

Reproducible Research Project

Question 1: Import, load, read, summarize, and identify header names of the activity data set.

```
activity_dataset <- read.csv("C:/Users/rashe/Downloads/repdata_data_activity/activity.csv")
View(activity_dataset)
summary(activity_dataset)
```

```
##      steps      date      cc      interval
## Min.   : 0.00   Length:17568   Length:17568   Min.    : 0.0
## 1st Qu.: 0.00   Class :character   Class :character   1st Qu.: 588.8
## Median : 0.00   Mode  :character   Mode  :character   Median :1177.5
## Mean   : 37.38                      Mean   :1177.5
## 3rd Qu.: 12.00                      3rd Qu.:1766.2
## Max.   :806.00                      Max.    :2355.0
## NA's   :2304
```

```
names(activity_dataset)
```

```
## [1] "steps" "date" "cc" "interval"
```

Question 2: Calculate the total number of steps per day.

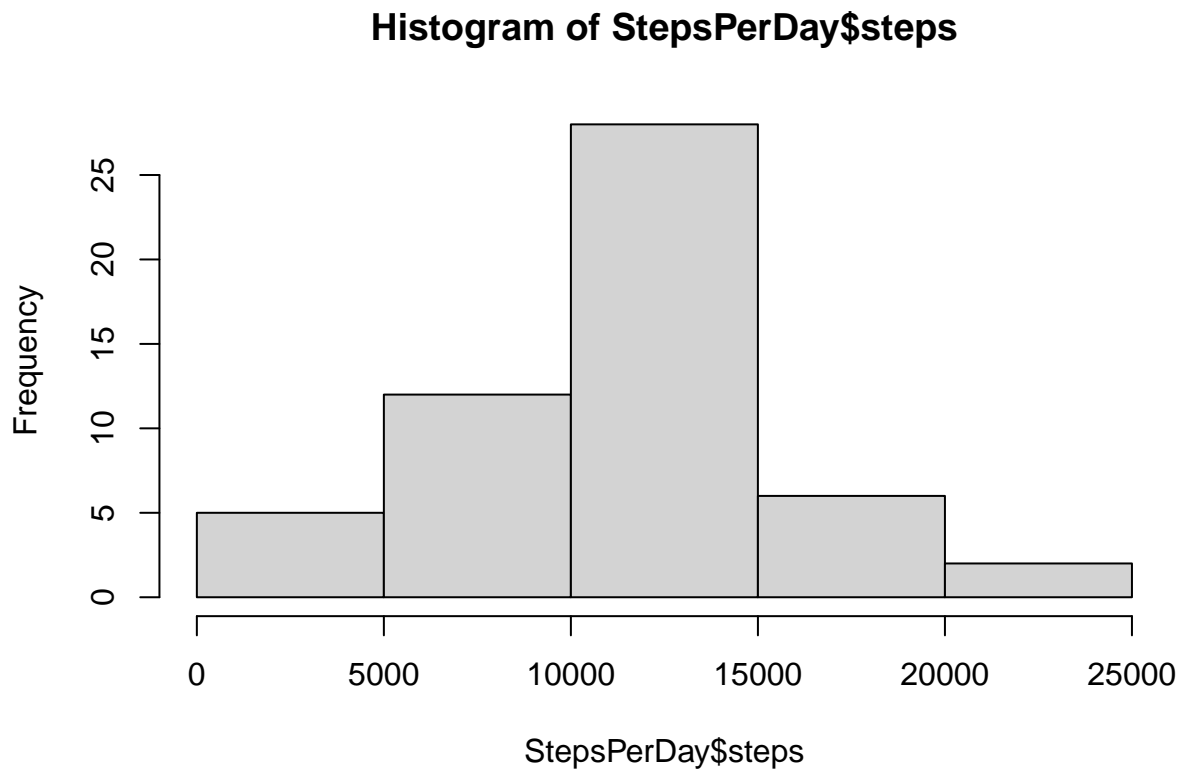
```
StepsPerDay <- aggregate(steps ~ date, activity_dataset, sum, na.rm = TRUE)
StepsPerDay
```

```
##      date steps
## 1 2012-10-02  126
## 2 2012-10-03 11352
## 3 2012-10-04 12116
## 4 2012-10-05 13294
## 5 2012-10-06 15420
## 6 2012-10-07 11015
## 7 2012-10-09 12811
## 8 2012-10-10  9900
## 9 2012-10-11 10304
## 10 2012-10-12 17382
## 11 2012-10-13 12426
## 12 2012-10-14 15098
## 13 2012-10-15 10139
## 14 2012-10-16 15084
## 15 2012-10-17 13452
## 16 2012-10-18 10056
## 17 2012-10-19 11829
## 18 2012-10-20 10395
## 19 2012-10-21  8821
## 20 2012-10-22 13460
## 21 2012-10-23  8918
## 22 2012-10-24  8355
## 23 2012-10-25  2492
## 24 2012-10-26  6778
```

```
## 25 2012-10-27 10119
## 26 2012-10-28 11458
## 27 2012-10-29 5018
## 28 2012-10-30 9819
## 29 2012-10-31 15414
## 30 2012-11-02 10600
## 31 2012-11-03 10571
## 32 2012-11-05 10439
## 33 2012-11-06 8334
## 34 2012-11-07 12883
## 35 2012-11-08 3219
## 36 2012-11-11 12608
## 37 2012-11-12 10765
## 38 2012-11-13 7336
## 39 2012-11-15 41
## 40 2012-11-16 5441
## 41 2012-11-17 14339
## 42 2012-11-18 15110
## 43 2012-11-19 8841
## 44 2012-11-20 4472
## 45 2012-11-21 12787
## 46 2012-11-22 20427
## 47 2012-11-23 21194
## 48 2012-11-24 14478
## 49 2012-11-25 11834
## 50 2012-11-26 11162
## 51 2012-11-27 13646
## 52 2012-11-28 10183
## 53 2012-11-29 7047
```

Question 3: Plot a histogram of the total number of steps per day.

```
hist(StepsPerDay$steps)
```



Question 4a: Calculate the mean of total steps per day.

```
avg_StepsPerDay <- mean(StepsPerDay$steps)
avg_StepsPerDay
```

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

Question 4b: Calculate the median of total steps per day.

```
med_StepsPerDay <- median(StepsPerDay$steps)
med_StepsPerDay
```

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

Question 5a: Create a time series plot of 5 minute intervals and average total steps per day.

```
avg_StepsPerInterval <- aggregate(steps ~ interval, activity_dataset, mean, na.rm = TRUE)
avg_StepsPerInterval
```

```
##      interval      steps
## 1           0  1.7169811
## 2           5  0.3396226
## 3          10  0.1320755
## 4          15  0.1509434
```

## 5	20	0.0754717
## 6	25	2.0943396
## 7	30	0.5283019
## 8	35	0.8679245
## 9	40	0.0000000
## 10	45	1.4716981
## 11	50	0.3018868
## 12	55	0.1320755
## 13	100	0.3207547
## 14	105	0.6792453
## 15	110	0.1509434
## 16	115	0.3396226
## 17	120	0.0000000
## 18	125	1.1132075
## 19	130	1.8301887
## 20	135	0.1698113
## 21	140	0.1698113
## 22	145	0.3773585
## 23	150	0.2641509
## 24	155	0.0000000
## 25	200	0.0000000
## 26	205	0.0000000
## 27	210	1.1320755
## 28	215	0.0000000
## 29	220	0.0000000
## 30	225	0.1320755
## 31	230	0.0000000
## 32	235	0.2264151
## 33	240	0.0000000
## 34	245	0.0000000
## 35	250	1.5471698
## 36	255	0.9433962
## 37	300	0.0000000
## 38	305	0.0000000
## 39	310	0.0000000
## 40	315	0.0000000
## 41	320	0.2075472
## 42	325	0.6226415
## 43	330	1.6226415
## 44	335	0.5849057
## 45	340	0.4905660
## 46	345	0.0754717
## 47	350	0.0000000
## 48	355	0.0000000
## 49	400	1.1886792
## 50	405	0.9433962
## 51	410	2.5660377
## 52	415	0.0000000
## 53	420	0.3396226
## 54	425	0.3584906
## 55	430	4.1132075
## 56	435	0.6603774
## 57	440	3.4905660
## 58	445	0.8301887

## 59	450	3.1132075
## 60	455	1.1132075
## 61	500	0.0000000
## 62	505	1.5660377
## 63	510	3.0000000
## 64	515	2.2452830
## 65	520	3.3207547
## 66	525	2.9622642
## 67	530	2.0943396
## 68	535	6.0566038
## 69	540	16.0188679
## 70	545	18.3396226
## 71	550	39.4528302
## 72	555	44.4905660
## 73	600	31.4905660
## 74	605	49.2641509
## 75	610	53.7735849
## 76	615	63.4528302
## 77	620	49.9622642
## 78	625	47.0754717
## 79	630	52.1509434
## 80	635	39.3396226
## 81	640	44.0188679
## 82	645	44.1698113
## 83	650	37.3584906
## 84	655	49.0377358
## 85	700	43.8113208
## 86	705	44.3773585
## 87	710	50.5094340
## 88	715	54.5094340
## 89	720	49.9245283
## 90	725	50.9811321
## 91	730	55.6792453
## 92	735	44.3207547
## 93	740	52.2641509
## 94	745	69.5471698
## 95	750	57.8490566
## 96	755	56.1509434
## 97	800	73.3773585
## 98	805	68.2075472
## 99	810	129.4339623
## 100	815	157.5283019
## 101	820	171.1509434
## 102	825	155.3962264
## 103	830	177.3018868
## 104	835	206.1698113
## 105	840	195.9245283
## 106	845	179.5660377
## 107	850	183.3962264
## 108	855	167.0188679
## 109	900	143.4528302
## 110	905	124.0377358
## 111	910	109.1132075
## 112	915	108.1132075

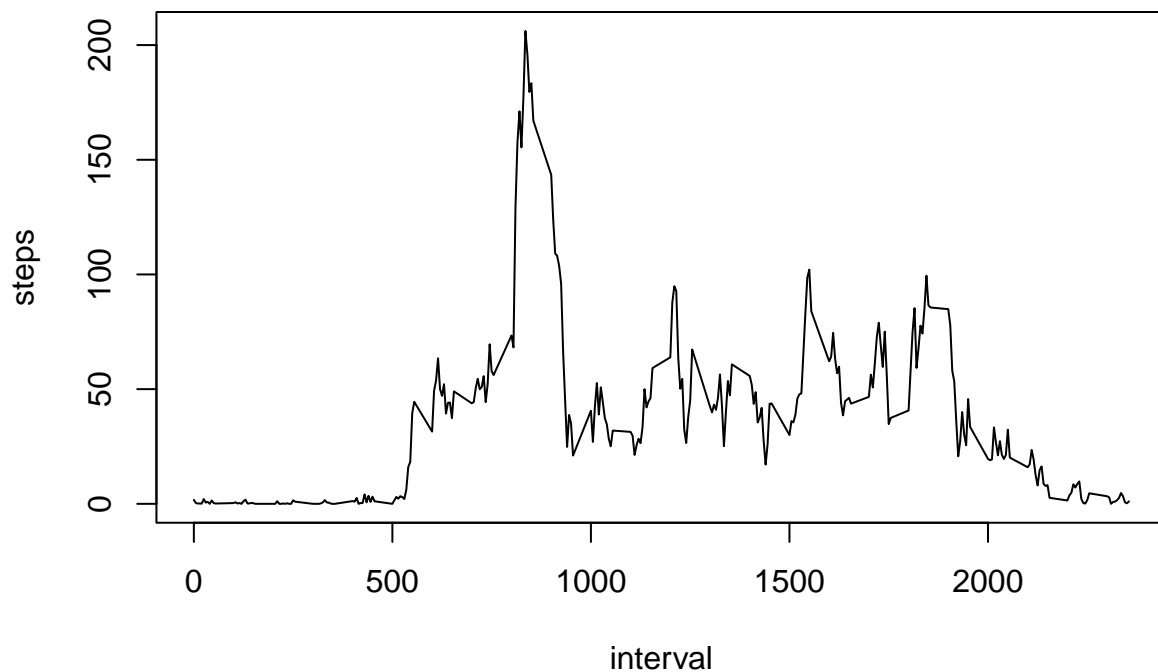
## 113	920	103.7169811
## 114	925	95.9622642
## 115	930	66.2075472
## 116	935	45.2264151
## 117	940	24.7924528
## 118	945	38.7547170
## 119	950	34.9811321
## 120	955	21.0566038
## 121	1000	40.5660377
## 122	1005	26.9811321
## 123	1010	42.4150943
## 124	1015	52.6603774
## 125	1020	38.9245283
## 126	1025	50.7924528
## 127	1030	44.2830189
## 128	1035	37.4150943
## 129	1040	34.6981132
## 130	1045	28.3396226
## 131	1050	25.0943396
## 132	1055	31.9433962
## 133	1100	31.3584906
## 134	1105	29.6792453
## 135	1110	21.3207547
## 136	1115	25.5471698
## 137	1120	28.3773585
## 138	1125	26.4716981
## 139	1130	33.4339623
## 140	1135	49.9811321
## 141	1140	42.0377358
## 142	1145	44.6037736
## 143	1150	46.0377358
## 144	1155	59.1886792
## 145	1200	63.8679245
## 146	1205	87.6981132
## 147	1210	94.8490566
## 148	1215	92.7735849
## 149	1220	63.3962264
## 150	1225	50.1698113
## 151	1230	54.4716981
## 152	1235	32.4150943
## 153	1240	26.5283019
## 154	1245	37.7358491
## 155	1250	45.0566038
## 156	1255	67.2830189
## 157	1300	42.3396226
## 158	1305	39.8867925
## 159	1310	43.2641509
## 160	1315	40.9811321
## 161	1320	46.2452830
## 162	1325	56.4339623
## 163	1330	42.7547170
## 164	1335	25.1320755
## 165	1340	39.9622642
## 166	1345	53.5471698

## 167	1350	47.3207547
## 168	1355	60.8113208
## 169	1400	55.7547170
## 170	1405	51.9622642
## 171	1410	43.5849057
## 172	1415	48.6981132
## 173	1420	35.4716981
## 174	1425	37.5471698
## 175	1430	41.8490566
## 176	1435	27.5094340
## 177	1440	17.1132075
## 178	1445	26.0754717
## 179	1450	43.6226415
## 180	1455	43.7735849
## 181	1500	30.0188679
## 182	1505	36.0754717
## 183	1510	35.4905660
## 184	1515	38.8490566
## 185	1520	45.9622642
## 186	1525	47.7547170
## 187	1530	48.1320755
## 188	1535	65.3207547
## 189	1540	82.9056604
## 190	1545	98.6603774
## 191	1550	102.1132075
## 192	1555	83.9622642
## 193	1600	62.1320755
## 194	1605	64.1320755
## 195	1610	74.5471698
## 196	1615	63.1698113
## 197	1620	56.9056604
## 198	1625	59.7735849
## 199	1630	43.8679245
## 200	1635	38.5660377
## 201	1640	44.6603774
## 202	1645	45.4528302
## 203	1650	46.2075472
## 204	1655	43.6792453
## 205	1700	46.6226415
## 206	1705	56.3018868
## 207	1710	50.7169811
## 208	1715	61.2264151
## 209	1720	72.7169811
## 210	1725	78.9433962
## 211	1730	68.9433962
## 212	1735	59.6603774
## 213	1740	75.0943396
## 214	1745	56.5094340
## 215	1750	34.7735849
## 216	1755	37.4528302
## 217	1800	40.6792453
## 218	1805	58.0188679
## 219	1810	74.6981132
## 220	1815	85.3207547

## 221	1820	59.2641509
## 222	1825	67.7735849
## 223	1830	77.6981132
## 224	1835	74.2452830
## 225	1840	85.3396226
## 226	1845	99.4528302
## 227	1850	86.5849057
## 228	1855	85.6037736
## 229	1900	84.8679245
## 230	1905	77.8301887
## 231	1910	58.0377358
## 232	1915	53.3584906
## 233	1920	36.3207547
## 234	1925	20.7169811
## 235	1930	27.3962264
## 236	1935	40.0188679
## 237	1940	30.2075472
## 238	1945	25.5471698
## 239	1950	45.6603774
## 240	1955	33.5283019
## 241	2000	19.6226415
## 242	2005	19.0188679
## 243	2010	19.3396226
## 244	2015	33.3396226
## 245	2020	26.8113208
## 246	2025	21.1698113
## 247	2030	27.3018868
## 248	2035	21.3396226
## 249	2040	19.5471698
## 250	2045	21.3207547
## 251	2050	32.3018868
## 252	2055	20.1509434
## 253	2100	15.9433962
## 254	2105	17.2264151
## 255	2110	23.4528302
## 256	2115	19.2452830
## 257	2120	12.4528302
## 258	2125	8.0188679
## 259	2130	14.6603774
## 260	2135	16.3018868
## 261	2140	8.6792453
## 262	2145	7.7924528
## 263	2150	8.1320755
## 264	2155	2.6226415
## 265	2200	1.4528302
## 266	2205	3.6792453
## 267	2210	4.8113208
## 268	2215	8.5094340
## 269	2220	7.0754717
## 270	2225	8.6981132
## 271	2230	9.7547170
## 272	2235	2.2075472
## 273	2240	0.3207547
## 274	2245	0.1132075


```
## 275    2250    1.6037736
## 276    2255    4.6037736
## 277    2300    3.3018868
## 278    2305    2.8490566
## 279    2310    0.0000000
## 280    2315    0.8301887
## 281    2320    0.9622642
## 282    2325    1.5849057
## 283    2330    2.6037736
## 284    2335    4.6981132
## 285    2340    3.3018868
## 286    2345    0.6415094
## 287    2350    0.2264151
## 288    2355    1.0754717
```

```
plot(steps ~ interval, data = avg_StepsPerInterval, type="l")
```



Question 5b: Calculate interval with maximum number of steps.

```
max_StepsPer_Interval <- avg_StepsPerInterval[which.max(avg_StepsPerInterval$steps),]$interval
max_StepsPer_Interval
```

```
## [1] 835
```

Question 6a: Count total number of missing values (N/A).

```
missing_count <- sum(is.na(activity_dataset$steps))
missing_count
```

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

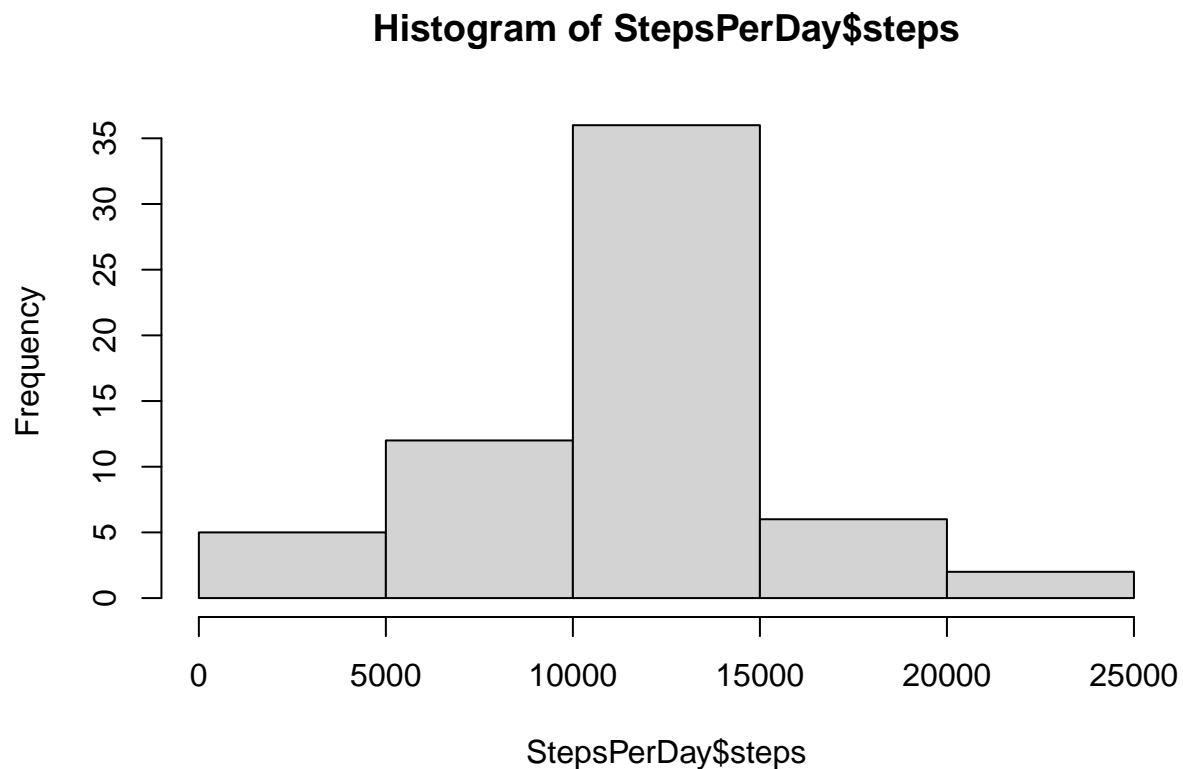
Question 6b: Replace missing values (N/A) with average steps per interval.

```
Mean_StepsPerInterval <- function(interval){
  avg_StepsPerInterval[avg_StepsPerInterval$interval==interval,]$steps}
```

Question 6c: Update data set, histogram, and recalculate mean and median.

```
new_estimates <- activity_dataset
for(i in 1:nrow(new_estimates)){
  if(is.na(new_estimates[i,]$steps)){
    new_estimates[i,]$steps <- Mean_StepsPerInterval(new_estimates[i,]$interval)}}}
```

```
StepsPerDay <- aggregate(steps ~ date, data = new_estimates, sum)
hist(StepsPerDay$steps)
```



Mean after filling missing values.

```
mean_new <- aggregate(steps ~ date, new_estimates, mean, na.rm = TRUE)
mean_new
```

```
##           date      steps
## 1 2012-10-01 37.3825996
## 2 2012-10-02  0.4375000
## 3 2012-10-03 39.4166667
## 4 2012-10-04 42.0694444
## 5 2012-10-05 46.1597222
## 6 2012-10-06 53.5416667
## 7 2012-10-07 38.2465278
## 8 2012-10-08 37.3825996
## 9 2012-10-09 44.4826389
## 10 2012-10-10 34.3750000
## 11 2012-10-11 35.7777778
## 12 2012-10-12 60.3541667
## 13 2012-10-13 43.1458333
## 14 2012-10-14 52.4236111
## 15 2012-10-15 35.2048611
## 16 2012-10-16 52.3750000
## 17 2012-10-17 46.7083333
## 18 2012-10-18 34.9166667
## 19 2012-10-19 41.0729167
## 20 2012-10-20 36.0937500
## 21 2012-10-21 30.6284722
## 22 2012-10-22 46.7361111
## 23 2012-10-23 30.9652778
## 24 2012-10-24 29.0104167
## 25 2012-10-25  8.6527778
## 26 2012-10-26 23.5347222
## 27 2012-10-27 35.1354167
## 28 2012-10-28 39.7847222
## 29 2012-10-29 17.4236111
## 30 2012-10-30 34.0937500
## 31 2012-10-31 53.5208333
## 32 2012-11-01 37.3825996
## 33 2012-11-02 36.8055556
## 34 2012-11-03 36.7048611
## 35 2012-11-04 37.3825996
## 36 2012-11-05 36.2465278
## 37 2012-11-06 28.9375000
## 38 2012-11-07 44.7326389
## 39 2012-11-08 11.1770833
## 40 2012-11-09 37.3825996
## 41 2012-11-10 37.3825996
## 42 2012-11-11 43.7777778
## 43 2012-11-12 37.3784722
## 44 2012-11-13 25.4722222
## 45 2012-11-14 37.3825996
## 46 2012-11-15  0.1423611
## 47 2012-11-16 18.8923611
## 48 2012-11-17 49.7881944
## 49 2012-11-18 52.4652778
```

```
## 50 2012-11-19 30.6979167
## 51 2012-11-20 15.5277778
## 52 2012-11-21 44.3993056
## 53 2012-11-22 70.9270833
## 54 2012-11-23 73.5902778
## 55 2012-11-24 50.2708333
## 56 2012-11-25 41.0902778
## 57 2012-11-26 38.7569444
## 58 2012-11-27 47.3819444
## 59 2012-11-28 35.3576389
## 60 2012-11-29 24.4687500
## 61 2012-11-30 37.3825996
```

Median after filling missing values.

```
median_new <- aggregate(steps ~ date, new_estimates, median, na.rm = TRUE)
median_new
```

```
##      date      steps
## 1 2012-10-01 34.11321
## 2 2012-10-02  0.00000
## 3 2012-10-03  0.00000
## 4 2012-10-04  0.00000
## 5 2012-10-05  0.00000
## 6 2012-10-06  0.00000
## 7 2012-10-07  0.00000
## 8 2012-10-08 34.11321
## 9 2012-10-09  0.00000
## 10 2012-10-10  0.00000
## 11 2012-10-11  0.00000
## 12 2012-10-12  0.00000
## 13 2012-10-13  0.00000
## 14 2012-10-14  0.00000
## 15 2012-10-15  0.00000
## 16 2012-10-16  0.00000
## 17 2012-10-17  0.00000
## 18 2012-10-18  0.00000
## 19 2012-10-19  0.00000
## 20 2012-10-20  0.00000
## 21 2012-10-21  0.00000
## 22 2012-10-22  0.00000
## 23 2012-10-23  0.00000
## 24 2012-10-24  0.00000
## 25 2012-10-25  0.00000
## 26 2012-10-26  0.00000
## 27 2012-10-27  0.00000
## 28 2012-10-28  0.00000
## 29 2012-10-29  0.00000
## 30 2012-10-30  0.00000
## 31 2012-10-31  0.00000
## 32 2012-11-01 34.11321
## 33 2012-11-02  0.00000
## 34 2012-11-03  0.00000
```

```
## 35 2012-11-04 34.11321
## 36 2012-11-05 0.00000
## 37 2012-11-06 0.00000
## 38 2012-11-07 0.00000
## 39 2012-11-08 0.00000
## 40 2012-11-09 34.11321
## 41 2012-11-10 34.11321
## 42 2012-11-11 0.00000
## 43 2012-11-12 0.00000
## 44 2012-11-13 0.00000
## 45 2012-11-14 34.11321
## 46 2012-11-15 0.00000
## 47 2012-11-16 0.00000
## 48 2012-11-17 0.00000
## 49 2012-11-18 0.00000
## 50 2012-11-19 0.00000
## 51 2012-11-20 0.00000
## 52 2012-11-21 0.00000
## 53 2012-11-22 0.00000
## 54 2012-11-23 0.00000
## 55 2012-11-24 0.00000
## 56 2012-11-25 0.00000
## 57 2012-11-26 0.00000
## 58 2012-11-27 0.00000
## 59 2012-11-28 0.00000
## 60 2012-11-29 0.00000
## 61 2012-11-30 34.11321
```

Question 7a: Create new factor variable.

```
new_estimates$date <- as.Date(strptime(new_estimates$date, format="%Y-%m-%d"))
new_estimates$day <- weekdays(new_estimates$date)
for (i in 1:nrow(new_estimates)) {
  if (new_estimates[i,]$day %in% c("Saturday","Sunday")) {
    new_estimates[i,]$day<-"weekend"}
  else{new_estimates[i,]$day<-"weekday"}}}
```

```
StepsByDay <- aggregate(new_estimates$steps ~ new_estimates$interval + new_estimates$day, new_estimates,
StepsByDay)
```

```
##      new_estimates$interval new_estimates$day new_estimates$steps
## 1              0      weekday      2.251153e+00
## 2              5      weekday      4.452830e-01
## 3             10      weekday      1.731656e-01
## 4             15      weekday      1.979036e-01
## 5             20      weekday      9.895178e-02
## 6             25      weekday      1.590356e+00
## 7             30      weekday      6.926625e-01
## 8             35      weekday      1.137945e+00
## 9             40      weekday      0.000000e+00
## 10            45      weekday      1.796226e+00
## 11            50      weekday      3.958071e-01
## 12            55      weekday      1.761006e-02
```

## 13	100	weekday	4.205451e-01
## 14	105	weekday	9.056604e-02
## 15	110	weekday	1.979036e-01
## 16	115	weekday	4.452830e-01
## 17	120	weekday	0.000000e+00
## 18	125	weekday	1.459539e+00
## 19	130	weekday	2.221803e+00
## 20	135	weekday	2.264151e-02
## 21	140	weekday	2.226415e-01
## 22	145	weekday	2.503145e-01
## 23	150	weekday	3.463312e-01
## 24	155	weekday	0.000000e+00
## 25	200	weekday	0.000000e+00
## 26	205	weekday	0.000000e+00
## 27	210	weekday	1.395388e+00
## 28	215	weekday	0.000000e+00
## 29	220	weekday	0.000000e+00
## 30	225	weekday	1.731656e-01
## 31	230	weekday	0.000000e+00
## 32	235	weekday	2.968553e-01
## 33	240	weekday	0.000000e+00
## 34	245	weekday	0.000000e+00
## 35	250	weekday	2.028512e+00
## 36	255	weekday	1.236897e+00
## 37	300	weekday	0.000000e+00
## 38	305	weekday	0.000000e+00
## 39	310	weekday	0.000000e+00
## 40	315	weekday	0.000000e+00
## 41	320	weekday	2.767296e-02
## 42	325	weekday	8.163522e-01
## 43	330	weekday	1.238574e+00
## 44	335	weekday	5.224319e-01
## 45	340	weekday	4.209644e-01
## 46	345	weekday	9.895178e-02
## 47	350	weekday	0.000000e+00
## 48	355	weekday	0.000000e+00
## 49	400	weekday	2.696017e-01
## 50	405	weekday	1.236897e+00
## 51	410	weekday	2.231027e+00
## 52	415	weekday	0.000000e+00
## 53	420	weekday	4.452830e-01
## 54	425	weekday	4.779874e-02
## 55	430	weekday	3.370650e+00
## 56	435	weekday	2.213836e-01
## 57	440	weekday	3.776520e+00
## 58	445	weekday	8.884696e-01
## 59	450	weekday	2.348428e+00
## 60	455	weekday	7.262055e-01
## 61	500	weekday	0.000000e+00
## 62	505	weekday	2.053249e+00
## 63	510	weekday	3.933333e+00
## 64	515	weekday	2.188260e+00
## 65	520	weekday	4.220545e+00
## 66	525	weekday	2.706080e+00

## 67	530	weekday	2.745912e+00
## 68	535	weekday	7.940881e+00
## 69	540	weekday	2.040252e+01
## 70	545	weekday	2.364528e+01
## 71	550	weekday	5.034927e+01
## 72	555	weekday	5.626541e+01
## 73	600	weekday	4.128763e+01
## 74	605	weekday	6.459078e+01
## 75	610	weekday	7.008092e+01
## 76	615	weekday	7.714927e+01
## 77	620	weekday	6.392830e+01
## 78	625	weekday	6.003229e+01
## 79	630	weekday	6.644235e+01
## 80	635	weekday	4.797862e+01
## 81	640	weekday	5.566918e+01
## 82	645	weekday	5.486709e+01
## 83	650	weekday	4.704780e+01
## 84	655	weekday	6.042725e+01
## 85	700	weekday	5.059706e+01
## 86	705	weekday	5.082809e+01
## 87	710	weekday	6.202348e+01
## 88	715	weekday	6.933459e+01
## 89	720	weekday	6.310105e+01
## 90	725	weekday	5.910860e+01
## 91	730	weekday	6.622390e+01
## 92	735	weekday	5.435388e+01
## 93	740	weekday	6.272411e+01
## 94	745	weekday	8.338407e+01
## 95	750	weekday	6.773543e+01
## 96	755	weekday	6.657568e+01
## 97	800	weekday	8.271698e+01
## 98	805	weekday	7.196101e+01
## 99	810	weekday	1.440134e+02
## 100	815	weekday	1.819816e+02
## 101	820	weekday	2.005757e+02
## 102	825	weekday	1.836084e+02
## 103	830	weekday	1.988847e+02
## 104	835	weekday	2.303782e+02
## 105	840	weekday	2.189010e+02
## 106	845	weekday	1.856532e+02
## 107	850	weekday	1.912306e+02
## 108	855	weekday	1.770914e+02
## 109	900	weekday	1.676604e+02
## 110	905	weekday	1.257828e+02
## 111	910	weekday	9.394843e+01
## 112	915	weekday	8.730398e+01
## 113	920	weekday	1.035400e+02
## 114	925	weekday	9.246164e+01
## 115	930	weekday	5.851656e+01
## 116	935	weekday	3.585241e+01
## 117	940	weekday	2.746122e+01
## 118	945	weekday	4.085618e+01
## 119	950	weekday	3.913082e+01
## 120	955	weekday	1.762977e+01

## 121	1000	weekday	3.787547e+01
## 122	1005	weekday	1.821971e+01
## 123	1010	weekday	3.907757e+01
## 124	1015	weekday	4.782138e+01
## 125	1020	weekday	3.034549e+01
## 126	1025	weekday	3.515010e+01
## 127	1030	weekday	3.312662e+01
## 128	1035	weekday	2.425535e+01
## 129	1040	weekday	2.351530e+01
## 130	1045	weekday	2.591195e+01
## 131	1050	weekday	2.203480e+01
## 132	1055	weekday	2.325912e+01
## 133	1100	weekday	2.169224e+01
## 134	1105	weekday	2.509057e+01
## 135	1110	weekday	1.168721e+01
## 136	1115	weekday	1.627296e+01
## 137	1120	weekday	2.418365e+01
## 138	1125	weekday	2.372956e+01
## 139	1130	weekday	3.276897e+01
## 140	1135	weekday	5.019748e+01
## 141	1140	weekday	4.456059e+01
## 142	1145	weekday	4.792495e+01
## 143	1150	weekday	5.011614e+01
## 144	1155	weekday	5.613627e+01
## 145	1200	weekday	5.571572e+01
## 146	1205	weekday	7.284864e+01
## 147	1210	weekday	8.364654e+01
## 148	1215	weekday	7.528092e+01
## 149	1220	weekday	4.871950e+01
## 150	1225	weekday	4.682264e+01
## 151	1230	weekday	6.257400e+01
## 152	1235	weekday	3.074423e+01
## 153	1240	weekday	2.198155e+01
## 154	1245	weekday	2.932034e+01
## 155	1250	weekday	3.278532e+01
## 156	1255	weekday	5.659329e+01
## 157	1300	weekday	2.460084e+01
## 158	1305	weekday	2.574046e+01
## 159	1310	weekday	2.456855e+01
## 160	1315	weekday	1.564193e+01
## 161	1320	weekday	3.563270e+01
## 162	1325	weekday	4.485786e+01
## 163	1330	weekday	3.176730e+01
## 164	1335	weekday	2.330650e+01
## 165	1340	weekday	2.523941e+01
## 166	1345	weekday	4.018407e+01
## 167	1350	weekday	2.557610e+01
## 168	1355	weekday	3.633040e+01
## 169	1400	weekday	4.692285e+01
## 170	1405	weekday	3.955052e+01
## 171	1410	weekday	3.212243e+01
## 172	1415	weekday	4.504864e+01
## 173	1420	weekday	2.748512e+01
## 174	1425	weekday	3.076184e+01

## 175	1430	weekday	3.149099e+01
## 176	1435	weekday	1.451237e+01
## 177	1440	weekday	1.154843e+01
## 178	1445	weekday	2.198784e+01
## 179	1450	weekday	4.186080e+01
## 180	1455	weekday	3.828092e+01
## 181	1500	weekday	3.086918e+01
## 182	1505	weekday	3.505451e+01
## 183	1510	weekday	2.995430e+01
## 184	1515	weekday	3.191321e+01
## 185	1520	weekday	3.986164e+01
## 186	1525	weekday	3.734507e+01
## 187	1530	weekday	4.212872e+01
## 188	1535	weekday	5.093166e+01
## 189	1540	weekday	9.056520e+01
## 190	1545	weekday	9.586583e+01
## 191	1550	weekday	9.394843e+01
## 192	1555	weekday	7.030608e+01
## 193	1600	weekday	4.688428e+01
## 194	1605	weekday	4.519539e+01
## 195	1610	weekday	5.660629e+01
## 196	1615	weekday	3.613375e+01
## 197	1620	weekday	2.680964e+01
## 198	1625	weekday	2.952537e+01
## 199	1630	weekday	2.251572e+01
## 200	1635	weekday	2.183103e+01
## 201	1640	weekday	2.586583e+01
## 202	1645	weekday	3.199371e+01
## 203	1650	weekday	2.762767e+01
## 204	1655	weekday	3.242390e+01
## 205	1700	weekday	2.357191e+01
## 206	1705	weekday	4.495136e+01
## 207	1710	weekday	3.418449e+01
## 208	1715	weekday	4.807463e+01
## 209	1720	weekday	6.011782e+01
## 210	1725	weekday	7.237023e+01
## 211	1730	weekday	5.614801e+01
## 212	1735	weekday	6.582138e+01
## 213	1740	weekday	8.287925e+01
## 214	1745	weekday	5.933459e+01
## 215	1750	weekday	3.450314e+01
## 216	1755	weekday	3.759371e+01
## 217	1800	weekday	2.664612e+01
## 218	1805	weekday	4.662474e+01
## 219	1810	weekday	6.722642e+01
## 220	1815	weekday	8.264277e+01
## 221	1820	weekday	6.139078e+01
## 222	1825	weekday	7.345870e+01
## 223	1830	weekday	7.922642e+01
## 224	1835	weekday	8.149937e+01
## 225	1840	weekday	9.171195e+01
## 226	1845	weekday	1.154604e+02
## 227	1850	weekday	1.013002e+02
## 228	1855	weekday	9.059161e+01

## 229	1900	weekday	8.756017e+01
## 230	1905	weekday	7.722180e+01
## 231	1910	weekday	6.238281e+01
## 232	1915	weekday	5.438113e+01
## 233	1920	weekday	3.788721e+01
## 234	1925	weekday	2.056226e+01
## 235	1930	weekday	2.909727e+01
## 236	1935	weekday	4.598029e+01
## 237	1940	weekday	3.004990e+01
## 238	1945	weekday	1.858407e+01
## 239	1950	weekday	4.426583e+01
## 240	1955	weekday	2.729266e+01
## 241	2000	weekday	1.339413e+01
## 242	2005	weekday	5.558071e+00
## 243	2010	weekday	6.823061e+00
## 244	2015	weekday	1.411195e+01
## 245	2020	weekday	8.708176e+00
## 246	2025	weekday	5.711530e+00
## 247	2030	weekday	9.773585e+00
## 248	2035	weekday	7.156394e+00
## 249	2040	weekday	8.961845e+00
## 250	2045	weekday	1.310943e+01
## 251	2050	weekday	2.597358e+01
## 252	2055	weekday	1.730901e+01
## 253	2100	weekday	1.137023e+01
## 254	2105	weekday	1.889686e+01
## 255	2110	weekday	2.850482e+01
## 256	2115	weekday	1.894382e+01
## 257	2120	weekday	1.428260e+01
## 258	2125	weekday	8.046960e+00
## 259	2130	weekday	1.279916e+01
## 260	2135	weekday	1.650692e+01
## 261	2140	weekday	7.135010e+00
## 262	2145	weekday	7.594549e+00
## 263	2150	weekday	8.262055e+00
## 264	2155	weekday	3.438574e+00
## 265	2200	weekday	1.527044e+00
## 266	2205	weekday	4.423899e+00
## 267	2210	weekday	6.308176e+00
## 268	2215	weekday	1.115681e+01
## 269	2220	weekday	9.276730e+00
## 270	2225	weekday	1.084864e+01
## 271	2230	weekday	1.278952e+01
## 272	2235	weekday	2.894340e+00
## 273	2240	weekday	4.276730e-02
## 274	2245	weekday	1.484277e-01
## 275	2250	weekday	1.902725e+00
## 276	2255	weekday	2.013836e+00
## 277	2300	weekday	3.551363e+00
## 278	2305	weekday	3.735430e+00
## 279	2310	weekday	0.000000e+00
## 280	2315	weekday	1.088470e+00
## 281	2320	weekday	1.261635e+00
## 282	2325	weekday	1.877987e+00

## 283	2330	weekday	3.036059e+00
## 284	2335	weekday	2.248637e+00
## 285	2340	weekday	2.240252e+00
## 286	2345	weekday	2.633124e-01
## 287	2350	weekday	2.968553e-01
## 288	2355	weekday	1.410063e+00
## 289	0	weekend	2.146226e-01
## 290	5	weekend	4.245283e-02
## 291	10	weekend	1.650943e-02
## 292	15	weekend	1.886792e-02
## 293	20	weekend	9.433962e-03
## 294	25	weekend	3.511792e+00
## 295	30	weekend	6.603774e-02
## 296	35	weekend	1.084906e-01
## 297	40	weekend	0.000000e+00
## 298	45	weekend	5.589623e-01
## 299	50	weekend	3.773585e-02
## 300	55	weekend	4.540094e-01
## 301	100	weekend	4.009434e-02
## 302	105	weekend	2.334906e+00
## 303	110	weekend	1.886792e-02
## 304	115	weekend	4.245283e-02
## 305	120	weekend	0.000000e+00
## 306	125	weekend	1.391509e-01
## 307	130	weekend	7.287736e-01
## 308	135	weekend	5.837264e-01
## 309	140	weekend	2.122642e-02
## 310	145	weekend	7.346698e-01
## 311	150	weekend	3.301887e-02
## 312	155	weekend	0.000000e+00
## 313	200	weekend	0.000000e+00
## 314	205	weekend	0.000000e+00
## 315	210	weekend	3.915094e-01
## 316	215	weekend	0.000000e+00
## 317	220	weekend	0.000000e+00
## 318	225	weekend	1.650943e-02
## 319	230	weekend	0.000000e+00
## 320	235	weekend	2.830189e-02
## 321	240	weekend	0.000000e+00
## 322	245	weekend	0.000000e+00
## 323	250	weekend	1.933962e-01
## 324	255	weekend	1.179245e-01
## 325	300	weekend	0.000000e+00
## 326	305	weekend	0.000000e+00
## 327	310	weekend	0.000000e+00
## 328	315	weekend	0.000000e+00
## 329	320	weekend	7.134434e-01
## 330	325	weekend	7.783019e-02
## 331	330	weekend	2.702830e+00
## 332	335	weekend	7.606132e-01
## 333	340	weekend	6.863208e-01
## 334	345	weekend	9.433962e-03
## 335	350	weekend	0.000000e+00
## 336	355	weekend	0.000000e+00

## 337	400	weekend	3.773585e+00
## 338	405	weekend	1.179245e-01
## 339	410	weekend	3.508255e+00
## 340	415	weekend	0.000000e+00
## 341	420	weekend	4.245283e-02
## 342	425	weekend	1.232311e+00
## 343	430	weekend	6.201651e+00
## 344	435	weekend	1.895047e+00
## 345	440	weekend	2.686321e+00
## 346	445	weekend	6.662736e-01
## 347	450	weekend	5.264151e+00
## 348	455	weekend	2.201651e+00
## 349	500	weekend	0.000000e+00
## 350	505	weekend	1.957547e-01
## 351	510	weekend	3.750000e-01
## 352	515	weekend	2.405660e+00
## 353	520	weekend	7.900943e-01
## 354	525	weekend	3.682783e+00
## 355	530	weekend	2.617925e-01
## 356	535	weekend	7.570755e-01
## 357	540	weekend	3.689858e+00
## 358	545	weekend	3.417453e+00
## 359	550	weekend	8.806604e+00
## 360	555	weekend	1.137382e+01
## 361	600	weekend	3.936321e+00
## 362	605	weekend	6.158019e+00
## 363	610	weekend	7.909198e+00
## 364	615	weekend	2.493160e+01
## 365	620	weekend	1.068278e+01
## 366	625	weekend	1.063443e+01
## 367	630	weekend	1.195637e+01
## 368	635	weekend	1.504245e+01
## 369	640	weekend	1.125236e+01
## 370	645	weekend	1.408373e+01
## 371	650	weekend	1.010731e+01
## 372	655	weekend	1.700472e+01
## 373	700	weekend	2.472642e+01
## 374	705	weekend	2.623467e+01
## 375	710	weekend	1.812618e+01
## 376	715	weekend	1.281368e+01
## 377	720	weekend	1.286557e+01
## 378	725	weekend	2.812264e+01
## 379	730	weekend	2.602241e+01
## 380	735	weekend	1.610259e+01
## 381	740	weekend	2.284552e+01
## 382	745	weekend	3.063090e+01
## 383	750	weekend	3.004363e+01
## 384	755	weekend	2.683137e+01
## 385	800	weekend	4.710967e+01
## 386	805	weekend	5.765094e+01
## 387	810	weekend	8.842925e+01
## 388	815	weekend	8.875354e+01
## 389	820	weekend	8.839387e+01
## 390	825	weekend	7.604953e+01

## 391	830	weekend	1.166002e+02
## 392	835	weekend	1.380837e+02
## 393	840	weekend	1.313031e+02
## 394	845	weekend	1.624458e+02
## 395	850	weekend	1.613620e+02
## 396	855	weekend	1.386899e+02
## 397	900	weekend	7.536910e+01
## 398	905	weekend	1.191297e+02
## 399	910	weekend	1.517642e+02
## 400	915	weekend	1.666392e+02
## 401	920	weekend	1.042146e+02
## 402	925	weekend	1.058078e+02
## 403	930	weekend	8.783844e+01
## 404	935	weekend	7.159080e+01
## 405	940	weekend	1.728656e+01
## 406	945	weekend	3.284434e+01
## 407	950	weekend	2.331014e+01
## 408	955	weekend	3.069458e+01
## 409	1000	weekend	4.813325e+01
## 410	1005	weekend	5.162264e+01
## 411	1010	weekend	5.180189e+01
## 412	1015	weekend	6.627005e+01
## 413	1020	weekend	6.305307e+01
## 414	1025	weekend	9.478656e+01
## 415	1030	weekend	7.566038e+01
## 416	1035	weekend	7.442689e+01
## 417	1040	weekend	6.614976e+01
## 418	1045	weekend	3.516745e+01
## 419	1050	weekend	3.369929e+01
## 420	1055	weekend	5.636792e+01
## 421	1100	weekend	5.854481e+01
## 422	1105	weekend	4.258491e+01
## 423	1110	weekend	4.841509e+01
## 424	1115	weekend	5.163090e+01
## 425	1120	weekend	4.017217e+01
## 426	1125	weekend	3.418396e+01
## 427	1130	weekend	3.530425e+01
## 428	1135	weekend	4.937264e+01
## 429	1140	weekend	3.494222e+01
## 430	1145	weekend	3.526297e+01
## 431	1150	weekend	3.456722e+01
## 432	1155	weekend	6.777358e+01
## 433	1200	weekend	8.679599e+01
## 434	1205	weekend	1.294623e+02
## 435	1210	weekend	1.263561e+02
## 436	1215	weekend	1.419717e+02
## 437	1220	weekend	1.046745e+02
## 438	1225	weekend	5.958373e+01
## 439	1230	weekend	3.168396e+01
## 440	1235	weekend	3.711439e+01
## 441	1240	weekend	3.931604e+01
## 442	1245	weekend	6.140448e+01
## 443	1250	weekend	7.956958e+01
## 444	1255	weekend	9.734788e+01

## 445	1300	weekend	9.222995e+01
## 446	1305	weekend	7.967335e+01
## 447	1310	weekend	9.584552e+01
## 448	1315	weekend	1.122476e+02
## 449	1320	weekend	7.609316e+01
## 450	1325	weekend	8.899175e+01
## 451	1330	weekend	7.365684e+01
## 452	1335	weekend	3.026651e+01
## 453	1340	weekend	8.137028e+01
## 454	1345	weekend	9.113090e+01
## 455	1350	weekend	1.084776e+02
## 456	1355	weekend	1.296639e+02
## 457	1400	weekend	8.059434e+01
## 458	1405	weekend	8.687028e+01
## 459	1410	weekend	7.582311e+01
## 460	1415	weekend	5.896226e+01
## 461	1420	weekend	5.793396e+01
## 462	1425	weekend	5.663090e+01
## 463	1430	weekend	7.098113e+01
## 464	1435	weekend	6.406368e+01
## 465	1440	weekend	3.276415e+01
## 466	1445	weekend	3.757193e+01
## 467	1450	weekend	4.857783e+01
## 468	1455	weekend	5.922170e+01
## 469	1500	weekend	2.762736e+01
## 470	1505	weekend	3.894693e+01
## 471	1510	weekend	5.106132e+01
## 472	1515	weekend	5.835613e+01
## 473	1520	weekend	6.312028e+01
## 474	1525	weekend	7.703184e+01
## 475	1530	weekend	6.501651e+01
## 476	1535	weekend	1.057901e+02
## 477	1540	weekend	6.136321e+01
## 478	1545	weekend	1.065200e+02
## 479	1550	weekend	1.250767e+02
## 480	1555	weekend	1.223703e+02
## 481	1600	weekend	1.050165e+02
## 482	1605	weekend	1.173915e+02
## 483	1610	weekend	1.250059e+02
## 484	1615	weekend	1.392087e+02
## 485	1620	weekend	1.415507e+02
## 486	1625	weekend	1.448467e+02
## 487	1630	weekend	1.039210e+02
## 488	1635	weekend	8.563325e+01
## 489	1640	weekend	9.752005e+01
## 490	1645	weekend	8.330660e+01
## 491	1650	weekend	9.846344e+01
## 492	1655	weekend	7.533491e+01
## 493	1700	weekend	1.114528e+02
## 494	1705	weekend	8.822524e+01
## 495	1710	weekend	9.721462e+01
## 496	1715	weekend	9.821580e+01
## 497	1720	weekend	1.081521e+02
## 498	1725	weekend	9.743042e+01

## 499	1730	weekend	1.049304e+02
## 500	1735	weekend	4.233255e+01
## 501	1740	weekend	5.319929e+01
## 502	1745	weekend	4.856368e+01
## 503	1750	weekend	3.553420e+01
## 504	1755	weekend	3.705660e+01
## 505	1800	weekend	8.014741e+01
## 506	1805	weekend	9.006486e+01
## 507	1810	weekend	9.571226e+01
## 508	1815	weekend	9.285259e+01
## 509	1820	weekend	5.328302e+01
## 510	1825	weekend	5.178420e+01
## 511	1830	weekend	7.339976e+01
## 512	1835	weekend	5.384316e+01
## 513	1840	weekend	6.741745e+01
## 514	1845	weekend	5.443160e+01
## 515	1850	weekend	4.519811e+01
## 516	1855	weekend	7.157547e+01
## 517	1900	weekend	7.729599e+01
## 518	1905	weekend	7.954127e+01
## 519	1910	weekend	4.581722e+01
## 520	1915	weekend	5.048231e+01
## 521	1920	weekend	3.191509e+01
## 522	1925	weekend	2.115212e+01
## 523	1930	weekend	2.261203e+01
## 524	1935	weekend	2.325236e+01
## 525	1940	weekend	3.065094e+01
## 526	1945	weekend	4.513090e+01
## 527	1950	weekend	4.958255e+01
## 528	1955	weekend	5.106604e+01
## 529	2000	weekend	3.714033e+01
## 530	2005	weekend	5.687736e+01
## 531	2010	weekend	5.454245e+01
## 532	2015	weekend	8.741745e+01
## 533	2020	weekend	7.772642e+01
## 534	2025	weekend	6.464623e+01
## 535	2030	weekend	7.660024e+01
## 536	2035	weekend	6.122995e+01
## 537	2040	weekend	4.931840e+01
## 538	2045	weekend	4.441509e+01
## 539	2050	weekend	5.010024e+01
## 540	2055	weekend	2.814387e+01
## 541	2100	weekend	2.880542e+01
## 542	2105	weekend	1.252830e+01
## 543	2110	weekend	9.244104e+00
## 544	2115	weekend	2.009316e+01
## 545	2120	weekend	7.306604e+00
## 546	2125	weekend	7.939858e+00
## 547	2130	weekend	1.989505e+01
## 548	2135	weekend	1.572524e+01
## 549	2140	weekend	1.302241e+01
## 550	2145	weekend	8.349057e+00
## 551	2150	weekend	7.766509e+00
## 552	2155	weekend	3.278302e-01

## 553	2200	weekend	1.244104e+00
## 554	2205	weekend	1.584906e+00
## 555	2210	weekend	6.014151e-01
## 556	2215	weekend	1.063679e+00
## 557	2220	weekend	8.844340e-01
## 558	2225	weekend	2.649764e+00
## 559	2230	weekend	1.219340e+00
## 560	2235	weekend	2.759434e-01
## 561	2240	weekend	1.102594e+00
## 562	2245	weekend	1.415094e-02
## 563	2250	weekend	7.629717e-01
## 564	2255	weekend	1.188797e+01
## 565	2300	weekend	2.600236e+00
## 566	2305	weekend	3.561321e-01
## 567	2310	weekend	0.000000e+00
## 568	2315	weekend	1.037736e-01
## 569	2320	weekend	1.202830e-01
## 570	2325	weekend	7.606132e-01
## 571	2330	weekend	1.387972e+00
## 572	2335	weekend	1.158726e+01
## 573	2340	weekend	6.287736e+00
## 574	2345	weekend	1.705189e+00
## 575	2350	weekend	2.830189e-02
## 576	2355	weekend	1.344340e-01

Question 7b: Create time series plot of weekdays versus weekends.

```
names(StepsByDay) <- c("interval", "day", "steps")
library(lattice)
xyplot(steps ~ interval | day, StepsByDay, type = "l", layout = c(1, 2),
       xlab = "Interval", ylab = "Number of steps")
```