 minutes

14 minutes

$$\begin{aligned}y &= 5.25 \\&+ 1.75x_A \\&+ 1.25x_B \\&+ 0.75x_A x_B\end{aligned}$$

Spoiler alert
the solution is
shown next

RStudio

Project: (None)

taste.R

Source on Save | Run | Source

```
1 A <- c(-1, +1, -1, +1)
2 B <- c(-1, -1, +1, +1)
3 y <- c( 3, 5, 4, 9)
4 taste <- lm(y ~ A + B + A*B)
5 summary(taste)
6
```

6:1 (Top Level) R Script

Console ~/ ↵

```
> taste <- lm(y ~ A + B + A*B)

> summary(taste)

Call:
lm(formula = y ~ A + B + A * B)

Residuals:
ALL 4 residuals are 0: no residual degrees of freedom!

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 5.25     NA     NA     NA
A            1.75     NA     NA     NA
B            1.25     NA     NA     NA
A:B          0.75     NA     NA     NA

Residual standard error: NaN on 0 degrees of freedom
Multiple R-squared:      1,    Adjusted R-squared:      NaN
F-statistic:  NaN on 3 and 0 DF,  p-value: NaN
```

Environment History

Import Dataset | Global Environment | List

Values

A	num [1:4]	-1 1 -1 1
B	num [1:4]	-1 -1 1 1
taste	List of 12	
y	num [1:4]	3 5 4 9

Files Plots Packages Help Viewer

R: Combine Values into a Vector or List Find in Topic

c {base} R Documentation

Combine Values into a Vector or List

Description

This is a generic function which combines its arguments.

The default method combines its arguments to form a vector. All arguments are coerced to a common type which is the type of the returned value, and all attributes except names are removed.

Usage