Data Analysis with R

Problem Set 1

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Diamonds Data

```
library(ggplot2)
```

```
nrow(diamonds)
```

```
## [1] 53940
```

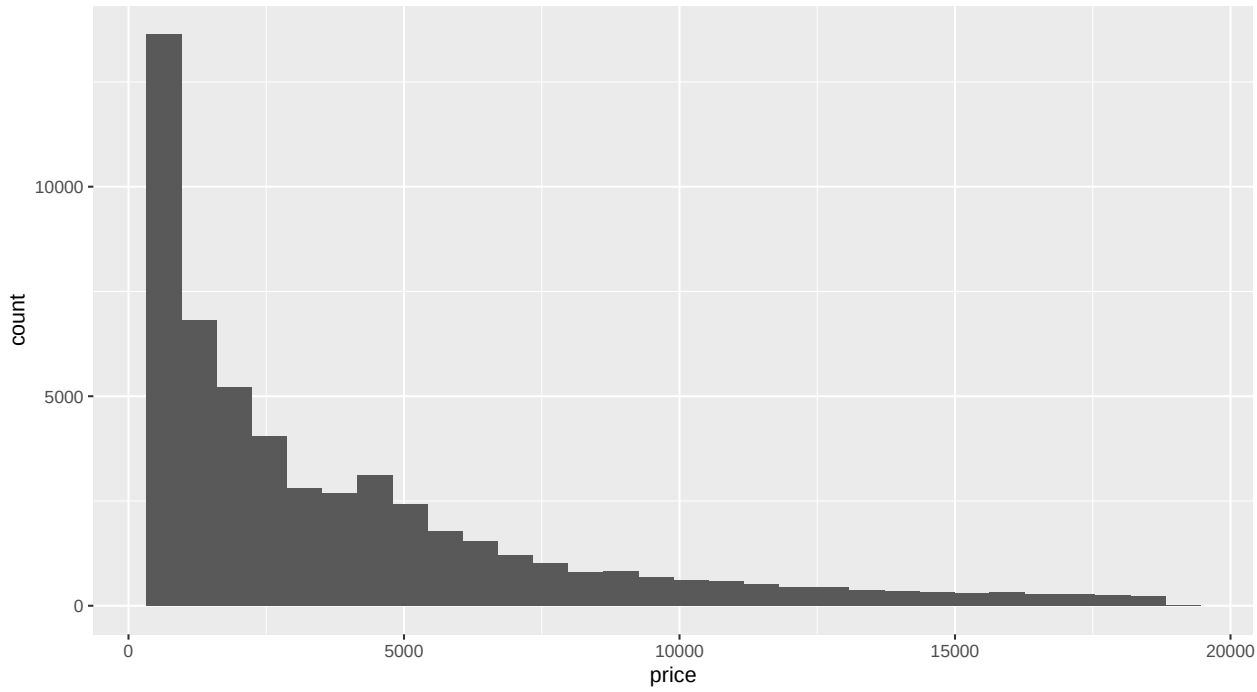
```
summary(diamonds)
```

```
##      carat               cut        color        clarity
##  Min.   :0.2000   Fair      : 1610   D: 6775   SI1    :13065
##  1st Qu.:0.4000   Good      : 4906   E: 9797   VS2    :12258
##  Median :0.7000   Very Good:12082   F: 9542   SI2    : 9194
##  Mean   :0.7979   Premium   :13791   G:11292   VS1    : 8171
##  3rd Qu.:1.0400   Ideal     :21551   H: 8304   VVS2   : 5066
##  Max.   :5.0100                     I: 5422   VVS1   : 3655
##                                     J: 2808   (Other): 2531
##      depth           table           price             x
##  Min.   :43.00   Min.   :43.00   Min.   :  326   Min.   : 0.000
##  1st Qu.:61.00   1st Qu.:56.00   1st Qu.:  950   1st Qu.: 4.710
##  Median :61.80   Median :57.00   Median : 2401   Median : 5.700
##  Mean   :61.75   Mean   :57.46   Mean   : 3933   Mean   : 5.731
##  3rd Qu.:62.50   3rd Qu.:59.00   3rd Qu.: 5324   3rd Qu.: 6.540
##  Max.   :79.00   Max.   :95.00   Max.   :18823   Max.   :10.740
##
##        y                z
##  Min.   : 0.000   Min.   : 0.000
##  1st Qu.: 4.720   1st Qu.: 2.910
##  Median : 5.710   Median : 3.530
##  Mean   : 5.735   Mean   : 3.539
##  3rd Qu.: 6.540   3rd Qu.: 4.040
##  Max.   :58.900   Max.   :31.800
##
```

```
?diamonds
```

```
ggplot(data = diamonds, mapping = aes(x = price)) +
  geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
summary(diamonds$price)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     326     950    2401    3933    5324   18823
```

```
mean(diamonds$price)
```

```
## [1] 3932.8
```

```
nrow(subset(diamonds, diamonds$price < 500))
```

```
## [1] 1729
```

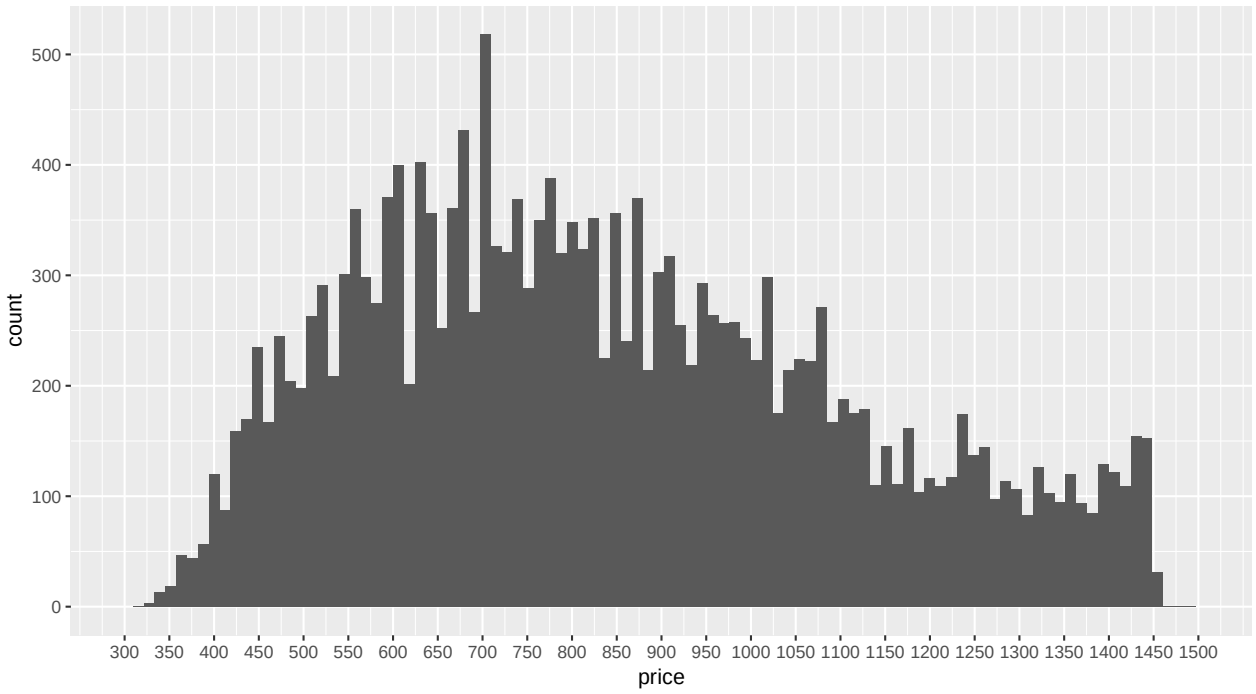
```
nrow(subset(diamonds, diamonds$price < 250))
```

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

```
nrow(subset(diamonds, diamonds$price >= 15000))
```

```
## [1] 1656
```

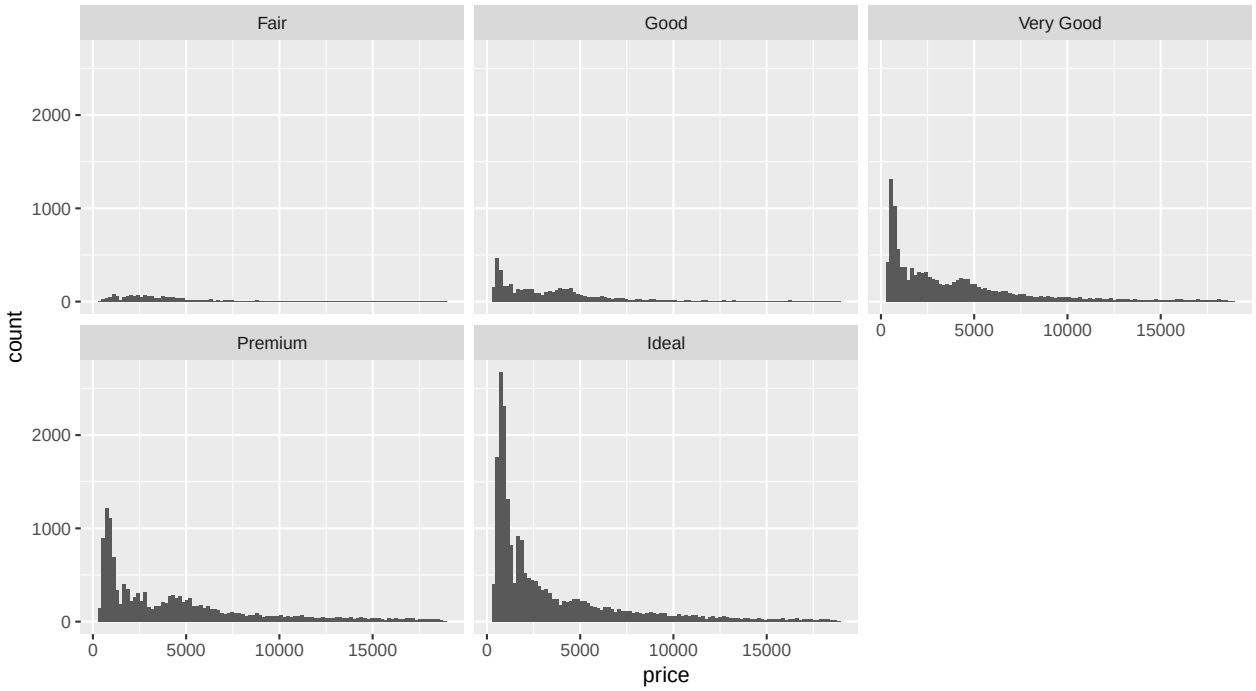
```
# Exploring the Peak of the Histogram
ggplot(data = diamonds, mapping = aes(x = price)) +
  geom_histogram(na.rm = TRUE, bins = 100) +
  scale_x_continuous(limits = c(300,1500),
                     breaks = seq(300,1500,50))
```




```
# Save the plot
ggsave('price_histogram.jpg')
```

```
## Saving 9 x 5 in image
```

```
# Histogram by Cut
ggplot(data = diamonds, mapping = aes(x = price)) +
  geom_histogram(na.rm = TRUE, bins = 100) +
  facet_wrap(~cut)
```



```r
# Highest Price By Cut
by(diamonds$price, diamonds$cut, FUN = max)
```

```
## diamonds$cut: Fair
## [1] 18574
## ------------------------------------------------------------
## diamonds$cut: Good
## [1] 18788
## ------------------------------------------------------------
## diamonds$cut: Very Good
## [1] 18818
## ------------------------------------------------------------
## diamonds$cut: Premium
## [1] 18823
## ------------------------------------------------------------
## diamonds$cut: Ideal
## [1] 18806
```

```r
# Lowest Price By Cut
by(diamonds$price, diamonds$cut, FUN = min)
```

```
## diamonds$cut: Fair
## [1] 337
## ------------------------------------------------------------
## diamonds$cut: Good
## [1] 327
## ------------------------------------------------------------
## diamonds$cut: Very Good
## [1] 336
## ------------------------------------------------------------
## diamonds$cut: Premium
## [1] 326
## ------------------------------------------------------------
## diamonds$cut: Ideal
## [1] 326
```

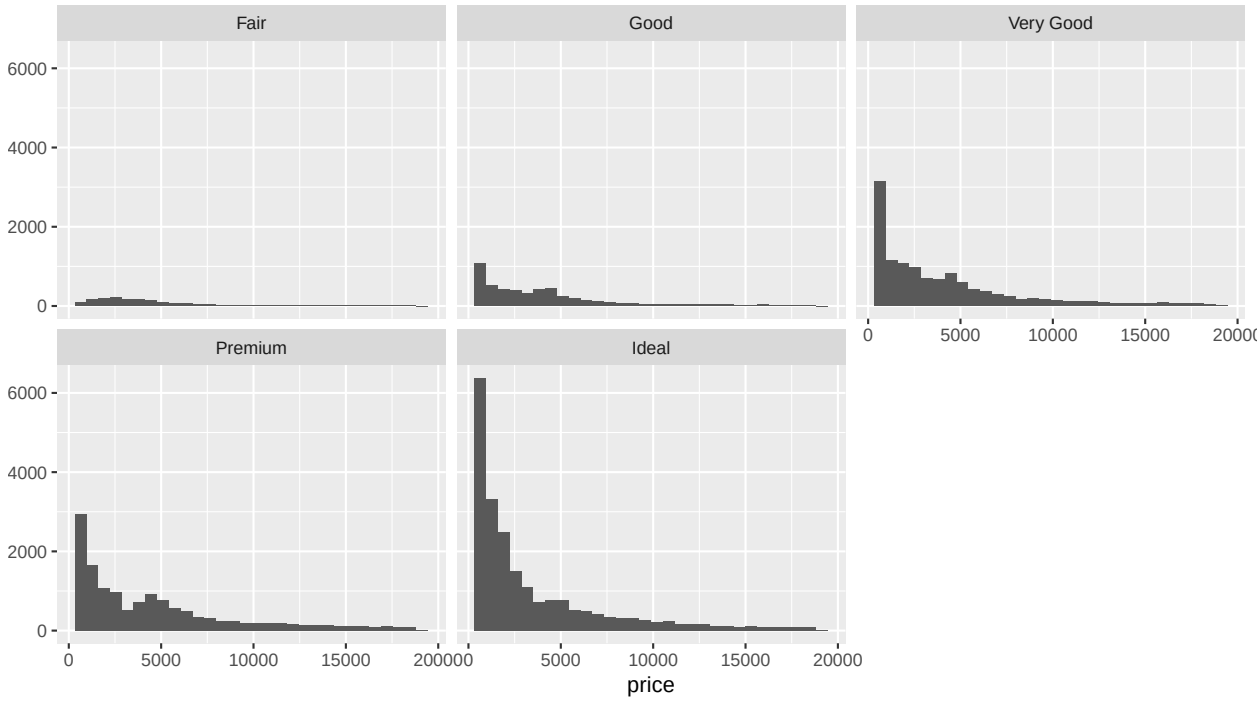
```r
# Median Lowest Price By Cut
by(diamonds$price, diamonds$cut, FUN = summary)
```

```
## diamonds$cut: Fair
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     337    2050    3282    4359    5206   18574
## ------------------------------------------------------------
## diamonds$cut: Good
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     327    1145    3050    3929    5028   18788
## ------------------------------------------------------------
## diamonds$cut: Very Good
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     336     912    2648    3982    5373   18818
## ------------------------------------------------------------
## diamonds$cut: Premium
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     326    1046    3185    4584    6296   18823
## ------------------------------------------------------------
```

```
## diamonds$cut: Ideal
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     326     878    1810    3458    4678   18806
```

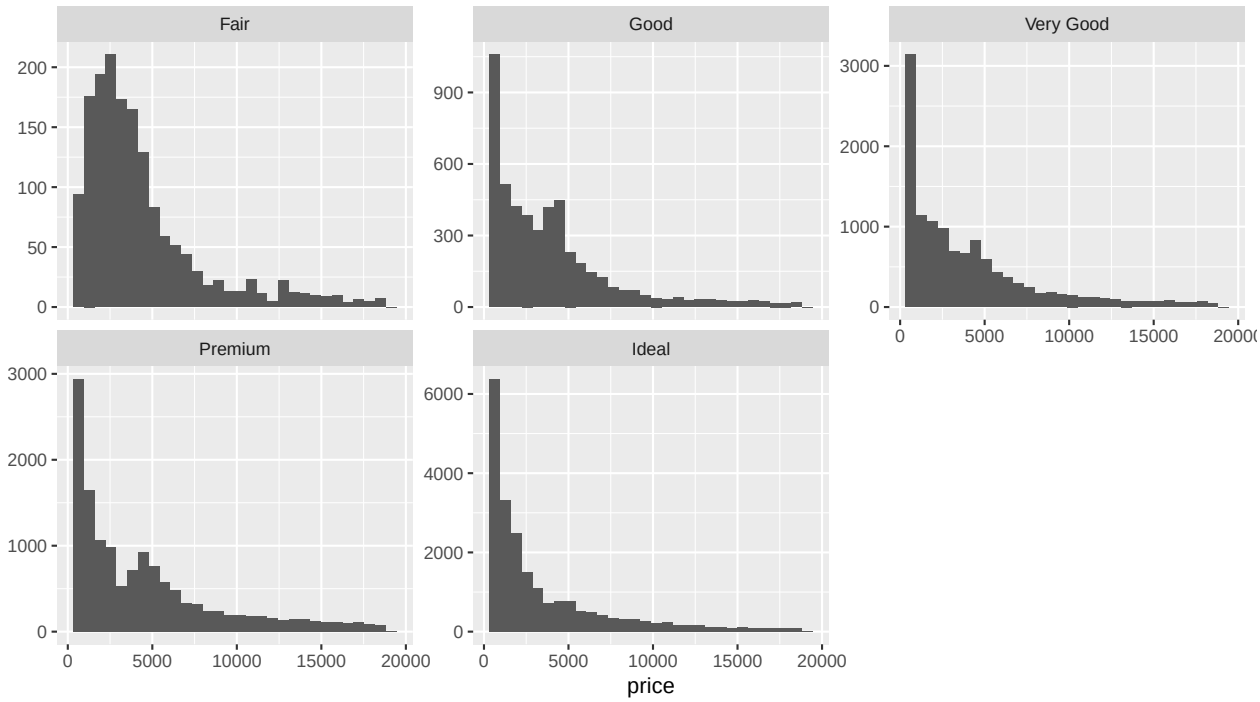
```
# Fixed Scales
qplot(x = price, data = diamonds) +
  facet_wrap(~cut)
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

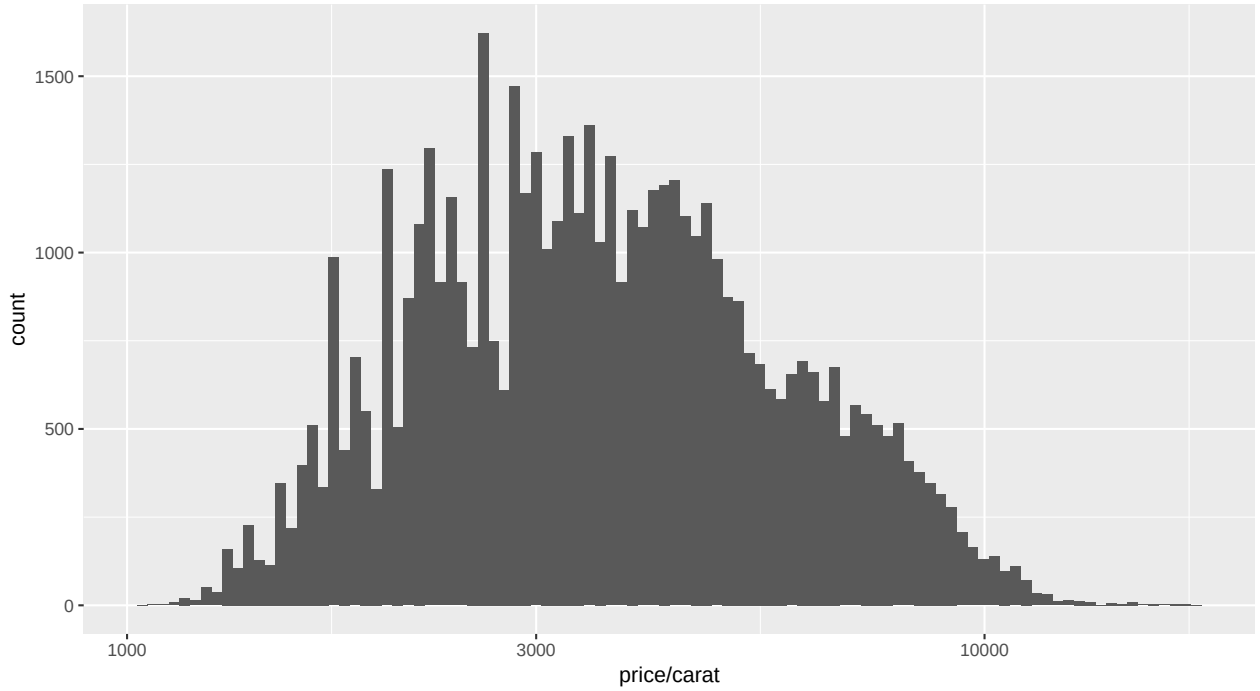



```
# Free Y-Axis Scale
qplot(x = price, data = diamonds) +
  facet_wrap(~cut, scales = "free_y")
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

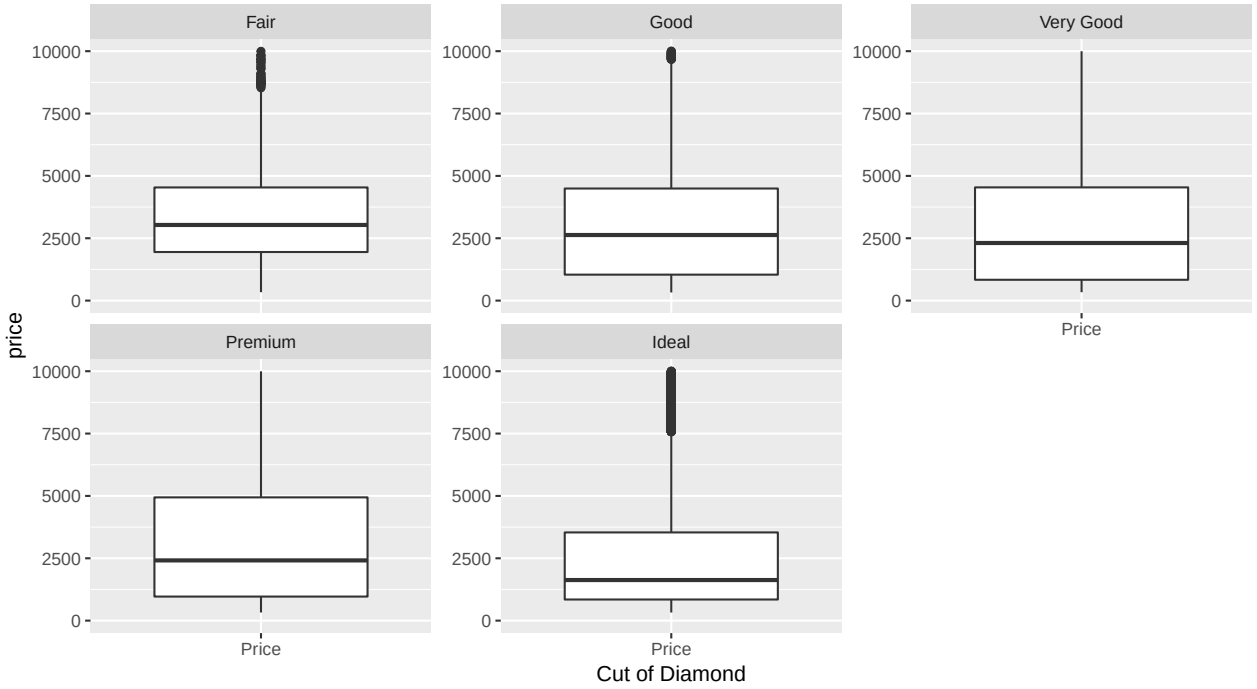



```
# Histogram for Price per Carat (Log Transformed X-Axis)
ggplot(data = diamonds,
       mapping = aes(x = price/carat)) +
  geom_histogram(bins = 100) +
  scale_x_log10()
```



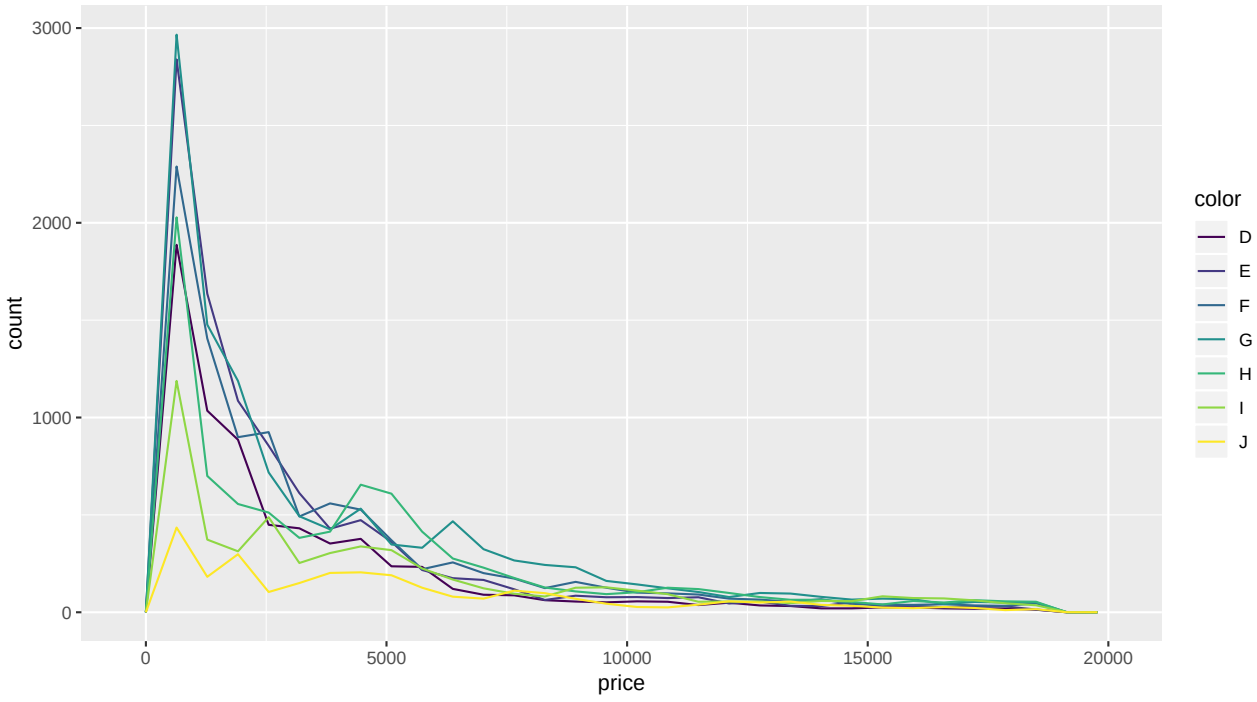

```
ggplot(data = diamonds, mapping = aes(x = "Price", y = price)) +
  geom_boxplot(na.rm = TRUE) +
  facet_wrap(~cut, scales = "free_y") +
  scale_y_continuous(limits = c(0,10000)) +
```

```
  xlab('Cut of Diamond')
```




```
ggplot(data = diamonds, mapping = aes(x = price)) +
  geom_freqpoly(mapping = aes(color = color), na.rm = TRUE)
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
summary(subset(diamonds, diamonds$color == 'D')$price)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##     357     911    1838    3170    4214   18693
```

```
summary(subset(diamonds, diamonds$color == 'J')$price)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     335    1860    4234    5324    7695   18710
```

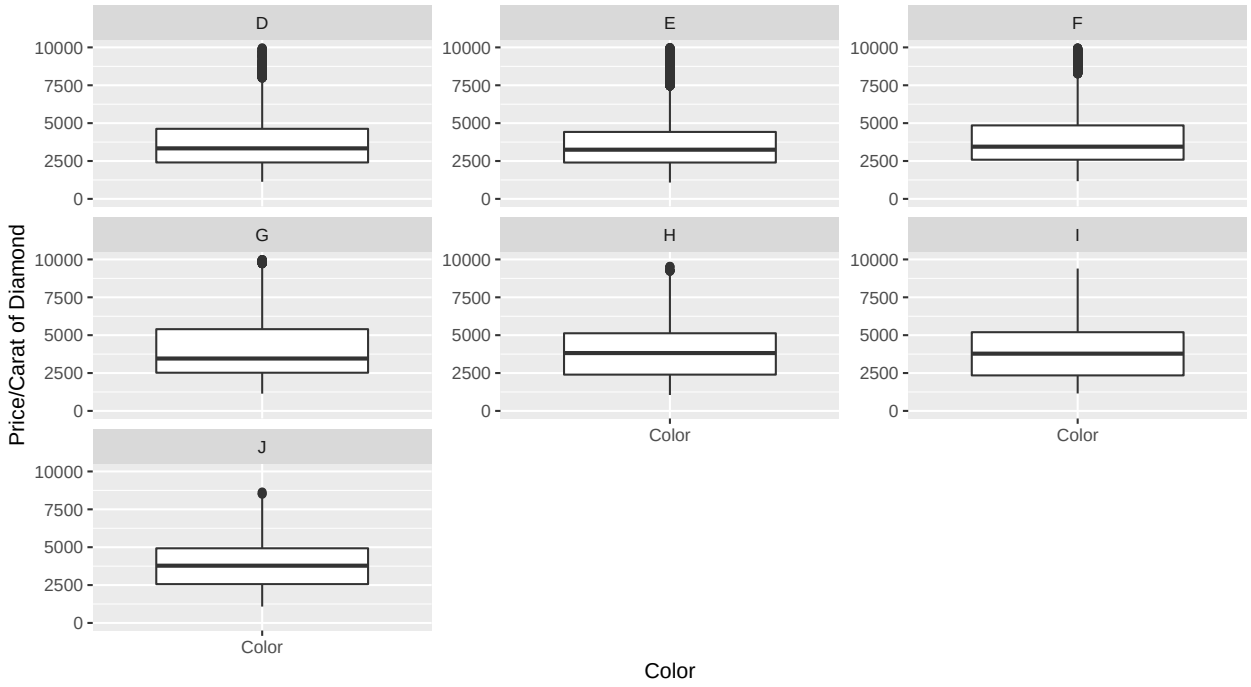
```
IQR(subset(diamonds, diamonds$color == 'D')$price)
```

```
## [1] 3302.5
```

```
IQR(subset(diamonds, diamonds$color == 'J')$price)
```

```
## [1] 5834.5
```

```
ggplot(data = diamonds, mapping = aes(x = "Color", y = price/carat)) +
  geom_boxplot(na.rm = TRUE) +
  facet_wrap(~color, scales = "free_y") +
  scale_y_continuous(limits = c(0,10000)) +
  ylab('Price/Carat of Diamond') +
  xlab('Color')
```




```
table(diamonds$carat)
```

```
##
##  0.2 0.21 0.22 0.23 0.24 0.25 0.26 0.27 0.28 0.29  0.3 0.31 0.32 0.33 0.34
##   12    9    5  293  254  212  253  233  198  130 2604 2249 1840 1189  910
## 0.35 0.36 0.37 0.38 0.39  0.4 0.41 0.42 0.43 0.44 0.45 0.46 0.47 0.48 0.49
##  667  572  394  670  398 1299 1382  706  488  212  110  178   99   63   45
##  0.5 0.51 0.52 0.53 0.54 0.55 0.56 0.57 0.58 0.59  0.6 0.61 0.62 0.63 0.64
## 1258 1127  817  709  625  496  492  430  310  282  228  204  135  102   80
## 0.65 0.66 0.67 0.68 0.69  0.7 0.71 0.72 0.73 0.74 0.75 0.76 0.77 0.78 0.79
##   65   48   48   25   26 1981 1294  764  492  322  249  251  251  187  155
##  0.8 0.81 0.82 0.83 0.84 0.85 0.86 0.87 0.88 0.89  0.9 0.91 0.92 0.93 0.94
##  284  200  140  131   64   62   34   31   23   21 1485  570  226  142   59
```

```
## 0.95 0.96 0.97 0.98 0.99    1 1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09
##   65  103   59   31   23 1558 2242  883  523  475  361  373  342  246  287
##  1.1 1.11 1.12 1.13 1.14 1.15 1.16 1.17 1.18 1.19  1.2 1.21 1.22 1.23 1.24
##  278  308  251  246  207  149  172  110  123  126  645  473  300  279  236
## 1.25 1.26 1.27 1.28 1.29  1.3 1.31 1.32 1.33 1.34 1.35 1.36 1.37 1.38 1.39
##  187  146  134  106  101  122  133   89   87   68   77   50   46   26   36
##  1.4 1.41 1.42 1.43 1.44 1.45 1.46 1.47 1.48 1.49  1.5 1.51 1.52 1.53 1.54
##   50   40   25   19   18   15   18   21    7   11  793  807  381  220  174
## 1.55 1.56 1.57 1.58 1.59  1.6 1.61 1.62 1.63 1.64 1.65 1.66 1.67 1.68 1.69
##  124  109  106   89   89   95   64   61   50   43   32   30   25   19   24
##  1.7 1.71 1.72 1.73 1.74 1.75 1.76 1.77 1.78 1.79  1.8 1.81 1.82 1.83 1.84
##  215  119   57   52   40   50   28   17   12   15   21    9   13   18    4
## 1.85 1.86 1.87 1.88 1.89  1.9 1.91 1.92 1.93 1.94 1.95 1.96 1.97 1.98 1.99
##    3    9    7    4    4    7   12    2    6    3    3    4    4    5    3
##    2 2.01 2.02 2.03 2.04 2.05 2.06 2.07 2.08 2.09  2.1 2.11 2.12 2.13 2.14
##  265  440  177  122   86   67   60   50   41   45   52   43   25   21   48
## 2.15 2.16 2.17 2.18 2.19  2.2 2.21 2.22 2.23 2.24 2.25 2.26 2.27 2.28 2.29
##   22   25   18   31   22   32   23   27   13   16   18   15   12   20   17
##  2.3 2.31 2.32 2.33 2.34 2.35 2.36 2.37 2.38 2.39  2.4 2.41 2.42 2.43 2.44
##   21   13   16    9    5    7    8    6    8    7   13    5    8    6    4
## 2.45 2.46 2.47 2.48 2.49  2.5 2.51 2.52 2.53 2.54 2.55 2.56 2.57 2.58 2.59
##    4    3    3    9    3   17   17    9    8    9    3    3    3    3    1
##  2.6 2.61 2.63 2.64 2.65 2.66 2.67 2.68  2.7 2.71 2.72 2.74 2.75 2.77  2.8
##    3    3    3    1    1    3    1    2    1    1    3    3    2    1    2
##    3 3.01 3.02 3.04 3.05 3.11 3.22 3.24  3.4  3.5 3.51 3.65 3.67    4 4.01
##    8   14    1    2    1    1    1    1    1    1    1    1    1    1    2
## 4.13  4.5 5.01
##    1    1    1
```

Gapminder Data

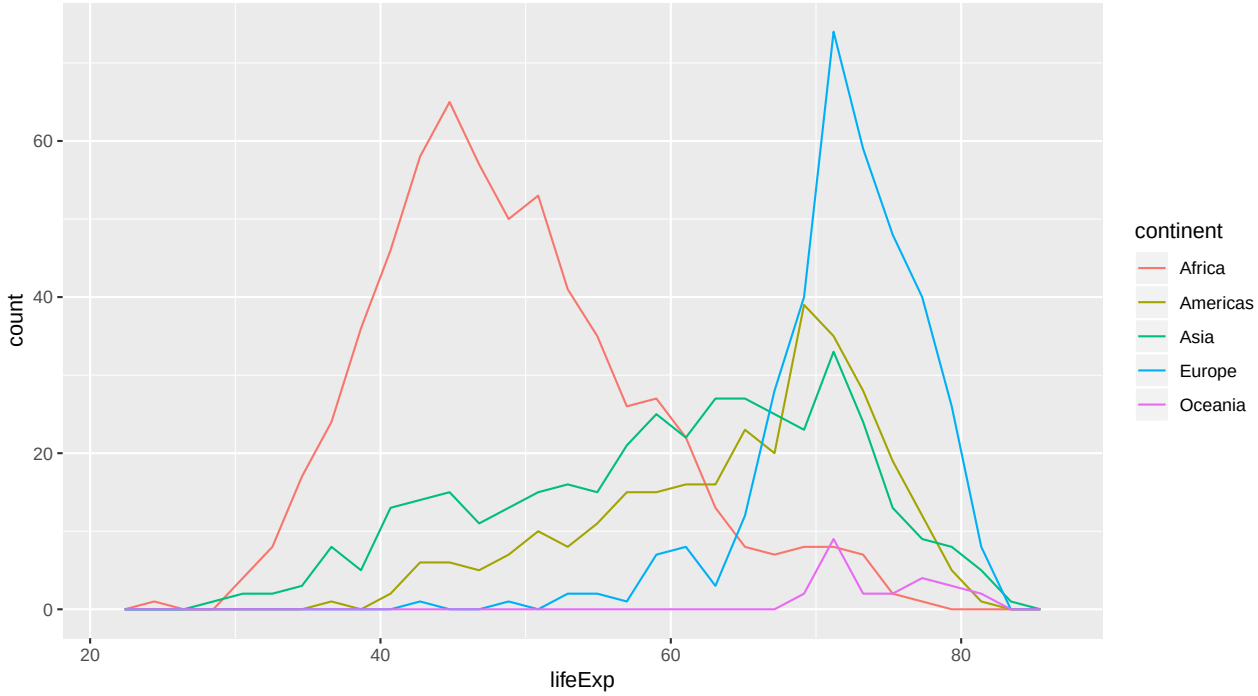
```
library(gapminder)
```

```
summary(gapminder)
```

```
##         country        continent        year         lifeExp
##  Afghanistan:  12   Africa  :624   Min.   :1952   Min.   :23.60
##  Albania    :  12   Americas:300   1st Qu.:1966   1st Qu.:48.20
##  Algeria    :  12   Asia    :396   Median :1980   Median :60.71
##  Angola     :  12   Europe  :360   Mean   :1980   Mean   :59.47
##  Argentina  :  12   Oceania : 24   3rd Qu.:1993   3rd Qu.:70.85
##  Australia  :  12                  Max.   :2007   Max.   :82.60
##  (Other)    :1632
##       pop              gdpPercap
##  Min.   :6.001e+04   Min.   :   241.2
##  1st Qu.:2.794e+06   1st Qu.:  1202.1
##  Median :7.024e+06   Median :  3531.8
##  Mean   :2.960e+07   Mean   :  7215.3
##  3rd Qu.:1.959e+07   3rd Qu.:  9325.5
##  Max.   :1.319e+09   Max.   :113523.1
##
```

```
ggplot(data = gapminder, mapping = aes(x = lifeExp)) +
  geom_freqpoly(mapping = aes(color = continent))
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
ggplot(data = gapminder, mapping = aes(x = gdpPercap)) +
  geom_freqpoly(mapping = aes(color = continent)) +
  scale_x_log10()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```