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# Introduction

The goal of this document is to show what you may need to generate a document using R Markdown, a file with Rmd extension. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

## Prerequisites

To be able to use R Markdown, an installation of R software is essential; use one of these [CRAN Mirrors](https://cran.r-project.org/mirrors.html) to find an appropriate installation file.

Although not necessary, it is highly recommended that RStudio, an integrated development environment (IDE) for R (and Python!), is also installed: the free [RStudio Desktop](https://www.rstudio.com/products/rstudio/download/) version is sufficient.

Finally, if not installed, these packages need to be installed:

* knitr
* rmarkdown

Those may need other packages, including *evaluate, digest, highr, markdown, yaml, Rcpp, htmltools, jsonlite, base64enc,* and *mime*.

The following code **chunk**, named installPreReq, install those packages and other requirements that could come handy:

install.packages("installr")  
library(installr)  
install.Rtools()  
install.packages('devtools')  
install.packages(c('evaluate', 'digest', 'highr', 'markdown', 'yaml',  
 'Rcpp', 'htmltools', 'knitr', 'jsonlite', 'base64enc',   
 'mime', 'rmarkdown'))

The following code **chunk**, named loadPackages shows how to run an R code to perform some tasks, and generate some outputs for inclusion in the final document.

When these are installed, RStudio shows the **Knit** button that starts the process of converting an Rmd file into a HTML, PDF or MS Word file.

cat('Loading knit and rmarkdown packages . . .')

## Loading knit and rmarkdown packages . . .

if(!require("knitr")){  
 # if failed to load knitr, install it  
 install.packages("knitr")  
 # then load it  
 library("knitr")  
}

## Loading required package: knitr

if(!require("rmarkdown")){  
 # if failed to load rmarkdown, install it  
 install.packages("rmarkdown")  
 # then load it  
 library("rmarkdown")  
}

## Loading required package: rmarkdown

cat('Loading knit and rmarkdown packages done.\n')

## Loading knit and rmarkdown packages done.

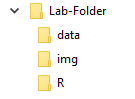
# Capabilities

The text shown above is an example of how code and text can be combined in an Rmd file to create a document.

In the rest of this document, examples of other capabilities of R Markdown are shown. In these examples, it is assumed that the document is generated in Rstudio.

## Adding an Image

The following image shows the folder structure used for this lab-template:



Folder Strucrure

This Rmd file is located in R folder, image files used here (like the one above) are located in img folder, data files are located in data folder. All these folders are are located under Lab-Folder.

Instead of embedding an image, a link to it can be provided; here is a link to the same [Folder Strucrure](../img/FolderStructure.png).

## Adding formula

Simple LaTeX commands can be used as inline formulas, like , or displayed formulas

Images of formulas, be it produced by online tools (like [atomurl.net/math](http://atomurl.net/math/)) or handwritten, could be a quick substitute for typing equations for novices.

## Data Structure and Summaries

There are many internal datasets in R that can be used right away; for example, cars contains the information on speed and stopping distance of some cars from 1977. Here is how to show the structure of the dataset:

str(cars)

## 'data.frame': 50 obs. of 2 variables:  
## $ speed: num 4 4 7 7 8 9 10 10 10 11 ...  
## $ dist : num 2 10 4 22 16 10 18 26 34 17 ...

and its summaries:

summary(cars)

## speed dist   
## Min. : 4.0 Min. : 2.00   
## 1st Qu.:12.0 1st Qu.: 26.00   
## Median :15.0 Median : 36.00   
## Mean :15.4 Mean : 42.98   
## 3rd Qu.:19.0 3rd Qu.: 56.00   
## Max. :25.0 Max. :120.00

## Including Plots

Another example of an internal dataset is pressure that contains vapor pressure of mercury as a function of temperature. The following code chunk shows how a plot can be produced while printing of the code is prevented by adding echo=FALSE option.



## Reading Data

When an external is needed to be used, R can read data from a local file; for example:

x = read.csv(file = '../data/CheeseTaste.csv', header = TRUE)   
head(x)

## ï..taste acetic h2s lactic  
## 1 12.3 4.543 3.135 0.86  
## 2 20.9 5.159 5.043 1.53  
## 3 39.0 5.366 5.438 1.57  
## 4 47.9 5.759 7.496 1.81  
## 5 5.6 4.663 3.807 0.99  
## 6 25.9 5.697 7.601 1.09

R can also read files online from a given url; for example, bac (bear alcohol content) is a CSV file on OpenIntro site:

y = read.csv(file = 'https://www.openintro.org/data/csv/bac.csv',   
 header = TRUE)

# Conclusion

R markdown is a flexible and powerful tool for generating reproducible documents.

This tool can produce reports in HTML, PDF and even (perhaps) MS Word formats. However,