# Functions

# Warmup activity

Work on the activity (handout) with a neighbor, then we will discuss as a class

# Warmup

```
z_score <- function(x) {
  (x - mean(x, na.rm = TRUE)) / sd(x, na.rm = TRUE)
}

diamonds_new <- diamonds |>
  mutate(carat_z = z_score(carat))
```

What does this code do?

# Warmup

```
z_score <- function(x) {
  (x - mean(x, na.rm = TRUE)) / sd(x, na.rm = TRUE)
}

diamonds_new <- diamonds |>
  mutate(carat_z = z_score(carat))
```

The `diamonds` dataset has 53940 rows and 10 columns.

What will be the dimensions of the `diamonds_new` dataset?

# Warmup

```r
z_score <- function(x) {
  (x - mean(x, na.rm = TRUE)) / sd(x, na.rm = TRUE)
}

diamonds_new <- diamonds |>
  mutate(carat_z = z_score(carat))

glimpse(diamonds_new)
```

```
Rows: 53,940
Columns: 11
$ carat   <dbl> 0.23, 0.21, 0.23, 0.29, 0.31, 0.24, 0.24, 0.26, 0.22,
0.23, 0.…
$ cut     <ord> Ideal, Premium, Good, Premium, Good, Very Good, Very
Good, Ver…
$ color   <ord> E, E, E, I, J, J, I, H, E, H, J, J, F, J, E, E, I, J,
J, J, I,…
$ clarity <ord> SI2, SI1, VS1, VS2, SI2, VVS2, VVS1, SI1, VS2, VS1,
SI1, VS1, …
$ depth   <dbl> 61.5, 59.8, 56.9, 62.4, 63.3, 62.8, 62.3, 61.9, 65.1,
59.4, 64…
```

# Functions

```r
z_score <- function(x) {
  (x - mean(x, na.rm = TRUE)) / sd(x, na.rm = TRUE)
}
```

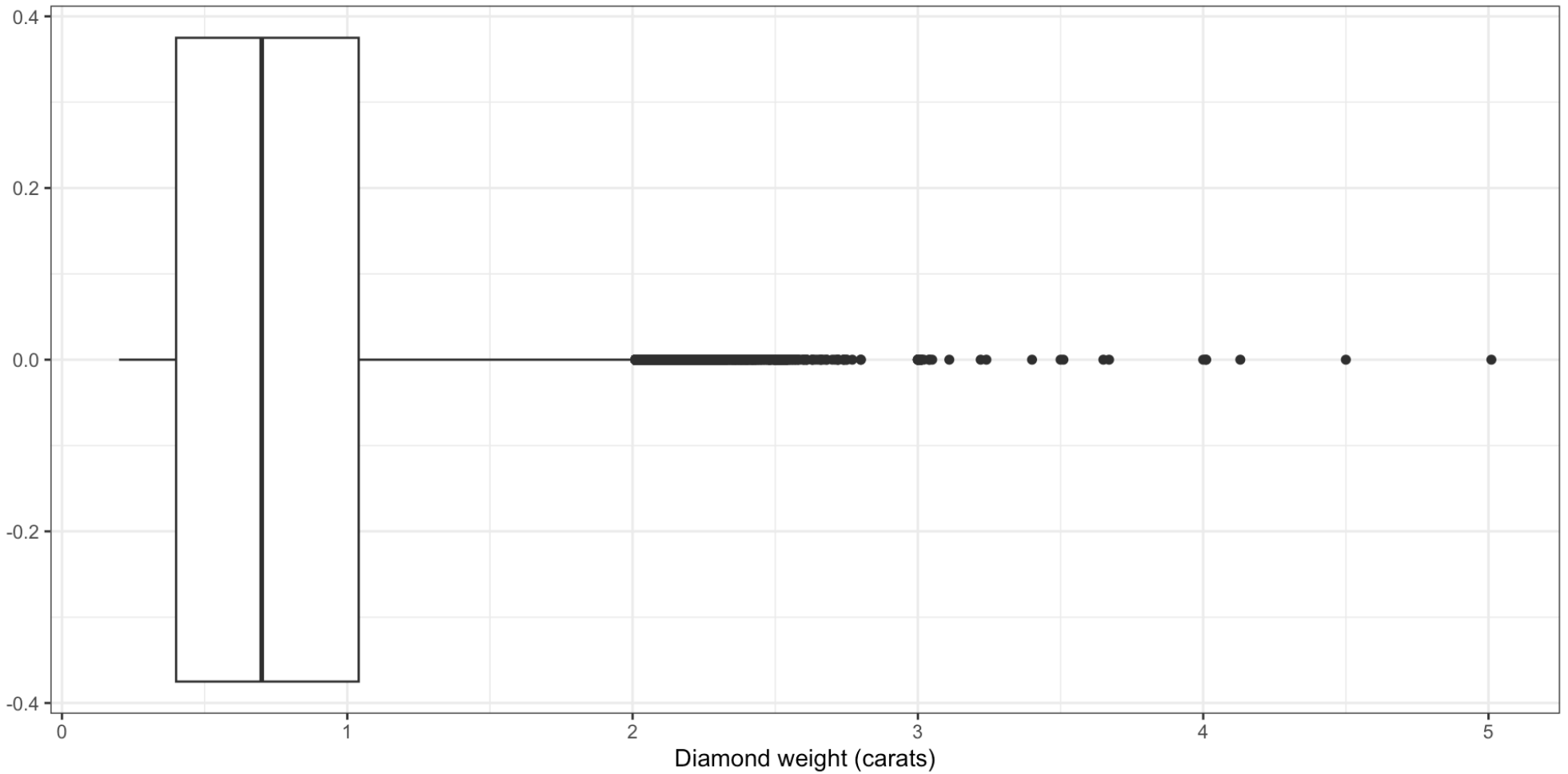
# Functions

```r
z_score <- function(x) {
  (x - mean(x, na.rm = TRUE)) / sd(x, na.rm = TRUE)
}

diamonds_new <- diamonds |>
  mutate(carat_z = z_score(carat))
```

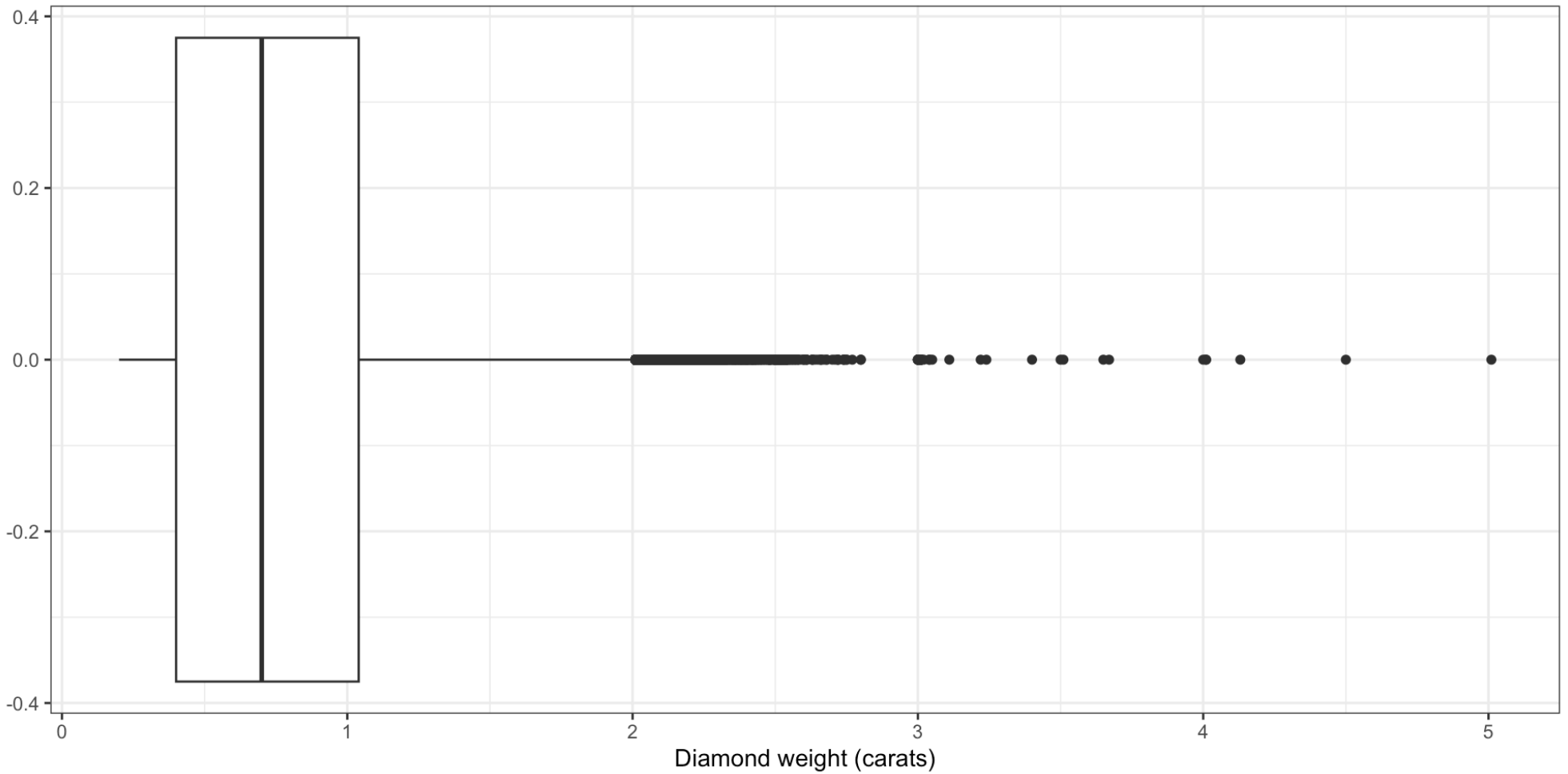
*R for Data Science* calls the `z_score` function a “mutate” function. Why?

# Another challenge




What are the individual points on the right of the boxplot?

# Another challenge: identifying outliers




How do we identify outliers when constructing a boxplot?

# Identifying outliers

We wish to write a function that we can use to identify outliers in numeric variables.

What should we name the function?

# Identifying outliers

We wish to write a function that we can use to identify outliers in numeric variables.

What should the input to the function be?

# Identifying outliers

```
find_outliers <- function(x) {

}
```

What needs to happen inside the function?

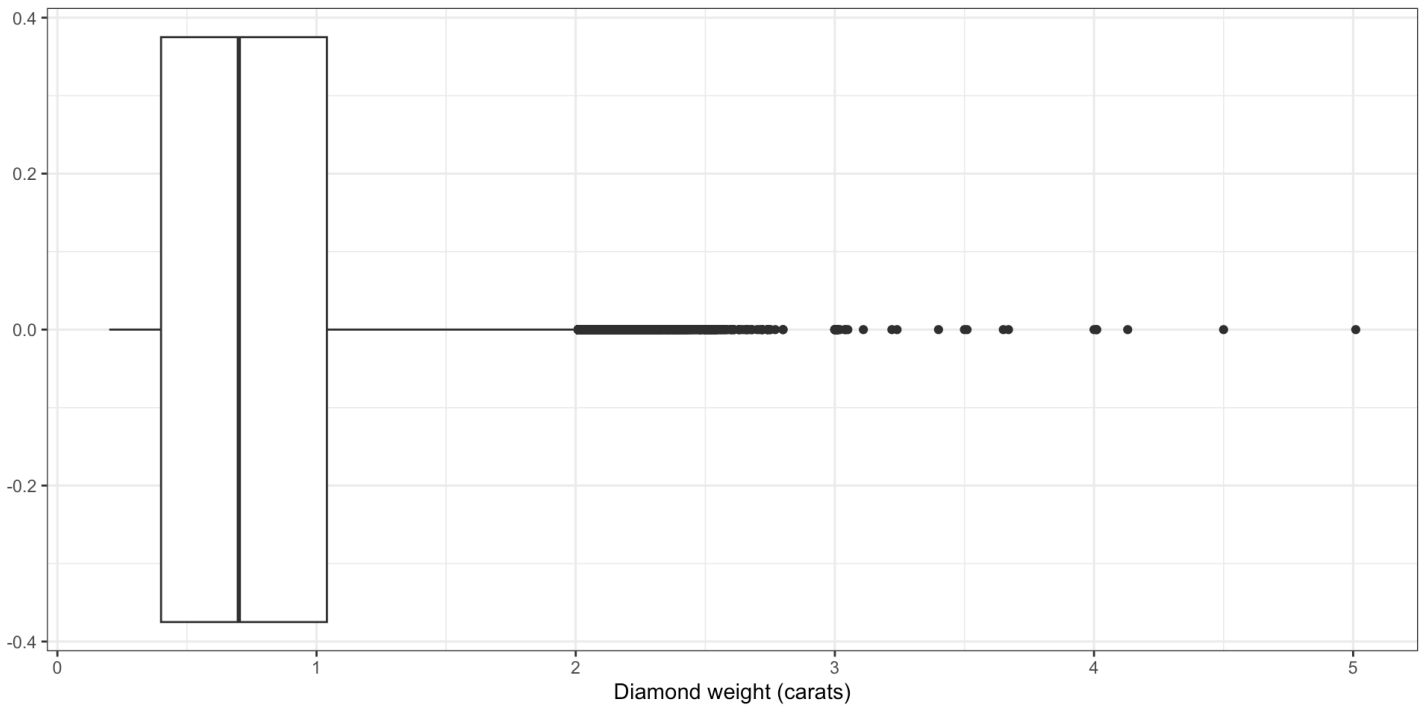
# Identifying outliers

```
find_outliers <- function(x) {

}
```

(Switch to R Studio)

# Identifying outliers




```
diamonds |>
  mutate(carat_outliers = find_outliers(carat)) |>
  filter(carat_outliers) |>
  pull(carat) |>
  head()
```

```
[1] 2.06 2.14 2.15 2.22 2.01 2.01
```

# Counting outliers

```
find_outliers <- function(x) {
  q1 <- quantile(x, 0.25)
  q3 <- quantile(x, 0.75)
  iqr <- q3 - q1
  (x > q3 + 1.5*iqr) | (x < q1 - 1.5*iqr)
}
```

What if we want to *count* the number of outliers?

# Counting outliers

```r
find_outliers <- function(x) {
  q1 <- quantile(x, 0.25)
  q3 <- quantile(x, 0.75)
  iqr <- q3 - q1
  (x > q3 + 1.5*iqr) | (x < q1 - 1.5*iqr)
}

count_outliers <- function(x) {
  sum(find_outliers(x))
}
```

# Counting outliers

```
1 diamonds |>
2   summarize(carat_outliers = count_outliers(carat))
```

```
# A tibble: 1 × 1
  carat_outliers
           <int>
1           1889
```

*R for Data Science* would call the `count_outliers` function a "summarize" function. Why?

# Counting outliers

```
1 diamonds |>
2   summarize(carat_outliers = count_outliers(carat))
```

```
# A tibble: 1 × 1
  carat_outliers
           <int>
1           1889
```

What if I want to count outliers for multiple variables?

# Counting outliers

```
diamonds |>
  summarize(across(c(carat, depth, price),
                   list("outliers" = count_outliers)))
```

```
# A tibble: 1 × 3
  carat_outliers depth_outliers price_outliers
           <int>          <int>          <int>
1           1889           2545           3540
```

# Class activity

https://sta279-f25.github.io/class_activities/ca_09.html

- Work with a neighbor on the class activity
- At the end of class, submit your work as an HTML file on Canvas (one per group, list all your names)

**For next time**, read:

- Chapter 25.3 in *R for Data Science*