library(tidyverse) — Attaching packages -- tidyverse 1.3.0 — ✓ purrr 0.3.4 ✓ ggplot2 3.3.3 ✓ dplyr 1.0.4 ✓ tibble 3.0.6 ✓ stringr 1.4.0 ✓ tidyr 1.1.2 ✓ forcats 0.5.1 ✓ readr 1.4.0 - Conflicts tidyverse conflicts() — * dplyr::filter() masks stats::filter() * dplyr::lag() masks stats::lag() **Conditional Statements** if (if..then) • if...else • if...else if...else In [3]: x <- 0 if (x < 0) { print("Number is negative") $}$ else if (x >= 50) { print("Number is 50 or greater") $}$ else if (x == 0) { print("Number is 0") print("Number is between 0 and 50") [1] "Number is 0" In [7]: zero and fifty <- function(x) { if (x < 0) { print("Number is negative") $\}$ else if (x >= 50) { print("Number is 50 or greater") } else if (x == 0) { print("Number is 0") print("Number is between 0 and 50") zero and fifty(10) zero and fifty(-5)zero and fifty(50) [1] "Number is between 0 and 50" [1] "Number is negative" [1] "Number is 50 or greater" Attempt: • Write a function that outputs the square if the input is a positive number, the absolute value if the input is a negative number, and prints "ZERO" if the input is zero. What is the output of the following block of code? In [13]: x <- 0 if (x > 0) { x**2 $}$ else if (x < 0) { abs(x) $}$ else if (x == 0){ print("ZERO") [1] "ZERO" In [19]: #warm up function <- function(x) {</pre> $if (x > 0) {$ x**2 $\}$ else if (x < 0) { abs(x) $}$ else if (x == 0){ print("ZERO") #} warm up function <- function(x) {</pre> if (x > 0) { x**2 } else if (x < 0) {</pre> abs(x) } else { print("ZERO") warm up function(10) warm up function(-10) warm_up_function(0) 100 10 [1] "ZERO" In [20]: x <- 0 if (x == 0) { print("THIS") $\}$ else if (x < 100) { print("THAT") [1] "THIS" Be careful with the position of the curly braces In [23]: x <- 0 if (x == 0) { print("THIS") $}$ else if (x < 100) { print("THAT") [1] "THIS" Be careful with the output of your condition statement. It must be either TRUE or FALSE. In [27]: c(1,2) == 1TRUE · FALSE In [26]: if (c(1,2) == 1) {print("THIS")} Warning message in if (c(1, 2) == 1) {: "the condition has length > 1 and only the first element will be used" [1] "THIS" The following commands condense Boolean vectors: • any() returns TRUE if any value is TRUE, FALSE otherwise • all() returns TRUE if all values are TRUE, FALSE otherwise In [28]: any(c(T, F)) any(c(F, F)) all(c(T, F))all(c(T, T))**TRUE FALSE FALSE TRUE** You can use logical operators to combine conditions: • && for "and" • || for "or" • identical() for == These are *not* vectorized meaning that they will always output a single TRUE / FALSE value In [31]: pos and not five \leftarrow function(x) {(x > 0) && !(identical(x,5))} pos_and_not_five(5) pos and not five(1) pos and not five (-1)**FALSE TRUE FALSE** The command identical() returns TRUE if all arguments are **exactly** the same, FALSE otherwise In [32]: identical(0, 0, 0, 0, 0) identical(1L, 1) **TRUE FALSE** Loops • Useful for when you want to do the same thing to many different inputs In [34]: seq(1:5) $1 \cdot 2 \cdot 3 \cdot 4 \cdot 5$ In [33]: # print the first five positive integers for (i in seq(1:5)) { print(i) [1] 1 [1] 2 [1] 3 [1] 4 [1] 5 The above loop is equivalent to: print(1) print(2) print(3) print(4) print(5) The variable i takes on the values in seq(1:5) = c(1, 2, 3, 4, 5) one by one. • We can iterate over vectors and lists In [39]: x <- list("hello", "everyone", "it's", "wednesday", 2)</pre> for (element in x) { print(element) [1] "hello" [1] "everyone" [1] "it's" [1] "wednesday" [1] 2 In [43]: diamonds_number <- diamonds %>% select(depth, table, price, x, y, z) %>% head() %>% print() # A tibble: 6 x 6 depth table price X <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> < 61.5 55 326 3.95 3.98 2.43 326 3.89 3.84 2.31 59.8 61 56.9 65 327 4.05 4.07 2.31 62.4 58 334 4.2 4.23 2.63 63.3 58 335 4.34 4.35 2.75 62.8 57 336 3.94 3.96 2.48 In [44]: for (column in diamonds_number) { column <- column - mean(column)</pre> diamonds_number A tibble: 6×6 depth table price Z У <dbl> <int> <dbl> <dbl> <dbl> <dbl> 61.5 55 326 3.95 3.98 2.43 59.8 326 3.89 3.84 2.31 61 56.9 65 327 4.05 4.07 2.31 62.4 58 334 4.20 4.23 2.63 63.3 58 335 4.34 4.35 2.75 62.8 57 336 3.94 3.96 2.48 In [42]: # to modify a dataframe we can use seq along() # here i represents an **index** rather than the element itself for (i in seq along(diamonds number)) { diamonds_number[[i]] <- diamonds_number[[i]] - mean(diamonds_number[[i]])</pre> diamonds number A tibble: 6×6 depth table price Z <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> 0.3833333 -4 -4.666667 -0.11166667 -0.091666667 -0.055 -1.3166667 2 -4.666667 -0.17166667 -0.231666667 -0.175 -4.2166667 6 -3.666667 -0.01166667 -0.001666667 -0.175 1.2833333 -1 3.333333 0.13833333 0.158333333 0.145 2.1833333 -1 4.333333 0.27833333 0.278333333 0.265 1.6833333 -2 5.333333 -0.12166667 -0.111666667 -0.005 In [49]: x < -c(1,2,3)for (i in seq_along(x)) { $x[[i]] \leftarrow x[[i]]**2$ print(x[[i]]) X [1] 1 [1] 4 [1] 9 $1 \cdot 4 \cdot 9$ Attempt Write a function that adjusts a column of a tibble by the mean if its an integer or double type column In [66]: is.numeric(diamonds\$carat) **TRUE** In [67]: is.numeric(diamonds\$price) **TRUE** In [68]: is.numeric(diamonds\$cut) **FALSE** In [70]: column <- diamonds\$price</pre> if (is.numeric(column)){ column <- column - mean(column)</pre> [1] "something" In [72]: new_diamonds <- diamonds</pre> In [73]: tib <- new_diamonds for (i in seq_along(tib)) { if (is.numeric(tib[[i]])){ tib[[i]] <- tib[[i]] - mean(tib[[i]]) tib A tibble: 53940 × 10 carat cut color clarity depth table price X Z У <dbl> <dbl> <dbl> <dbl> <dbl> <ord> <ord> <ord> <dbl> <dbl> -0.5679397 Ideal Ε SI2 -0.2494049 -2.4571839 -3606.8 -1.781157 -1.754526 -1.1087338 -0.5879397 Premium Ε SI1 -1.9494049 3.5428161 -3606.8 -1.841157 -1.894526 -1.2287338 -0.5679397 Good Ε VS1 -4.8494049 7.5428161 -3605.8 -1.681157 -1.664526 -1.2287338 -0.5079397 Premium VS2 0.6505951 0.5428161 -3598.8 -1.531157 -1.504526 -0.9087338 -0.4879397 J SI2 1.5505951 0.5428161 -3597.8 -1.391157 -1.384526 -0.7887338 Good -0.5579397 Very Good VVS2 1.0505951 -0.4571839 -3596.8 -1.791157 -1.774526 -1.0587338 -0.5579397 Very Good VVS1 0.5505951 -0.4571839 -3596.8 -1.781157 -1.754526 -1.0687338 -0.5379397 Very Good Η SI1 0.1505951 -2.4571839 -3595.8 -1.661157 -1.624526 -1.0087338 -0.5779397 Fair Ε VS2 3.3505951 3.5428161 -3595.8 -1.861157 -1.954526 -1.0487338 -0.5679397 Very Good Η VS1 -2.3494049 3.5428161 -3594.8 -1.731157 -1.684526 -1.1487338 -0.4979397 J SI1 2.2505951 -2.4571839 -3593.8 -1.481157 -1.454526 -0.8087338 Good -0.5679397 VS1 1.0505951 -1.4571839 -3592.8 -1.801157 -1.834526 -1.0787338 Ideal Premium F -0.5779397 SI1 -1.3494049 3.5428161 -3590.8 -1.851157 -1.894526 -1.2087338 -0.4879397 Ideal J SI2 0.4505951 -3.4571839 -3588.8 -1.381157 -1.364526 -0.8287338 Premium -0.5979397 Ε SI2 -1.5494049 4.5428161 -3587.8 -1.941157 -1.984526 -1.2687338 Premium -0.4779397 Ε -0.8494049 0.5428161 -3587.8 -1.351157 -1.314526 -0.8587338 11 -0.4979397 SI2 0.2505951 -3.4571839 -3584.8 -1.421157 -1.394526 -0.8587338 Ideal 1.6505951 -3.4571839 -3581.8 -0.4979397 Good J SI1 -1.501157 -1.444526 -0.8387338 -0.4979397 SI1 2.0505951 -1.4571839 -3581.8 -1.501157 -1.474526 -0.8287338 Good J -0.4979397 Very Good SI1 0.9505951 1.5428161 -3581.8 -1.521157 -1.464526 -0.8787338 -0.4979397 SI2 1.5505951 -1.4571839 -3581.8 -1.471157 -1.434526 -0.8287338 Good -0.5679397 Very Good -1.881157 -1.814526 VS2 2.0505951 -2.4571839 -3580.8 -1.0587338 -0.7494049 -0.4571839 -0.5679397 Very Good Н VS1 -3579.8 -1.791157 -1.774526 -1.1287338 -0.4879397 Very Good SI1 -2.3494049 4.5428161 -3579.8 -1.341157 -1.304526 -0.9187338 -0.4879397 Very Good 4.5428161 -1.291157 J SI1 -3.6494049 -3579.8 -1.264526 -0.9487338 -1.3494049 -0.5679397 Very Good VVS2 0.5428161 -3578.8 -1.761157 -1.724526 -1.1287338 0.7505951 -0.4571839 -1.794526 -0.5579397 Premium VS1 -3577.8 -1.761157 -1.0687338 0.4505951 -0.4571839 -0.4979397 Very Good VS2 -3575.8 -1.451157 -1.434526 -0.8687338 -0.5679397 Very Good D VS2 -1.2494049 3.5428161 -3575.8 -1.771157 -1.764526 -1.1387338 -0.8494049 -0.4571839 -3575.8 -1.1187338 -0.5679397 Very Good F VS1 -1.771157 -1.744526 : -0.097939748 Premium Ε SI1 -1.24940489 0.5428161 -1179.8 0.008842788 0.035474045 -0.058733778 -0.227939748 Ε IF -1.94940489 2.5428161 -1179.8 -0.301157212 -0.354525955 -0.308733778 Premium -1179.8 -0.251157212 -0.334525955 -0.187939748 F VVS1 0.05059511 1.5428161 Premium -0.178733778 -1179.8 0.108842788 0.002060252 G VS2 2.45059511 0.5428161 0.075474045 0.201266222 Good 0.042060252 -1179.8 0.208842788 VS1 1.95059511 1.5428161 Good 0.165474045 0.231266222 -1179.8 0.108842788 -0.027939748 Ideal Ε SI2 0.35059511 -1.4571839 0.125474045 0.091266222 -0.057939748 D 1.35059511 1.5428161 -1179.8 -0.021157212 0.005474045 0.071266222 Good SI1 0.102060252 Very Good 1.45059511 2.5428161 -1179.8 0.388842788 0.355474045 0.321266222 SI1 VS1 -2.44940489 -0.037939748 4.5428161 -1179.8 0.198842788 0.115474045 Premium -0.048733778 -0.037939748 VVS1 0.45059511 -2.4571839 -1179.8 0.158842788 0.135474045 Ideal 0.121266222 -1177.8 -0.161157212 -0.097939748 Very Good Ε VS2 0.65059511 2.5428161 -0.124525955 -0.048733778 -0.097939748 Very Good VS2 1.05059511 2.5428161 -1177.8 -0.141157212 -0.084525955 Ε -0.008733778 -0.097939748 Very Good -1177.8 -0.061157212 -0.154525955 VS1 1.35059511 1.5428161 D 0.011266222 -0.44940489 -1.4571839 -0.067939748 VS2 -1176.8 0.068842788 Ideal 0.105474045 0.031266222 -0.067939748 VS2 -0.14940489 -2.4571839 -1176.8 0.088842788 0.105474045 0.051266222 Ideal -0.007939748 Ideal SI1 -0.14940489 -1.4571839 -1176.8 0.218842788 0.235474045 0.131266222 -0.087939748 0.15059511 -1.4571839 -1176.8 -0.021157212 -0.004525955 Ε SI1 0.001266222 Ideal -0.007939748 F SI1 -3.64940489 1.5428161 -1176.8 0.328842788 0.395474045 0.001266222 Good -0.007939748 Ε SI2 -0.34940489 0.5428161 -1176.8 0.298842788 0.225474045 Premium 0.141266222 -0.087939748 -0.34940489 -1.4571839 -1176.8 0.028842788 -0.004525955 Ideal G VS1 -0.008733778 -1176.8 0.058842788 -0.087939748 Premium Ε -1.24940489 -2.4571839 0.005474045 -0.048733778 -0.087939748 F SI1 -1.94940489 4.5428161 -1176.8 0.008842788 -0.004525955 Premium -0.108733778 -1175.8 -0.021157212 0.025474045 -0.068733778 -0.097939748 Very Good VS2 -1.24940489 1.5428161 -1175.8 -0.041157212 -0.014525955 -0.048733778 VS2 -0.54940489 1.5428161 -0.097939748 Very Good Premium -0.077939748 0.95059511 1.5428161 -1175.8 -0.041157212 -0.004525955 0.041266222 -0.077939748 Ideal D SI1 -0.94940489 -0.4571839 -1175.8 0.018842788 0.025474045 -0.038733778 -0.077939748 D 1.35059511 -2.4571839 -1175.8 -0.041157212 0.015474045 0.071266222 SI1 Good 2.5428161 -1175.8 -0.071157212 -0.054525955 -0.097939748 Very Good D SI1 1.05059511 0.021266222 -0.74940489 -1175.8 0.418842788 Premium 0.5428161 0.062060252 Η SI2 0.385474045 0.201266222 -0.047939748 D SI2 0.45059511 -2.4571839 -1175.8 0.098842788 0.135474045 0.101266222 Ideal In [83]: subtract_tib_mean <- function(tib) {</pre> # tib is a copy of the input tibble; the following code will not actually alter the original object for (i in seq along(tib)){ if (is.numeric(tib[[i]])) { tib[[i]] <- tib[[i]] - mean(tib[[i]]) tib # need to add this line to make sure function *outputs* a tibble In [84]: subtract_tib_mean(new_diamonds) A tibble: 53940 × 10 carat cut color clarity depth table price X Z У <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <ord> <ord> <ord> <dbl> -0.5679397 SI2 -0.2494049 -2.4571839 -3606.8 Ideal Ε -1.781157 -1.754526 -1.1087338 -0.5879397 Ε SI1 -1.9494049 3.5428161 -3606.8 -1.841157 -1.894526 -1.2287338 Premium -0.5679397 Good Ε VS1 -4.8494049 7.5428161 -3605.8 -1.681157 -1.664526 -1.2287338 VS2 0.6505951 0.5428161 -3598.8 -0.5079397 Premium -1.531157 -1.504526 -0.9087338 -0.4879397 SI2 1.5505951 0.5428161 -3597.8 -1.384526 -0.7887338 Good J -1.391157 VVS2 1.0505951 -0.4571839 -3596.8 -1.774526 -0.5579397 Very Good -1.791157 -1.0587338 -0.5579397 Very Good VVS1 0.5505951 -0.4571839 -3596.8 -1.781157 -1.754526 -1.0687338 -0.5379397 Very Good Н SI1 0.1505951 -2.4571839 -3595.8 -1.661157 -1.624526 -1.0087338 -0.5779397 Ε VS2 3.3505951 3.5428161 -3595.8 -1.954526 Fair -1.861157 -1.0487338 3.5428161 -3594.8 -0.5679397 Very Good Н VS1 -2.3494049 -1.684526 -1.731157 -1.1487338 2.2505951 -2.4571839 -3593.8 -0.4979397 SI1 -0.8087338 J -1.481157 -1.454526 Good -0.5679397 VS1 1.0505951 -1.4571839 -3592.8 Ideal J -1.801157 -1.834526 -1.0787338 -0.5779397 Premium F SI1 -1.3494049 3.5428161 -3590.8 -1.851157 -1.894526 -1.2087338 -0.4879397 J SI2 0.4505951 -3.4571839 -3588.8 -1.364526 -1.381157 -0.8287338 Ideal -1.984526 -0.5979397 Premium Ε SI2 -1.5494049 4.5428161 -3587.8 -1.941157 -1.2687338 Premium -1.351157 -0.4779397 Ε -0.8494049 0.5428161 -3587.8 -1.314526 -0.8587338 11 -0.4979397 SI2 Ideal 0.2505951 -3.4571839 -3584.8 -1.421157 -1.394526 -0.8587338 -0.4979397 Good J SI1 1.6505951 -3.4571839 -3581.8 -1.501157 -1.444526 -0.8387338 -0.4979397 2.0505951 -1.4571839 -1.474526 Good J SI1 -3581.8 -1.501157 -0.8287338 -0.4979397 Very Good 1.5428161 -1.464526 SI1 0.9505951 -3581.8 -1.521157 -0.8787338 J -3581.8 -0.4979397 SI2 1.5505951 -1.4571839 -1.471157 -1.434526 -0.8287338 Good -0.5679397 Very Good VS2 2.0505951 -2.4571839 -3580.8 -1.881157 -1.814526 Ε -1.0587338 -0.7494049 -0.4571839 -1.774526 -0.5679397 Very Good Η VS1 -3579.8 -1.791157 -1.1287338 -0.4879397 Very Good -2.3494049 4.5428161 -3579.8 -1.304526 SI1 -1.341157 -0.9187338 -0.4879397 Very Good SI1 -3.6494049 4.5428161 -3579.8 -1.291157 -1.264526 -0.9487338 J VVS2 -1.3494049 0.5428161 -3578.8 -1.724526 -0.5679397 Very Good -1.761157 -1.1287338 VS1 0.7505951 -0.4571839 -3577.8 -1.794526 -0.5579397 Premium -1.761157 -1.0687338 -0.4979397 Very Good VS2 0.4505951 -0.4571839 -3575.8 -1.451157 -1.434526 -0.8687338 -0.5679397 Very Good VS2 -1.2494049 3.5428161 -3575.8 -1.771157 -1.764526 D -1.1387338 F VS1 -0.8494049 -0.4571839 -3575.8 -1.771157 -1.744526 -0.5679397 Very Good -1.1187338 : -1179.8 0.008842788 -0.097939748 Premium SI1 -1.24940489 0.5428161 0.035474045 Ε -0.058733778 IF -1.94940489 -0.227939748 Ε 2.5428161 -1179.8 -0.301157212 -0.354525955 Premium -0.308733778 -0.187939748 VVS1 0.05059511 1.5428161 -1179.8 -0.251157212 -0.334525955 Premium F -0.178733778 0.002060252 G VS2 2.45059511 0.5428161 -1179.8 0.108842788 0.075474045 Good 0.201266222 -1179.8 0.208842788 0.042060252 Good VS1 1.95059511 1.5428161 0.165474045 0.231266222 -0.027939748 Ε SI2 0.35059511 -1.4571839 -1179.8 0.108842788 0.125474045 Ideal 0.091266222 -0.057939748 D 1.35059511 1.5428161 -1179.8 -0.021157212 0.005474045 0.071266222 Good SI1 0.102060252 Very Good 1.45059511 2.5428161 -1179.8 0.388842788 0.355474045 J SI1 0.321266222 VS1 -2.44940489 -0.037939748 4.5428161 -1179.8 0.198842788 0.115474045 -0.048733778 Premium -0.037939748 0.45059511 -2.4571839 Ideal VVS1 -1179.8 0.158842788 0.135474045 0.121266222 -0.097939748 Very Good Ε VS2 0.65059511 2.5428161 -1177.8 -0.161157212 -0.124525955 -0.048733778 -0.097939748 Very Good VS2 1.05059511 2.5428161 -1177.8 -0.141157212 -0.084525955 Ε -0.008733778 -1177.8 -0.061157212 -0.154525955 -0.097939748 Very Good VS1 1.35059511 1.5428161 D 0.011266222 VS2 -0.44940489 -1.4571839 -1176.8 0.068842788 -0.067939748 Ideal 0.105474045 0.031266222 -0.067939748 Ideal VS2 -0.14940489 -2.4571839 -1176.8 0.088842788 0.105474045 0.051266222 -0.007939748 -0.14940489 -1.4571839 -1176.8 0.218842788 0.235474045 Ideal 0.131266222 -0.087939748 -1176.8 -0.021157212 -0.004525955 Ideal 0.15059511 -1.4571839 0.001266222 -3.64940489 -0.007939748 1.5428161 -1176.8 0.328842788 0.395474045 0.001266222 Good Ε 0.141266222 -0.007939748 Premium SI2 -0.34940489 0.5428161 -1176.8 0.298842788 0.225474045 -0.087939748 Ideal G -0.34940489 -1.4571839 -1176.8 0.028842788 -0.004525955 -0.008733778 -0.087939748 Premium SI1 -1.24940489 -2.4571839 -1176.8 0.058842788 0.005474045 -0.048733778 Ε -0.087939748 Premium F SI1 -1.94940489 4.5428161 -1176.8 0.008842788 -0.004525955 -0.108733778 -1175.8 -0.021157212 -0.097939748 Very Good -1.24940489 1.5428161 0.025474045 Ε -0.068733778 -0.097939748 Very Good -0.54940489 1.5428161 -1175.8 -0.041157212 Ε -0.014525955 -0.048733778 -0.077939748 Premium D 0.95059511 1.5428161 -1175.8 -0.041157212 -0.004525955 0.041266222 -0.077939748 D -0.94940489 -0.4571839 -1175.8 0.018842788 0.025474045 Ideal -0.038733778 -0.077939748 D 1.35059511 -2.4571839 -1175.8 -0.041157212 Good SI1 0.015474045 0.071266222 -1175.8 -0.071157212 -0.097939748 Very Good 1.05059511 2.5428161 D SI1 -0.054525955 0.021266222 -0.74940489 0.5428161 -1175.8 0.418842788 0.062060252 Premium Η 0.385474045 0.201266222 -0.047939748 Ideal D 0.45059511 -2.4571839 -1175.8 0.098842788 0.135474045 0.101266222 In [82]: new_diamonds A tibble: 53940 × 10 carat color clarity depth table price X Z cut У <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> < <dbl> <ord> <ord> <ord> <dbl> 0.23 SI2 61.5 326 3.95 3.98 2.43 Ideal Ε 55 SI1 59.8 326 3.89 3.84 2.31 0.21 Premium Ε 61 0.23 4.07 2.31 Ε VS1 56.9 65 327 4.05 Good VS2 334 4.20 4.23 2.63 0.29 Premium 62.4 58 0.31 Good SI2 63.3 58 335 4.34 4.35 2.75 J 0.24 Very Good J VVS2 62.8 336 3.94 3.96 2.48 57 62.3 336 3.98 2.47 0.24 Very Good VVS1 57 3.95 SI1 337 4.07 2.53 0.26 Very Good Η 61.9 55 4.11 0.22 VS2 337 3.87 3.78 2.49 Fair Ε 65.1 61 0.23 Very Good Η VS1 59.4 338 4.00 4.05 2.39 61 0.30 SI1 4.28 2.73 J 64.0 55 339 4.25 Good VS1 3.93 3.90 2.46 0.23 Ideal 62.8 56 340 J 3.84 2.33 0.22 Premium F SI1 60.4 342 3.88 61 SI2 62.2 344 4.35 4.37 0.31 Ideal J 54 2.71 0.20 Premium Ε SI2 60.2 62 345 3.79 3.75 2.27 0.32 60.9 0.30 SI2 62.0 4.31 4.34 2.68 Ideal 54 348 63.4 0.30 Good J SI1 54 351 4.23 4.29 2.70 4.26 SI1 2.71 0.30 Good J 63.8 56 351 4.23 0.30 Very Good SI1 62.7 59 351 4.21 4.27 2.66 0.30 Good SI2 63.3 351 4.26 4.30 2.71 56 0.23 Very Good VS2 63.8 352 3.85 3.92 2.48 55 0.23 Very Good Η VS1 61.0 353 3.94 3.96 2.41 57 0.31 Very Good SI1 59.4 353 4.39 4.43 2.62 62 SI1 0.31 Very Good J 58.1 62 353 4.44 4.47 2.59 G VVS2 0.23 Very Good 60.4 354 3.97 4.01 2.41 58 Premium VS1 62.5 57 355 3.97 3.94 2.47 0.24 0.30 Very Good VS2 62.2 357 4.28 4.30 2.67 57 VS2 0.23 Very Good 60.5 357 3.96 3.97 2.40 D 61 0.23 Very Good VS1 60.9 57 357 3.96 3.99 2.42 : : : : 58 2753 0.70 Premium SI1 60.5 5.74 5.77 3.48 60 2753 5.38 IF 59.8 0.57 Premium Ε 5.43 3.23 F VVS1 59 2753 0.61 Premium 61.8 5.48 5.40 3.36 VS2 58 2753 0.80 G 64.2 5.84 5.81 3.74 Good VS1 0.84 63.7 59 2753 5.94 5.90 3.77 Good SI2 3.63 0.77 Ε 62.1 56 2753 5.84 5.86 Ideal 0.74 Good D SI1 63.1 59 2753 5.71 5.74 3.61 60 2753 6.09 SI1 3.86 0.90 Very Good 63.2 6.12 0.76 Premium VS1 59.3 62 2753 5.93 5.85 3.49 62.2 0.76 Ideal I VVS1 55 2753 5.89 5.87 3.66 60 2755 62.4 0.70 Very Good VS2 5.57 5.61 3.49 VS2 60 2755 5.65 3.53 0.70 Very Good 62.8 5.59 0.70 Very Good VS1 63.1 59 2755 5.67 5.58 3.55 VS2 0.73 61.3 56 2756 5.80 5.84 3.57 Ideal VS2 0.73 61.6 55 2756 5.82 5.84 3.59 Ideal 5.97 0.79 SI1 61.6 56 2756 5.95 3.67 Ideal SI1 0.71 61.9 56 2756 5.71 5.73 3.54 Ideal 59 2756 6.13 0.79 Good SI1 58.1 6.06 3.54 58 2756 5.96 0.79 Premium SI2 61.4 6.03 3.68 0.71 G VS1 61.4 56 2756 5.76 5.73 3.53 Ideal 0.71 Premium SI1 60.5 55 2756 5.79 5.74 Ε 3.49 0.71 Premium F SI1 59.8 62 2756 5.74 5.73 3.43 0.70 Very Good VS2 60.5 59 2757 5.71 5.76 3.47 0.70 Very Good VS2 61.2 59 2757 5.69 5.72 3.49 0.72 Premium SI1 62.7 59 2757 5.73 3.58 D 5.69 0.72 D SI1 60.8 57 2757 5.75 5.76 3.50 Ideal 0.72 D SI1 55 2757 5.69 5.75 3.61 Good 63.1 0.70 Very Good 5.68 SI1 62.8 60 2757 5.66 3.56 61.0 0.86 Premium SI2 58 2757 6.15 6.12 3.74 SI2 0.75 D 62.2 55 2757 5.83 5.87 3.64 Ideal In []: