# Displaying large data

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**October 2009**

1. Introduction to the diamonds data
2. Histograms and bar charts
3. More boxplots
4. Scatterplots for large data
5. Some theory

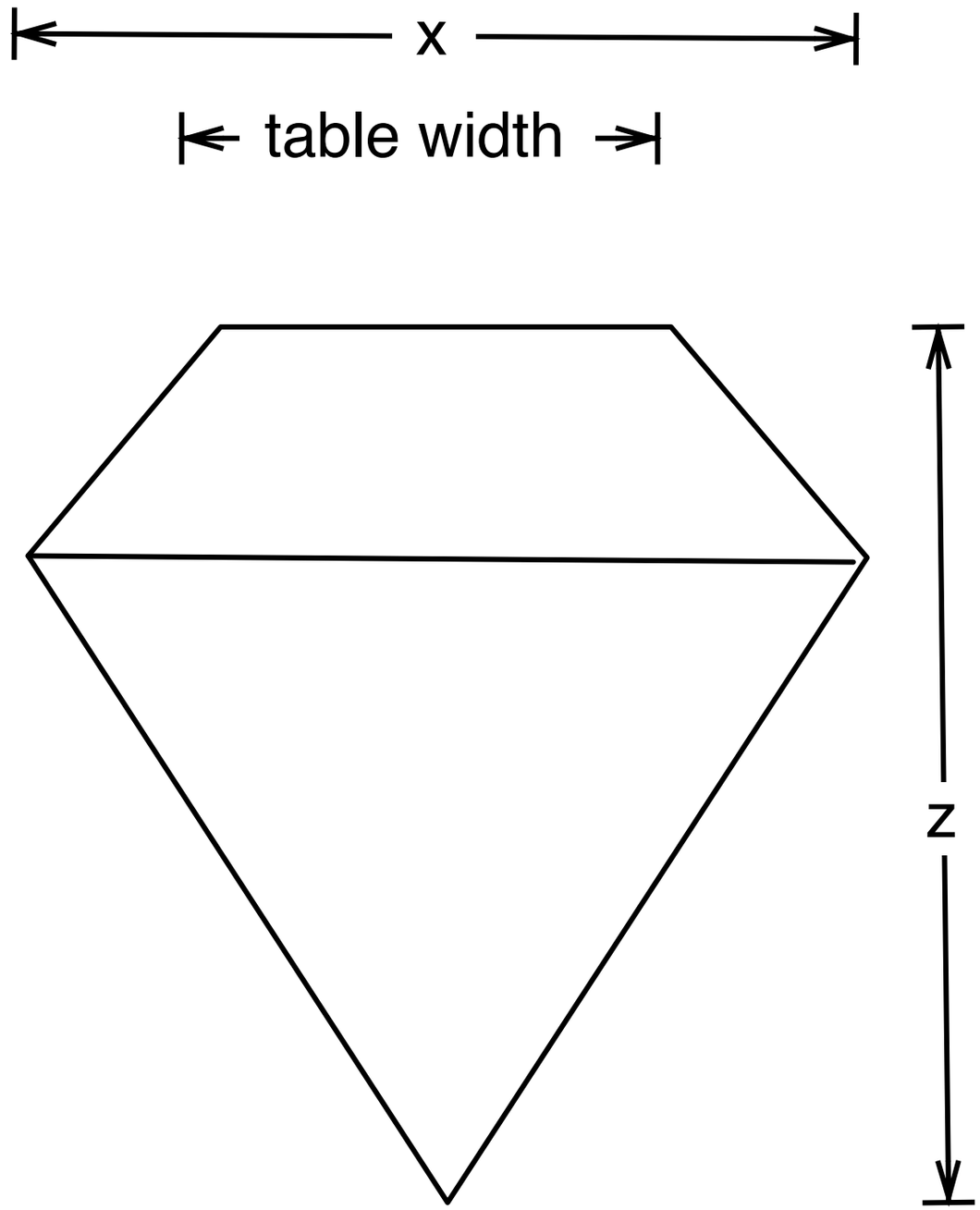
# Diamonds data

~**54,000** round diamonds from http://www.diamondse.info/

Carat, colour, clarity, cut

Total depth, table, depth, width, height

Price




depth = z / diameter
table = table width / x * 100

# Histogram & bar charts

# Histograms and barcharts

Used to display the **distribution** of a variable

Categorical variable → bar chart

Continuous variable → histogram

Always experiment with the bin width!

# Examples

```
# With only one variable, qplot guesses that
# you want a bar chart or histogram
qplot(cut, data = diamonds)

qplot(carat, data = diamonds)
qplot(carat, data = diamonds, binwidth = 1)
qplot(carat, data = diamonds, binwidth = 0.1)
qplot(carat, data = diamonds, binwidth = 0.01)
resolution(diamonds$carat)

last_plot() + xlim(0, 3)
```

# Examples

```
# With only one variable, qplot guesses that
# you want a bar chart or histogram
qplot(cut, data = diamonds)

qplot(carat, data = diamonds)
qplot(carat, data = diamonds, binwidth = 1)
qplot(carat, data = diamonds, binwidth = 0.1)
qplot(carat, data = diamonds, binwidth = 0.01)
resolution(diamonds$carat)

last_plot() + xlim(0, 3)
```

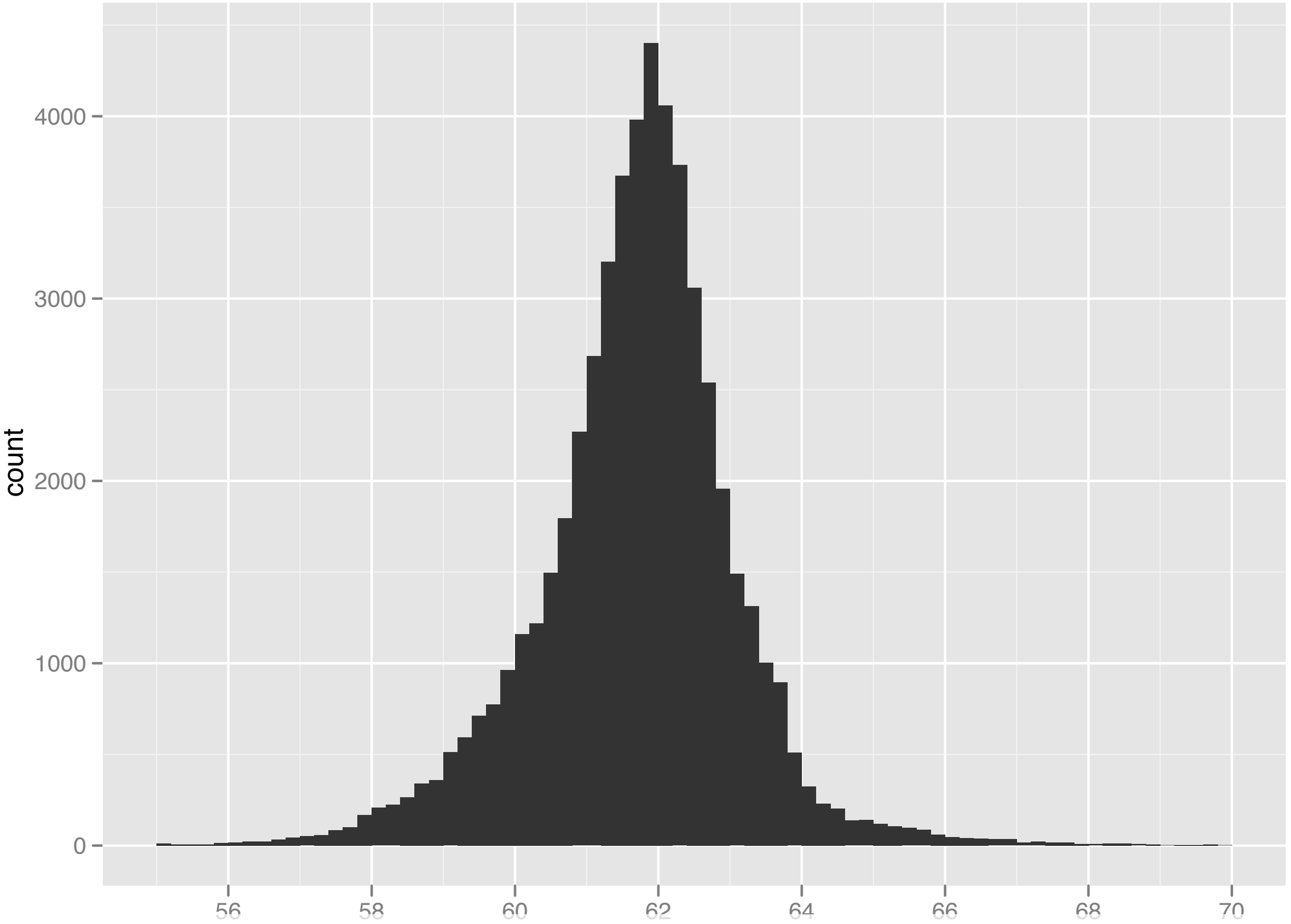
Common ggplot2 technique: adding together plot components

```
qplot(table, data = diamonds, binwidth = 1)

# To zoom in on a plot region use xlim() and ylim()
qplot(table, data = diamonds, binwidth = 1) +
   xlim(50, 70)
qplot(table, data = diamonds, binwidth = 0.1) +
  xlim(50, 70)
qplot(table, data = diamonds, binwidth = 0.1) +
  xlim(50, 70) + ylim(0, 50)

# Note that this type of zooming discards data
outside of the plot regions
# See coord_cartesian() for an alternative
```

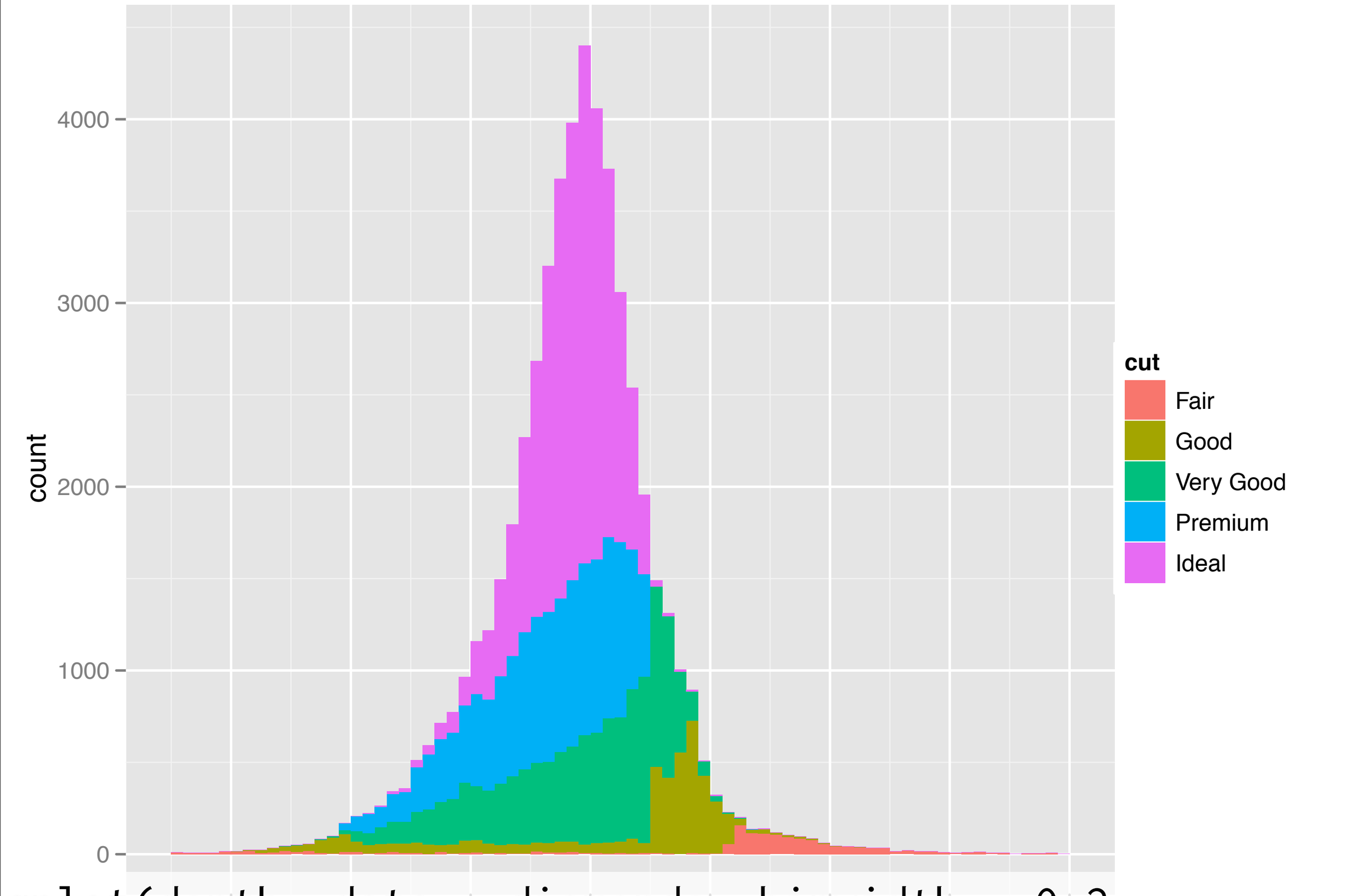
# Additional variables

As with scatterplots can use **aesthetics** or **faceting**. Using aesthetics creates pretty, but ineffective, plots.

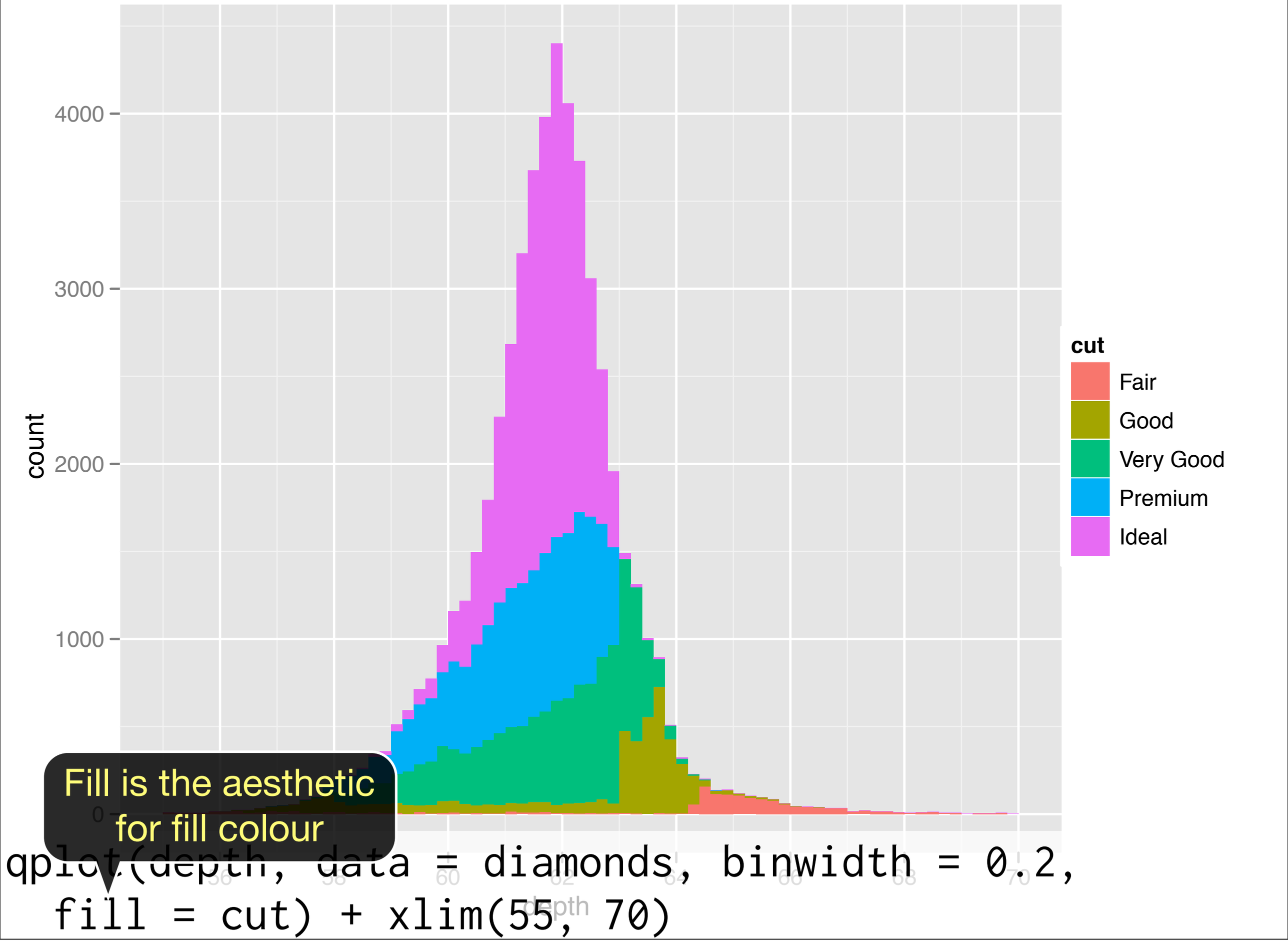
The following examples show the difference, when investigation the relationship between cut and depth.




```
qplot(depth, data = diamonds, binwidth = 0.2)
```

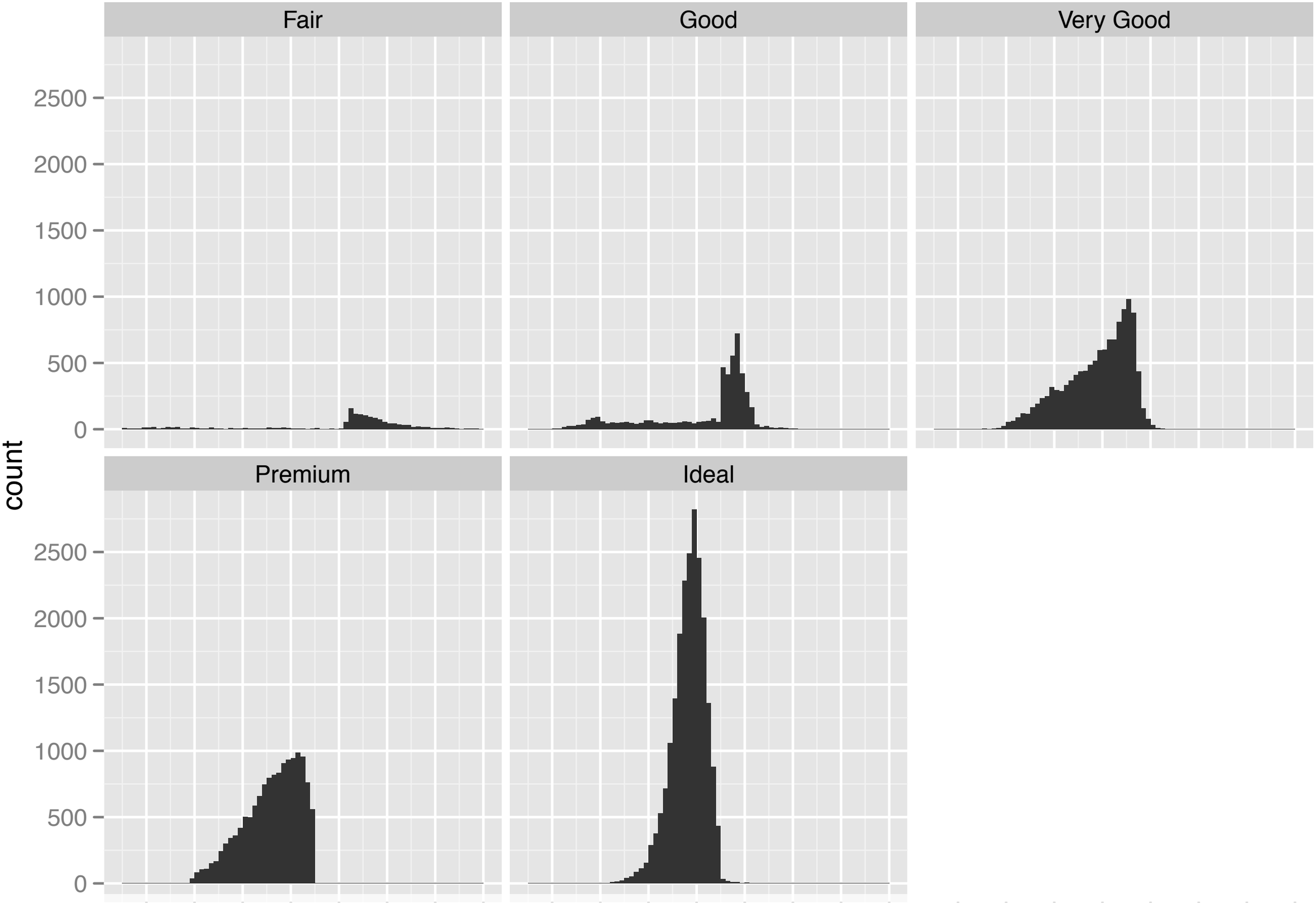



```
qplot(depth, data = diamonds, binwidth = 0.2,
  fill = cut) + xlim(55, 70)
```




Fill is the aesthetic for fill colour

```
qplot(depth, data = diamonds, binwidth = 0.2,
  fill = cut) + xlim(55, 70)
```




```
qplot(depth, data = diamonds, binwidth = 0.2) +
  xlim(55, 70) + facet_wrap(~cut)
```

# Your turn

Explore the distribution of price.

How does it vary with colour, or cut, and clarity?

# Weighting

```
qplot(cut, data = diamonds, weight = carat)
qplot(cut, data = diamonds, weight = price)
```

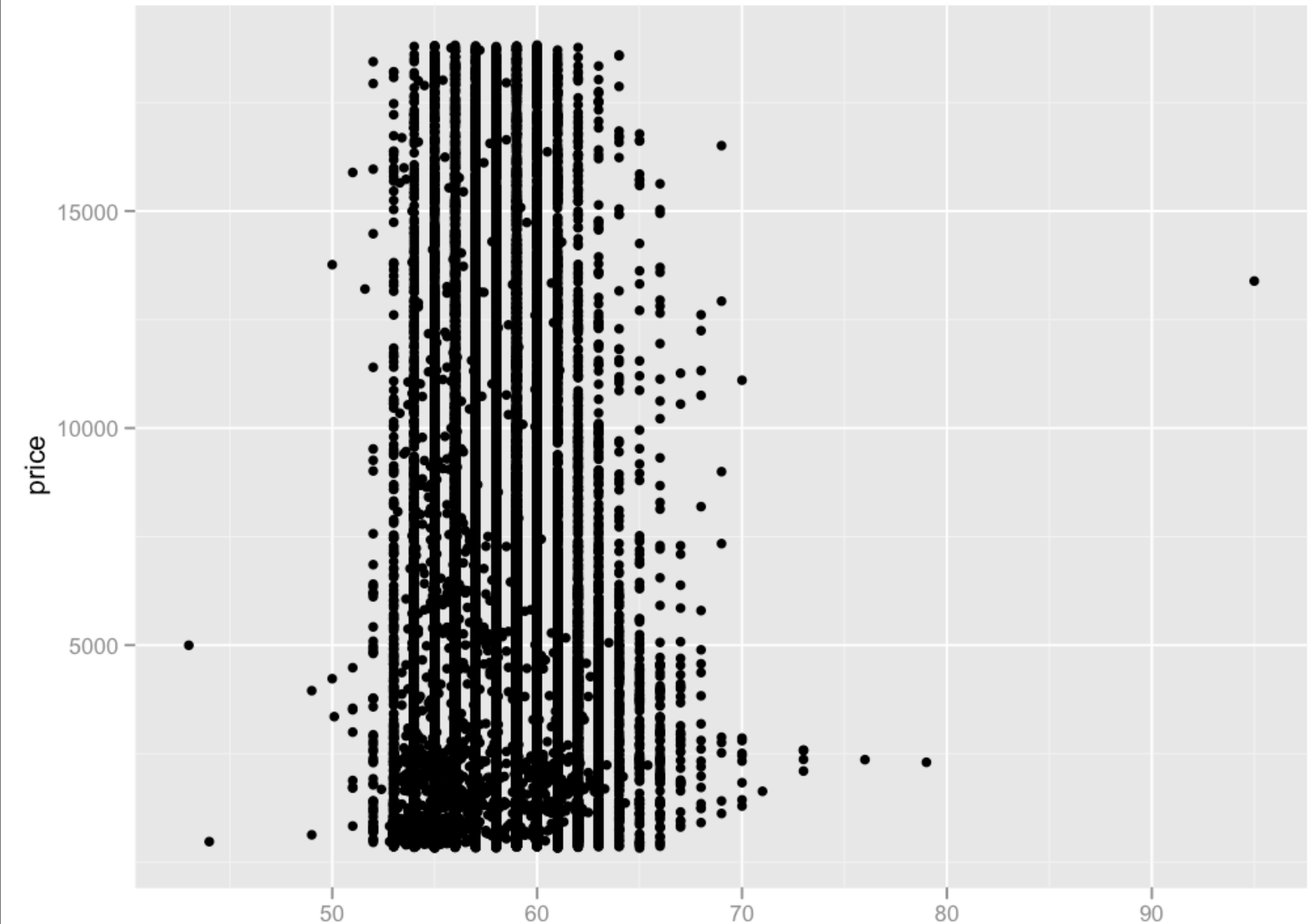
```
# Also useful for pretabulated data
cuts <- as.data.frame(table(
  cut = diamonds$cut))
qplot(cut, weight = Freq, data = cuts)
```

# Box and whisker plots

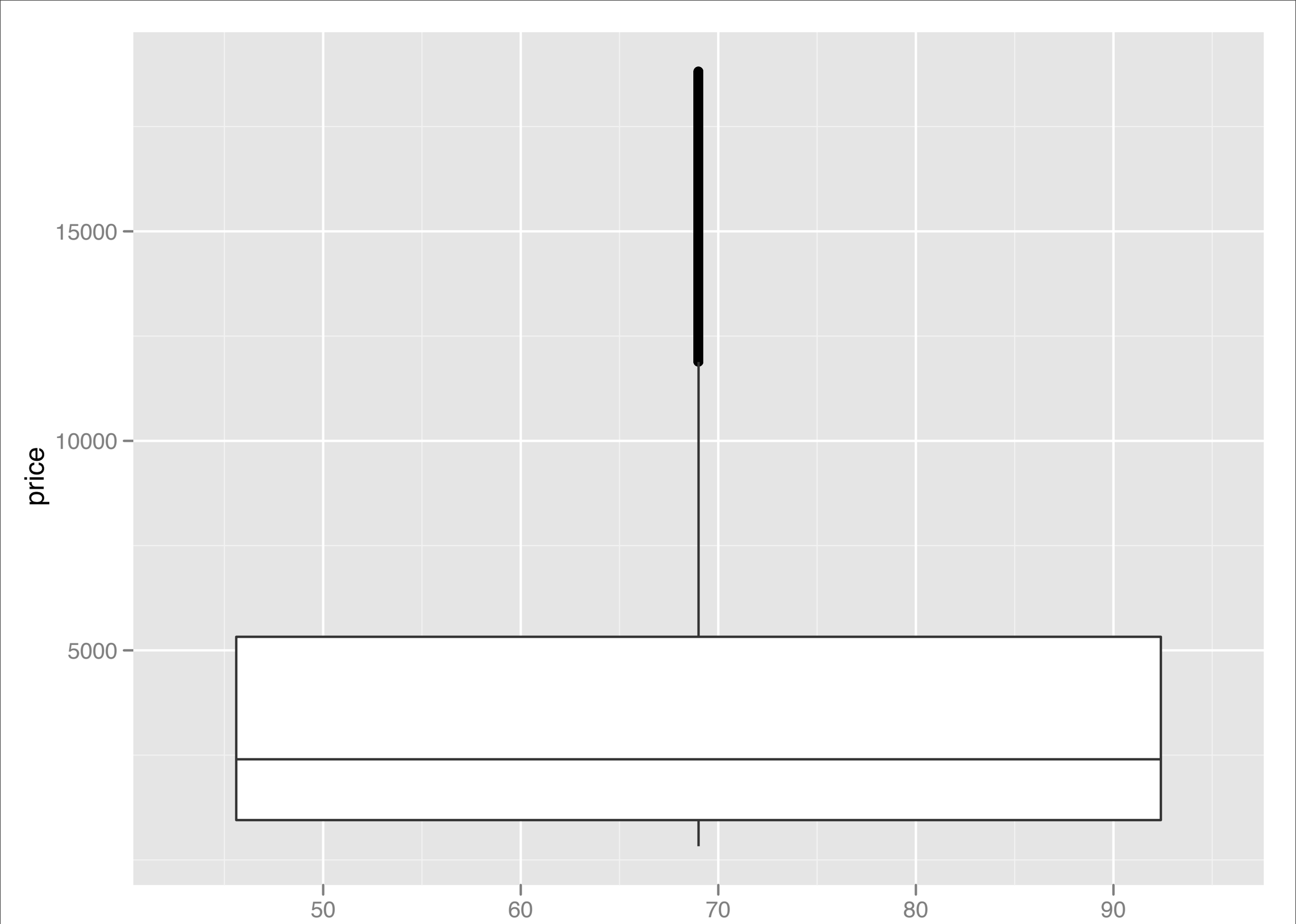
# Boxplots

Less information than a histogram, but take up much less space.

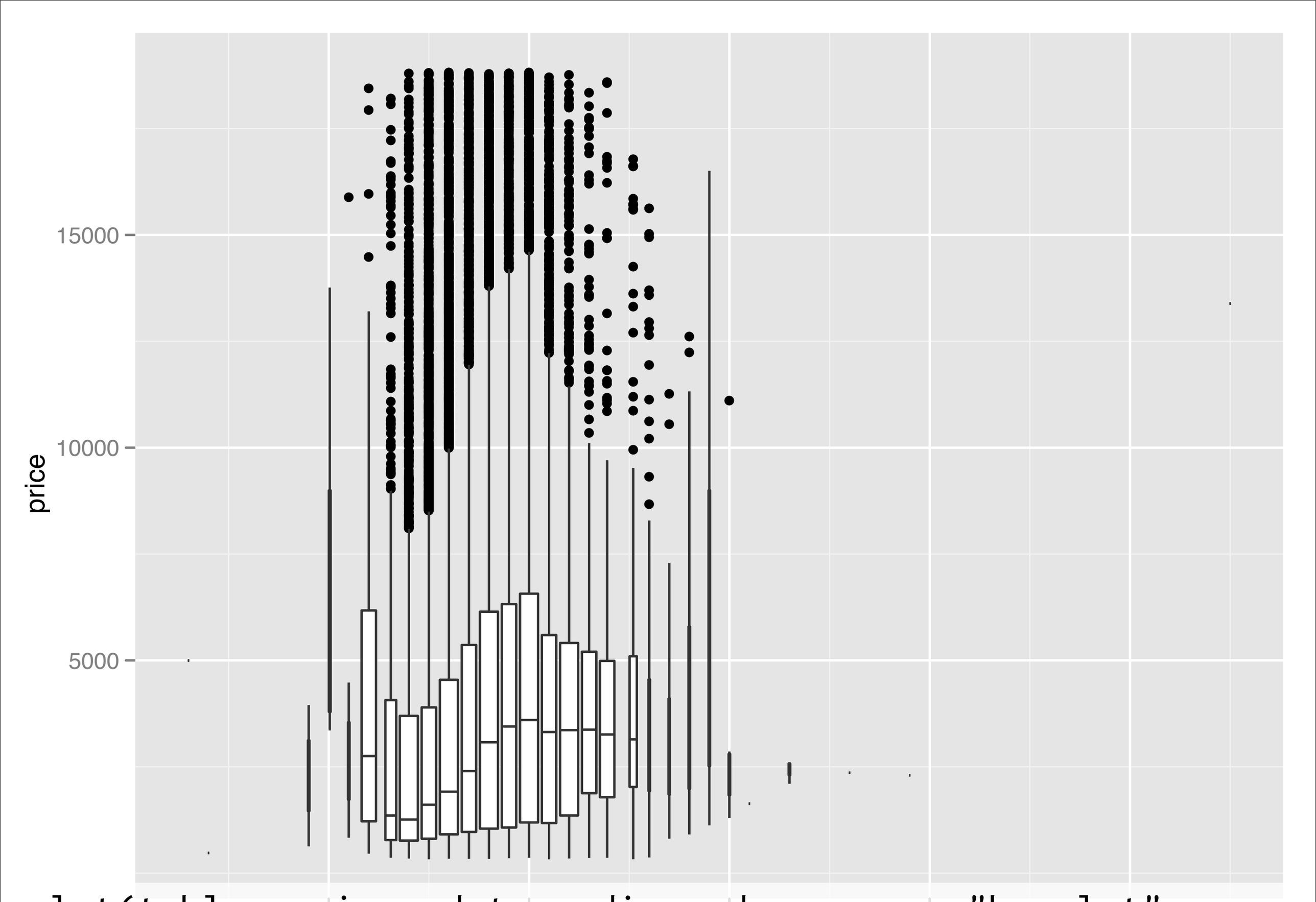
Already seen them used with discrete x values.  Can also use with continuous x values, by specifying how we want the data **group**ed.



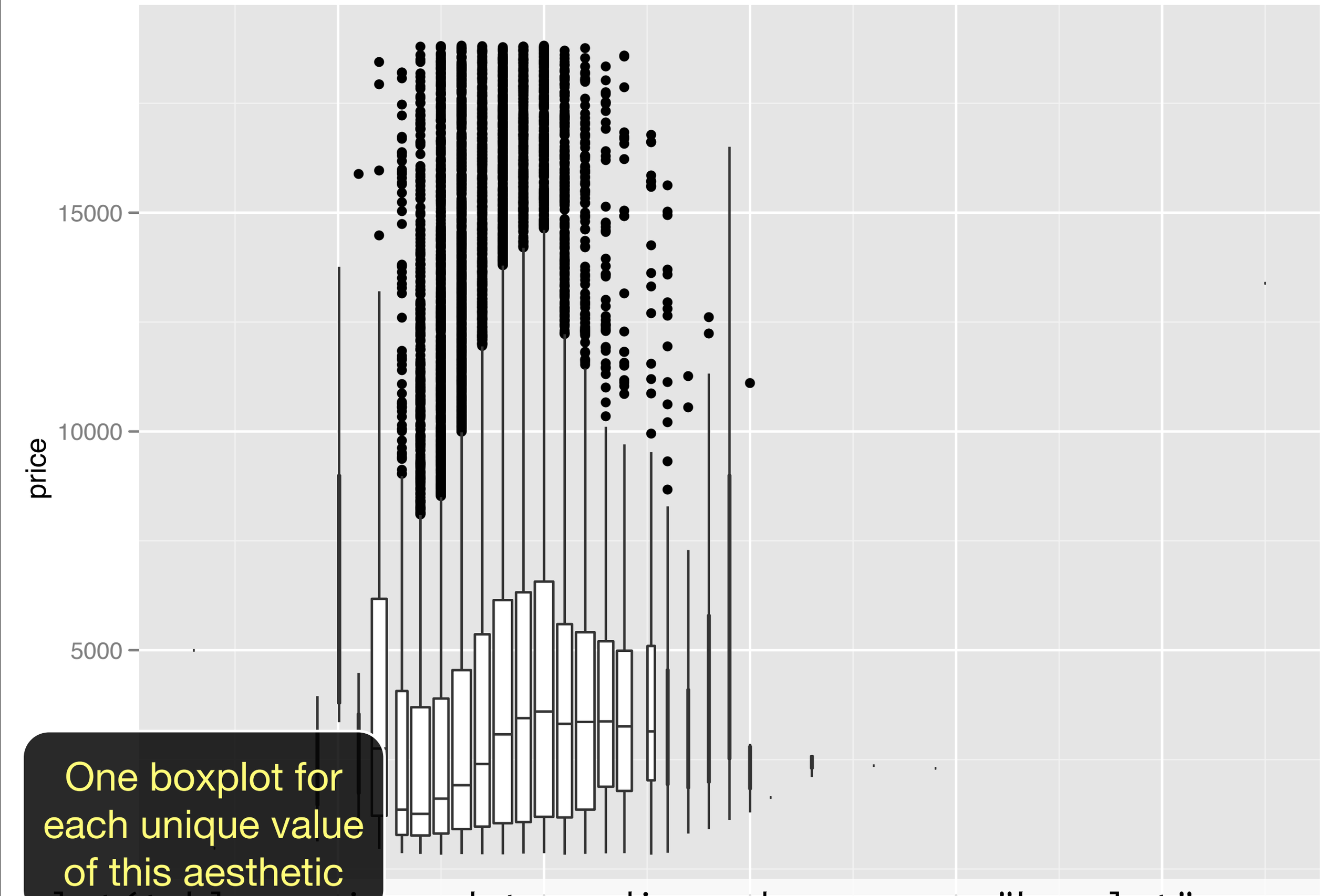

```
qplot(table, price, data = diamonds)
```




```
qplot(table, price, data = diamonds, geom = "boxplot")
```



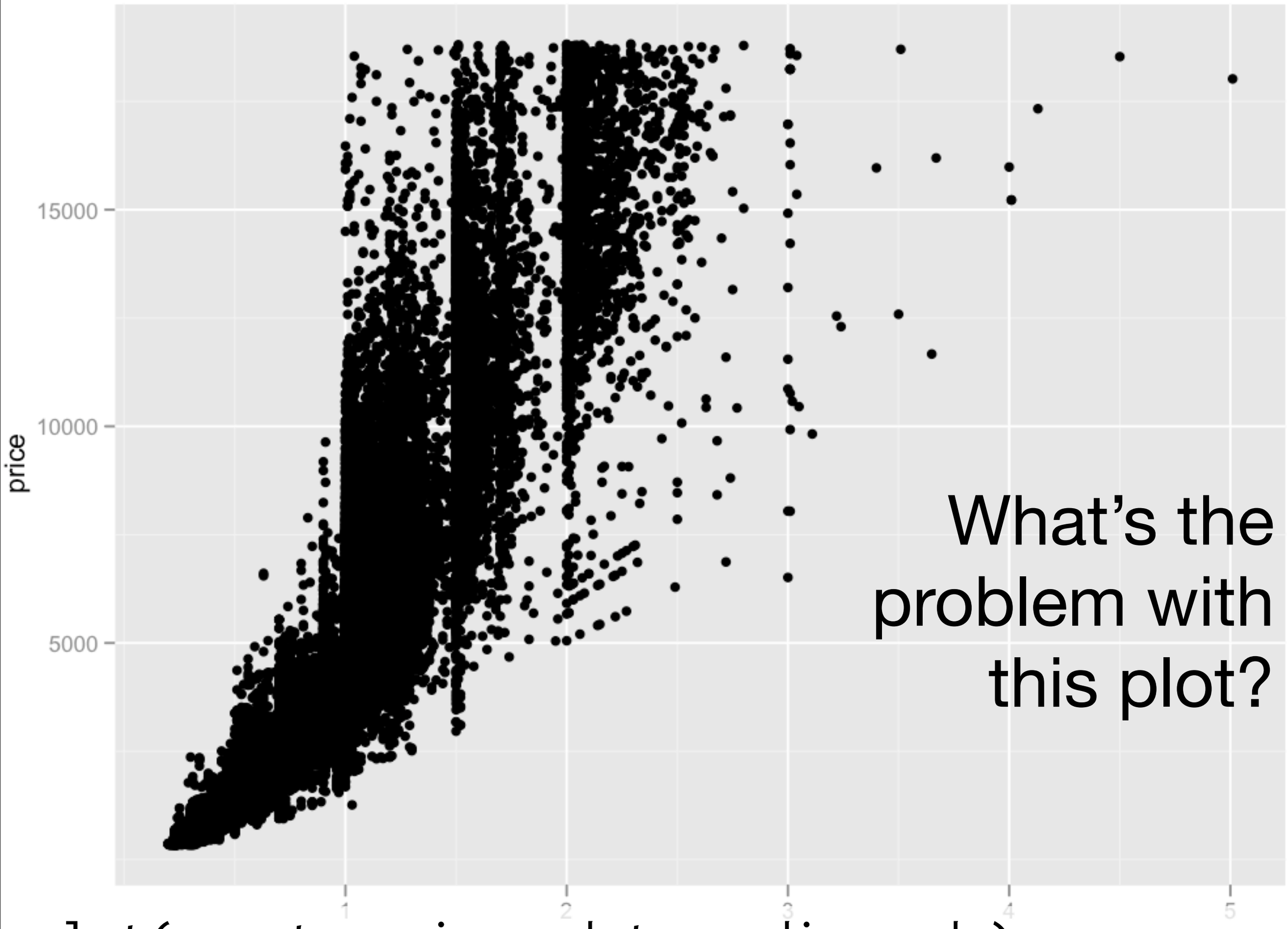

```
qplot(table, price, data = diamonds, geom = "boxplot",
  group = round(table))
```




One boxplot for each unique value of this aesthetic

```
qplot(table, price, data = diamonds, geom = "boxplot",
  group = round(table))
```

# Scatterplots




What's the problem with this plot?

```
qplot(carat, price, data = diamonds)
```


# What's the problem with this plot?

In pairs, brainstorm solutions for 2 minutes.

```
qplot(carat, price, data = diamonds)
```

# Ideas

If x discrete, use boxplots.

Use semi-transparent points

Divide into bins and count number of points in each bin (2d histogram)

Display statistical summary.

```
qplot(carat, price, data = diamonds,
  colour = I(alpha("black", 1/255)))

qplot(carat, price, data = diamonds, geom = "bin2d")
qplot(carat, price, data = diamonds, geom = "bin2d",
bins = 100)
qplot(carat, price, data = diamonds, geom = "hex")

qplot(carat, price, data = diamonds) + geom_smooth()
```

```
# Very basic cleaning
diamonds$x[diamonds$x == 0] <- NA
diamonds$y[diamonds$y == 0] <- NA
diamonds$y[diamonds$y > 12] <- NA

qplot(x, y, data = diamonds)
qplot(x, y, data = diamonds, geom = "bin2d")
qplot(x, y, data = diamonds, geom = "hex")
qplot(x, y, data = diamonds, geom = "bin2d", bins = 100)
qplot(x, y, data = diamonds, geom = "hex", bins = 100)

# Zoom in
qplot(x, y, data = diamonds, geom = "bin2d", bins = 100) +
  xlim(4,7) + ylim(4,7)
qplot(x, y, data = diamonds, geom = "bin2d", bins = 100) +
  xlim(4,5) + ylim(4,5)
```

```
qplot(x, x / y, data = diamonds,
  geom = "bin2d")
qplot(x, log(x / y), data = diamonds,
  geom = "bin2d")

clean <- subset(diamonds, abs(log(x / y)) < 0.1)

qplot(x, log(x / y), data = clean, geom = "bin2d")
qplot(x, log(x / y), data = clean, geom = "bin2d",
  bins = 80)
```

```
qplot(x, x / y, data = diamonds,
  geom = "bin2d")
qplot(x, log(x / y), data = diamonds,
  geom = "bin2d")

clean <- subset(diamonds, abs(log(x / y)) < 0.1)

qplot(x, log(x / y), data = clean, geom = "bin2d")
qplot(x, log(x / y), data = clean, geom = "bin2d",
  bins = 80)
```

What would be a good name for log(x / y)? What other variable might you create to go with it?

# Your turn

Continue to explore the relationship between x, y, z and carat.  Create new variables as necessary.

You might also want to do more cleaning.

Some good ideas here: http://www.diamondhelpers.com/fivesteps/4-certified-diamonds.shtml

Sunday, August 14, 2011