Assignment 1

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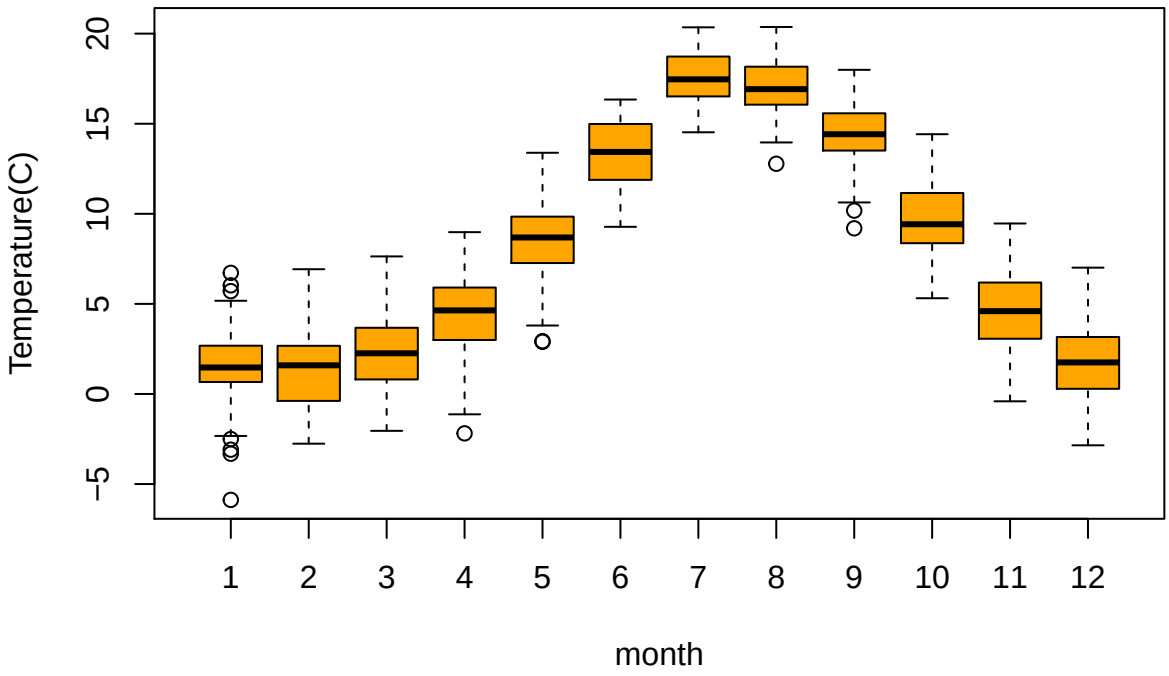
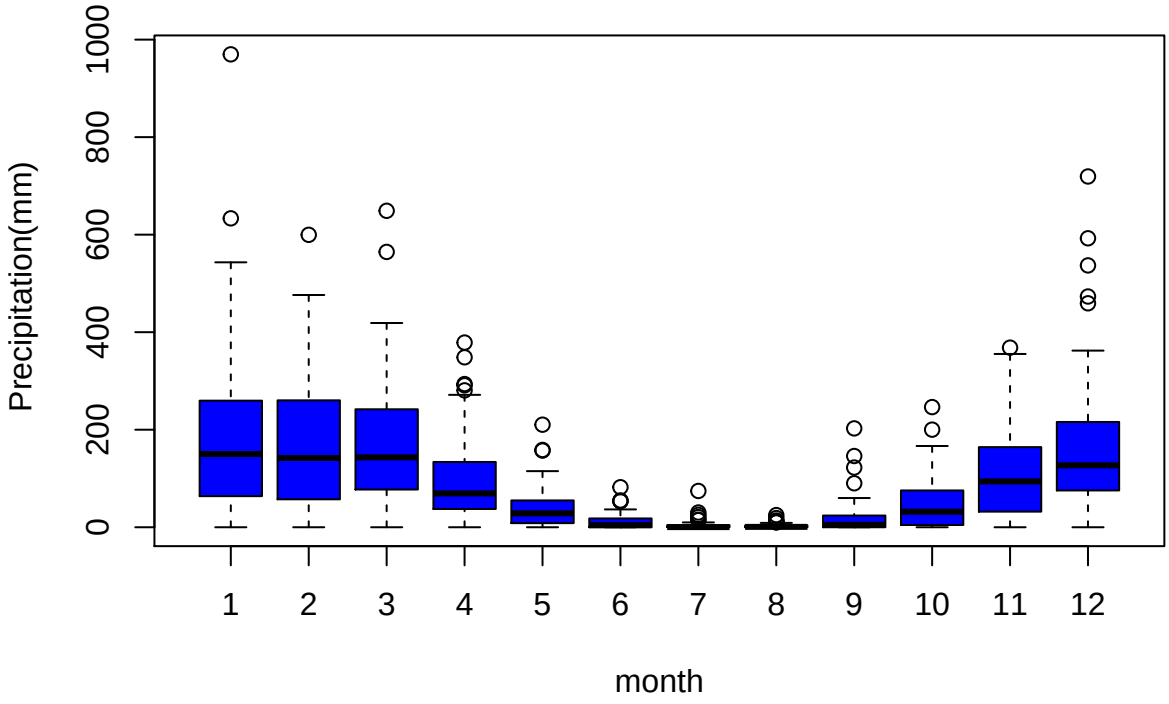
Average temperature by month from 1942 to 2016

```
clim = read.table("clim.txt", header=TRUE)
Aggdata <- aggregate(clim, by=list(clim$month, clim$year), FUN="mean")
Aggdata$Tmean <- (Aggdata$tmax+Aggdata$tmin)/2
boxplot(Aggdata$Tmean ~ Aggdata$month, ylab="Temperature(C)", xlab="month", col="orange")
```



Precipitation by month from 1942 to 2016

```
clim2 <- clim[,2:7]
Aggrain <- aggregate(clim2, by=list(clim2$month, clim2$year), FUN="sum")
boxplot(Aggrain$rain~Aggrain$Group.1, ylab=" Precipitation(mm)", xlab="month", col="blue")
```



The wettest year

```
# Aggregate precipitation by year
Aggdata2 <- aggregate(clim2, by=list(clim2$year), FUN="sum")

# what is the wettest year (total precipitation per year)
Wetyear=which.max(Aggdata2$rain)
Aggdata2[Wetyear,c("Group.1","rain")]
```

```
##    Group.1     rain
## 41    1982 2135.378
```

```
Aggdata2$year= as.integer(Aggdata2$Group.1)
Aggdata2$rain = as.integer(Aggdata2$rain)
Aggdata2[Wetyear,c("year","rain")]
```

```
##    year rain
## 41 1982 2135
```

The driest year

```
# what is the driest year (total precipitation per year)
Dryyear=which.min(Aggdata2$rain)
Aggdata2[Dryyear,c("Group.1","rain")]
```

```
##    Group.1 rain
## 72    2013  263
```

```
Aggdata2[Dryyear,c("year","rain")]
```

```
##    year rain
## 72 2013  263
```

The picture of a dry year

The picture of a wet year

Addition of season column

```
clim2$Season <- ifelse(clim2$month <= 5 & clim2$month >= 3, 1, ifelse(clim2$month <= 8, 2,(ifelse(clim2
```

The wettest season (mean season precipitation)

```
Aggdata4 <- aggregate(clim2, by=list(clim2$Season, clim2$year), FUN="sum")
Seasonagg <- Aggdata4[,c(1,2,5)]
colnames(Seasonagg) <- c("Season", "year", "rain")
Aggdata3 <-aggregate(Seasonagg, by=list(Seasonagg$Season), FUN="mean")
Wetseason = which.max(Aggdata3$rain)
Aggdata3[Wetseason,c("Group.1","rain")]
```

```
##   Group.1     rain
## 2       2 374.2301
```

```
Aggdata3$rain = as.integer(Aggdata3$rain)
Aggdata3[Wetseason,c("Season","rain")]
```

```
##   Season rain
## 2      2  374
```

The driest season (mean season precipitation)

```
Dryseason = which.min(Aggdata3$rain)
Aggdata3[Dryseason,c("Group.1","rain")]
```

```
##   Group.1 rain
## 4       4  166
```

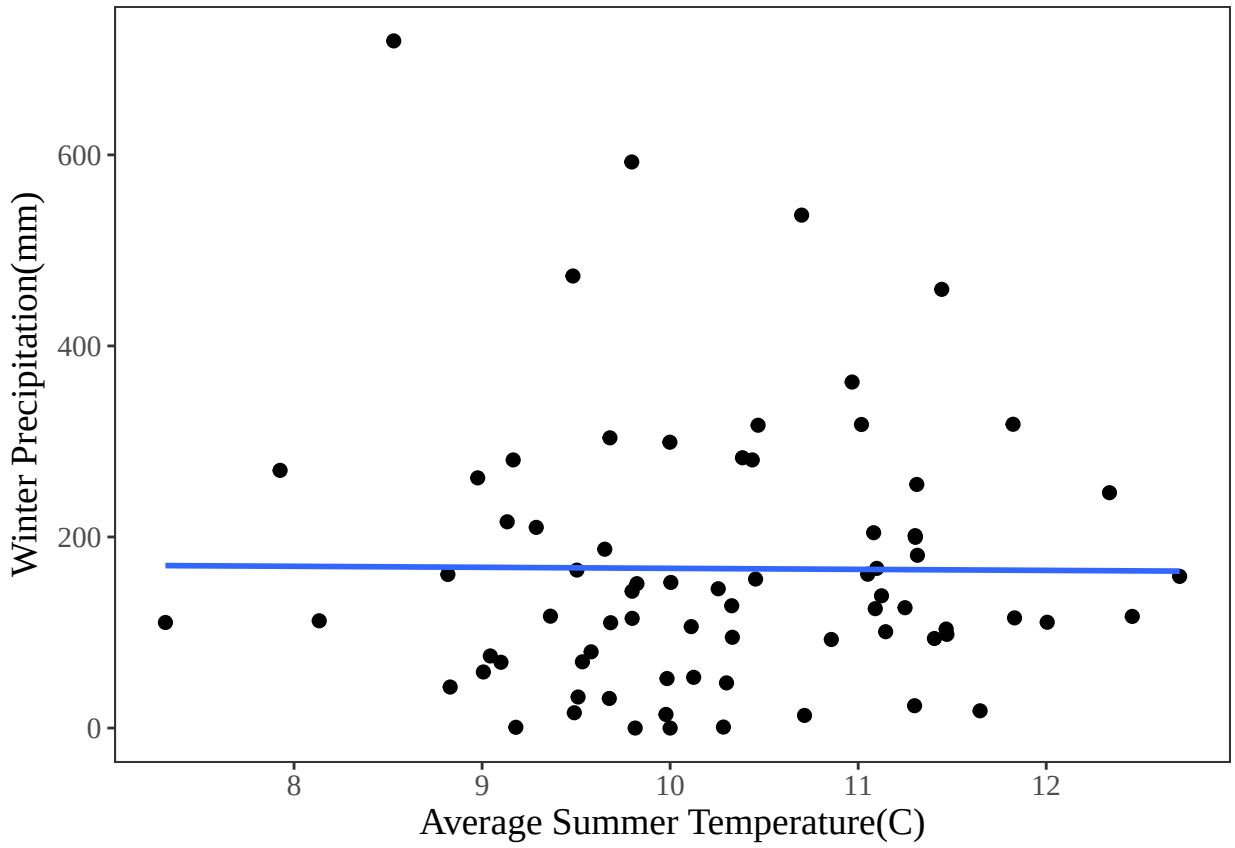
```
Aggdata3$rain = as.integer(Aggdata3$rain)
Aggdata3[Dryseason,c("Season","rain")]
```

```
##   Season rain
## 4      4  166
```

Relationship between winter precipitation and summer temperature

```
Aggdata5 <- aggregate(clim2, by=list(clim2$Season, clim2$year), FUN="mean")
Aggdata5$Tmean <- (Aggdata5$tmax + Aggdata5$tmin)/2
Summertem <- subset(Aggdata5, Season == 2)
Winterrain <- subset(Seasonagg, Season == 4)
Reltemrain <- merge(Summertem, Winterrain,by="year")

library(ggplot2)
ggplot(Reltemrain, aes(Tmean,rain.y))+
  geom_point(size=2)+ # creat scatter plot, and dot as blank circles
  geom_smooth(method="lm", se=FALSE)+ # creat a trend line
  xlab("Average Summer Temperature(C)")+
  ylab("Winter Precipitation(mm)") +
  theme_bw() +
  theme(text=element_text(family ="Times", size=14), panel.grid.major = element_blank(),panel.grid.mino
```




```
lmtemrain <- lm(rain.y ~ Tmean, data=Reltemrain)
summary(lmtemrain)
```

```
##
## Call:
## lm(formula = rain.y ~ Tmean, data = Reltemrain)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -167.37  -91.54  -39.33   46.38  550.58
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   177.88     157.44    1.13    0.262
## Tmean          -1.07      15.26   -0.07    0.944
##
## Residual standard error: 142 on 72 degrees of freedom
## Multiple R-squared:  6.831e-05,  Adjusted R-squared:  -0.01382
## F-statistic: 0.004919 on 1 and 72 DF,  p-value: 0.9443
```

As the trend line in the graph shows, the linear regression revealed that the winter precipitation decreases slightly as the average summer temperature increases. However, the precipitation only declines by 1mm during winter when the average temperature rises by 1°C, showing a nearly flat line. This result indicates that the winter precipitation may not have a significant relationship with the summer temperature.