# Diamond Data Visualization with R

```
library(ggplot2)
data(diamonds)
names(diamonds)
```

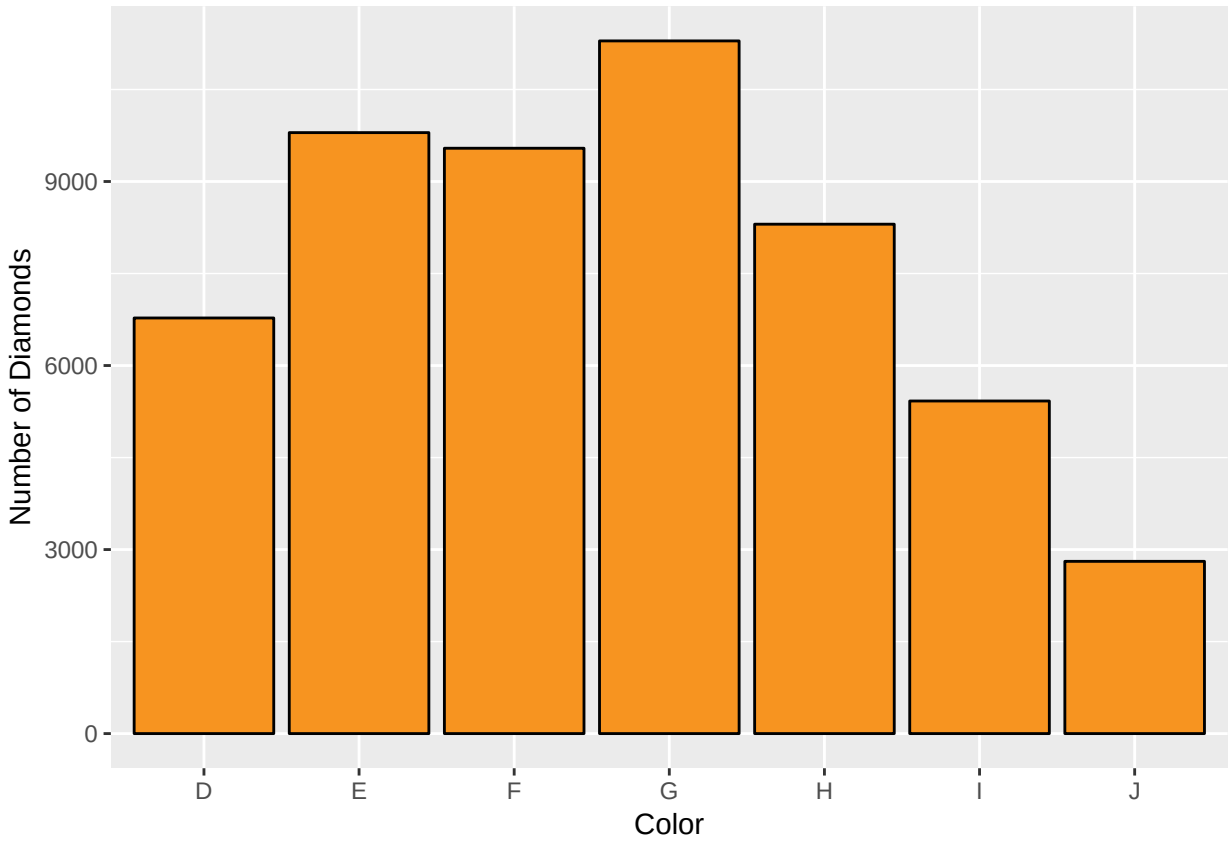
```
##  [1] "carat"   "cut"     "color"   "clarity" "depth"   "table"   "price"
##  [8] "x"       "y"       "z"
```

```
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
##
```

**Representing the best Color**

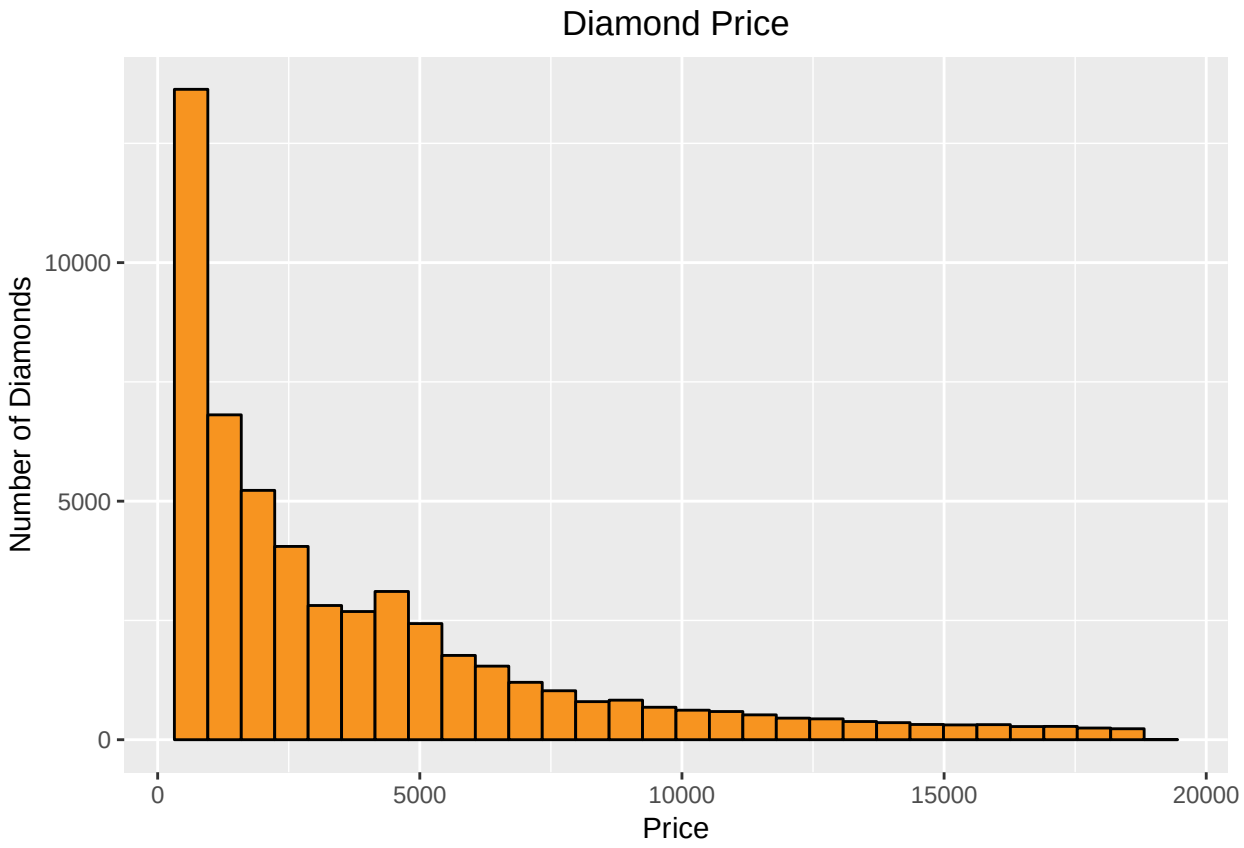
```
qplot(data = diamonds, x = color, color = I('black'), fill = I('#F79420'),
      xlab = 'Color', ylab = 'Number of Diamonds')
```




### Creating a histogram of the price of all the diamonds in the diamond data set.

```
qplot(data = diamonds, x = price, color = I('black'), fill = I('#F79420'),
      xlab = 'Price', ylab = 'Number of Diamonds')  +
  ggtitle('Diamond Price') +
  theme(plot.title = element_text(hjust = 0.5))
```

```
## `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
```

**How many diamonds cost less than $500?**

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

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

**How many diamonds cost less than $250?**

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

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

**How many diamonds cost $15000 or more?**

```
nrow(subset(diamonds, price <= 15000))
```

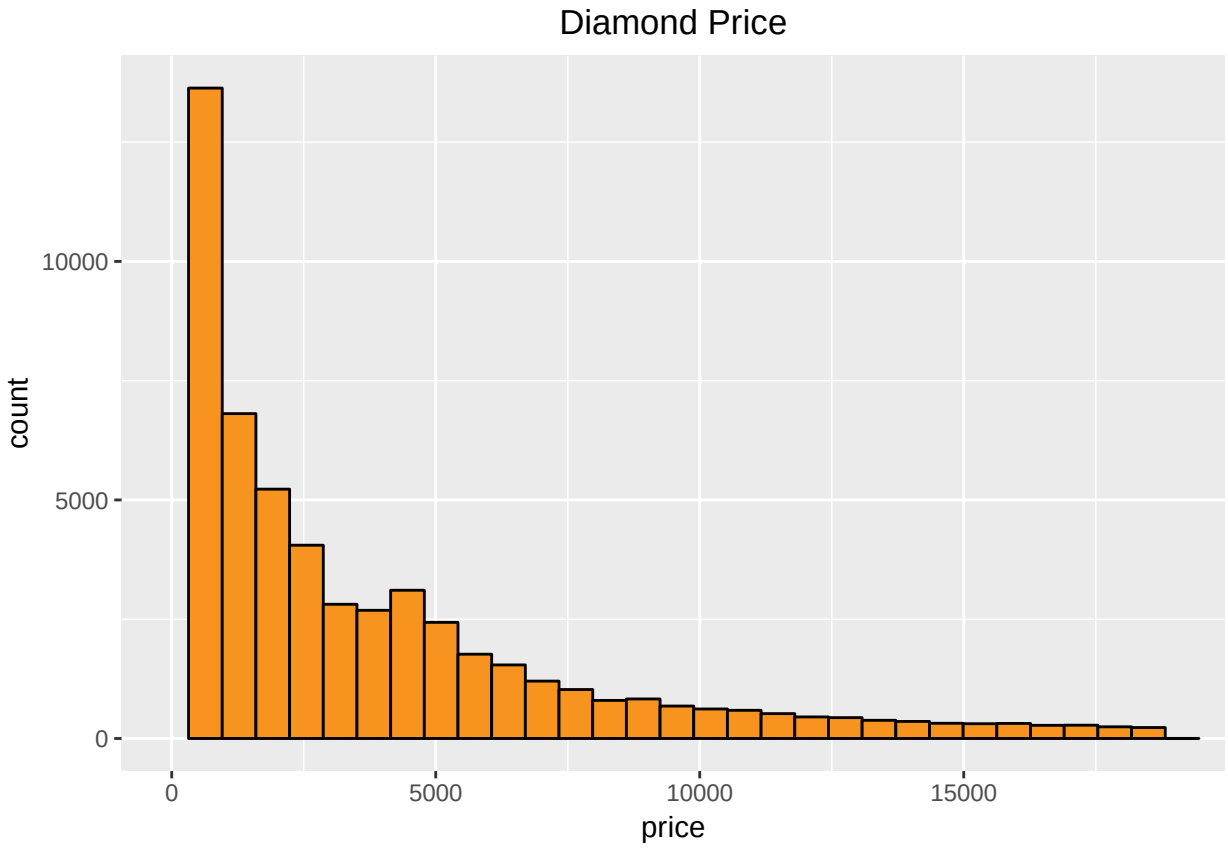
```
## [1] 52285
```

**Changing the transparency of the points and making the x-axis every 2 units**

```
ggplot(diamonds) +
 geom_histogram( aes(x = price), color = I('black'), fill = I('#F79420'),
     xlab = 'Price', ylab = 'Number of Diamonds')  +
 ggtitle('Diamond Price') +
 theme(plot.title = element_text(hjust = 0.5)) +
 coord_cartesian(xlim = c(0,19000))
```

```
## Warning: Ignoring unknown parameters: xlab, ylab
```

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

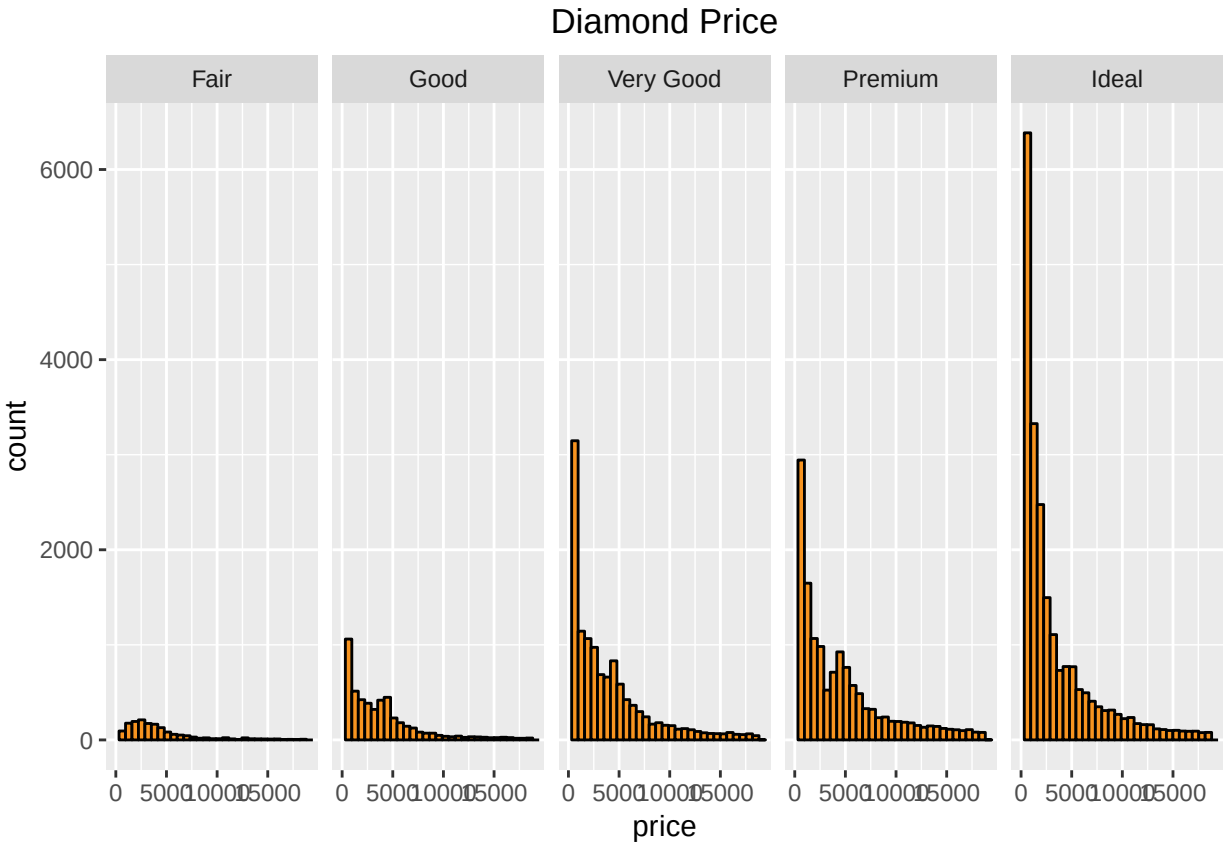



**Breaking down the main price histogram to five histograms in separate panels.**

```
ggplot(diamonds) +
 geom_histogram( aes(x = price), color = I('black'), fill = I('#F79420'),
     xlab = 'Price', ylab = 'Number of Diamonds')  +
 ggtitle('Diamond Price') +
 theme(plot.title = element_text(hjust = 0.5)) +
 coord_cartesian(xlim = c(0,19000)) +
 facet_grid(. ~ cut)
```

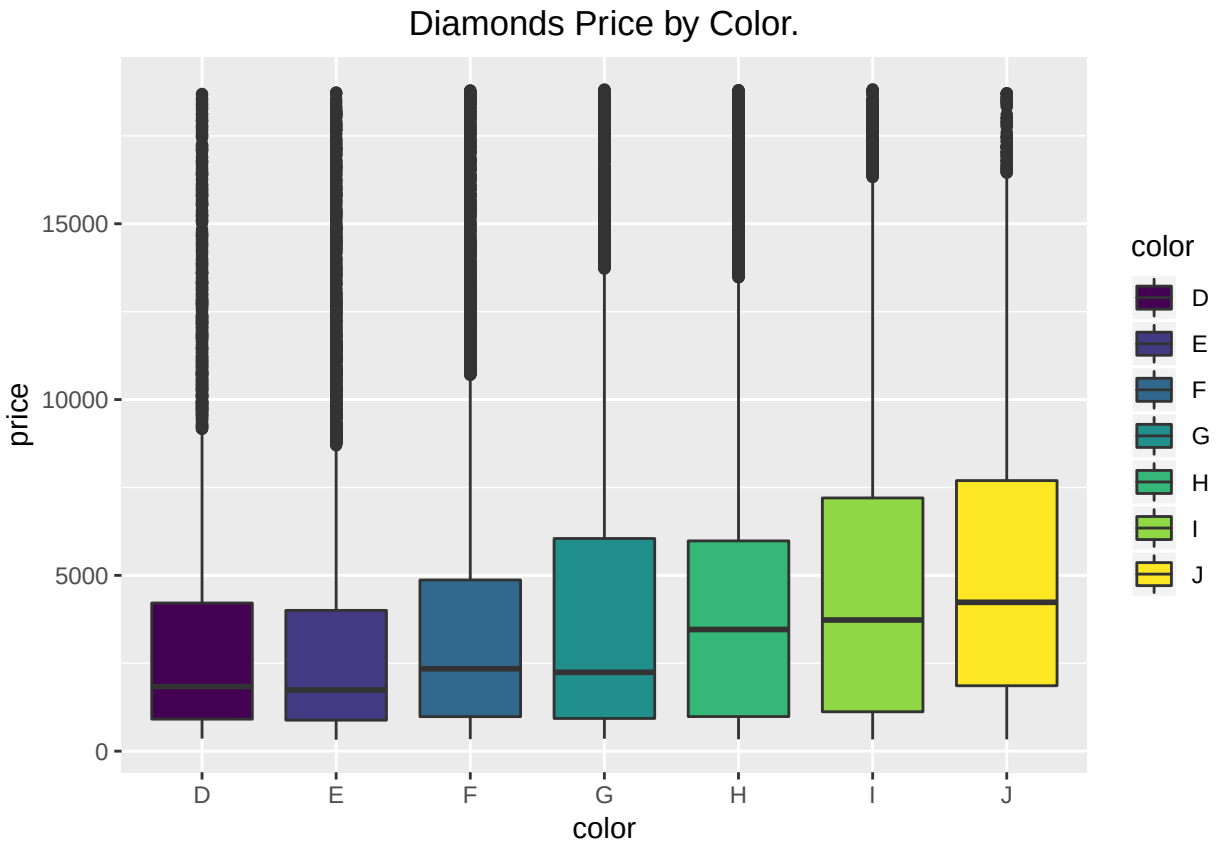
```
## Warning: Ignoring unknown parameters: xlab, ylab
```

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




**Investigate the price of diamonds using box plots**

```
ggplot(diamonds) +
  geom_boxplot(aes(x = color,  y = price, fill = color)) +
   ggtitle("Diamonds Price by Color.") +
   theme(plot.title = element_text(hjust = 0.5))
```




**what is the price range for the middle 50% of diamonds with color D?**

**what is the price range for the middle 50% of diamonds with color J?**

**what is the IQR for the diamonds with best color?**

**what is the IQR for the diamonds with worst color?**

```
summary(diamonds$price[diamonds$color == 'D'])
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     357     911    1838    3170    4214   18693
```

```
summary(diamonds$price[diamonds$color == 'J'])
```

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

```
IQR(diamonds$price[diamonds$color == "D"])
```

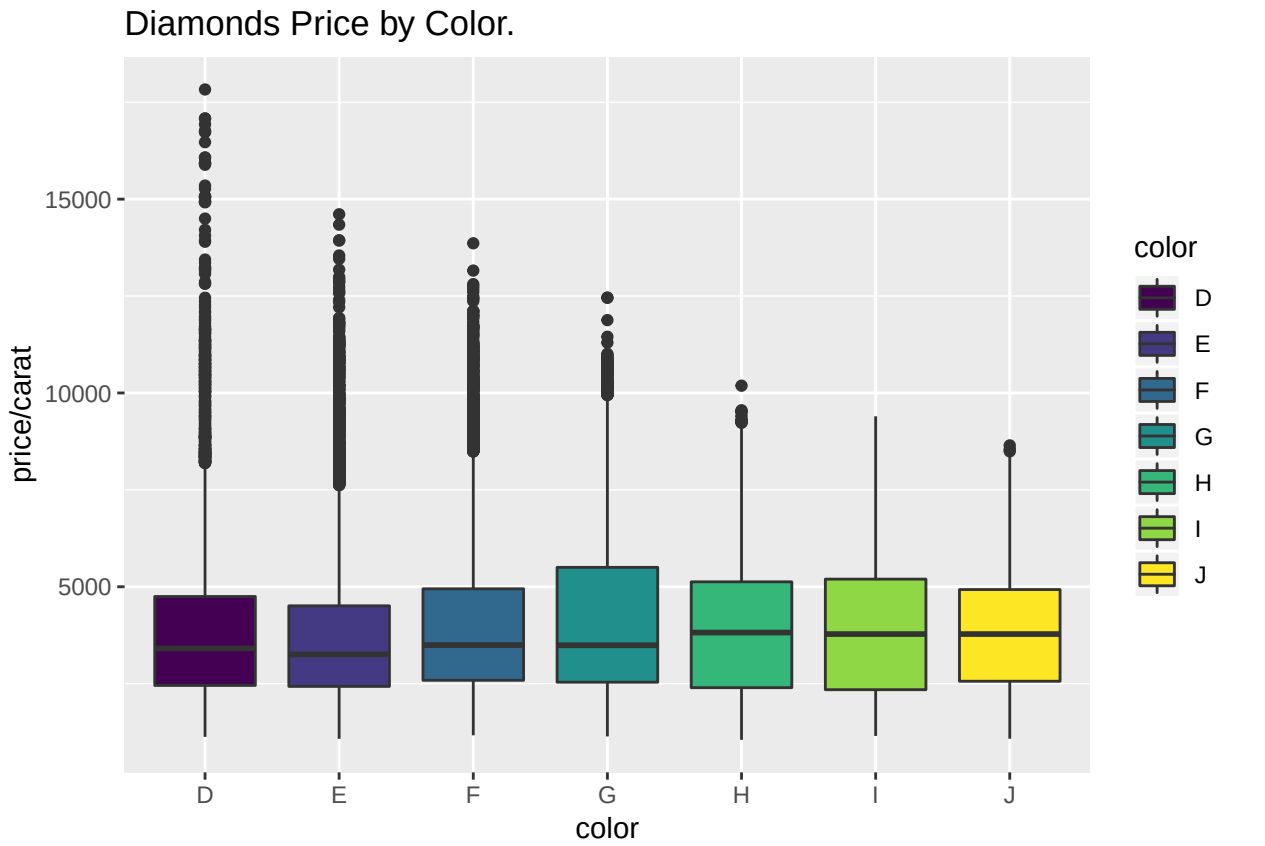
```
## [1] 3302.5
```

```
IQR(diamonds$price[diamonds$color == "J"])
```

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

**Investigating the price per carat of diamonds across the different colors of diamonds using boxplots.**

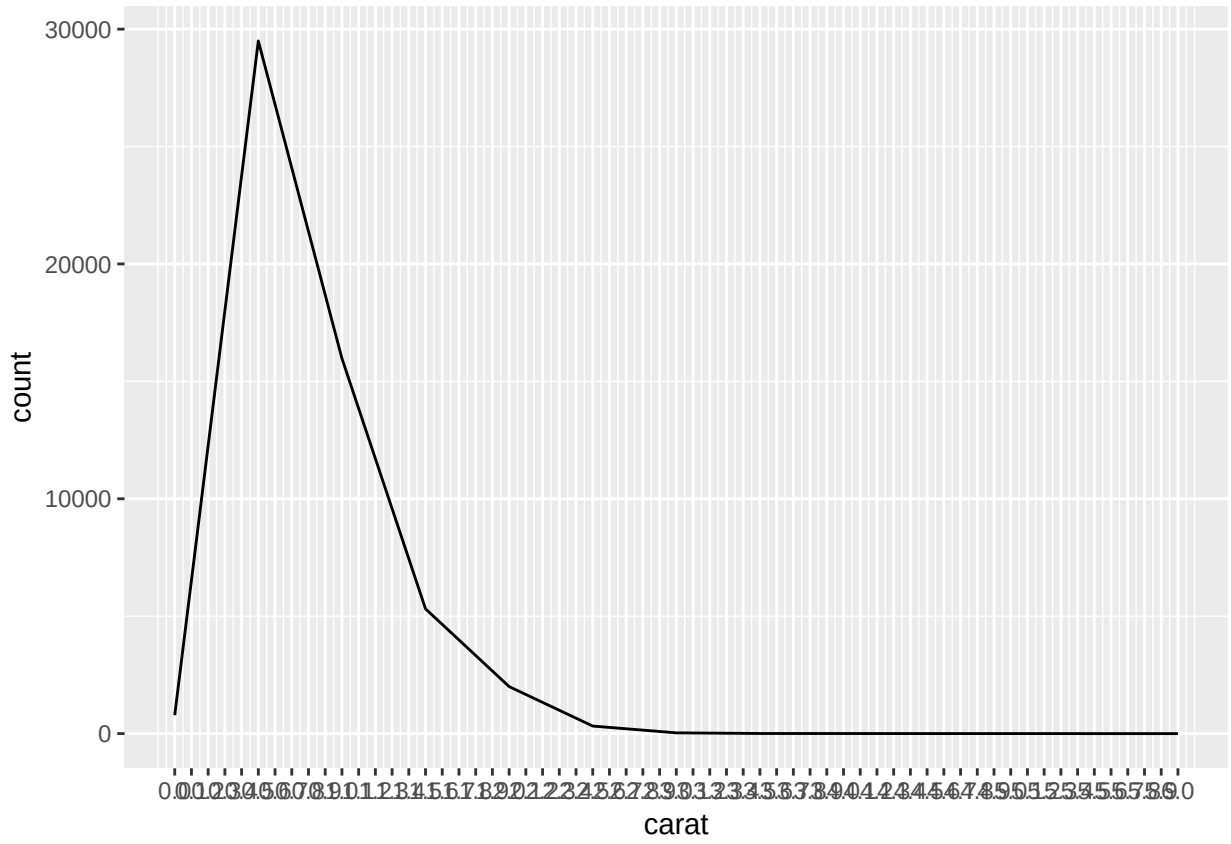
```
ggplot(diamonds) +
  geom_boxplot(aes(x = color,  y = price/carat, fill = color)) +
   ggtitle("Diamonds Price by Color.")
```




### investigate the weight of the diamonds using frequency polygon. ### what carat size has a count greater than 2000?

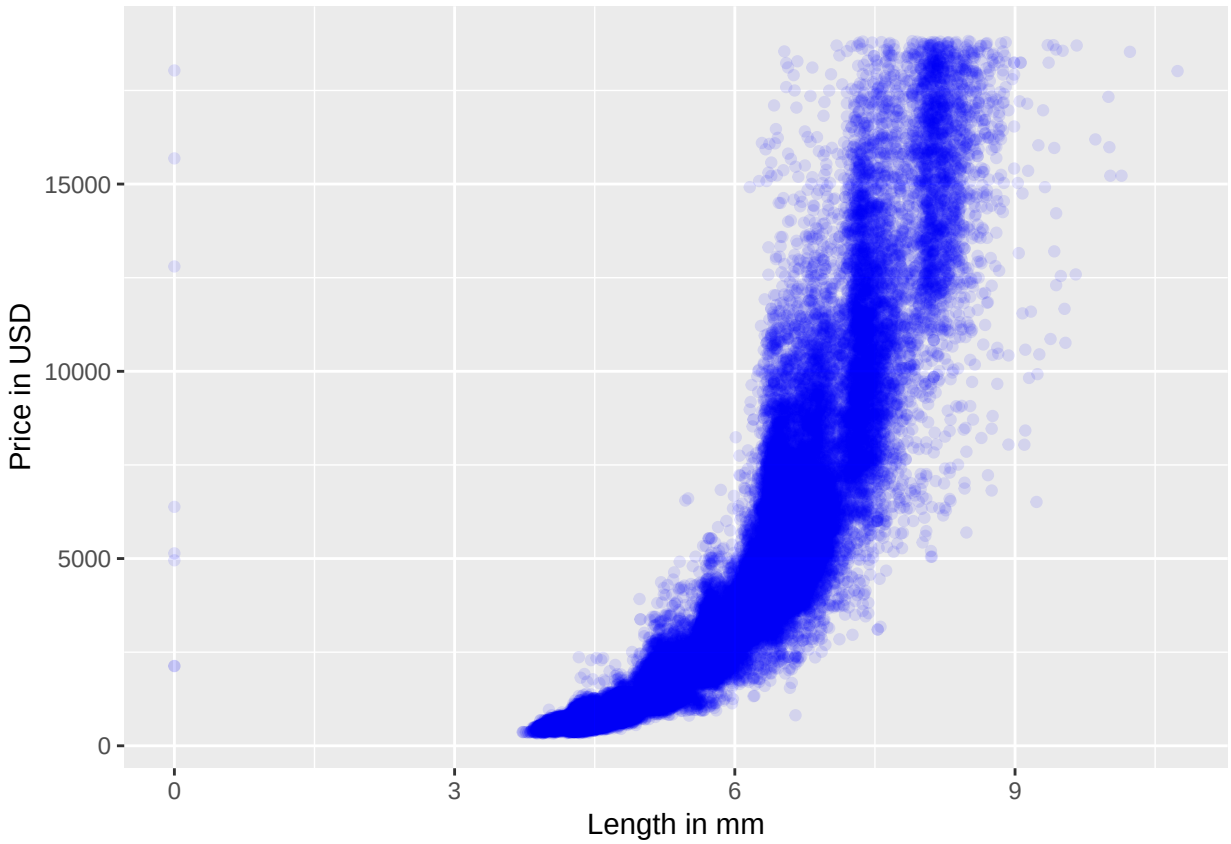
```
ggplot(diamonds) + geom_freqpoly(aes(x = carat), binwidth = 0.5) +
scale_x_continuous(limits = c(0,6), breaks = seq(0,6,0.1))
```

```
## Warning: Removed 2 rows containing missing values (geom_path).
```




**Create a scatterplot of price vs x**

```
ggplot(data = diamonds) +
       xlab('Length in mm') +
       ylab('Price in USD') +
  geom_point(aes(x = x, y = price),color = 'blue', alpha = 1/10)
```




**Correlation between price and x, between price and y, between price and z**

```
cor.test(diamonds$price,diamonds$x)
```

```
##
##  Pearson's product-moment correlation
##
## data:  diamonds$price and diamonds$x
## t = 440.16, df = 53938, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.8825835 0.8862594
## sample estimates:
##       cor
## 0.8844352
```

```
cor.test(diamonds$price,diamonds$y)
```

```
##
##  Pearson's product-moment correlation
##
## data:  diamonds$price and diamonds$y
## t = 401.14, df = 53938, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.8632867 0.8675241
```

```
## sample estimates:
##       cor
## 0.8654209
```

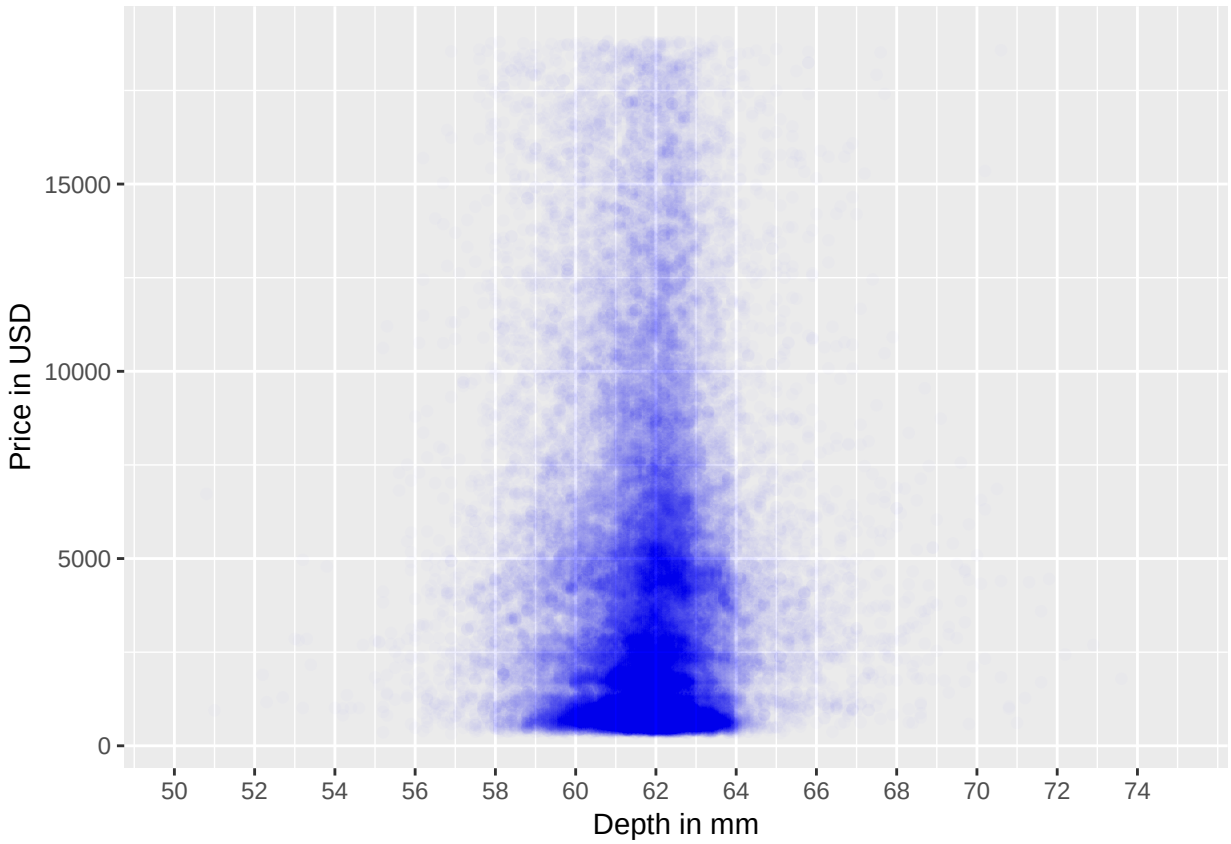
```
cor.test(diamonds$price,diamonds$z)
```

```
##
##  Pearson's product-moment correlation
##
## data:  diamonds$price and diamonds$z
## t = 393.6, df = 53938, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.8590541 0.8634131
## sample estimates:
##       cor
## 0.8612494
```

### Create a scatterplot of price vs depth

```
ggplot(data = diamonds) +
       xlab('Depth in mm') +
       ylab('Price in USD') +
  geom_point(aes(x = depth, y = price),alpha=1/100, color = 'blue') +
  scale_x_continuous(limits = c(50, 75),
                     breaks = seq(50,75, 2))
```

```
## Warning: Removed 6 rows containing missing values (geom_point).
```




### Correlation between price and depth

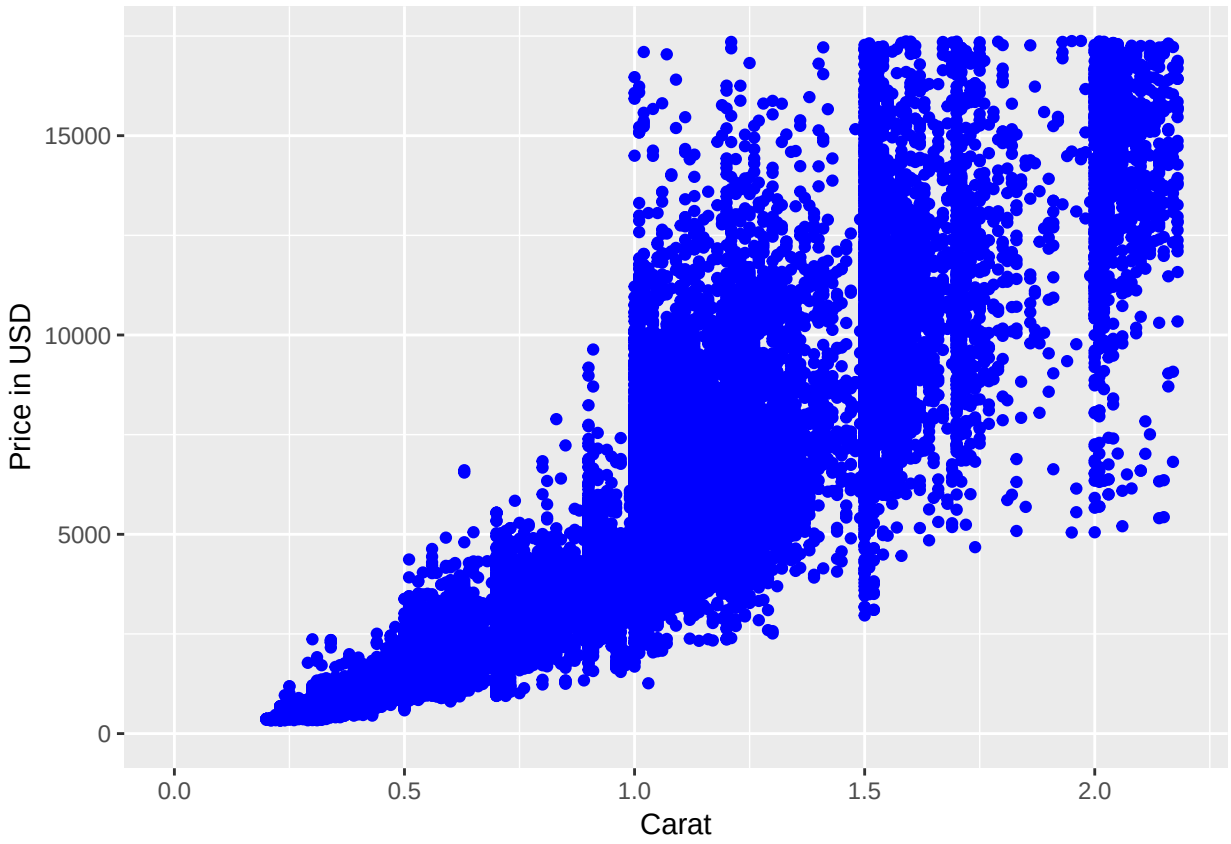
```
cor.test(diamonds$price,diamonds$depth)
```

```
##
##  Pearson's product-moment correlation
##
## data:  diamonds$price and diamonds$depth
## t = -2.473, df = 53938, p-value = 0.0134
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.019084756 -0.002208537
## sample estimates:
##        cor
## -0.0106474
```

**Creating a scatterplot of price vs carat and omit the top 1% of price and carat values.**

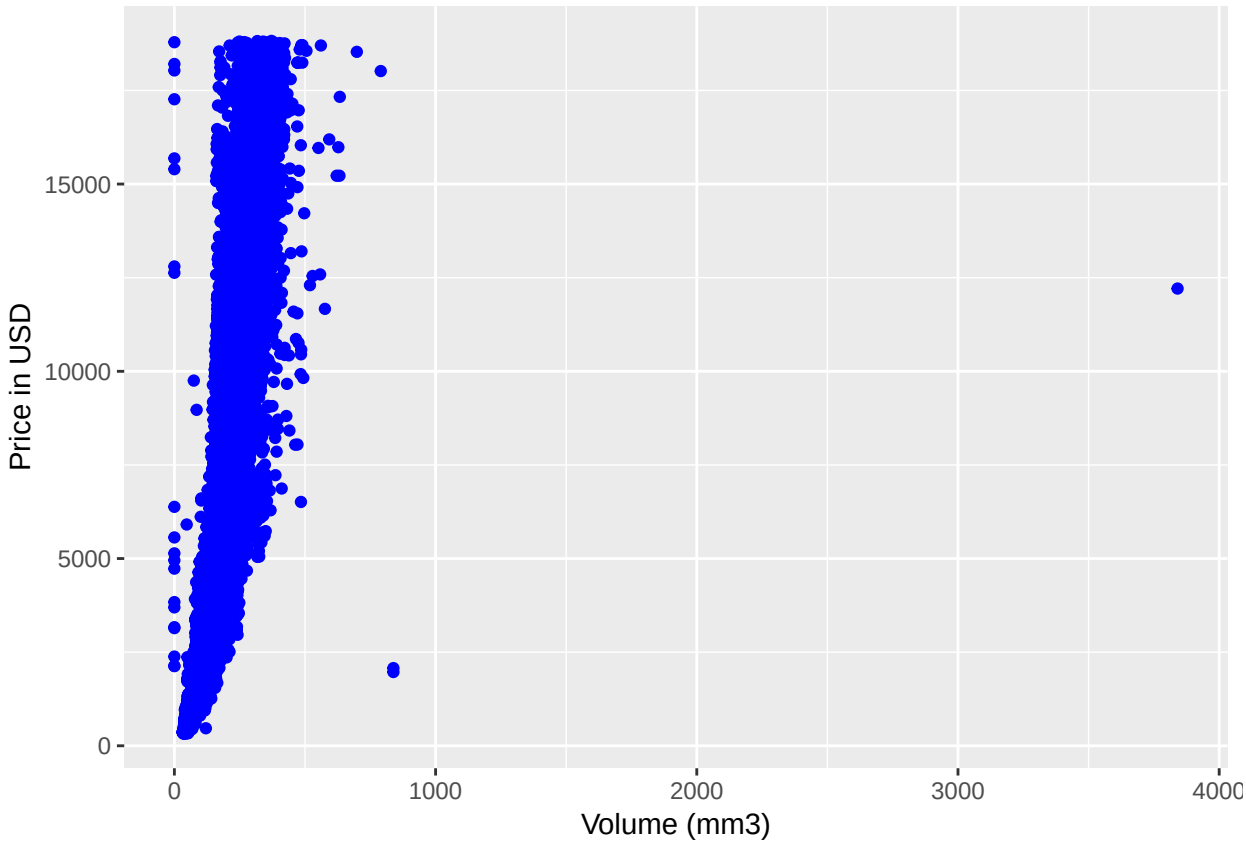
```
ggplot( data = diamonds) +
       xlab('Carat') +
       ylab('Price in USD') +
  geom_point(aes(x = carat, y = price),color = 'blue') +
  xlim(0, quantile(diamonds$carat, probs = 0.99)) +   # 99% percentile on x variable
  ylim(0, quantile(diamonds$price, probs = 0.99))
```

```
## Warning: Removed 926 rows containing missing values (geom_point).
```




**Create a scatterplot of price vs volume (xyz)**

```
diamonds$volume <- diamonds$x * diamonds$y * diamonds$z

ggplot( data = diamonds) +
       xlab('Volume (mm3)') +
       ylab('Price in USD') +
  geom_point(aes(x = volume, y = price),color = 'blue')
```




**number of diamonds with volume=0**

```
dim(diamonds[diamonds$volume == 0,])
```

```
## [1] 20 11
```

**Correlation between price vs volume (xyz)**

**Exclude diamonds with volume=0 and volume >= 800**

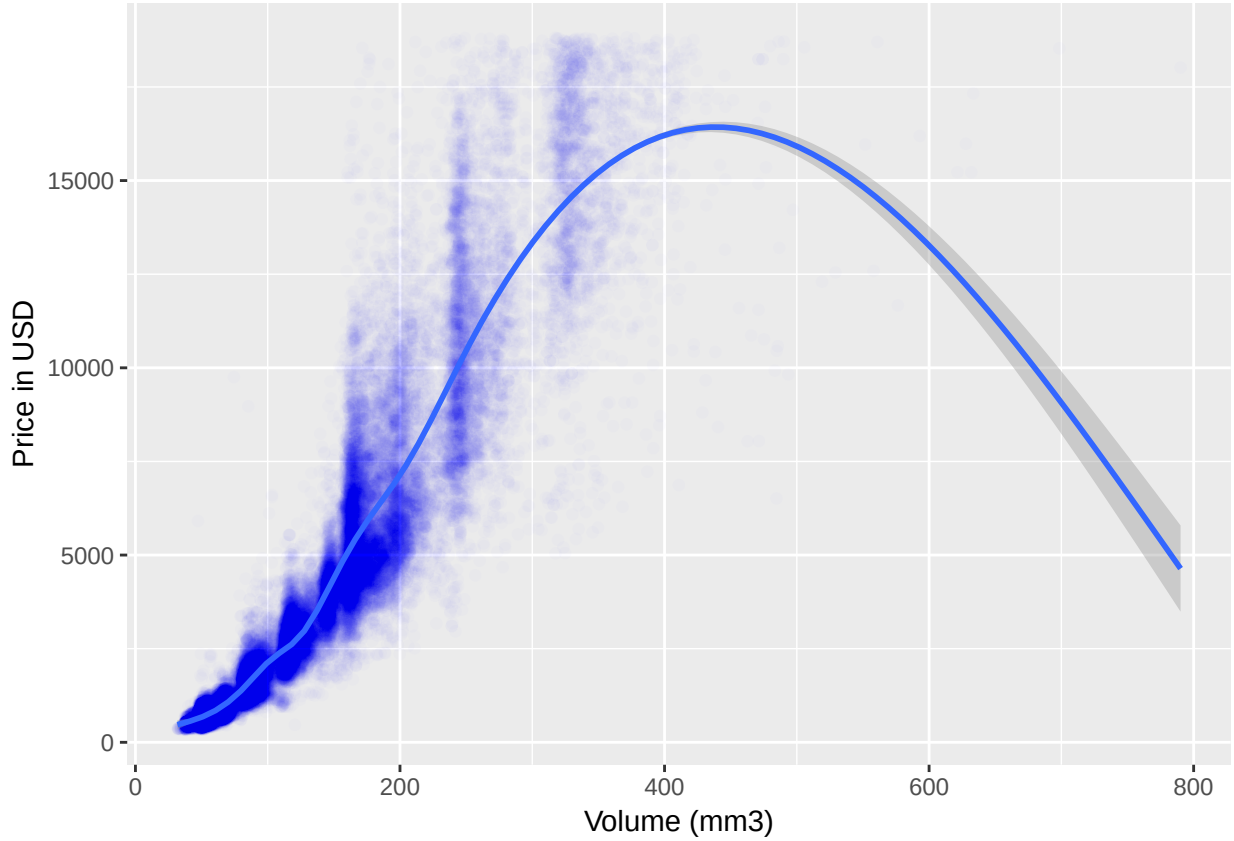
```
temp_df <- diamonds[ diamonds$volume > 0 & diamonds$volume <= 800 , ]

cor.test(temp_df$price,temp_df$volume)
```

```
##
##  Pearson's product-moment correlation
##
## data:  temp_df$price and temp_df$volume
## t = 559.19, df = 53915, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.9222944 0.9247772
## sample estimates:
##       cor
## 0.9235455
```

**Create a scatterplot of price vs volume (xyz)**

```
temp_df <- diamonds[ diamonds$volume > 0 & diamonds$volume <= 800 , ]

ggplot( data = temp_df) +
       xlab('Volume (mm3)') +
       ylab('Price in USD') +
  geom_point(aes(x = volume, y = price),color = 'blue',alpha=1/100) +
  geom_smooth(aes(x = volume, y = price))
```

```
## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```




### Create a new data frame containing info on diamonds by clarity

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
clarity_groups  <- group_by(diamonds,clarity)     # first groups data by clarity

diamondsByClarity <- summarise(clarity_groups,                # then summarizes
```

```
          mean_price = mean(price),                    # and creates new variables
          median_price = median(price),
          min_price = min(price),
          max_price = max(price),
          n = n()                                      # number of items in each group
          )

diamondsByClarity
```

```
## # A tibble: 8 x 6
##   clarity mean_price median_price min_price max_price     n
##   <ord>        <dbl>        <dbl>     <dbl>     <dbl> <int>
## 1 I1           3924.         3344       345     18531   741
## 2 SI2          5063.         4072       326     18804  9194
## 3 SI1          3996.         2822       326     18818 13065
## 4 VS2          3925.         2054       334     18823 12258
## 5 VS1          3839.         2005       327     18795  8171
## 6 VVS2         3284.         1311       336     18768  5066
## 7 VVS1         2523.         1093       336     18777  3655
## 8 IF           2865.         1080       369     18806  1790
```

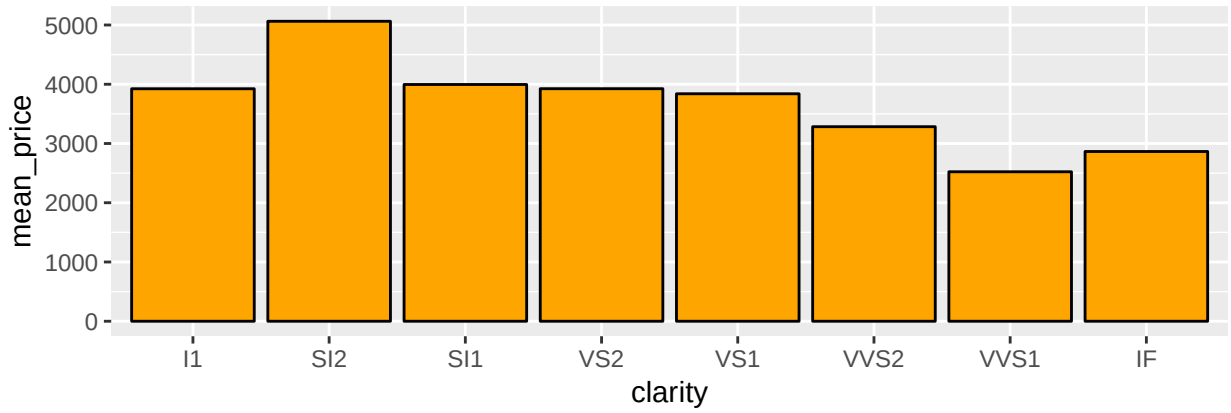
**Create two bar plots : mean_price vs. clarity, mean_price vs. color**

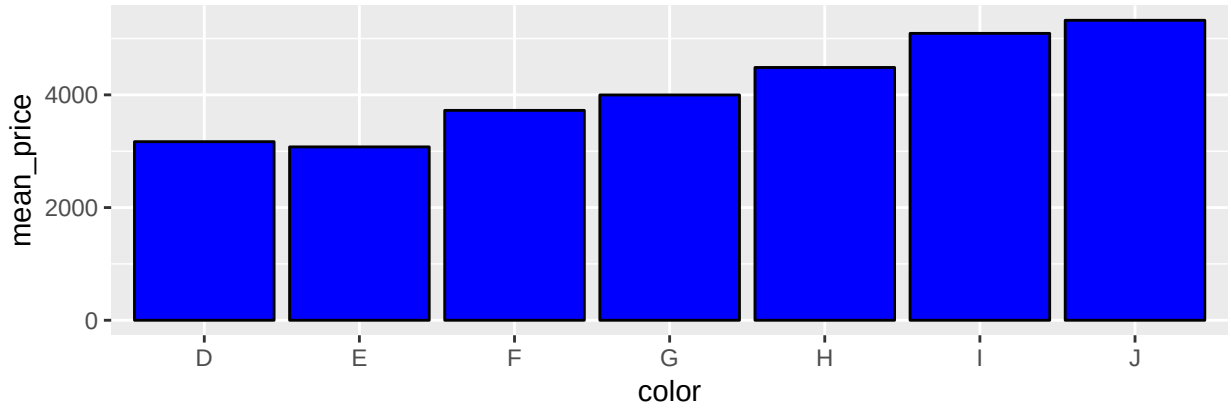
```
library(dplyr)
library(ggplot2)

diamonds_by_clarity <- group_by(diamonds, clarity)
diamonds_mp_by_clarity <- summarise(diamonds_by_clarity, mean_price = mean(price))
p1 <- ggplot( data = diamonds_mp_by_clarity) +
  geom_bar(aes(x = clarity, y = mean_price),stat="identity",color = 'black', fill = 'orange')

diamonds_by_color <- group_by(diamonds, color)
diamonds_mp_by_color <- summarise(diamonds_by_color, mean_price = mean(price))
p2 <- ggplot( data = diamonds_mp_by_color) +
  geom_bar(aes(x = color, y = mean_price),stat="identity",color = 'black',fill = 'blue')

library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

```
grid.arrange(p1,p2,ncol=1)
```




```
library(ggplot2)
data(diamonds)
summary(diamonds)
```

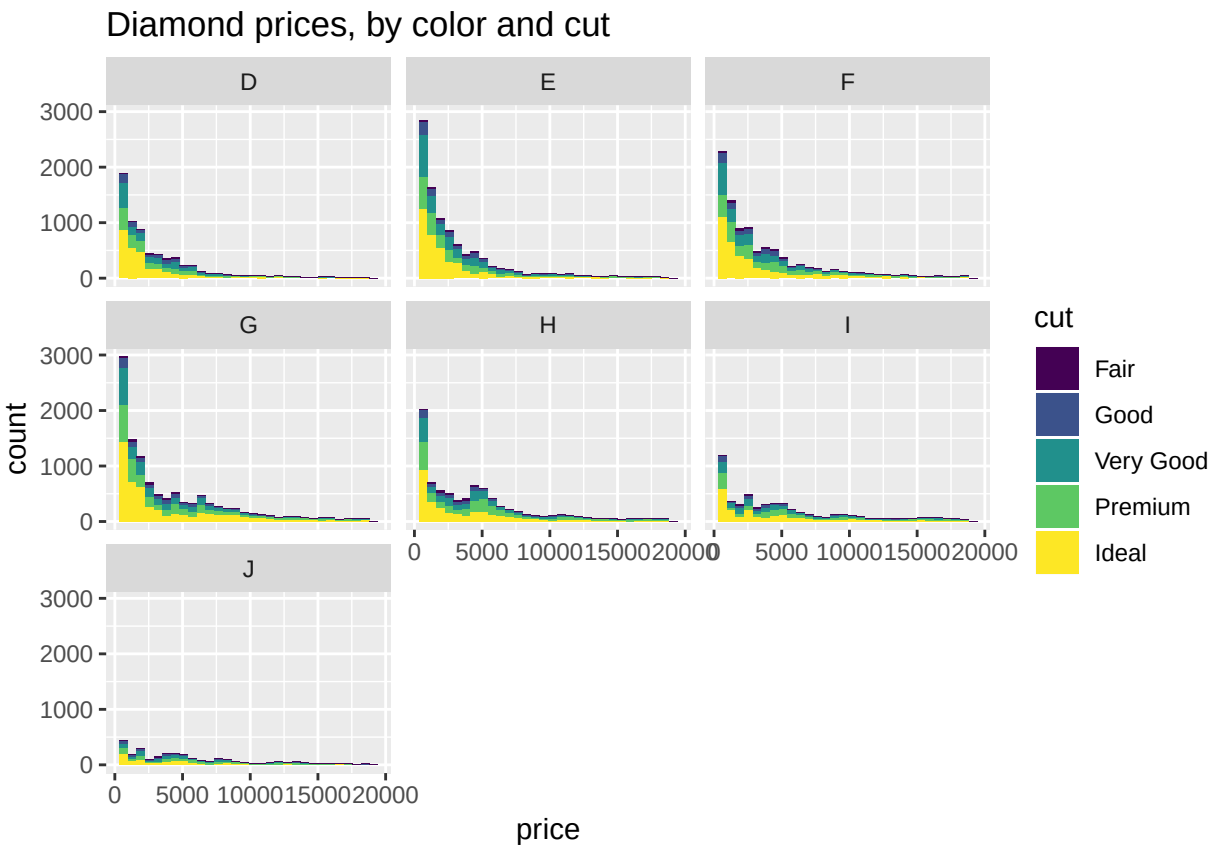
```
##      carat               cut        color        clarity
##  Min.   :0.2000   Fair      : 1610   D: 6775   SI1     :13065
##  1st Qu.:0.4000   Good      : 4906   E: 9797   VS2     :12258
##  Median :0.7000   Very Good:12082   F: 9542   SI2     : 9194
##  Mean   :0.7979   Premium   :13791   G:11292   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
```

##

### Create a histogram of diamond prices

```
ggplot(data = diamonds) +
  geom_histogram(aes(fill = cut, x=price) ) +
  facet_wrap(~color) +
  ggtitle('Diamond prices, by color and cut')
```

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




### Create a scatterplot of diamond prices

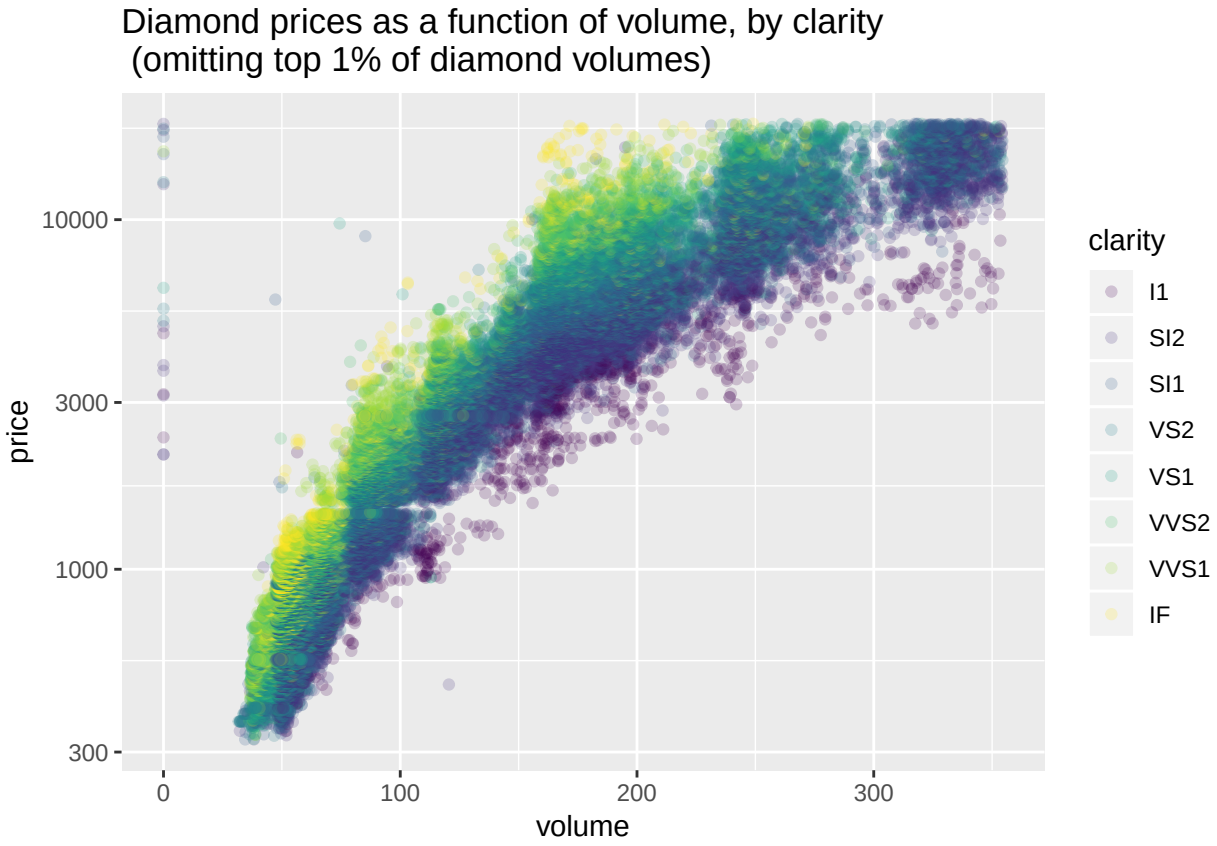
```
ggplot( data = diamonds) +
  geom_point(aes(x=table, y=price,color = cut),alpha=1/3) +
  scale_x_continuous(limits = c(50, 70),
                     breaks = seq(50, 70, 5)) +
  ggtitle('Diamond prices as a function of table, by cut')
```

```
## Warning: Removed 12 rows containing missing values (geom_point).
```


**Create a scatterplot of diamond prices**

```
diamonds$volume <- diamonds$x * diamonds$y * diamonds$z

ggplot(data = diamonds) +
  geom_point(alpha=1/5, aes(color = clarity, x=volume, y=price)) +
  xlim(0, quantile(diamonds$volume, probs = 0.99)) +
  scale_y_log10() +
  ggtitle('Diamond prices as a function of volume, by clarity \n (omitting top 1% of diamond volumes)')
```

```
## Warning: Removed 540 rows containing missing values (geom_point).
```


Diamond prices as a function of volume, by clarity
(omitting top 1% of diamond volumes)
price
10000
3000
1000
300
0
100
200
300
volume
clarity
I1
SI2
SI1
VS2
VS1
VVS2
VVS1
IF