STA6856 **HW #1** **Instructor: Tharindu De Alwis**

Student Name (print): Farooq Mahmud

Due on Tuesday, February 4th at 11:59 PM

Question:	1	2	Total
Points:	15	15	30
Score:			

1. (15 points) Choose and download one of the following datasets

   - Consumption of Electrical Blower Machine: KwhConsumptionBlower78_1.csv.
   - Population Data from U.S. Census Bureau: POP.csv.
   - Air Passenger Data: AirPassengers.csv.

   (a) Import your chosen dataset into R.

   (b) Construct following plots: Time Series Plot, Autocorrelation Function (ACF) Plot

2. (15 points) For the R output bellow, let a 0 denote Tails and a 1 denote Heads for a coin flip.

   Let the e_t be iid where $e_t = 1$ for Heads and $e_t = -1$ for Tails (so change the 0 to a -1 from the given output. That is, $e_1 = e_2 = e_3 = e_4 = e_5 = e_6 = -1$; $e_7 = e_8 = 1$ and $e_9 = e_{10} = -1$.) Let $Y_t = \sum_{t=1}^{t} e_t$.

   rbinom(10,1,0.5)
   0 0 0 0 0 0 1 1 0 0

   (a) Plot Y_t on the vertical axis versus time t on the horizontal axis.

   (b) The process $\{Y_t\}$ is a random walk with $E(Y_t) = 0$, as shown in class. Does there seems to be a trend in the plot in (a) or are the Y_t scattering about the horizontal axis in a roughly even band?

HW 1

Farooq Mahmud

Problem 1a

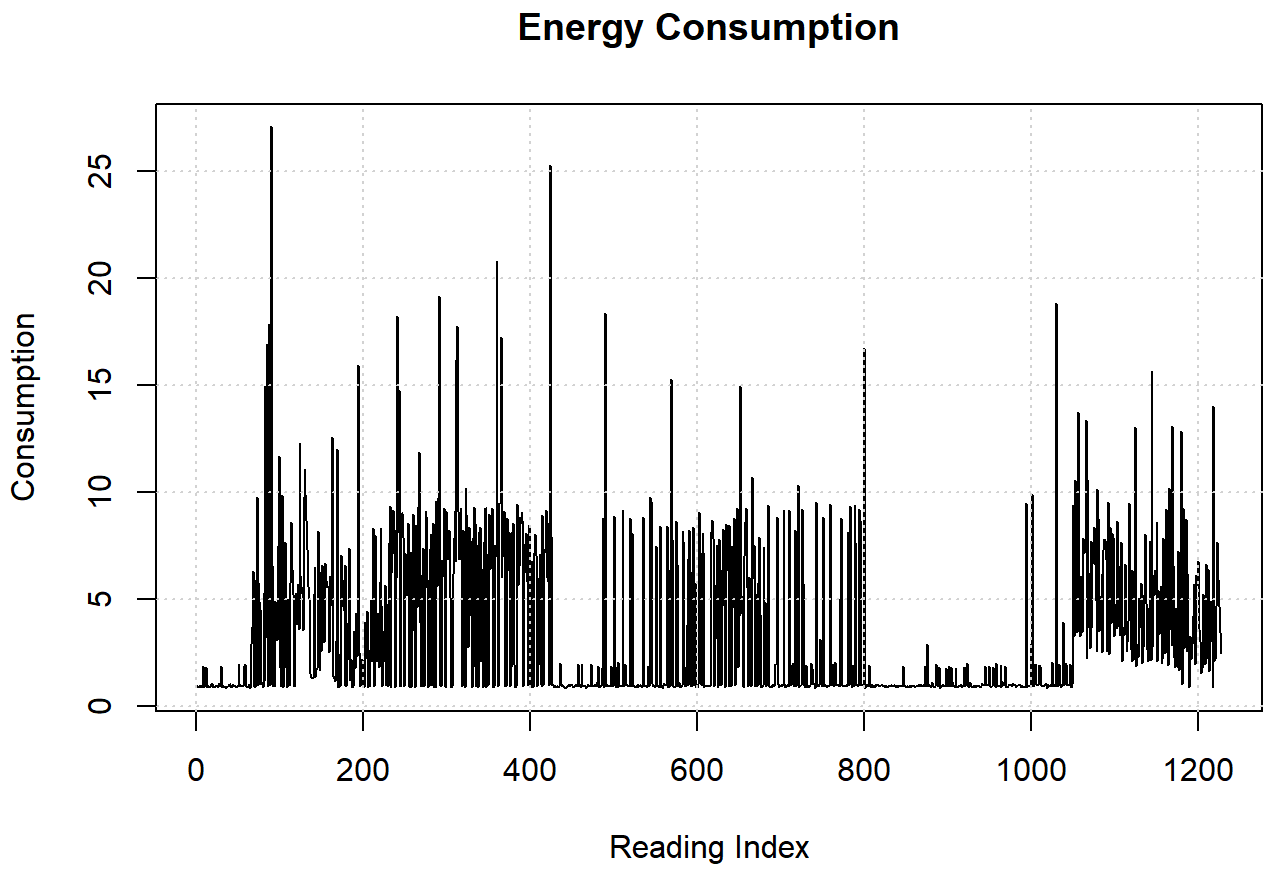
Import data

```
csv_path <- file.path(getwd(), "KwhConsumptionBlower.csv")
data <- read.csv(csv_path)
ts_data <- data$Consumption
```

Problem 1b

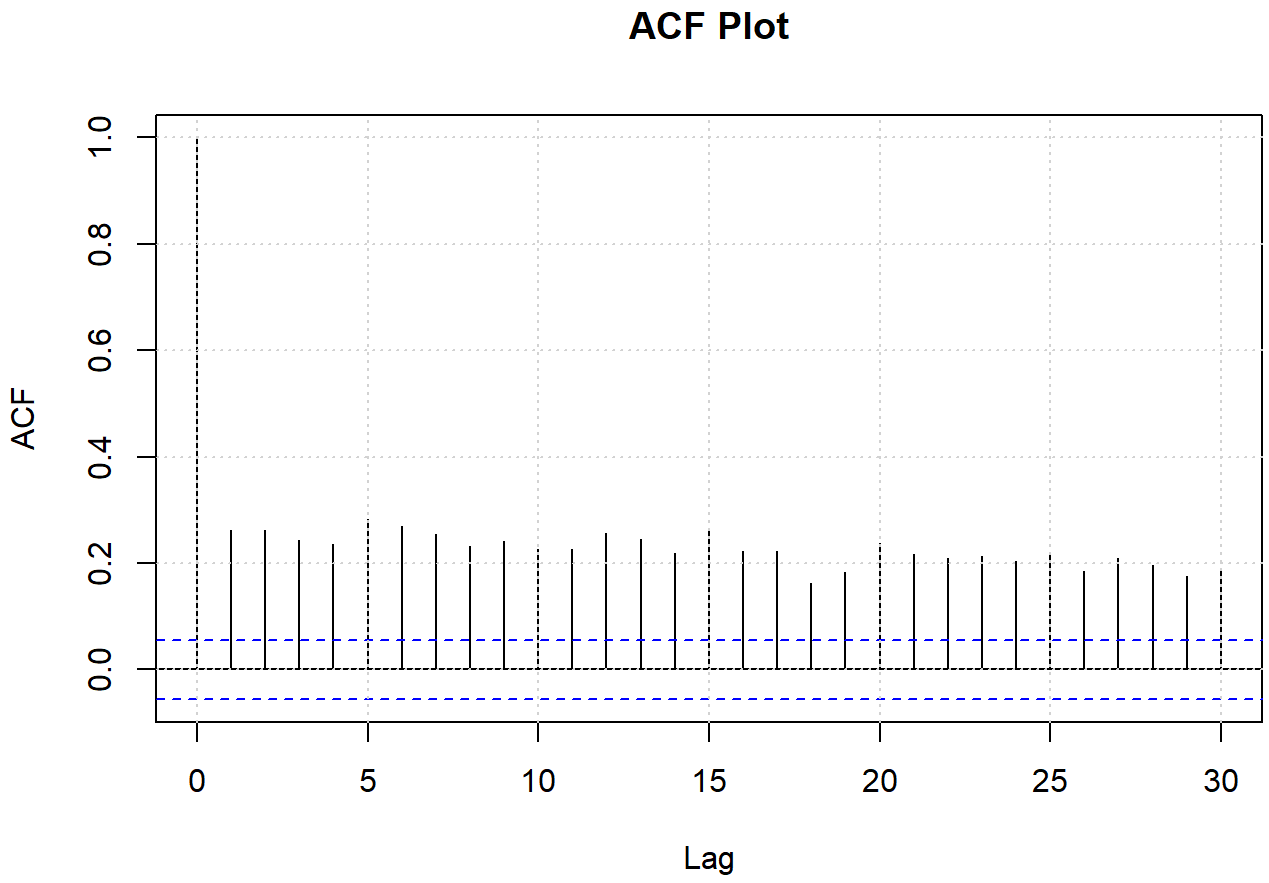
Time-series plot

```
plot(ts_data, type = "l", xlab = "Reading Index", ylab = "Consumption", main = "Energy Consumpti
on")
grid()
```



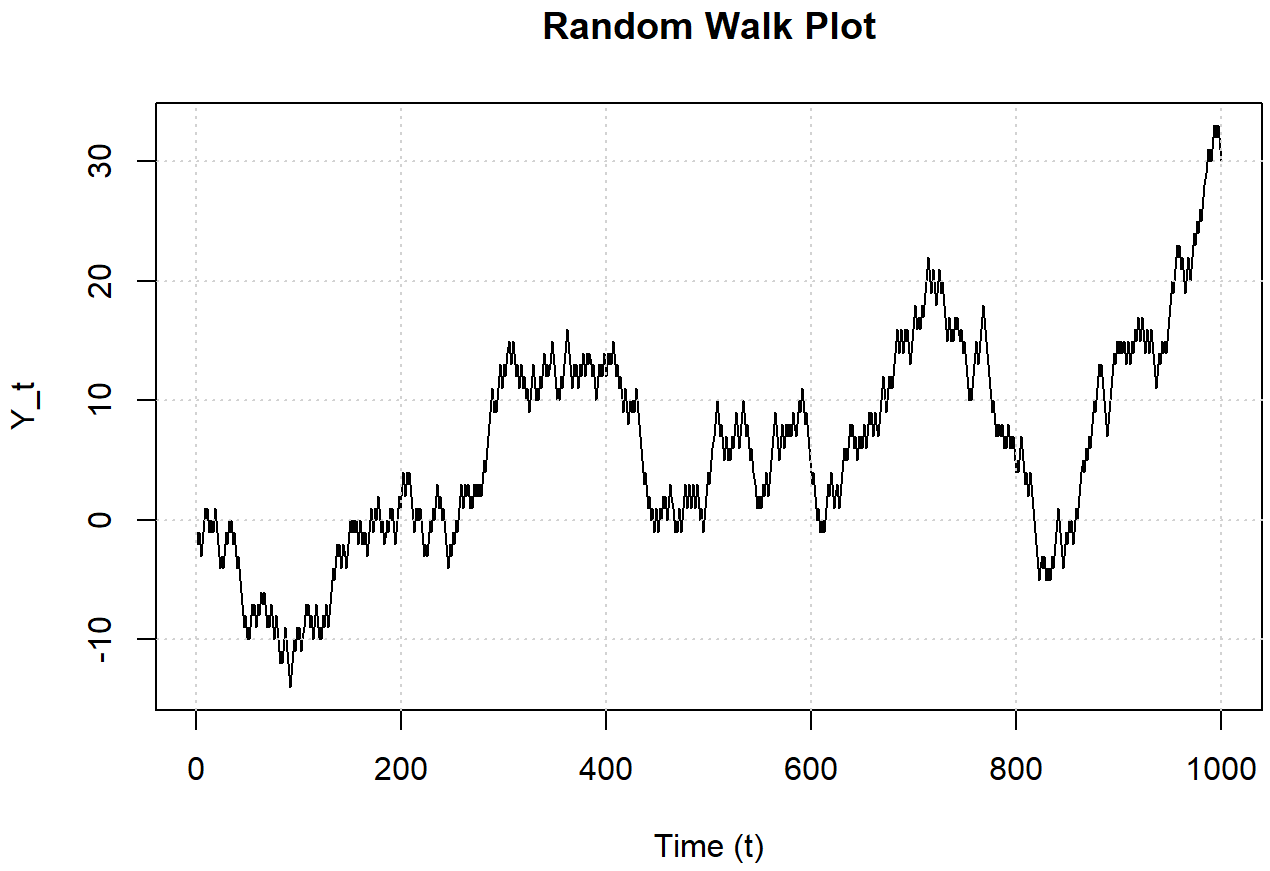
ACF plot

```
acf(ts_data, main = "ACF Plot")
grid()
```



Problem 2a

```
flips <- rbinom(1000, 1, 0.5)
e_t <- ifelse(flips == 0, -1, 1)
Y_t <- cumsum(e_t)
time <- 1:length(Y_t)
plot(time, Y_t, type = "l", xlab = "Time (t)", main = "Random Walk Plot")
grid()
```



The random walk plot clearly shows trends. It starts with a downward trend for about the first 175 samples. This is followed by an upward trend for about the next 400 samples followed by another downward trend.