ExploratoryDataAnalysis

Prof. Eric A. Suess

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Today we will discuss Exploratory Data Analysis (EDA).

This is the process of exploring your data using visualization and transformations and modeling (will discuss modeling more later).

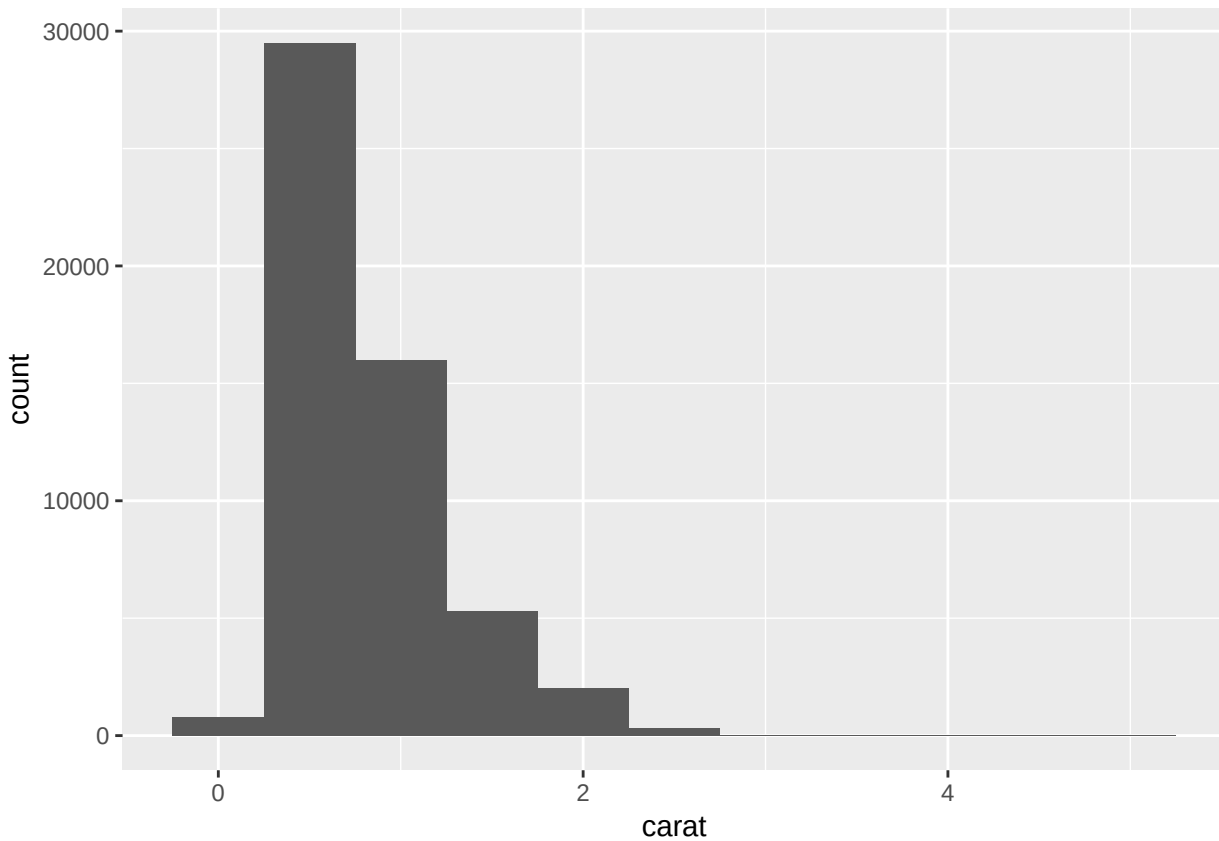
```
library(tidyverse)
```

Lets take a look at the *diamonds* data set and the variable carat.

```
diamonds
```

```
## # A tibble: 53,940 x 10
##    carat cut       color clarity depth table price     x     y     z
##    <dbl> <ord>     <ord> <ord>   <dbl> <dbl> <int> <dbl> <dbl> <dbl>
##  1 0.23  Ideal     E     SI2      61.5    55   326  3.95  3.98  2.43
##  2 0.21  Premium   E     SI1      59.8    61   326  3.89  3.84  2.31
##  3 0.23  Good      E     VS1      56.9    65   327  4.05  4.07  2.31
##  4 0.290 Premium   I     VS2      62.4    58   334  4.2   4.23  2.63
##  5 0.31  Good      J     SI2      63.3    58   335  4.34  4.35  2.75
##  6 0.24  Very Good J     VVS2     62.8    57   336  3.94  3.96  2.48
##  7 0.24  Very Good I     VVS1     62.3    57   336  3.95  3.98  2.47
##  8 0.26  Very Good H     SI1      61.9    55   337  4.07  4.11  2.53
##  9 0.22  Fair      E     VS2      65.1    61   337  3.87  3.78  2.49
## 10 0.23  Very Good H     VS1      59.4    61   338  4     4.05  2.39
## # ... with 53,930 more rows
```

```
ggplot(data = diamonds) +
  geom_histogram(mapping = aes(x = carat), binwidth = 0.5)
```



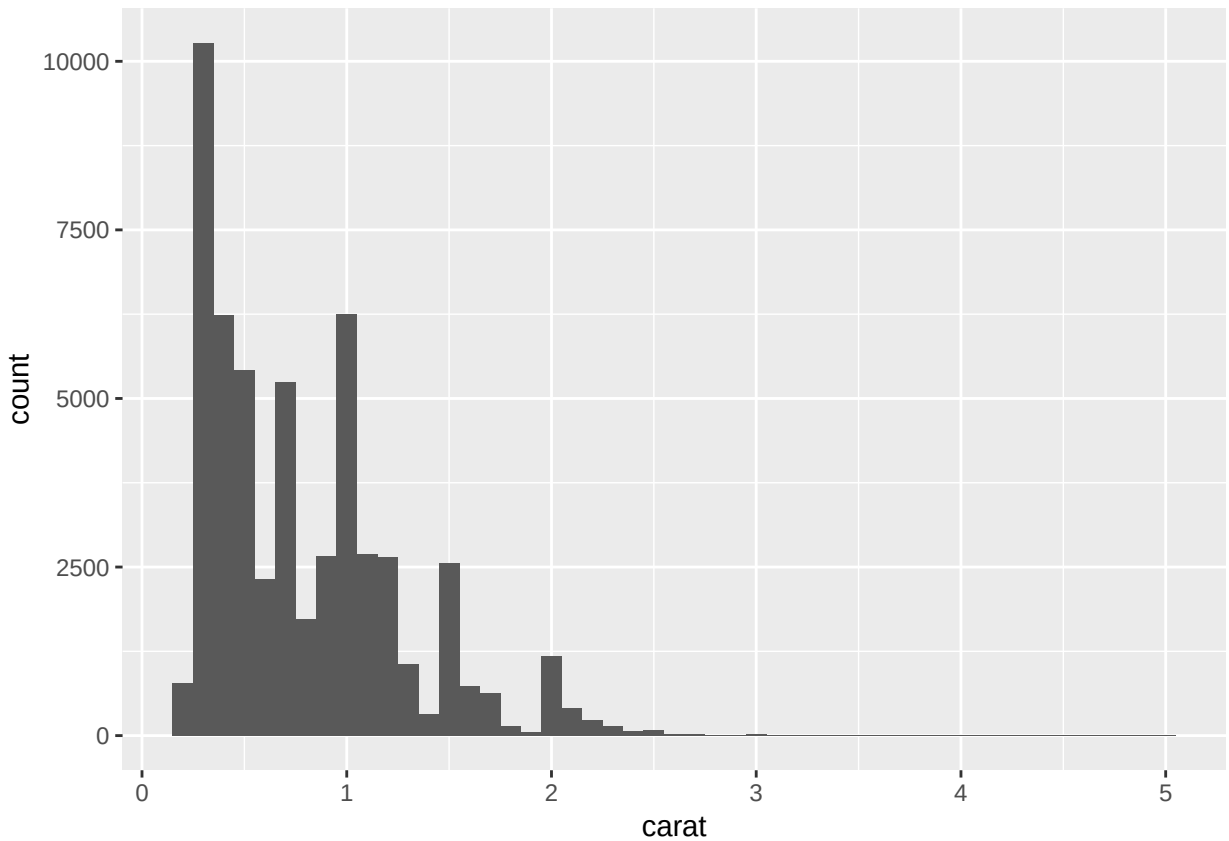

```
diamonds %>%
  count(cut_width(carat, 0.5))
```

```
## # A tibble: 11 x 2
##    `cut_width(carat, 0.5)`     n
##    <fct>                   <int>
##  1 [-0.25,0.25]              785
##  2 (0.25,0.75]             29498
##  3 (0.75,1.25]             15977
##  4 (1.25,1.75]              5313
##  5 (1.75,2.25]              2002
##  6 (2.25,2.75]               322
##  7 (2.75,3.25]                32
##  8 (3.25,3.75]                 5
##  9 (3.75,4.25]                 4
## 10 (4.25,4.75]                 1
## 11 (4.75,5.25]                 1
```

Looking at the smaller diamonds.

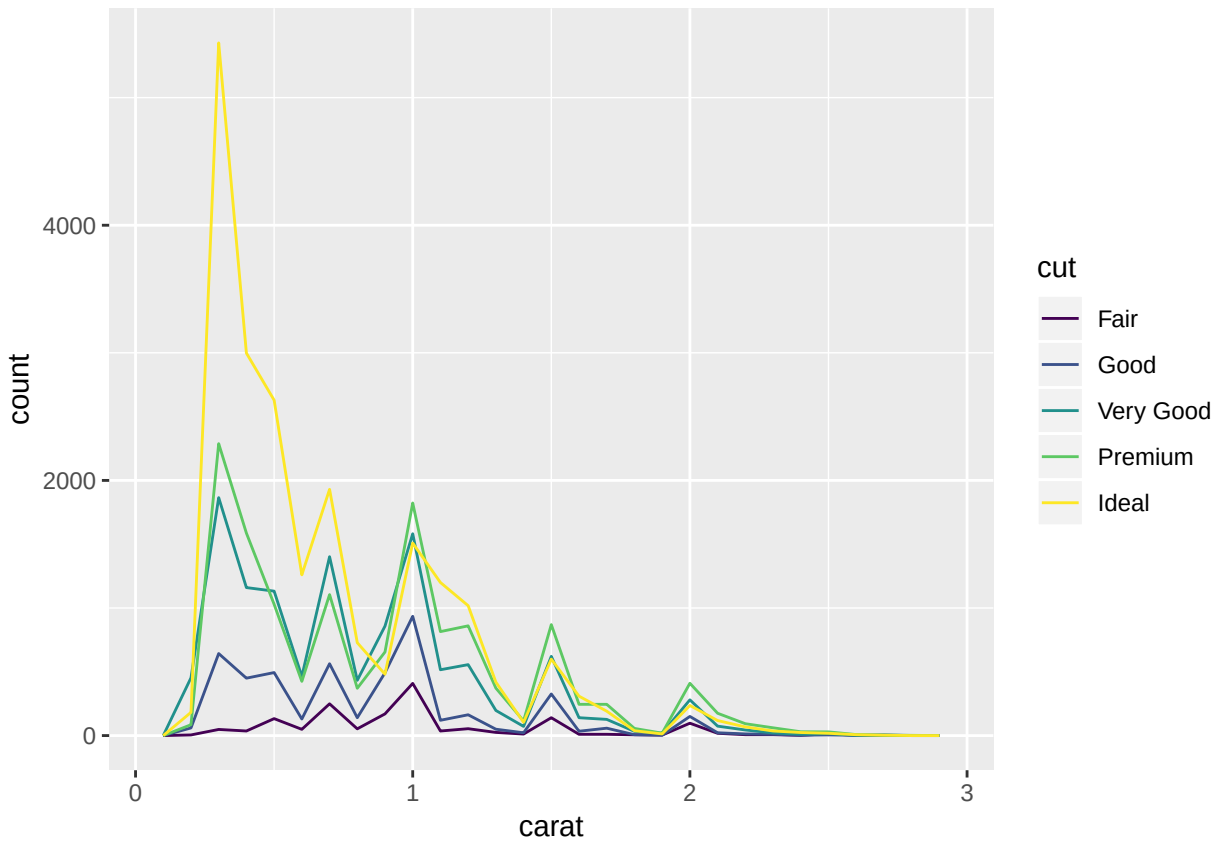
```
smaller <- diamonds %>%
  filter(carat < 3)

diamonds %>% ggplot(mapping = aes(x = carat)) +
  geom_histogram(binwidth = 0.1)
```



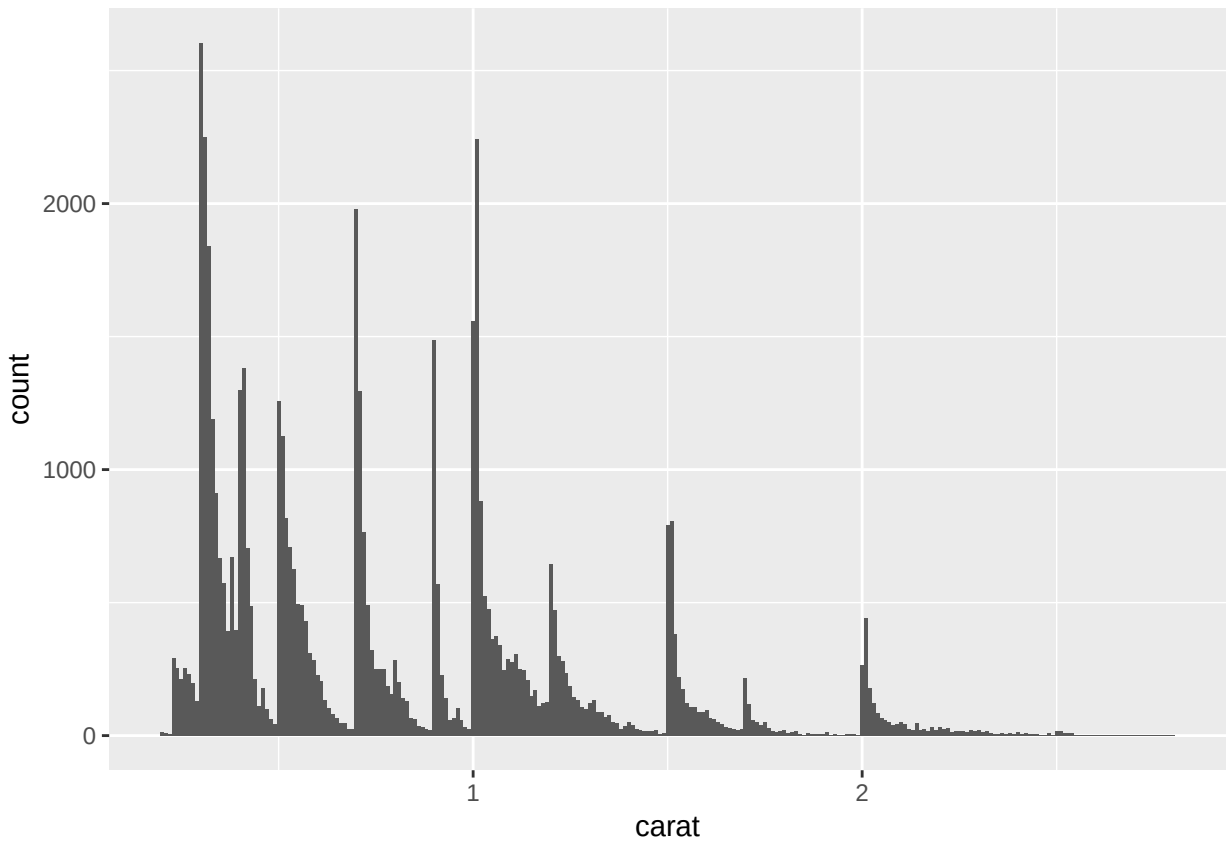
Look at carat by cut.

```
smaller %>% ggplot(mapping = aes(x = carat, colour = cut)) +
  geom_freqpoly(binwidth = 0.1)
```



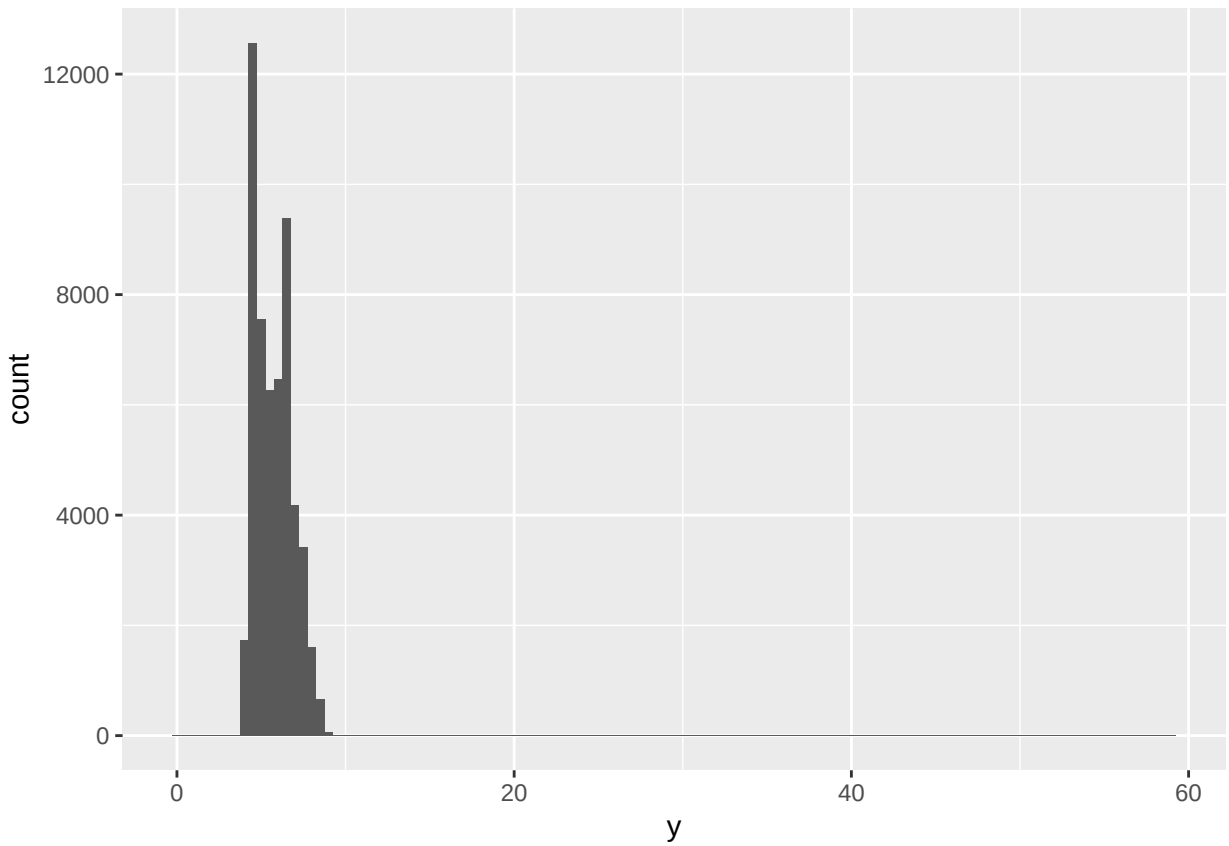
Looking for *typical values*.

```
smaller %>% ggplot(mapping = aes(x = carat)) +
  geom_histogram(binwidth = 0.01)
```



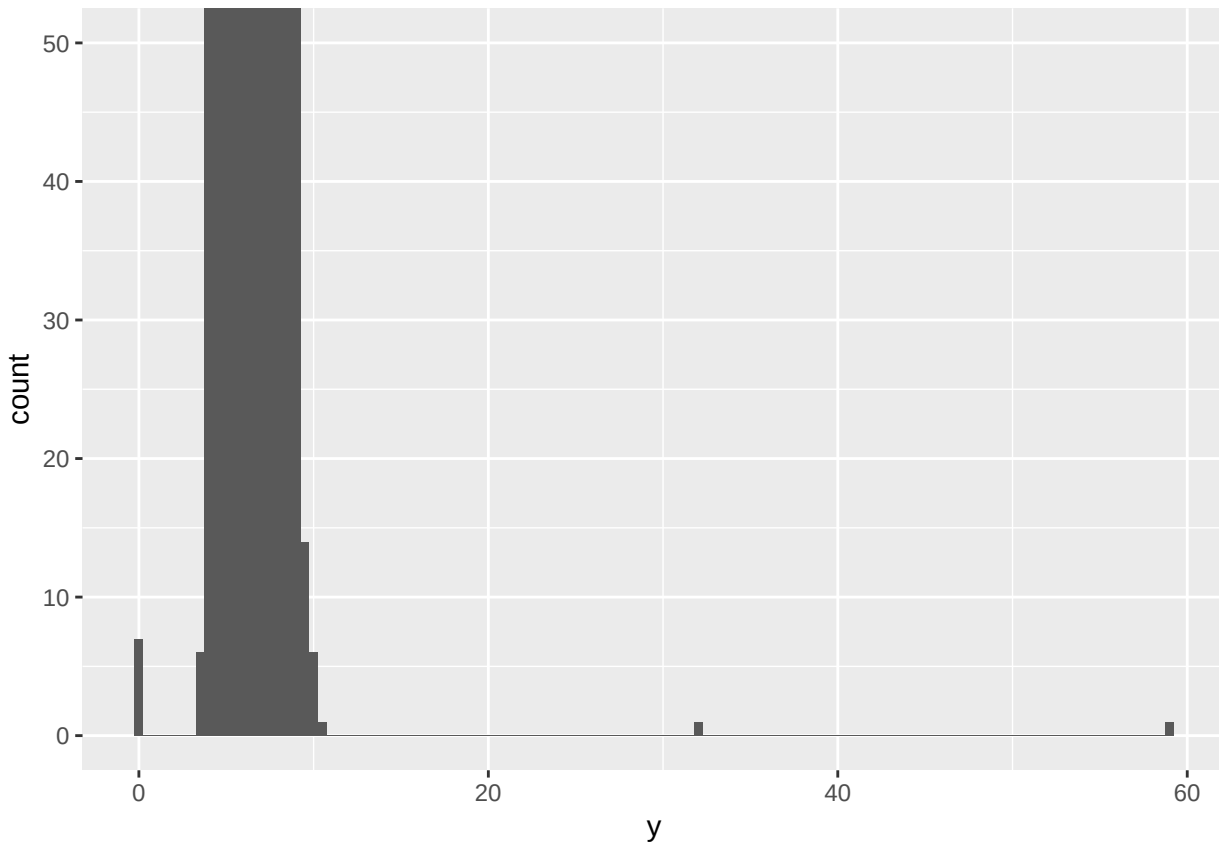
Looking for *unusual values*. Lets look at the y variable.

```
diamonds %>% ggplot(mapping = aes(x = y)) +
  geom_histogram(binwidth = 0.5)
```



Are there outliers?

```
diamonds %>% ggplot(mapping = aes(x = y)) +
  geom_histogram(binwidth = 0.5) +
  coord_cartesian(ylim = c(0, 50))
```



Lets find the outliers.

```
unusual <- diamonds %>%
  filter(y < 3 | y > 20) %>%
  select(price, x, y, z) %>%
  arrange(y)
unusual
```

```
## # A tibble: 9 x 4
##   price     x     y     z
##   <int> <dbl> <dbl> <dbl>
## 1  5139  0      0    0
## 2  6381  0      0    0
## 3 12800  0      0    0
## 4 15686  0      0    0
## 5 18034  0      0    0
## 6  2130  0      0    0
## 7  2130  0      0    0
## 8  2075  5.15  31.8  5.12
## 9 12210  8.09  58.9  8.06
```

Remove outliers.

```
diamonds2 <- diamonds %>%
  filter(between(y, 3, 20))
```

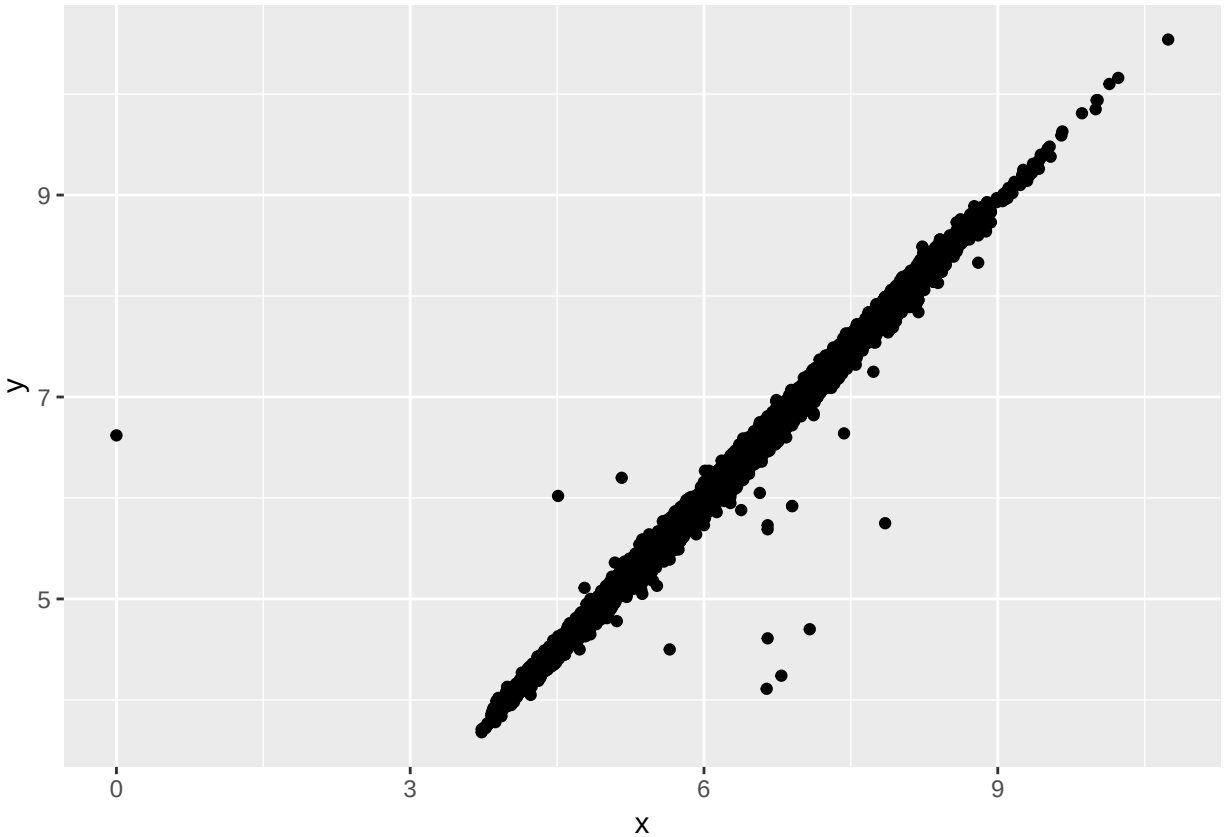
Better to convert them to **NA**, which means not available.

```r
diamonds2 <- diamonds %>%
  mutate(y = ifelse(y < 3 | y > 20, NA, y))
```

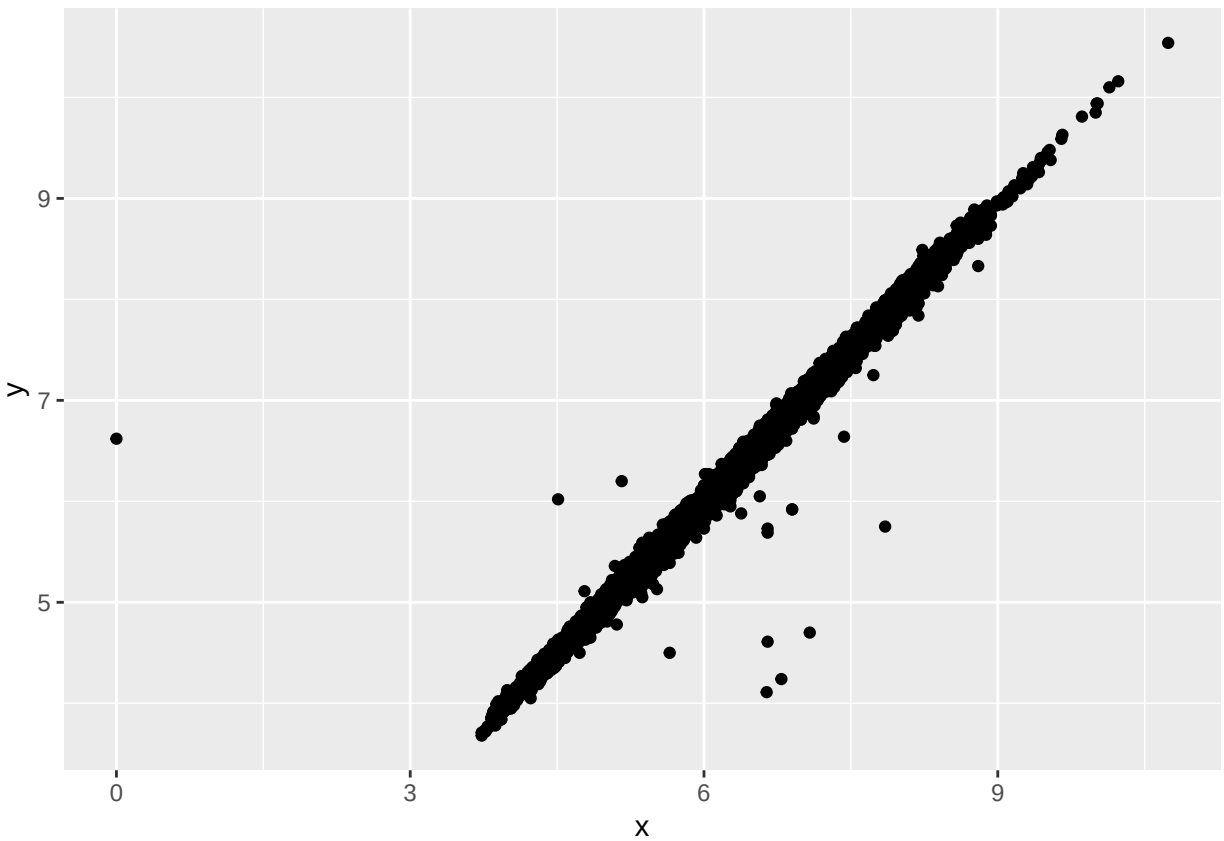
Scatterplots.

```r
diamonds2 %>% ggplot(mapping = aes(x = x, y = y)) +
  geom_point()
```

```
## Warning: Removed 9 rows containing missing values (geom_point).
```

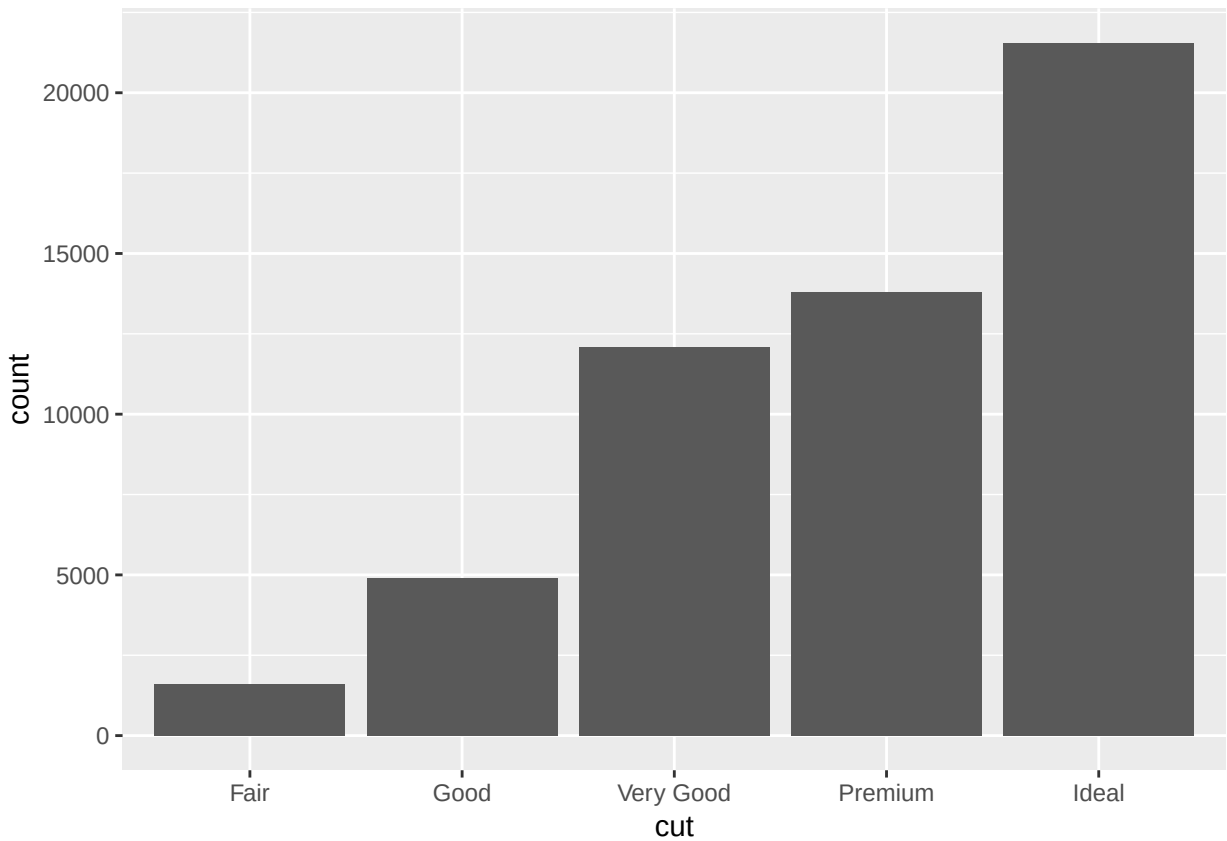



```r
ggplot(data = diamonds2, mapping = aes(x = x, y = y)) +
  geom_point(na.rm = TRUE)
```



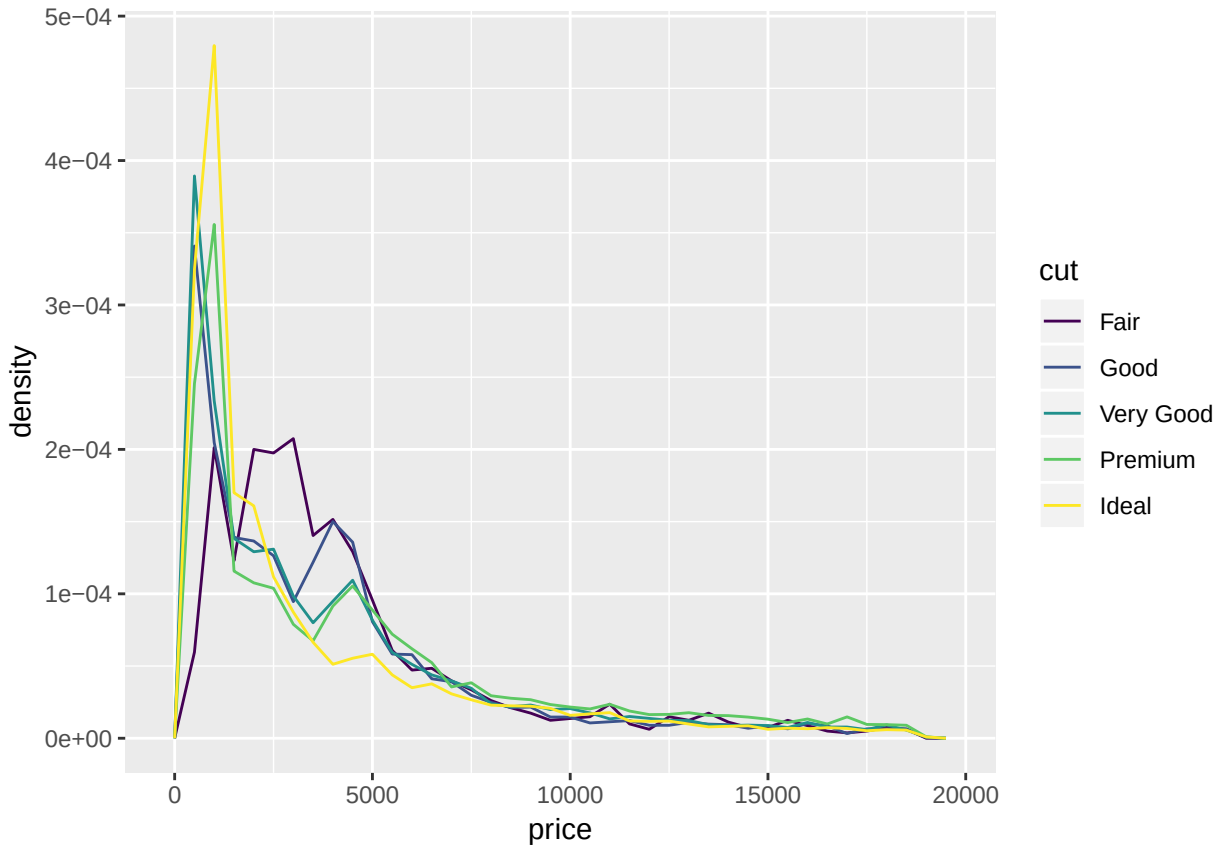
Categorical variable. cut

```
diamonds %>% ggplot(mapping = aes(x = cut)) +
  geom_bar()
```



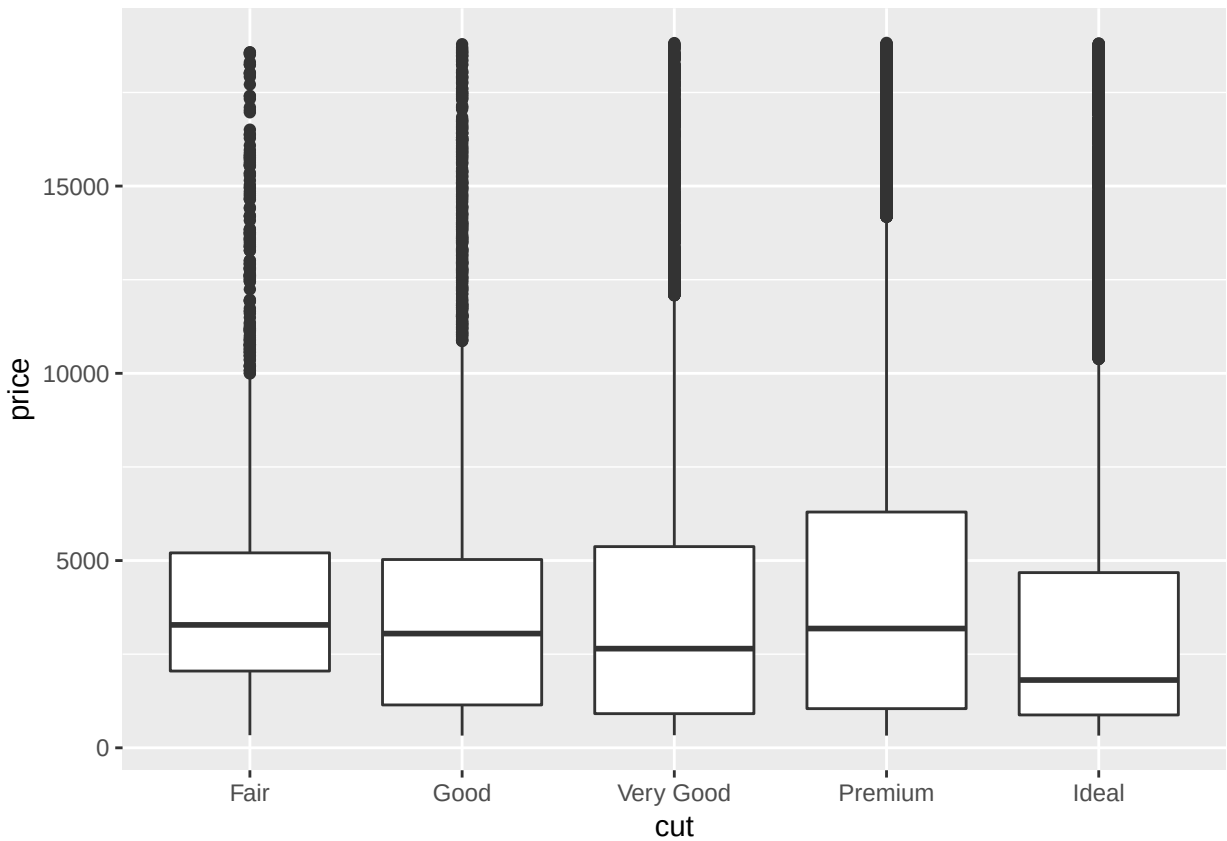
Continuous variable. price

```
diamonds %>% ggplot(mapping = aes(x = price, y = ..density..)) +
  geom_freqpoly(mapping = aes(colour = cut), binwidth = 500)
```



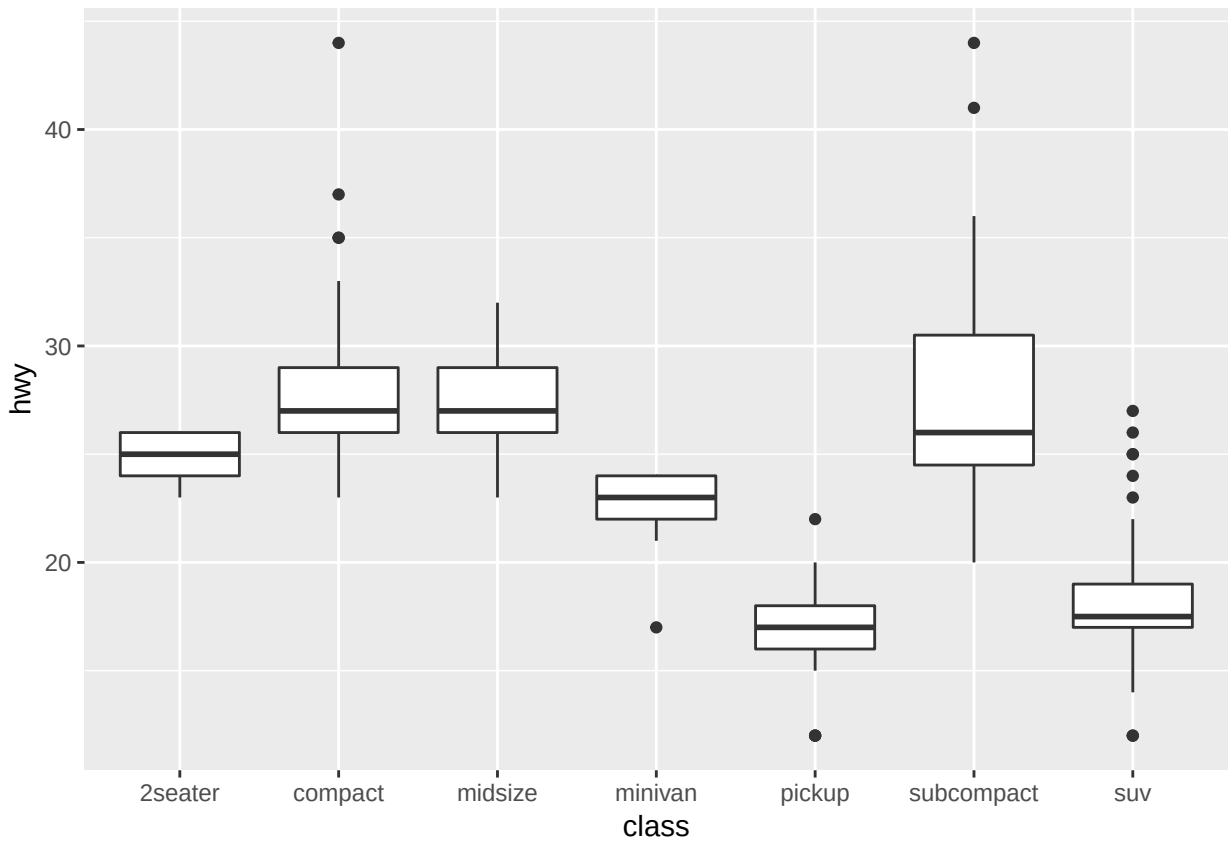
Putting them together in one plot.

```
diamonds %>% ggplot(mapping = aes(x = cut, y = price)) +
  geom_boxplot()
```



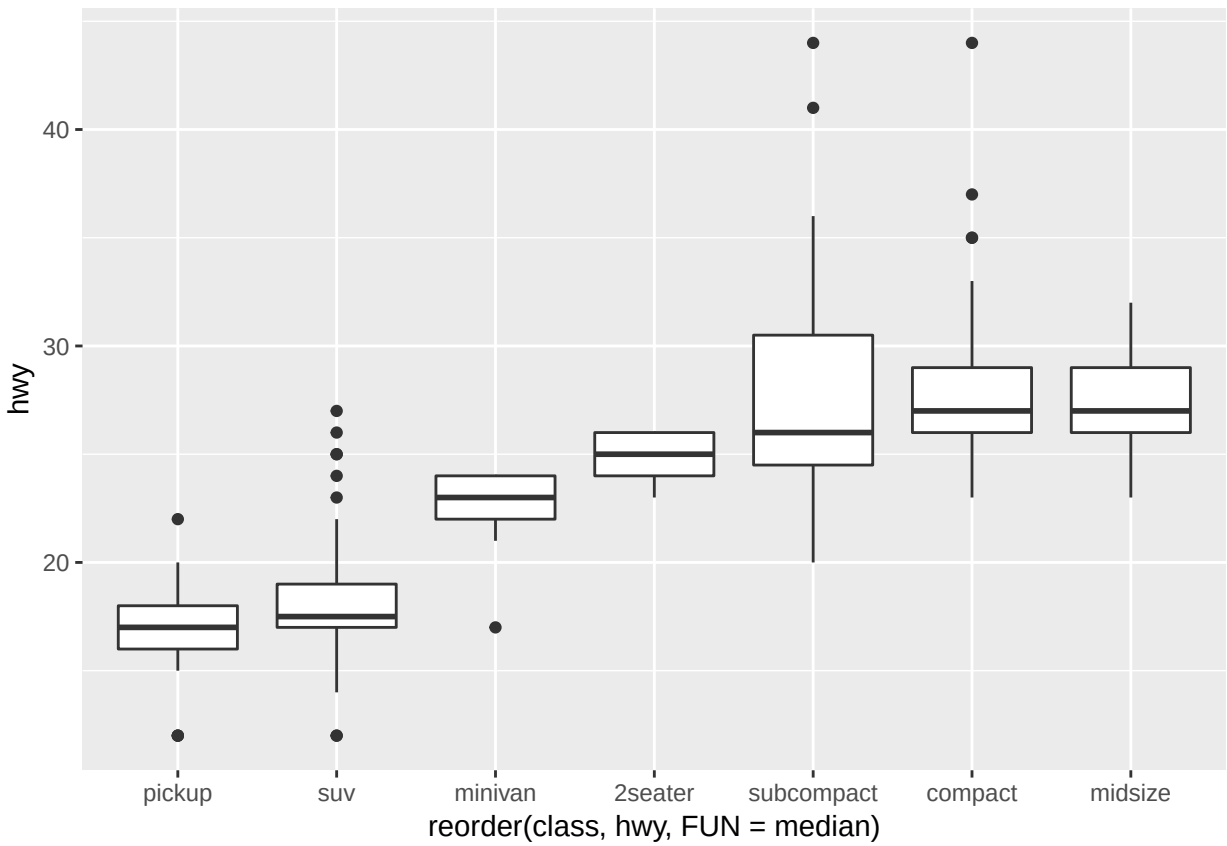
For a different data set. mpg

```
mpg %>% ggplot(mapping = aes(x = class, y = hwy)) +
  geom_boxplot()
```



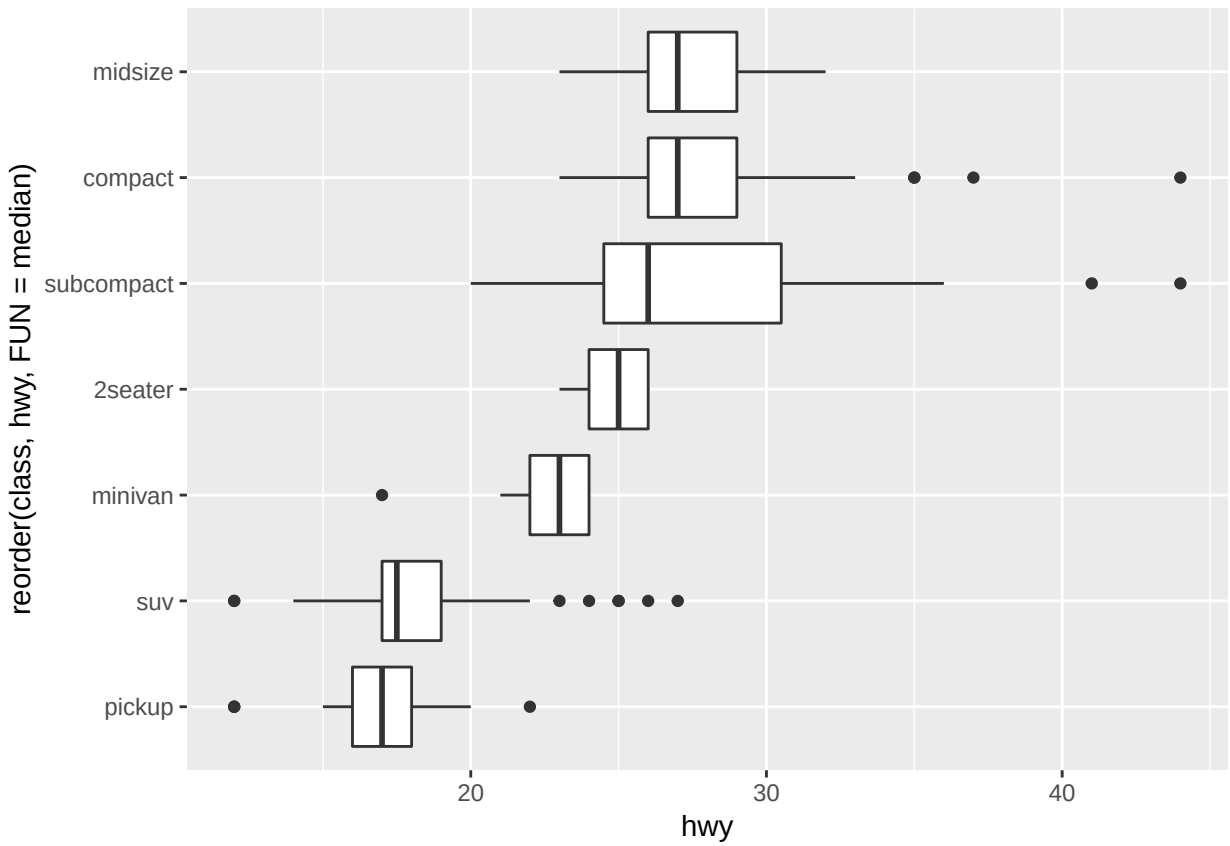
Re-order.

```
mpg %>% ggplot(mapping = aes(x = reorder(class, hwy, FUN = median), y = hwy)) +
  geom_boxplot()
```



Flip.

```
mpg %>% ggplot(mapping = aes(x = reorder(class, hwy, FUN = median), y = hwy)) +
  geom_boxplot() +
  coord_flip()
```


midsize
compact
subcompact
2seater
minivan
suv
pickup
reorder(class, hwy, FUN = median)
20
30
40
hwy