Reproducible Research: Peer Assessment 1

Loading and preprocessing the data

The activity data is contained within a CSV file:

```
x <- read.csv("activity.csv")
```

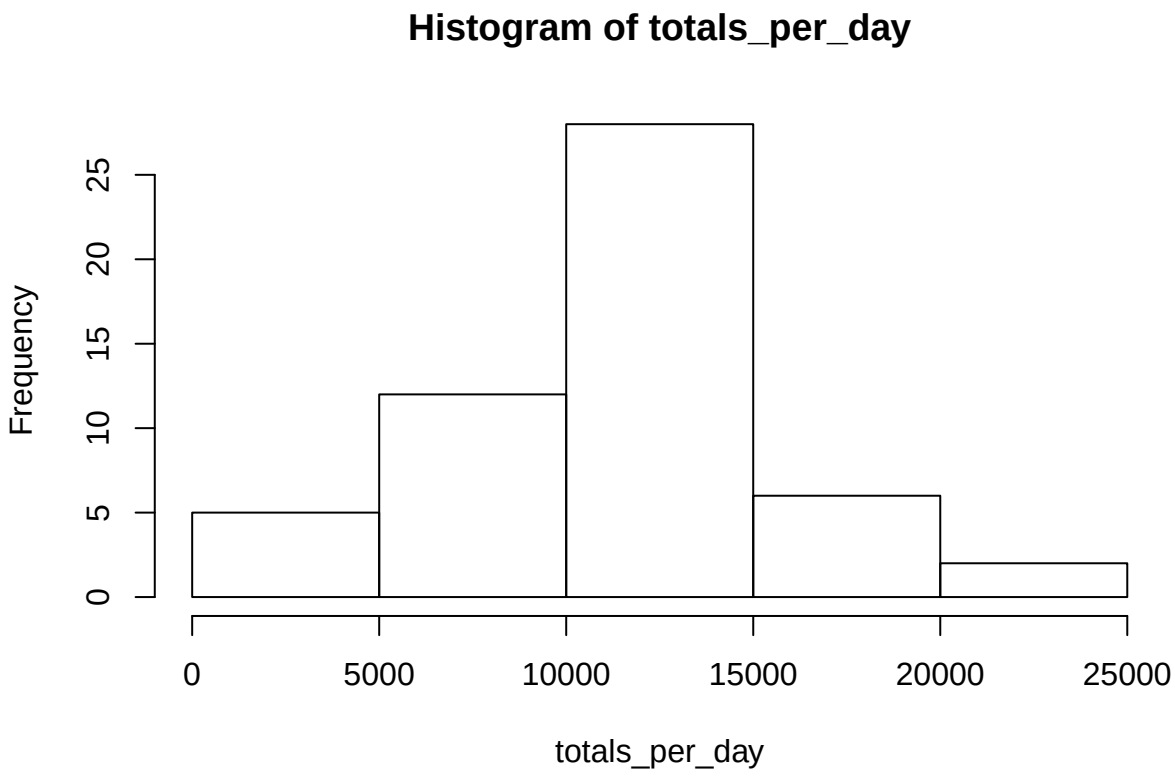
What is mean total number of steps taken per day?

To do this we calculate the sum of the number of steps grouped by day.

```
# Ignore the 'NA' values in the 'steps' column.
y <- x[!is.na(x$steps),]
z <- aggregate(steps ~ date, y, sum)
totals_per_day <- z[,2]
```

A histogram of this looks like:

```
hist(totals_per_day)
```



The mean and median of the total number of steps per day are:

```
mean(totals_per_day)
```

```
## [1] 10766.19
```

```
median(totals_per_day)
```

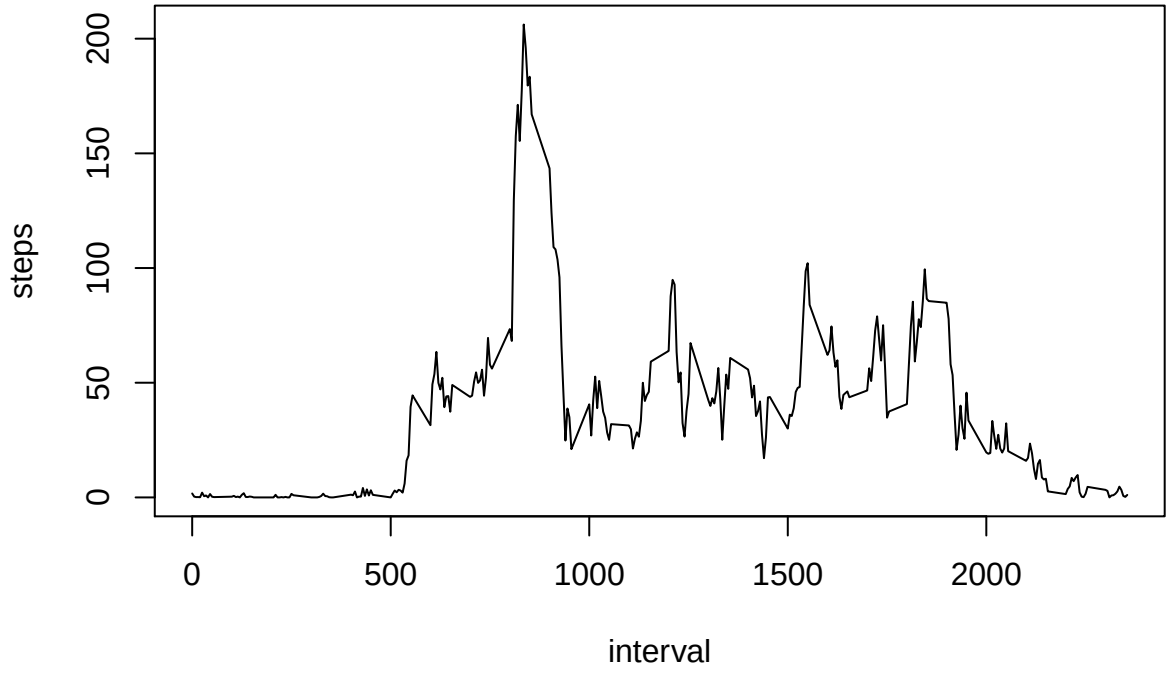
```
## [1] 10765
```

What is the average daily activity pattern?

The daily activity pattern is a plot of the number of steps over time (or time-interval). Rather than do this for every single day in the dataset, we take the average for each time interval and plot that instead.

```
# Group the activity by the interval and take the average number of steps
daily_activity <- aggregate(steps ~ interval, y, mean)
```

```
plot(daily_activity, type="l")
```



Imputing missing values

The number of missing values (coded as NA) is calculated as follows:

```
missing_values <-  x[is.na(x$steps),]
nrow(missing_values)
```

```
## [1] 2304
```

A simple strategy for filling in the missing values is to use the average for that time interval for other days in the data set that do have values. The variable `daily_activity` already records the average number of steps for time intervals for the rows in the dataset that do have values, so we'll use this as the base for a new data set.

We can join the missing values to the averages using the `merge` R function: the common column in both is `interval`:

```
library(dplyr)
z <- select(merge(missing_values, daily_activity, by.x = 'interval', by.y = 'interval'),
            steps=steps.y, date, interval)

imputed <- z[with(z, order(date, interval)),]
```

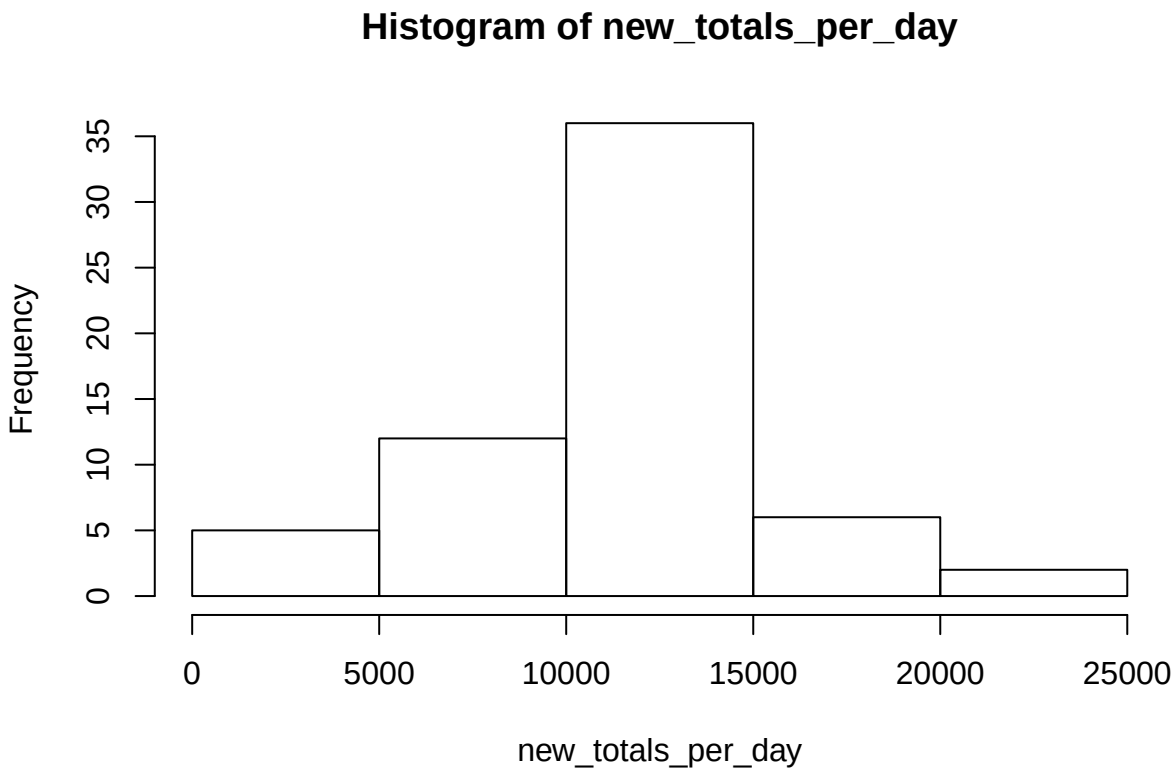
We can now use the `rbind` function to concatentate this with the `y` dataset to get a new dataset with all values filled:

```
new_data_set <- rbind(y, imputed)
```

```
new_totals_per_day <- aggregate(steps ~ date, new_data_set, sum)[,2]
```

A histogram of the new data looks like:

```
hist(new_totals_per_day)
```



The mean and median of the new total number of steps per day are:

```
mean(new_totals_per_day)
```

```
## [1] 10766.19
```

```
median(new_totals_per_day)
```

```
## [1] 10766.19
```

As you can see from the results, the mean stays the same - this is expected, but the median changes and now has the same value of the mean. The total daily number of steps has increased.

Are there differences in activity patterns between weekdays and weekends?

Let's create a new factor column in the new dataset to distinguish weekdays from weekends.

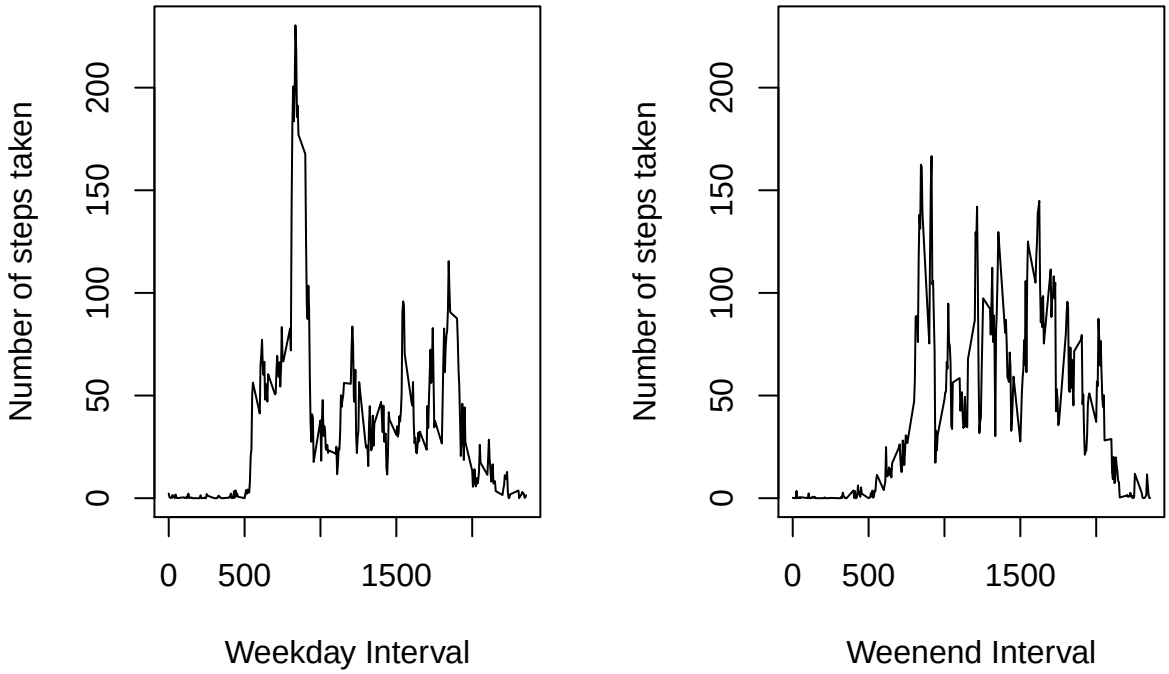
```
weekends <- c('Saturday', 'Sunday')
new_data_set$week_or_weekend <- factor((weekdays(as.Date(new_data_set$date)) %in% weekends),
         levels=c(TRUE, FALSE), labels=c('weekend', 'weekday'))
```

With this new column in place we can get the average number of steps taken for weekends or weekdays and make a side-by-side plot for comparison:

```r
weekday_daily_activity <- aggregate(steps ~ interval,
                                    new_data_set[new_data_set$week_or_weekend=='weekday',], mean)
weekend_daily_activity <- aggregate(steps ~ interval,
                                    new_data_set[new_data_set$week_or_weekend=='weekend',], mean)

# When making the two graphs, ensure that the y-axis limits are the same for easier comparison.
ylim <- range(weekday_daily_activity$steps)

par(mfrow=c(1, 2))
plot(weekday_daily_activity, type="l",
     xlab="Weekday Interval",
     ylab="Number of steps taken",
     ylim=ylim)
plot(weekend_daily_activity, type="l",
     xlab="Weenend Interval",
     ylab="Number of steps taken",
     ylim=ylim)
```



From the plots we can see that there's a big difference in activity between weekdays and weekends:

- Weekdays show high periods of activity early in the morning, with less activity during the day.
- Weekends show a wider range of activity during the day.