```
# Plotting system in R

# base plot
library(datasets)
data(cars)
with(cars, plot(speed,dist))

# lattice plot
library(lattice)
state <- data.frame(state.x77, region = state.region)
xyplot(Life.Exp ~ Income | region, data = state, layout=c(4,1))

# ggplot2 plot
library(ggplot2)
data(mpg)
qplot(displ, hwy, data = mpg)

# 1- Base plotting system
# make histogram
library(datasets)
hist(airquality$Ozone)
# Load the dataset
data(mtcars)

# Create a histogram of the "mpg" (miles per gallon) variable
hist(mtcars$mpg, main="Histogram of MPG", xlab="MPG", ylab="Frequency", col="blue")

# Make Scatter plot
library(datasets)
with(airquality, plot(Wind, Ozone))

# annotation points and colors
with(airquality, plot(Wind, Ozone, pch = 7))
with(airquality, plot(Wind, Ozone, pch = 7, col = "orange"))
# add title
with(airquality, plot(Wind, Ozone, pch = 7, main = "Ozone and wind in New York city"))
with(subset(airquality, Month == 5), points(Wind, Ozone,col = "blue")
        with(subset(airquality, Month != 5), points(Wind, Ozone,col = "red")
        legend("topright", pch = 1, col = c('blue', 'red'), legend = c('May', 'Other
Months'))

# base plot with regression line
with(airquality, plot(Wind, Ozone, pch = 20, main = "Ozone and wind in New York city"))
model <- lm(Ozone ~ Wind, airquality)
abline(model, lwd = 2)

# Multiple base plots
par(mfrow = c(1,2))
with(airquality, {
        plot(Wind, Ozone, main = "Wind and Ozone")
        plot(Solar.R, Ozone, main = "Ozone and Solar Radiation")
})

par(mfrow = c(1,3))
with(airquality, {
        plot(Wind, Ozone, main = "Wind and Ozone")
        plot(Solar.R, Ozone, main = "Ozone and Solar Radiation")
        plot(Temp, Ozone, main = "Ozone and Temperature")
        mtext("Ozone and weather in New York city", outer = TRUE)
})


# Load the dataset
data(iris)
```

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# Create a scatter plot of sepal length vs. sepal width
plot(iris$Sepal.Length, iris$Sepal.Width,
     main="Scatter Plot of Sepal Length vs. Sepal Width", xlab="Sepal Length", ylab="Sepal
Width",
     pch=19, col=iris$Species)

# Make Boxplot
library(datasets)
airquality <- transform(airquality, Month = factor(Month))
boxplot(Ozone ~ Month, airquality, xlab = 'Month', ylab = 'Ozone(ppb)')

# Load the dataset
data(mtcars)

# Create a box plot of miles per gallon (mpg) by number of cylinders (cyl)
boxplot(mpg ~ cyl, data=mtcars, main="Box Plot of MPG by Number of Cylinders",
        xlab="Number of Cylinders", ylab="MPG")

## 2- Lattice plotting system

# simple scatter plot
library(lattice)
library(datasets)
xyplot(Ozone ~ Wind, data = airquality)

# convert month to factor variable
airquality <- transform(airquality, Month = factor(Month))
xyplot(Ozone ~ Wind | Month, data = airquality, layout = c(5,1))
p <- xyplot(Ozone ~ Wind, data = airquality)  ## nothing happens
print(p) # plot appears
xyplot(Ozone ~ Wind, data = airquality)  ## auto printing

# lattice panel functions

set.seed(10)
x <- rnorm(100)
f <- rep(0:1, each = 50)
y <- x + f - f * x + rnorm(100, sd = 0.5)
f <- factor(f, labels = c("Group 1", "Group 2"))
xyplot(y ~ x | f, layout = c(2, 1))  # plot with two panels

# lattice panel functions
xyplot(y ~ x | f , panel = function(x,y, ...) {
        panel.xyplot(x,y, ...)
        panel.lmline(x,y, col = 2)
})

# Load the lattice package
library(lattice)

# Create a conditioned scatter plot using panel.xyplot()
xyplot(Sepal.Length ~ Sepal.Width | Species, data = iris, panel = panel.xyplot)

# Create a conditioned scatter plot with a regression line
xyplot(Sepal.Length ~ Sepal.Width | Species, data = iris,
       panel = function(x, y, ...) {
               panel.xyplot(x, y, ...)
               panel.lmline(x, y, col = "blue")
       })

## 3- ggplot plotting system

# scatter plot
library(ggplot2)
```

```
qplot(displ, hwy, data = mpg)

# adding aesthetics
qplot(displ, hwy, data = mpg, color = drv)

# adding a geometric
qplot(displ, hwy, data = mpg, geom = c("point", "smooth"))

# Create a scatter plot of Sepal.Length vs. Sepal.Width from iris dataset
ggplot(iris, aes(x = Sepal.Width, y = Sepal.Length)) +
        geom_point(color = "red") +
        labs(title = "Scatter Plot of Sepal Width vs. Sepal Length", x = "Sepal Width", y
= "Sepal Length")


# make Histograms
qplot(hwy, data = mpg, fill = drv)
qplot(displ, hwy, data = mpg, facets = . ~ drv)
qplot(displ, hwy, data = mpg, facets = drv ~ .) # variation from above
qplot(displ, hwy, data = mpg, facets = drv ~ ., binwidth = 2)


# Load the ggplot2 package
library(ggplot2)

# Create a histogram of Sepal.Length from iris dataset
ggplot(iris, aes(x = Sepal.Length)) +
        geom_histogram(binwidth = 0.2, fill = "blue", color = "black") +
        labs(title = "Histogram of Sepal Length", x = "Sepal Length", y = "Frequency")


#  bar plot
# Create a bar plot of average Sepal.Length by Species from iris dataset
ggplot(iris, aes(x = Species, y = Sepal.Length)) +
        geom_bar(stat = "summary", fun = "mean", fill = "green") +
        labs(title = "Average Sepal Length by Species", x = "Species", y = "Average Sepal
Length")

# box plot
# Create a box plot of Sepal.Length by Species from iris dataset
ggplot(iris, aes(x = Species, y = Sepal.Length, fill = Species)) +
        geom_boxplot() +
        labs(title = "Box Plot of Sepal Length by Species", x = "Species", y = "Sepal
Length")
```