Week-3: Code-Along

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I. Code to Edit and Execute

Loading Packages

```
# Load package tidyverse
library("tidyverse")
```

```
## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ─
─
## ✔ dplyr     1.1.0     ✔ readr     2.1.4
## ✔ forcats   1.0.0     ✔ stringr   1.5.0
## ✔ ggplot2   3.4.3     ✔ tibble    3.1.8
## ✔ lubridate 1.9.2     ✔ tidyr     1.3.0
## ✔ purrr     1.0.1
## ── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ─
─
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
## ℹ Use the ]8;;http://conflicted.r-lib.org/conflicted package]8;; to force a
ll conflicts to become errors
```

Assigning Values to Variables

```
# Example A
x <- 'A'
x
```

```
## [1] "A"
```

```
# Example B
x <- "Apple"
x
```

```
## [1] "Apple"
```

```
# Example C
x <- FALSE
x
```

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

```
# Example D
x <- 5L
x
```

```
## [1] 5
```

```
# Example E
x <- 5
x
```

```
## [1] 5
```

```
# Example F
x <- 1i
x
```

```
## [1] 0+1i
```

Checking the Type of Variables

```
# Example A
x <- 'A'
typeof(x)
```

```
## [1] "character"
```

```
# Example B
x <- "Apple"
typeof(x)
```

```
## [1] "character"
```

```
# Example C
x <- FALSE
typeof(x)
```

```
## [1] "logical"
```

```
# Example D
x <- 5L
typeof(x)
```

```
## [1] "integer"
```

```
# Example E
x <- 5
typeof(x)
```

```
## [1] "double"
```

```
# Example F
x <- 1i
typeof(x)
```

```
## [1] "complex"
```

Need for Data Types

```
# To import data,
cat_lovers <- read.csv("cat-lovers.csv")
```

```
# To compute the mean,
mean(cat_lovers$number_of_cats)
```

```
## Warning in mean.default(cat_lovers$number_of_cats): argument is not numeric or
## logical: returning NA
```

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

```
# To understand mean operator,
?mean
```

```
# Convert the variable using as.integer(),
mean(as.integer(cat_lovers$number_of_cats))
```

```
## Warning in mean(as.integer(cat_lovers$number_of_cats)): NAs introduced by
## coercion
```

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

```
# Display the elements of the column number_of_cats,
cat_lovers$number_of_cats
```

```
##  [1] "0"
##  [2] "0"
```

```
##  [3] "1"
##  [4] "3"
##  [5] "3"
##  [6] "2"
##  [7] "1"
##  [8] "1"
##  [9] "0"
## [10] "0"
## [11] "0"
## [12] "0"
## [13] "1"
## [14] "3"
## [15] "3"
## [16] "2"
## [17] "1"
## [18] "1"
## [19] "0"
## [20] "0"
## [21] "1"
## [22] "1"
## [23] "0"
## [24] "0"
## [25] "4"
## [26] "0"
## [27] "0"
## [28] "0"
## [29] "0"
## [30] "0"
## [31] "0"
## [32] "0"
## [33] "0"
## [34] "0"
## [35] "0"
## [36] "0"
## [37] "0"
## [38] "0"
## [39] "0"
## [40] "0"
## [41] "0"
## [42] "0"
## [43] "1"
## [44] "3"
## [45] "3"
## [46] "2"
## [47] "1"
## [48] "1.5 - honestly I think one of my cats is half human"
## [49] "0"
## [50] "0"
## [51] "1"
## [52] "0"
## [53] "1"
## [54] "three"
## [55] "1"
## [56] "1"
```

```
## [57] "1"
## [58] "0"
## [59] "0"
## [60] "2"
```

```
# Display the elements of the column number_of_cats after converting it using as.nu
meric(),
as.integer(cat_lovers$number_of_cats)
```

```
## Warning: NAs introduced by coercion
```

```
##  [1]  0  0  1  3  3  2  1  1  0  0  0  0  1  3  3  2  1  1  0  0  1  1  0  0  4
## [26]  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  3  3  2  1 NA  0  0
## [51]  1  0  1 NA  1  1  1  0  0  2
```

Create an Empty Vector

```
# To create an empty vector,
x <- vector()

# To find the type of empty vector,
typeof(x)
```

```
## [1] "logical"
```

Create Vectors of Type: Logical

```
# Method 1,
x<-vector("logical",length=5)

# Display the contents of x,
print(x)
```

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

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "logical"
```

```
# Method 2,
x<-logical(5)

# Display the contents of x,
print(x)
```

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

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "logical"
```

```
# Method 3,
x<-c(TRUE,FALSE,TRUE,FALSE,TRUE)

# Display the contents of x,
print(x)
```

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

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "logical"
```

Create Vectors of Type: Character

```
# Method 1,
x <- vector("character",length=5)

# Display the contents of x,
print(x)
```

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

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "character"
```

```
# Method 2,
x <- character(5)

# Display the contents of x,
print(x)
```

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

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "character"
```

```
# Method 3,
x <- c('A','b','r','q')

# Display the contents of x,
print(x)
```

```
## [1] "A" "b" "r" "q"
```

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "character"
```

Create Vectors of Type: Integer

```
# Method 1,
x <- vector("integer",length=5)

# Display the contents of x,
print(x)
```

```
## [1] 0 0 0 0 0
```

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "integer"
```

```
# Method 2,
x <- integer(5)

# Display the contents of x,
print(x)
```

```
## [1] 0 0 0 0 0
```

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "integer"
```

```
# Method 3,
x <- c(1,2,3,4,5)

# Display the contents of x,
print(x)
```

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

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "double"
```

```
# Method 4,
x <- seq(from=1,to=5,by=0.1)

# Display the contents of x,
print(x)
```

```
##  [1] 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8
## [20] 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7
## [39] 4.8 4.9 5.0
```

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "double"
```

```
# Method 5,
x <- 1:5

# Display the contents of x,
print(x)
```

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

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "integer"
```

Create Vectors of Type: Double

```
# Method 1,
x <- vector("double",length=5)

# Display the contents of x,
print(x)
```

```
## [1] 0 0 0 0 0
```

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "double"
```

```
# Method 2,
x <- double(5)

# Display the contents of x,
print(x)
```

```
## [1] 0 0 0 0 0
```

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "double"
```

```
# Method 3,
x <- c(1.787,0.63573,2.3890)

# Display the contents of x,
print(x)
```

```
## [1] 1.78700 0.63573 2.38900
```

```
# Display the type of x,
print(typeof(x))
```

```
## [1] "double"
```

Implicit Coercion

Example 1

```
# Create a vector,
x <- c(1.8)

# Check the type of x,
typeof(x)
```

```
## [1] "double"
```

```
# Add a character to the vector,
x <- c(x,'a')

# Check the type of x
typeof(x)
```

```
## [1] "character"
```

Example 2

```
# Create a vector,
x <- c(TRUE)

# Check the type of x,
typeof(x)
```

```
## [1] "logical"
```

```
# Add a number to the vector,
x <- c(x,2)

# Check the type of x,
typeof(x)
```

```
## [1] "double"
```

Example 3

```
# Create a vector,
x <- c('a')

# Check the type of x,
typeof(x)
```

```
## [1] "character"
```

```
# Add a logical value to the vector,
x <- c(x,TRUE)

# Check the type of x,
typeof(x)
```

```
## [1] "character"
```

Example 4

```
# Create a vector,
x <- c(1L)

# Check the type of x,
typeof(x)
```

```
## [1] "integer"
```

```
# Add a number to the vector,
x <- c(x,2)

# Check the type of x,
typeof(x)
```

```
## [1] "double"
```

Explicit Coercion

Example 1

```
# Create a vector,
x <- c(1L)

# Check the type of x,
typeof(x)
```

```
## [1] "integer"
```

```
# Convert the vector to type character,
x <- as.character(x)

# Check the type of x,
typeof(x)
```

```
## [1] "character"
```

Example 2

```
# Create a vector,
x <- c('A')

# Check the type of x,
typeof(x)
```

```
## [1] "character"
```

```
# Convert the vector to type double,
x <- as.numeric(x)
```

```
## Warning: NAs introduced by coercion
```

```
# Check the type of x,
typeof(x)
```

```
## [1] "double"
```

Accessing Elements of the Vector

```
# Create a vector,
x <- c(1,10,9,8,1,3,5)
```

```
# Access one element with index 3,
x[3]
```

```
## [1] 9
```

```
# Access elements with consecutive indices, 2 to 4: 2,3,4,
x[2:4]
```

```
## [1] 10  9  8
```

```
# Access elements with non-consecutive indices, 1,3,5,
x[c(1,3,5)]
```

```
## [1] 1 9 1
```

```
# Access elements using logical vector,
x[c(TRUE,FALSE,FALSE,TRUE,FALSE,FALSE,TRUE)]
```

```
## [1] 1 8 5
```

```
# Access elements using the conditional operator <,
x[x<10]
```

```
## [1] 1 9 8 1 3 5
```

Examining Vectors

```
# Display the length of the vector
print(length(x))
```

```
## [1] 7
```

```
# Display the type of the vector
print(typeof(x))
```

```
## [1] "double"
```

```
# Display the structure of the vector
print(str(x))
```

```
##  num [1:7] 1 10 9 8 1 3 5
## NULL
```

Lists

```
# Initialise a named list,
my_pie = list(type="key lime", diameter=7, is.vegetarian=TRUE)

# Display the list,
my_pie
```

```
## $type
## [1] "key lime"
##
## $diameter
## [1] 7
##
## $is.vegetarian
## [1] TRUE
```

```
# Print the names of the list,
names(my_pie)
```

```
## [1] "type"          "diameter"      "is.vegetarian"
```

```
# Retrieve the element named type,
my_pie$type
```

```
## [1] "key lime"
```

```
# Retrieve a truncated list,
my_pie["type"]
```

```
## $type
## [1] "key lime"
```

```
# Retrieve the element named type,
my_pie[["type"]]
```

```
## [1] "key lime"
```

Exploring Data-Sets

```
# Install package,
install.packages("openintro", repos = "http://cran.us.r-project.org")
```

```
##
## The downloaded binary packages are in
##  /var/folders/94/vfdq9lz14bs344svgl34kq200000gn/T//RtmpJCCXOy/downloaded_package
s
```

```
# Load the package,
library(openintro)
```

```
## Loading required package: airports
```

```
## Loading required package: cherryblossom
```

```
## Loading required package: usdata
```

```
# Load package,
library(tidyverse)
```

```
# Catch a glimpse of the data-set: see how the rows are stacked one below another,
glimpse(loans_full_schema)
```

```
## Rows: 10,000
## Columns: 55
## $ emp_title                         <chr> "global config engineer ", "warehouse…
```

```
## $ emp_length                      <dbl> 3, 10, 3, 1, 10, NA, 10, 10, 10, 3, 1…
## $ state                           <fct> NJ, HI, WI, PA, CA, KY, MI, AZ, NV, I…
## $ homeownership                   <fct> MORTGAGE, RENT, RENT, RENT, RENT, OWN…
## $ annual_income                   <dbl> 90000, 40000, 40000, 30000, 35000, 34…
## $ verified_income                 <fct> Verified, Not Verified, Source Verifi…
## $ debt_to_income                  <dbl> 18.01, 5.04, 21.15, 10.16, 57.96, 6.4…
## $ annual_income_joint             <dbl> NA, NA, NA, NA, 57000, NA, 155000, NA…
## $ verification_income_joint       <fct> , , , , Verified, , Not Verified, , ,…
## $ debt_to_income_joint            <dbl> NA, NA, NA, NA, 37.66, NA, 13.12, NA,…
## $ delinq_2y                       <int> 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0…
## $ months_since_last_delinq        <int> 38, NA, 28, NA, NA, 3, NA, 19, 18, NA…
## $ earliest_credit_line            <dbl> 2001, 1996, 2006, 2007, 2008, 1990, 2…
## $ inquiries_last_12m              <int> 6, 1, 4, 0, 7, 6, 1, 1, 3, 0, 4, 4, 8…
## $ total_credit_lines              <int> 28, 30, 31, 4, 22, 32, 12, 30, 35, 9,…
## $ open_credit_lines               <int> 10, 14, 10, 4, 16, 12, 10, 15, 21, 6,…
## $ total_credit_limit              <int> 70795, 28800, 24193, 25400, 69839, 42…
## $ total_credit_utilized           <int> 38767, 4321, 16000, 4997, 52722, 3898…
## $ num_collections_last_12m        <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0…
## $ num_historical_failed_to_pay    <int> 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0…
## $ months_since_90d_late           <int> 38, NA, 28, NA, NA, 60, NA, 71, 18, N…
## $ current_accounts_delinq         <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0…
## $ total_collection_amount_ever    <int> 1250, 0, 432, 0, 0, 0, 0, 0, 0, 0, 0,…
## $ current_installment_accounts    <int> 2, 0, 1, 1, 1, 0, 2, 2, 6, 1, 2, 1, 2…
## $ accounts_opened_24m             <int> 5, 11, 13, 1, 6, 2, 1, 4, 10, 5, 6, 7…
## $ months_since_last_credit_inquiry <int> 5, 8, 7, 15, 4, 5, 9, 7, 4, 17, 3, 4,…
## $ num_satisfactory_accounts       <int> 10, 14, 10, 4, 16, 12, 10, 15, 21, 6,…
## $ num_accounts_120d_past_due      <int> 0, 0, 0, 0, 0, 0, 0, NA, 0, 0, 0, 0, …
## $ num_accounts_30d_past_due       <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0…
## $ num_active_debit_accounts       <int> 2, 3, 3, 2, 10, 1, 3, 5, 11, 3, 2, 2,…
## $ total_debit_limit               <int> 11100, 16500, 4300, 19400, 32700, 272…
## $ num_total_cc_accounts           <int> 14, 24, 14, 3, 20, 27, 8, 16, 19, 7, …
## $ num_open_cc_accounts            <int> 8, 14, 8, 3, 15, 12, 7, 12, 14, 5, 8,…
## $ num_cc_carrying_balance         <int> 6, 4, 6, 2, 13, 5, 6, 10, 14, 3, 5, 3…
## $ num_mort_accounts               <int> 1, 0, 0, 0, 0, 3, 2, 7, 2, 0, 2, 3, 3…
## $ account_never_delinq_percent    <dbl> 92.9, 100.0, 93.5, 100.0, 100.0, 78.1…
## $ tax_liens                       <int> 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0…
## $ public_record_bankrupt          <int> 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0…
## $ loan_purpose                    <fct> moving, debt_consolidation, other, de…
## $ application_type                <fct> individual, individual, individual, i…
## $ loan_amount                     <int> 28000, 5000, 2000, 21600, 23000, 5000…
## $ term                            <dbl> 60, 36, 36, 36, 36, 36, 60, 60, 36, 3…
## $ interest_rate                   <dbl> 14.07, 12.61, 17.09, 6.72, 14.07, 6.7…
## $ installment                     <dbl> 652.53, 167.54, 71.40, 664.19, 786.87…
## $ grade                           <fct> C, C, D, A, C, A, C, B, C, A, C, B, C…
## $ sub_grade                       <fct> C3, C1, D1, A3, C3, A3, C2, B5, C2, A…
## $ issue_month                     <fct> Mar-2018, Feb-2018, Feb-2018, Jan-201…
## $ loan_status                     <fct> Current, Current, Current, Current, C…
## $ initial_listing_status          <fct> whole, whole, fractional, whole, whol…
## $ disbursement_method             <fct> Cash, Cash, Cash, Cash, Cash, Cash, C…
## $ balance                         <dbl> 27015.86, 4651.37, 1824.63, 18853.26,…
## $ paid_total                      <dbl> 1999.330, 499.120, 281.800, 3312.890,…
## $ paid_principal                  <dbl> 984.14, 348.63, 175.37, 2746.74, 1569…
## $ paid_interest                   <dbl> 1015.19, 150.49, 106.43, 566.15, 754.…
## $ paid_late_fees                  <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0…
```

```
# Selecting numeric variables,
loans <- loans_full_schema %>% # <-- pipe operator
  select(paid_total, term, interest_rate,
         annual_income,paid_late_fees,debt_to_income)

# View the columns stacked one below another,
glimpse(loans)
```

```
## Rows: 10,000
## Columns: 6
## $ paid_total     <dbl> 1999.330, 499.120, 281.800, 3312.890, 2324.650, 873.130…
## $ term           <dbl> 60, 36, 36, 36, 36, 36, 60, 60, 36, 36, 60, 60, 36, 60,…
## $ interest_rate  <dbl> 14.07, 12.61, 17.09, 6.72, 14.07, 6.72, 13.59, 11.99, 1…
## $ annual_income  <dbl> 90000, 40000, 40000, 30000, 35000, 34000, 35000, 110000…
## $ paid_late_fees <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0…
## $ debt_to_income <dbl> 18.01, 5.04, 21.15, 10.16, 57.96, 6.46, 23.66, 16.19, 3…
```

```
# Selecting categoric variables,
loans <- loans_full_schema %>%
  select(grade, state, homeownership, disbursement_method)
# View the columns stacked one below another
glimpse(loans)
```

```
## Rows: 10,000
## Columns: 4
## $ grade               <fct> C, C, D, A, C, A, C, B, C, A, C, B, C, B, D, D, D,…
## $ state               <fct> NJ, HI, WI, PA, CA, KY, MI, AZ, NV, IL, IL, FL, SC…
## $ homeownership       <fct> MORTGAGE, RENT, RENT, RENT, RENT, OWN, MORTGAGE, M…
## $ disbursement_method <fct> Cash, Cash, Cash, Cash, Cash, Cash, Cash, Cash, Ca…
```