

Machine Learning

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Machine Learning

Predicting the number of crime complaints using the the Linear Regression. It is a supervised regression model.

The predictor that is used is the temperature of the day and the temperature of the month.

I will be predicting the number of crime complaints daily and monthly.

Load the library

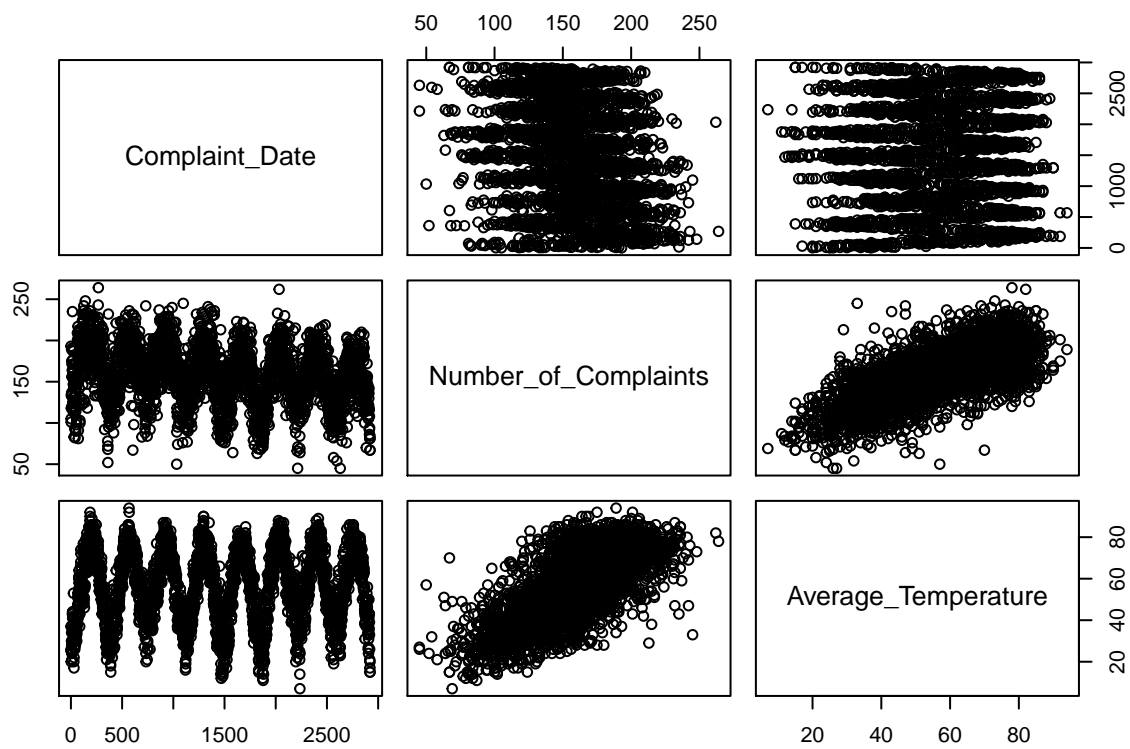
```
library(dplyr)
library(tidyr)
library(lubridate)
library(caTools)
```

Load the dataframe

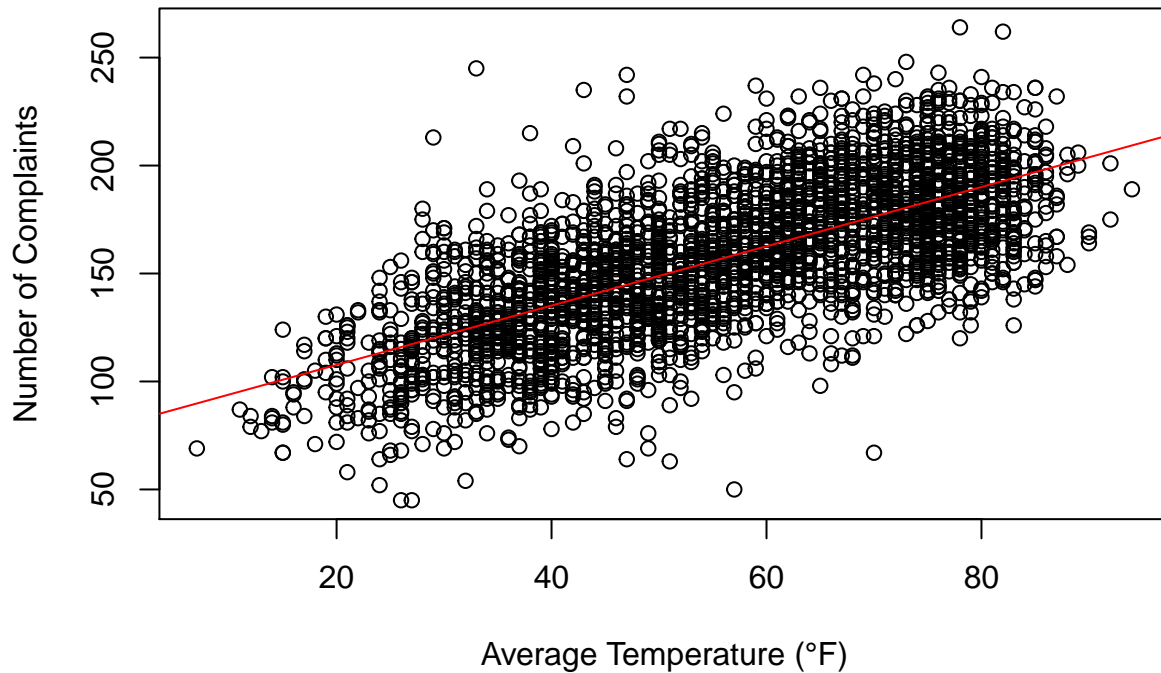
Looking into the daily dataset

```
## 'data.frame': 2922 obs. of 3 variables:
## $ Complaint_Date : Factor w/ 2922 levels "2010-01-01","2010-01-02",...: 1 2 3 4 5 6 7 8 9 10 ..
## $ Number_of_Complaints: int 193 105 101 118 133 135 189 175 137 120 ...
## $ Average_Temperature : int 37 26 20 25 25 30 34 28 24 21 ...

## Complaint_Date Number_of_Complaints Average_Temperature
## 2010-01-01: 1 Min. : 45 Min. : 7.00
## 2010-01-02: 1 1st Qu.:134 1st Qu.:43.00
## 2010-01-03: 1 Median :160 Median :58.00
## 2010-01-04: 1 Mean :158 Mean :56.64
## 2010-01-05: 1 3rd Qu.:183 3rd Qu.:72.00
## 2010-01-06: 1 Max. :264 Max. :94.00
## (Other) :2916
```



Daily Number of Complaints vs. Average Temperature



The summary function show the minimum, 1st quartile, median, mean, 3rd quartile, and the maximum for number of complaints and average temperature. In the Daily Number of Complaints vs. Average Temperature plot, the best fit line is shown as red.

Splitting the data into training and testing data

```
set.seed(314)
daily.split <- sample.split(Daily, SplitRatio = 0.7)
daily.train <- subset(Daily, split = "TRUE")
daily.test <- subset(Daily, split = "FALSE")
```

Splitting the data into 70% training data and 30% testing data.

Creating the model

```
daily.model <- lm(Number_of_Complaints ~ Average_Temperature, data = daily.train)
summary(daily.model)
```

```
##
## Call:
```

```
## lm(formula = Number_of_Complaints ~ Average_Temperature, data = daily.train)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -109.345  -16.968   -0.167   16.461  119.467
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      80.21428     1.56140   51.37  <2e-16 ***
## Average_Temperature  1.37330     0.02634   52.13  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 24.84 on 2920 degrees of freedom
## Multiple R-squared:  0.482, Adjusted R-squared:  0.4819
## F-statistic: 2718 on 1 and 2920 DF, p-value: < 2.2e-16
```

The summary of the daily.model show that average temperature is very significant by the significant codes. The multiple R-squared is 0.482.

Prediction

```
daily.pred <- predict(daily.model, daily.test)
daily.pred
```

```
##      1      2      3      4      5      6      7
## 131.02633 115.92004 107.68025 114.54674 114.54674 121.41324 126.90643
##      8      9     10     11     12     13     14
## 118.66664 113.17345 109.05355 115.92004 121.41324 121.41324 129.65303
##     15     16     17     18     19     20     21
## 139.26612 140.63941 136.51952 140.63941 140.63941 132.39962 129.65303
##     22     23     24     25     26     27     28
## 132.39962 126.90643 136.51952 152.99910 137.89282 128.27973 122.78654
##     29     30     31     32     33     34     35
## 107.68025 103.56036 110.42685 121.41324 121.41324 126.90643 125.53313
##     36     37     38     39     40     41     42
## 125.53313 117.29334 115.92004 121.41324 128.27973 124.15983 125.53313
##     43     44     45     46     47     48     49
## 124.15983 118.66664 126.90643 126.90643 122.78654 122.78654 129.65303
##     50     51     52     53     54     55     56
## 133.77292 135.14622 135.14622 131.02633 131.02633 133.77292 125.53313
##     57     58     59     60     61     62     63
## 121.41324 126.90643 131.02633 137.89282 137.89282 132.39962 136.51952
##     64     65     66     67     68     69     70
## 137.89282 139.26612 144.75931 150.25250 152.99910 150.25250 146.13261
##     71     72     73     74     75     76     77
## 136.51952 137.89282 144.75931 140.63941 151.62580 155.74570 162.61219
##     78     79     80     81     82     83     84
## 163.98549 168.10538 159.86559 154.37240 147.50591 151.62580 155.74570
##     85     86     87     88     89     90     91
## 139.26612 131.02633 139.26612 150.25250 143.38601 150.25250 161.23889
```

##	92	93	94	95	96	97	98
##	159.86559	158.49229	165.35879	170.85198	173.59858	181.83837	179.09177
##	99	100	101	102	103	104	105
##	157.11900	151.62580	168.10538	162.61219	151.62580	157.11900	165.35879
##	106	107	108	109	110	111	112
##	151.62580	148.87921	148.87921	155.74570	161.23889	163.98549	165.35879
##	113	114	115	116	117	118	119
##	157.11900	158.49229	147.50591	150.25250	148.87921	146.13261	158.49229
##	120	121	122	123	124	125	126
##	172.22528	183.21167	185.95826	181.83837	179.09177	174.97188	174.97188
##	127	128	129	130	131	132	133
##	166.73208	166.73208	146.13261	150.25250	148.87921	143.38601	155.74570
##	134	135	136	137	138	139	140
##	173.59858	172.22528	166.73208	169.47868	157.11900	158.49229	172.22528
##	141	142	143	144	145	146	147
##	180.46507	170.85198	169.47868	172.22528	179.09177	188.70486	174.97188
##	148	149	150	151	152	153	154
##	166.73208	174.97188	184.58496	187.33156	184.58496	185.95826	185.95826
##	155	156	157	158	159	160	161
##	190.07816	192.82475	183.21167	170.85198	172.22528	166.73208	170.85198
##	162	163	164	165	166	167	168
##	169.47868	176.34517	179.09177	179.09177	180.46507	176.34517	176.34517
##	169	170	171	172	173	174	175
##	180.46507	180.46507	190.07816	188.70486	188.70486	190.07816	196.94465
##	176	177	178	179	180	181	182
##	188.70486	190.07816	191.45146	196.94465	191.45146	177.71847	176.34517
##	183	184	185	186	187	188	189
##	179.09177	185.95826	196.94465	201.06455	206.55774	203.81114	194.19805
##	190	191	192	193	194	195	196
##	194.19805	187.33156	192.82475	195.57135	187.33156	184.58496	190.07816
##	197	198	199	200	201	202	203
##	195.57135	196.94465	198.31795	192.82475	192.82475	196.94465	192.82475
##	204	205	206	207	208	209	210
##	190.07816	202.43784	192.82475	187.33156	191.45146	192.82475	192.82475
##	211	212	213	214	215	216	217
##	184.58496	184.58496	183.21167	185.95826	188.70486	194.19805	198.31795
##	218	219	220	221	222	223	224
##	190.07816	187.33156	191.45146	195.57135	196.94465	196.94465	179.09177
##	225	226	227	228	229	230	231
##	183.21167	181.83837	179.09177	187.33156	194.19805	188.70486	190.07816
##	232	233	234	235	236	237	238
##	192.82475	184.58496	183.21167	173.59858	172.22528	172.22528	181.83837
##	239	240	241	242	243	244	245
##	176.34517	180.46507	191.45146	192.82475	198.31795	198.31795	198.31795
##	246	247	248	249	250	251	252
##	190.07816	180.46507	176.34517	176.34517	188.70486	187.33156	170.85198
##	253	254	255	256	257	258	259
##	173.59858	174.97188	166.73208	173.59858	173.59858	169.47868	169.47868
##	260	261	262	263	264	265	266
##	169.47868	168.10538	177.71847	172.22528	168.10538	183.21167	181.83837
##	267	268	269	270	271	272	273
##	184.58496	187.33156	173.59858	172.22528	179.09177	177.71847	179.09177
##	274	275	276	277	278	279	280
##	172.22528	161.23889	158.49229	154.37240	158.49229	161.23889	165.35879

##	281	282	283	284	285	286	287
##	168.10538	166.73208	159.86559	170.85198	165.35879	157.11900	158.49229
##	288	289	290	291	292	293	294
##	152.99910	154.37240	161.23889	155.74570	152.99910	152.99910	157.11900
##	295	296	297	298	299	300	301
##	148.87921	154.37240	163.98549	168.10538	173.59858	176.34517	169.47868
##	302	303	304	305	306	307	308
##	151.62580	148.87921	148.87921	139.26612	139.26612	146.13261	147.50591
##	309	310	311	312	313	314	315
##	147.50591	143.38601	140.63941	139.26612	146.13261	150.25250	147.50591
##	316	317	318	319	320	321	322
##	154.37240	155.74570	154.37240	154.37240	157.11900	157.11900	148.87921
##	323	324	325	326	327	328	329
##	140.63941	146.13261	140.63941	155.74570	157.11900	143.38601	139.26612
##	330	331	332	333	334	335	336
##	143.38601	132.39962	136.51952	137.89282	150.25250	148.87921	132.39962
##	337	338	339	340	341	342	343
##	131.02633	129.65303	125.53313	125.53313	125.53313	122.78654	117.29334
##	344	345	346	347	348	349	350
##	121.41324	135.14622	146.13261	128.27973	109.05355	113.17345	117.29334
##	351	352	353	354	355	356	357
##	121.41324	124.15983	126.90643	122.78654	125.53313	125.53313	125.53313
##	358	359	360	361	362	363	364
##	128.27973	120.03994	115.92004	113.17345	122.78654	126.90643	126.90643
##	365	366	367	368	369	370	371
##	136.51952	144.75931	140.63941	124.15983	129.65303	126.90643	121.41324
##	372	373	374	375	376	377	378
##	120.03994	117.29334	120.03994	121.41324	117.29334	118.66664	113.17345
##	379	380	381	382	383	384	385
##	113.17345	122.78654	124.15983	111.80015	125.53313	132.39962	125.53313
##	386	387	388	389	390	391	392
##	114.54674	106.30695	104.93366	100.81376	122.78654	125.53313	125.53313
##	393	394	395	396	397	398	399
##	122.78654	125.53313	125.53313	117.29334	118.66664	125.53313	120.03994
##	400	401	402	403	404	405	406
##	120.03994	131.02633	136.51952	136.51952	121.41324	110.42685	115.92004
##	407	408	409	410	411	412	413
##	118.66664	128.27973	131.02633	146.13261	122.78654	131.02633	155.74570
##	414	415	416	417	418	419	420
##	158.49229	133.77292	122.78654	122.78654	115.92004	122.78654	131.02633
##	421	422	423	424	425	426	427
##	143.38601	131.02633	140.63941	148.87921	135.14622	133.77292	117.29334
##	428	429	430	431	432	433	434
##	126.90643	150.25250	151.62580	140.63941	133.77292	135.14622	143.38601
##	435	436	437	438	439	440	441
##	146.13261	144.75931	144.75931	136.51952	136.51952	146.13261	155.74570
##	442	443	444	445	446	447	448
##	168.10538	147.50591	139.26612	136.51952	142.01271	129.65303	131.02633
##	449	450	451	452	453	454	455
##	128.27973	125.53313	131.02633	129.65303	135.14622	142.01271	135.14622
##	456	457	458	459	460	461	462
##	135.14622	144.75931	148.87921	152.99910	154.37240	144.75931	144.75931
##	463	464	465	466	467	468	469
##	143.38601	147.50591	150.25250	170.85198	161.23889	144.75931	161.23889

##	470	471	472	473	474	475	476
##	147.50591	146.13261	157.11900	155.74570	148.87921	155.74570	152.99910
##	477	478	479	480	481	482	483
##	143.38601	151.62580	172.22528	170.85198	174.97188	173.59858	172.22528
##	484	485	486	487	488	489	490
##	165.35879	161.23889	162.61219	158.49229	169.47868	155.74570	157.11900
##	491	492	493	494	495	496	497
##	163.98549	168.10538	166.73208	166.73208	168.10538	165.35879	166.73208
##	498	499	500	501	502	503	504
##	162.61219	163.98549	168.10538	159.86559	157.11900	163.98549	173.59858
##	505	506	507	508	509	510	511
##	163.98549	172.22528	157.11900	163.98549	181.83837	183.21167	177.71847
##	512	513	514	515	516	517	518
##	181.83837	184.58496	183.21167	187.33156	188.70486	190.07816	177.71847
##	519	520	521	522	523	524	525
##	172.22528	172.22528	166.73208	177.71847	185.95826	195.57135	192.82475
##	526	527	528	529	530	531	532
##	188.70486	170.85198	170.85198	172.22528	169.47868	176.34517	180.46507
##	533	534	535	536	537	538	539
##	176.34517	181.83837	184.58496	181.83837	184.58496	184.58496	174.97188
##	540	541	542	543	544	545	546
##	173.59858	179.09177	180.46507	181.83837	187.33156	184.58496	181.83837
##	547	548	549	550	551	552	553
##	180.46507	185.95826	179.09177	187.33156	188.70486	191.45146	194.19805
##	554	555	556	557	558	559	560
##	185.95826	187.33156	185.95826	194.19805	198.31795	187.33156	181.83837
##	561	562	563	564	565	566	567
##	185.95826	190.07816	192.82475	196.94465	196.94465	192.82475	198.31795
##	568	569	570	571	572	573	574
##	209.30434	206.55774	196.94465	181.83837	190.07816	184.58496	188.70486
##	575	576	577	578	579	580	581
##	187.33156	194.19805	191.45146	194.19805	192.82475	187.33156	184.58496
##	582	583	584	585	586	587	588
##	187.33156	188.70486	191.45146	192.82475	185.95826	187.33156	184.58496
##	589	590	591	592	593	594	595
##	181.83837	185.95826	176.34517	180.46507	179.09177	184.58496	183.21167
##	596	597	598	599	600	601	602
##	183.21167	183.21167	185.95826	177.71847	176.34517	181.83837	183.21167
##	603	604	605	606	607	608	609
##	185.95826	183.21167	176.34517	173.59858	179.09177	181.83837	183.21167
##	610	611	612	613	614	615	616
##	179.09177	183.21167	188.70486	185.95826	173.59858	169.47868	177.71847
##	617	618	619	620	621	622	623
##	184.58496	181.83837	173.59858	180.46507	183.21167	187.33156	169.47868
##	624	625	626	627	628	629	630
##	159.86559	161.23889	163.98549	162.61219	169.47868	173.59858	181.83837
##	631	632	633	634	635	636	637
##	177.71847	180.46507	183.21167	181.83837	180.46507	177.71847	172.22528
##	638	639	640	641	642	643	644
##	172.22528	161.23889	158.49229	152.99910	157.11900	165.35879	158.49229
##	645	646	647	648	649	650	651
##	158.49229	170.85198	179.09177	177.71847	173.59858	163.98549	165.35879
##	652	653	654	655	656	657	658
##	168.10538	162.61219	162.61219	163.98549	163.98549	163.98549	163.98549

##	659	660	661	662	663	664	665
##	152.99910	154.37240	155.74570	157.11900	157.11900	158.49229	148.87921
##	666	667	668	669	670	671	672
##	139.26612	133.77292	135.14622	142.01271	148.87921	148.87921	152.99910
##	673	674	675	676	677	678	679
##	144.75931	139.26612	143.38601	154.37240	163.98549	159.86559	158.49229
##	680	681	682	683	684	685	686
##	142.01271	146.13261	154.37240	165.35879	165.35879	157.11900	144.75931
##	687	688	689	690	691	692	693
##	136.51952	142.01271	158.49229	152.99910	144.75931	143.38601	143.38601
##	694	695	696	697	698	699	700
##	154.37240	159.86559	155.74570	166.73208	161.23889	146.13261	140.63941
##	701	702	703	704	705	706	707
##	143.38601	137.89282	147.50591	152.99910	161.23889	151.62580	136.51952
##	708	709	710	711	712	713	714
##	140.63941	133.77292	126.90643	133.77292	135.14622	139.26612	152.99910
##	715	716	717	718	719	720	721
##	148.87921	131.02633	117.29334	132.39962	142.01271	151.62580	152.99910
##	722	723	724	725	726	727	728
##	137.89282	125.53313	133.77292	137.89282	146.13261	136.51952	122.78654
##	729	730	731	732	733	734	735
##	140.63941	148.87921	144.75931	137.89282	113.17345	107.68025	126.90643
##	736	737	738	739	740	741	742
##	140.63941	154.37240	135.14622	129.65303	135.14622	139.26612	139.26612
##	743	744	745	746	747	748	749
##	133.77292	121.41324	109.05355	115.92004	142.01271	133.77292	120.03994
##	750	751	752	753	754	755	756
##	121.41324	115.92004	115.92004	140.63941	146.13261	135.14622	131.02633
##	757	758	759	760	761	762	763
##	148.87921	135.14622	133.77292	131.02633	154.37240	155.74570	139.26612
##	764	765	766	767	768	769	770
##	131.02633	136.51952	129.65303	137.89282	140.63941	128.27973	133.77292
##	771	772	773	774	775	776	777
##	135.14622	128.27973	115.92004	129.65303	137.89282	139.26612	135.14622
##	778	779	780	781	782	783	784
##	143.38601	137.89282	135.14622	133.77292	133.77292	148.87921	151.62580
##	785	786	787	788	789	790	791
##	136.51952	133.77292	131.02633	146.13261	142.01271	135.14622	133.77292
##	792	793	794	795	796	797	798
##	132.39962	147.50591	136.51952	129.65303	128.27973	148.87921	165.35879
##	799	800	801	802	803	804	805
##	150.25250	129.65303	147.50591	161.23889	168.10538	162.61219	146.13261
##	806	807	808	809	810	811	812
##	144.75931	154.37240	155.74570	169.47868	168.10538	165.35879	172.22528
##	813	814	815	816	817	818	819
##	172.22528	163.98549	147.50591	140.63941	136.51952	157.11900	151.62580
##	820	821	822	823	824	825	826
##	147.50591	136.51952	144.75931	147.50591	151.62580	159.86559	148.87921
##	827	828	829	830	831	832	833
##	147.50591	150.25250	157.11900	158.49229	152.99910	146.13261	151.62580
##	834	835	836	837	838	839	840
##	154.37240	163.98549	173.59858	185.95826	176.34517	157.11900	161.23889
##	841	842	843	844	845	846	847
##	166.73208	166.73208	148.87921	146.13261	148.87921	152.99910	152.99910

##	848	849	850	851	852	853	854
##	147.50591	147.50591	154.37240	152.99910	162.61219	151.62580	154.37240
##	855	856	857	858	859	860	861
##	168.10538	162.61219	161.23889	161.23889	163.98549	166.73208	159.86559
##	862	863	864	865	866	867	868
##	161.23889	170.85198	179.09177	172.22528	166.73208	176.34517	166.73208
##	869	870	871	872	873	874	875
##	166.73208	172.22528	173.59858	162.61219	169.47868	176.34517	168.10538
##	876	877	878	879	880	881	882
##	173.59858	184.58496	180.46507	190.07816	188.70486	179.09177	180.46507
##	883	884	885	886	887	888	889
##	173.59858	173.59858	172.22528	161.23889	159.86559	166.73208	173.59858
##	890	891	892	893	894	895	896
##	177.71847	177.71847	183.21167	177.71847	174.97188	172.22528	176.34517
##	897	898	899	900	901	902	903
##	176.34517	176.34517	170.85198	169.47868	176.34517	192.82475	199.69125
##	904	905	906	907	908	909	910
##	190.07816	185.95826	183.21167	173.59858	169.47868	185.95826	187.33156
##	911	912	913	914	915	916	917
##	191.45146	196.94465	195.57135	190.07816	190.07816	191.45146	198.31795
##	918	919	920	921	922	923	924
##	194.19805	196.94465	192.82475	190.07816	187.33156	187.33156	190.07816
##	925	926	927	928	929	930	931
##	192.82475	188.70486	190.07816	191.45146	196.94465	199.69125	179.09177
##	932	933	934	935	936	937	938
##	172.22528	176.34517	181.83837	188.70486	194.19805	184.58496	187.33156
##	939	940	941	942	943	944	945
##	188.70486	183.21167	181.83837	183.21167	183.21167	181.83837	188.70486
##	946	947	948	949	950	951	952
##	192.82475	194.19805	192.82475	188.70486	184.58496	190.07816	191.45146
##	953	954	955	956	957	958	959
##	183.21167	191.45146	190.07816	187.33156	184.58496	183.21167	184.58496
##	960	961	962	963	964	965	966
##	185.95826	177.71847	173.59858	179.09177	181.83837	183.21167	185.95826
##	967	968	969	970	971	972	973
##	187.33156	187.33156	184.58496	184.58496	190.07816	180.46507	179.09177
##	974	975	976	977	978	979	980
##	190.07816	194.19805	185.95826	183.21167	183.21167	184.58496	183.21167
##	981	982	983	984	985	986	987
##	188.70486	179.09177	177.71847	169.47868	168.10538	176.34517	179.09177
##	988	989	990	991	992	993	994
##	179.09177	172.22528	170.85198	173.59858	177.71847	168.10538	165.35879
##	995	996	997	998	999	1000	1001
##	173.59858	173.59858	165.35879	162.61219	166.73208	176.34517	174.97188
##	1002	1003	1004	1005	1006	1007	1008
##	169.47868	163.98549	165.35879	163.98549	170.85198	173.59858	176.34517
##	1009	1010	1011	1012	1013	1014	1015
##	176.34517	170.85198	148.87921	148.87921	154.37240	162.61219	152.99910
##	1016	1017	1018	1019	1020	1021	1022
##	147.50591	143.38601	165.35879	169.47868	154.37240	152.99910	159.86559
##	1023	1024	1025	1026	1027	1028	1029
##	168.10538	165.35879	158.49229	159.86559	162.61219	159.86559	161.23889
##	1030	1031	1032	1033	1034	1035	1036
##	163.98549	165.35879	158.49229	158.49229	150.25250	144.75931	144.75931

##	1037	1038	1039	1040	1041	1042	1043
##	146.13261	143.38601	142.01271	135.14622	131.02633	129.65303	135.14622
##	1044	1045	1046	1047	1048	1049	1050
##	142.01271	147.50591	158.49229	158.49229	150.25250	137.89282	135.14622
##	1051	1052	1053	1054	1055	1056	1057
##	137.89282	142.01271	140.63941	137.89282	143.38601	144.75931	146.13261
##	1058	1059	1060	1061	1062	1063	1064
##	148.87921	139.26612	131.02633	137.89282	132.39962	132.39962	133.77292
##	1065	1066	1067	1068	1069	1070	1071
##	137.89282	133.77292	144.75931	155.74570	155.74570	144.75931	128.27973
##	1072	1073	1074	1075	1076	1077	1078
##	136.51952	144.75931	143.38601	151.62580	148.87921	135.14622	136.51952
##	1079	1080	1081	1082	1083	1084	1085
##	139.26612	139.26612	142.01271	137.89282	147.50591	139.26612	136.51952
##	1086	1087	1088	1089	1090	1091	1092
##	143.38601	131.02633	133.77292	131.02633	131.02633	126.90643	128.27973
##	1093	1094	1095	1096	1097	1098	1099
##	126.90643	124.15983	122.78654	125.53313	125.53313	118.66664	118.66664
##	1100	1101	1102	1103	1104	1105	1106
##	126.90643	131.02633	135.14622	136.51952	137.89282	140.63941	140.63941
##	1107	1108	1109	1110	1111	1112	1113
##	137.89282	142.01271	144.75931	144.75931	131.02633	128.27973	133.77292
##	1114	1115	1116	1117	1118	1119	1120
##	121.41324	136.51952	137.89282	120.03994	107.68025	102.18706	103.56036
##	1121	1122	1123	1124	1125	1126	1127
##	106.30695	109.05355	117.29334	125.53313	139.26612	147.50591	143.38601
##	1128	1129	1130	1131	1132	1133	1134
##	118.66664	113.17345	117.29334	117.29334	121.41324	126.90643	120.03994
##	1135	1136	1137	1138	1139	1140	1141
##	122.78654	117.29334	117.29334	135.14622	135.14622	133.77292	135.14622
##	1142	1143	1144	1145	1146	1147	1148
##	143.38601	129.65303	114.54674	115.92004	136.51952	124.15983	120.03994
##	1149	1150	1151	1152	1153	1154	1155
##	124.15983	133.77292	136.51952	133.77292	135.14622	137.89282	142.01271
##	1156	1157	1158	1159	1160	1161	1162
##	136.51952	129.65303	128.27973	128.27973	135.14622	135.14622	129.65303
##	1163	1164	1165	1166	1167	1168	1169
##	131.02633	142.01271	139.26612	144.75931	148.87921	142.01271	128.27973
##	1170	1171	1172	1173	1174	1175	1176
##	133.77292	131.02633	126.90643	124.15983	132.39962	133.77292	128.27973
##	1177	1178	1179	1180	1181	1182	1183
##	128.27973	133.77292	135.14622	132.39962	142.01271	142.01271	140.63941
##	1184	1185	1186	1187	1188	1189	1190
##	146.13261	148.87921	147.50591	148.87921	132.39962	135.14622	139.26612
##	1191	1192	1193	1194	1195	1196	1197
##	152.99910	140.63941	146.13261	165.35879	172.22528	169.47868	154.37240
##	1198	1199	1200	1201	1202	1203	1204
##	140.63941	148.87921	151.62580	151.62580	155.74570	166.73208	155.74570
##	1205	1206	1207	1208	1209	1210	1211
##	166.73208	151.62580	143.38601	146.13261	144.75931	158.49229	157.11900
##	1212	1213	1214	1215	1216	1217	1218
##	161.23889	162.61219	162.61219	155.74570	162.61219	159.86559	163.98549
##	1219	1220	1221	1222	1223	1224	1225
##	159.86559	161.23889	155.74570	159.86559	166.73208	161.23889	163.98549

##	1226	1227	1228	1229	1230	1231	1232
##	174.97188	170.85198	163.98549	151.62580	151.62580	165.35879	177.71847
##	1233	1234	1235	1236	1237	1238	1239
##	169.47868	163.98549	158.49229	174.97188	185.95826	174.97188	179.09177
##	1240	1241	1242	1243	1244	1245	1246
##	155.74570	148.87921	158.49229	165.35879	165.35879	176.34517	191.45146
##	1247	1248	1249	1250	1251	1252	1253
##	194.19805	192.82475	188.70486	179.09177	170.85198	170.85198	169.47868
##	1254	1255	1256	1257	1258	1259	1260
##	163.98549	172.22528	179.09177	170.85198	179.09177	177.71847	165.35879
##	1261	1262	1263	1264	1265	1266	1267
##	166.73208	177.71847	180.46507	185.95826	181.83837	173.59858	177.71847
##	1268	1269	1270	1271	1272	1273	1274
##	180.46507	183.21167	188.70486	194.19805	192.82475	190.07816	190.07816
##	1275	1276	1277	1278	1279	1280	1281
##	188.70486	185.95826	190.07816	183.21167	185.95826	187.33156	191.45146
##	1282	1283	1284	1285	1286	1287	1288
##	194.19805	196.94465	196.94465	191.45146	191.45146	190.07816	190.07816
##	1289	1290	1291	1292	1293	1294	1295
##	180.46507	181.83837	192.82475	198.31795	198.31795	201.06455	203.81114
##	1296	1297	1298	1299	1300	1301	1302
##	203.81114	199.69125	194.19805	191.45146	190.07816	184.58496	170.85198
##	1303	1304	1305	1306	1307	1308	1309
##	181.83837	184.58496	181.83837	185.95826	183.21167	183.21167	177.71847
##	1310	1311	1312	1313	1314	1315	1316
##	183.21167	180.46507	180.46507	176.34517	180.46507	183.21167	184.58496
##	1317	1318	1319	1320	1321	1322	1323
##	190.07816	185.95826	180.46507	184.58496	180.46507	173.59858	174.97188
##	1324	1325	1326	1327	1328	1329	1330
##	180.46507	181.83837	179.09177	180.46507	187.33156	191.45146	183.21167
##	1331	1332	1333	1334	1335	1336	1337
##	185.95826	180.46507	181.83837	184.58496	188.70486	188.70486	184.58496
##	1338	1339	1340	1341	1342	1343	1344
##	187.33156	190.07816	190.07816	187.33156	183.21167	181.83837	179.09177
##	1345	1346	1347	1348	1349	1350	1351
##	169.47868	176.34517	181.83837	169.47868	187.33156	199.69125	188.70486
##	1352	1353	1354	1355	1356	1357	1358
##	173.59858	163.98549	165.35879	169.47868	159.86559	165.35879	172.22528
##	1359	1360	1361	1362	1363	1364	1365
##	176.34517	174.97188	165.35879	159.86559	162.61219	166.73208	169.47868
##	1366	1367	1368	1369	1370	1371	1372
##	166.73208	169.47868	169.47868	170.85198	177.71847	181.83837	177.71847
##	1373	1374	1375	1376	1377	1378	1379
##	184.58496	176.34517	173.59858	173.59858	163.98549	159.86559	162.61219
##	1380	1381	1382	1383	1384	1385	1386
##	168.10538	170.85198	163.98549	161.23889	166.73208	165.35879	172.22528
##	1387	1388	1389	1390	1391	1392	1393
##	165.35879	159.86559	158.49229	159.86559	161.23889	148.87921	146.13261
##	1394	1395	1396	1397	1398	1399	1400
##	144.75931	146.13261	151.62580	151.62580	148.87921	154.37240	162.61219
##	1401	1402	1403	1404	1405	1406	1407
##	169.47868	165.35879	143.38601	136.51952	146.13261	155.74570	154.37240
##	1408	1409	1410	1411	1412	1413	1414
##	142.01271	140.63941	152.99910	146.13261	137.89282	126.90643	139.26612

##	1415	1416	1417	1418	1419	1420	1421
##	150.25250	152.99910	157.11900	159.86559	140.63941	132.39962	140.63941
##	1422	1423	1424	1425	1426	1427	1428
##	154.37240	139.26612	117.29334	120.03994	135.14622	147.50591	125.53313
##	1429	1430	1431	1432	1433	1434	1435
##	126.90643	124.15983	139.26612	142.01271	143.38601	144.75931	154.37240
##	1436	1437	1438	1439	1440	1441	1442
##	148.87921	131.02633	122.78654	128.27973	126.90643	121.41324	117.29334
##	1443	1444	1445	1446	1447	1448	1449
##	120.03994	118.66664	128.27973	120.03994	118.66664	121.41324	133.77292
##	1450	1451	1452	1453	1454	1455	1456
##	144.75931	159.86559	170.85198	152.99910	126.90643	114.54674	125.53313
##	1457	1458	1459	1460	1461	1462	1463
##	129.65303	143.38601	142.01271	126.90643	117.29334	120.03994	115.92004
##	1464	1465	1466	1467	1468	1469	1470
##	99.44046	106.30695	126.90643	131.02633	96.69387	102.18706	117.29334
##	1471	1472	1473	1474	1475	1476	1477
##	126.90643	146.13261	143.38601	140.63941	146.13261	135.14622	132.39962
##	1478	1479	1480	1481	1482	1483	1484
##	133.77292	126.90643	122.78654	135.14622	111.80015	98.06716	99.44046
##	1485	1486	1487	1488	1489	1490	1491
##	100.81376	113.17345	115.92004	125.53313	103.56036	106.30695	111.80015
##	1492	1493	1494	1495	1496	1497	1498
##	124.15983	136.51952	146.13261	132.39962	120.03994	124.15983	117.29334
##	1499	1500	1501	1502	1503	1504	1505
##	118.66664	114.54674	115.92004	114.54674	109.05355	106.30695	121.41324
##	1506	1507	1508	1509	1510	1511	1512
##	129.65303	124.15983	115.92004	114.54674	125.53313	135.14622	140.63941
##	1513	1514	1515	1516	1517	1518	1519
##	139.26612	144.75931	147.50591	129.65303	120.03994	115.92004	113.17345
##	1520	1521	1522	1523	1524	1525	1526
##	103.56036	120.03994	129.65303	114.54674	109.05355	125.53313	113.17345
##	1527	1528	1529	1530	1531	1532	1533
##	124.15983	143.38601	135.14622	140.63941	157.11900	140.63941	115.92004
##	1534	1535	1536	1537	1538	1539	1540
##	126.90643	148.87921	129.65303	120.03994	129.65303	133.77292	144.75931
##	1541	1542	1543	1544	1545	1546	1547
##	142.01271	151.62580	128.27973	118.66664	125.53313	121.41324	125.53313
##	1548	1549	1550	1551	1552	1553	1554
##	148.87921	150.25250	140.63941	143.38601	148.87921	146.13261	158.49229
##	1555	1556	1557	1558	1559	1560	1561
##	140.63941	144.75931	147.50591	146.13261	155.74570	152.99910	148.87921
##	1562	1563	1564	1565	1566	1567	1568
##	170.85198	165.35879	170.85198	172.22528	146.13261	135.14622	137.89282
##	1569	1570	1571	1572	1573	1574	1575
##	137.89282	155.74570	152.99910	154.37240	163.98549	152.99910	151.62580
##	1576	1577	1578	1579	1580	1581	1582
##	154.37240	158.49229	152.99910	157.11900	146.13261	144.75931	169.47868
##	1583	1584	1585	1586	1587	1588	1589
##	166.73208	166.73208	162.61219	162.61219	165.35879	162.61219	157.11900
##	1590	1591	1592	1593	1594	1595	1596
##	161.23889	176.34517	177.71847	183.21167	166.73208	165.35879	169.47868
##	1597	1598	1599	1600	1601	1602	1603
##	166.73208	165.35879	161.23889	163.98549	170.85198	174.97188	166.73208

##	1604	1605	1606	1607	1608	1609	1610
##	168.10538	168.10538	173.59858	184.58496	183.21167	161.23889	161.23889
##	1611	1612	1613	1614	1615	1616	1617
##	169.47868	169.47868	170.85198	176.34517	184.58496	180.46507	174.97188
##	1618	1619	1620	1621	1622	1623	1624
##	174.97188	177.71847	184.58496	173.59858	177.71847	170.85198	172.22528
##	1625	1626	1627	1628	1629	1630	1631
##	179.09177	172.22528	176.34517	179.09177	190.07816	194.19805	180.46507
##	1632	1633	1634	1635	1636	1637	1638
##	179.09177	176.34517	179.09177	180.46507	183.21167	187.33156	187.33156
##	1639	1640	1641	1642	1643	1644	1645
##	183.21167	185.95826	184.58496	185.95826	191.45146	192.82475	187.33156
##	1646	1647	1648	1649	1650	1651	1652
##	176.34517	179.09177	183.21167	191.45146	191.45146	190.07816	187.33156
##	1653	1654	1655	1656	1657	1658	1659
##	188.70486	187.33156	187.33156	187.33156	188.70486	183.21167	181.83837
##	1660	1661	1662	1663	1664	1665	1666
##	180.46507	179.09177	179.09177	184.58496	188.70486	190.07816	183.21167
##	1667	1668	1669	1670	1671	1672	1673
##	181.83837	183.21167	187.33156	183.21167	176.34517	179.09177	183.21167
##	1674	1675	1676	1677	1678	1679	1680
##	187.33156	174.97188	177.71847	185.95826	191.45146	185.95826	183.21167
##	1681	1682	1683	1684	1685	1686	1687
##	181.83837	185.95826	187.33156	188.70486	183.21167	183.21167	176.34517
##	1688	1689	1690	1691	1692	1693	1694
##	172.22528	177.71847	181.83837	179.09177	180.46507	185.95826	181.83837
##	1695	1696	1697	1698	1699	1700	1701
##	179.09177	179.09177	179.09177	184.58496	190.07816	190.07816	181.83837
##	1702	1703	1704	1705	1706	1707	1708
##	177.71847	180.46507	192.82475	192.82475	196.94465	188.70486	187.33156
##	1709	1710	1711	1712	1713	1714	1715
##	190.07816	188.70486	180.46507	176.34517	173.59858	179.09177	184.58496
##	1716	1717	1718	1719	1720	1721	1722
##	176.34517	168.10538	165.35879	166.73208	168.10538	168.10538	172.22528
##	1723	1724	1725	1726	1727	1728	1729
##	162.61219	170.85198	177.71847	166.73208	165.35879	169.47868	163.98549
##	1730	1731	1732	1733	1734	1735	1736
##	173.59858	179.09177	181.83837	180.46507	172.22528	166.73208	170.85198
##	1737	1738	1739	1740	1741	1742	1743
##	168.10538	163.98549	154.37240	162.61219	172.22528	173.59858	165.35879
##	1744	1745	1746	1747	1748	1749	1750
##	159.86559	155.74570	157.11900	161.23889	176.34517	180.46507	170.85198
##	1751	1752	1753	1754	1755	1756	1757
##	169.47868	166.73208	148.87921	150.25250	163.98549	154.37240	151.62580
##	1758	1759	1760	1761	1762	1763	1764
##	158.49229	161.23889	159.86559	157.11900	166.73208	165.35879	152.99910
##	1765	1766	1767	1768	1769	1770	1771
##	148.87921	142.01271	142.01271	148.87921	163.98549	162.61219	152.99910
##	1772	1773	1774	1775	1776	1777	1778
##	144.75931	137.89282	151.62580	152.99910	158.49229	157.11900	137.89282
##	1779	1780	1781	1782	1783	1784	1785
##	133.77292	132.39962	135.14622	143.38601	128.27973	120.03994	132.39962
##	1786	1787	1788	1789	1790	1791	1792
##	125.53313	129.65303	148.87921	163.98549	162.61219	139.26612	129.65303

##	1793	1794	1795	1796	1797	1798	1799
##	125.53313	129.65303	148.87921	154.37240	133.77292	140.63941	136.51952
##	1800	1801	1802	1803	1804	1805	1806
##	133.77292	142.01271	129.65303	122.78654	133.77292	129.65303	128.27973
##	1807	1808	1809	1810	1811	1812	1813
##	128.27973	133.77292	137.89282	139.26612	140.63941	146.13261	135.14622
##	1814	1815	1816	1817	1818	1819	1820
##	128.27973	124.15983	126.90643	135.14622	142.01271	150.25250	152.99910
##	1821	1822	1823	1824	1825	1826	1827
##	142.01271	148.87921	147.50591	133.77292	122.78654	121.41324	125.53313
##	1828	1829	1830	1831	1832	1833	1834
##	133.77292	132.39962	147.50591	128.27973	109.05355	102.18706	100.81376
##	1835	1836	1837	1838	1839	1840	1841
##	115.92004	107.68025	118.66664	131.02633	117.29334	113.17345	121.41324
##	1842	1843	1844	1845	1846	1847	1848
##	124.15983	114.54674	131.02633	133.77292	129.65303	122.78654	129.65303
##	1849	1850	1851	1852	1853	1854	1855
##	126.90643	129.65303	131.02633	117.29334	114.54674	114.54674	118.66664
##	1856	1857	1858	1859	1860	1861	1862
##	120.03994	107.68025	118.66664	113.17345	107.68025	126.90643	118.66664
##	1863	1864	1865	1866	1867	1868	1869
##	107.68025	125.53313	125.53313	117.29334	125.53313	118.66664	118.66664
##	1870	1871	1872	1873	1874	1875	1876
##	100.81376	113.17345	100.81376	96.69387	109.05355	115.92004	104.93366
##	1877	1878	1879	1880	1881	1882	1883
##	95.32057	111.80015	132.39962	111.80015	99.44046	120.03994	117.29334
##	1884	1885	1886	1887	1888	1889	1890
##	113.17345	109.05355	118.66664	125.53313	121.41324	135.14622	121.41324
##	1891	1892	1893	1894	1895	1896	1897
##	107.68025	118.66664	139.26612	144.75931	143.38601	151.62580	137.89282
##	1898	1899	1900	1901	1902	1903	1904
##	131.02633	143.38601	135.14622	140.63941	143.38601	126.90643	129.65303
##	1905	1906	1907	1908	1909	1910	1911
##	126.90643	132.39962	129.65303	122.78654	129.65303	137.89282	151.62580
##	1912	1913	1914	1915	1916	1917	1918
##	139.26612	125.53313	129.65303	142.01271	136.51952	137.89282	154.37240
##	1919	1920	1921	1922	1923	1924	1925
##	165.35879	150.25250	151.62580	152.99910	151.62580	136.51952	135.14622
##	1926	1927	1928	1929	1930	1931	1932
##	146.13261	150.25250	155.74570	161.23889	162.61219	165.35879	159.86559
##	1933	1934	1935	1936	1937	1938	1939
##	166.73208	176.34517	157.11900	151.62580	161.23889	161.23889	144.75931
##	1940	1941	1942	1943	1944	1945	1946
##	143.38601	148.87921	155.74570	157.11900	163.98549	168.10538	159.86559
##	1947	1948	1949	1950	1951	1952	1953
##	157.11900	163.98549	170.85198	177.71847	184.58496	170.85198	173.59858
##	1954	1955	1956	1957	1958	1959	1960
##	174.97188	168.10538	179.09177	185.95826	183.21167	165.35879	165.35879
##	1961	1962	1963	1964	1965	1966	1967
##	169.47868	170.85198	181.83837	173.59858	176.34517	163.98549	158.49229
##	1968	1969	1970	1971	1972	1973	1974
##	169.47868	162.61219	174.97188	183.21167	187.33156	187.33156	187.33156
##	1975	1976	1977	1978	1979	1980	1981
##	183.21167	184.58496	179.09177	155.74570	152.99910	163.98549	162.61219

##	1982	1983	1984	1985	1986	1987	1988
##	166.73208	173.59858	169.47868	177.71847	184.58496	181.83837	191.45146
##	1989	1990	1991	1992	1993	1994	1995
##	191.45146	188.70486	185.95826	181.83837	179.09177	181.83837	173.59858
##	1996	1997	1998	1999	2000	2001	2002
##	187.33156	176.34517	190.07816	188.70486	194.19805	184.58496	181.83837
##	2003	2004	2005	2006	2007	2008	2009
##	183.21167	169.47868	173.59858	176.34517	183.21167	184.58496	183.21167
##	2010	2011	2012	2013	2014	2015	2016
##	181.83837	179.09177	184.58496	187.33156	192.82475	194.19805	181.83837
##	2017	2018	2019	2020	2021	2022	2023
##	187.33156	188.70486	191.45146	191.45146	187.33156	185.95826	179.09177
##	2024	2025	2026	2027	2028	2029	2030
##	181.83837	187.33156	198.31795	201.06455	192.82475	185.95826	185.95826
##	2031	2032	2033	2034	2035	2036	2037
##	188.70486	188.70486	192.82475	188.70486	196.94465	199.69125	192.82475
##	2038	2039	2040	2041	2042	2043	2044
##	191.45146	192.82475	190.07816	194.19805	188.70486	190.07816	183.21167
##	2045	2046	2047	2048	2049	2050	2051
##	185.95826	183.21167	185.95826	185.95826	184.58496	187.33156	183.21167
##	2052	2053	2054	2055	2056	2057	2058
##	187.33156	194.19805	196.94465	199.69125	192.82475	192.82475	192.82475
##	2059	2060	2061	2062	2063	2064	2065
##	188.70486	187.33156	187.33156	190.07816	192.82475	184.58496	183.21167
##	2066	2067	2068	2069	2070	2071	2072
##	180.46507	185.95826	191.45146	195.57135	194.19805	194.19805	195.57135
##	2073	2074	2075	2076	2077	2078	2079
##	188.70486	183.21167	184.58496	191.45146	199.69125	194.19805	183.21167
##	2080	2081	2082	2083	2084	2085	2086
##	181.83837	181.83837	177.71847	173.59858	180.46507	185.95826	188.70486
##	2087	2088	2089	2090	2091	2092	2093
##	187.33156	184.58496	179.09177	170.85198	172.22528	176.34517	177.71847
##	2094	2095	2096	2097	2098	2099	2100
##	176.34517	172.22528	168.10538	179.09177	187.33156	174.97188	162.61219
##	2101	2102	2103	2104	2105	2106	2107
##	152.99910	151.62580	159.86559	162.61219	166.73208	170.85198	170.85198
##	2108	2109	2110	2111	2112	2113	2114
##	176.34517	159.86559	163.98549	172.22528	172.22528	166.73208	159.86559
##	2115	2116	2117	2118	2119	2120	2121
##	161.23889	147.50591	140.63941	140.63941	161.23889	172.22528	172.22528
##	2122	2123	2124	2125	2126	2127	2128
##	155.74570	147.50591	159.86559	151.62580	151.62580	163.98549	169.47868
##	2129	2130	2131	2132	2133	2134	2135
##	155.74570	147.50591	162.61219	161.23889	162.61219	166.73208	168.10538
##	2136	2137	2138	2139	2140	2141	2142
##	176.34517	166.73208	150.25250	150.25250	154.37240	154.37240	157.11900
##	2143	2144	2145	2146	2147	2148	2149
##	151.62580	143.38601	147.50591	161.23889	143.38601	151.62580	163.98549
##	2150	2151	2152	2153	2154	2155	2156
##	155.74570	146.13261	147.50591	133.77292	133.77292	139.26612	150.25250
##	2157	2158	2159	2160	2161	2162	2163
##	159.86559	152.99910	139.26612	135.14622	146.13261	151.62580	148.87921
##	2164	2165	2166	2167	2168	2169	2170
##	144.75931	143.38601	143.38601	146.13261	142.01271	146.13261	157.11900

##	2171	2172	2173	2174	2175	2176	2177
##	157.11900	163.98549	163.98549	162.61219	163.98549	148.87921	155.74570
##	2178	2179	2180	2181	2182	2183	2184
##	146.13261	132.39962	133.77292	146.13261	159.86559	159.86559	173.59858
##	2185	2186	2187	2188	2189	2190	2191
##	165.35879	152.99910	154.37240	135.14622	135.14622	139.26612	142.01271
##	2192	2193	2194	2195	2196	2197	2198
##	132.39962	129.65303	135.14622	114.54674	107.68025	125.53313	133.77292
##	2199	2200	2201	2202	2203	2204	2205
##	133.77292	140.63941	148.87921	125.53313	128.27973	115.92004	121.41324
##	2206	2207	2208	2209	2210	2211	2212
##	139.26612	144.75931	129.65303	114.54674	110.42685	124.15983	122.78654
##	2213	2214	2215	2216	2217	2218	2219
##	115.92004	115.92004	118.66664	126.90643	139.26612	136.51952	131.02633
##	2220	2221	2222	2223	2224	2225	2226
##	129.65303	126.90643	143.38601	151.62580	140.63941	150.25250	151.62580
##	2227	2228	2229	2230	2231	2232	2233
##	132.39962	126.90643	135.14622	126.90643	124.15983	128.27973	114.54674
##	2234	2235	2236	2237	2238	2239	2240
##	109.05355	99.44046	89.82737	113.17345	142.01271	131.02633	124.15983
##	2241	2242	2243	2244	2245	2246	2247
##	124.15983	148.87921	148.87921	142.01271	132.39962	146.13261	147.50591
##	2248	2249	2250	2251	2252	2253	2254
##	125.53313	126.90643	147.50591	154.37240	143.38601	137.89282	122.78654
##	2255	2256	2257	2258	2259	2260	2261
##	128.27973	128.27973	132.39962	146.13261	158.49229	163.98549	177.71847
##	2262	2263	2264	2265	2266	2267	2268
##	159.86559	148.87921	157.11900	143.38601	150.25250	158.49229	154.37240
##	2269	2270	2271	2272	2273	2274	2275
##	148.87921	136.51952	132.39962	136.51952	143.38601	162.61219	148.87921
##	2276	2277	2278	2279	2280	2281	2282
##	159.86559	144.75931	147.50591	151.62580	144.75931	144.75931	163.98549
##	2283	2284	2285	2286	2287	2288	2289
##	176.34517	155.74570	137.89282	131.02633	128.27973	133.77292	152.99910
##	2290	2291	2292	2293	2294	2295	2296
##	142.01271	135.14622	136.51952	154.37240	151.62580	147.50591	152.99910
##	2297	2298	2299	2300	2301	2302	2303
##	154.37240	157.11900	162.61219	172.22528	168.10538	161.23889	163.98549
##	2304	2305	2306	2307	2308	2309	2310
##	177.71847	166.73208	159.86559	162.61219	154.37240	154.37240	154.37240
##	2311	2312	2313	2314	2315	2316	2317
##	151.62580	157.11900	146.13261	152.99910	154.37240	148.87921	151.62580
##	2318	2319	2320	2321	2322	2323	2324
##	150.25250	154.37240	159.86559	165.35879	158.49229	166.73208	173.59858
##	2325	2326	2327	2328	2329	2330	2331
##	165.35879	169.47868	151.62580	155.74570	159.86559	157.11900	168.10538
##	2332	2333	2334	2335	2336	2337	2338
##	169.47868	162.61219	163.98549	172.22528	170.85198	183.21167	190.07816
##	2339	2340	2341	2342	2343	2344	2345
##	190.07816	192.82475	188.70486	183.21167	187.33156	183.21167	176.34517
##	2346	2347	2348	2349	2350	2351	2352
##	172.22528	183.21167	173.59858	181.83837	183.21167	162.61219	166.73208
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##	172.22528	181.83837	180.46507	170.85198	174.97188	181.83837	176.34517

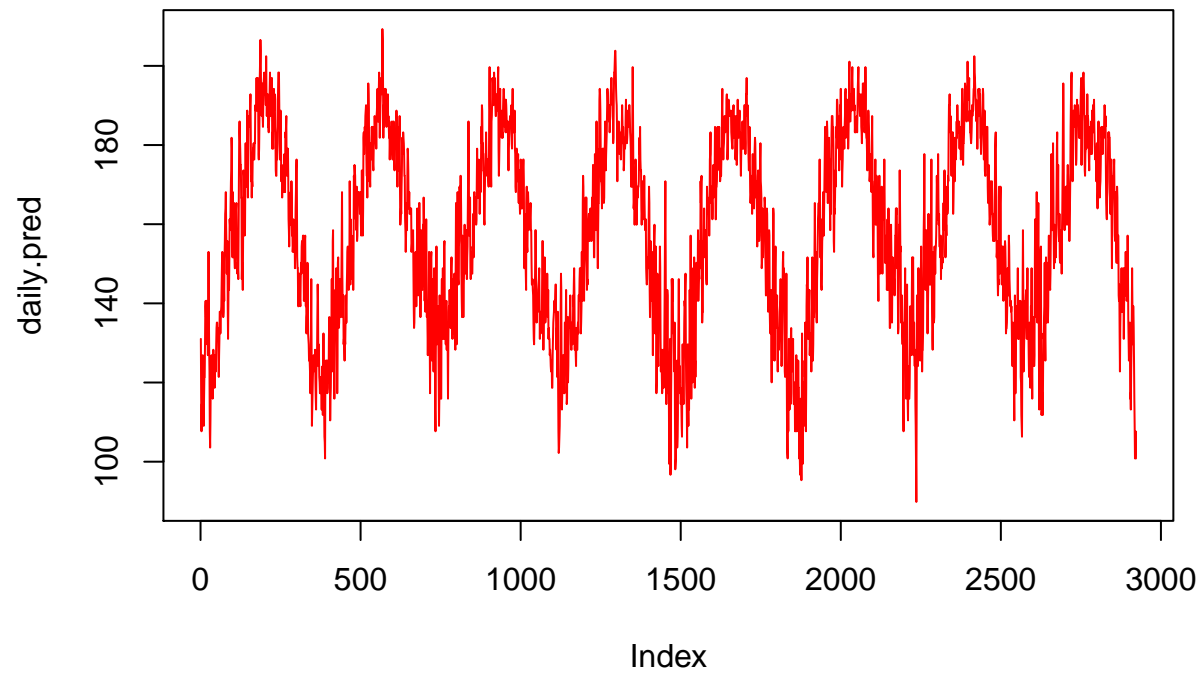
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##	184.58496	183.21167	185.95826	183.21167	179.09177	183.21167	184.58496
##	2374	2375	2376	2377	2378	2379	2380
##	180.46507	176.34517	177.71847	183.21167	187.33156	194.19805	194.19805
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##	185.95826	174.97188	180.46507	180.46507	183.21167	187.33156	191.45146
##	2388	2389	2390	2391	2392	2393	2394
##	195.57135	194.19805	192.82475	194.19805	187.33156	185.95826	191.45146
##	2395	2396	2397	2398	2399	2400	2401
##	195.57135	201.06455	196.94465	194.19805	191.45146	194.19805	196.94465
##	2402	2403	2404	2405	2406	2407	2408
##	185.95826	188.70486	183.21167	183.21167	181.83837	180.46507	181.83837
##	2409	2410	2411	2412	2413	2414	2415
##	184.58496	190.07816	187.33156	188.70486	188.70486	191.45146	194.19805
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##	194.19805	202.43784	198.31795	196.94465	194.19805	191.45146	188.70486
##	2423	2424	2425	2426	2427	2428	2429
##	191.45146	185.95826	190.07816	179.09177	179.09177	187.33156	187.33156
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##	194.19805	192.82475	191.45146	194.19805	187.33156	192.82475	181.83837
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##	181.83837	177.71847	180.46507	183.21167	184.58496	187.33156	190.07816
##	2444	2445	2446	2447	2448	2449	2450
##	194.19805	192.82475	183.21167	176.34517	181.83837	188.70486	173.59858
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##	172.22528	172.22528	184.58496	180.46507	183.21167	184.58496	184.58496
##	2458	2459	2460	2461	2462	2463	2464
##	184.58496	169.47868	165.35879	168.10538	174.97188	166.73208	163.98549
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##	159.86559	161.23889	162.61219	170.85198	169.47868	162.61219	168.10538
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##	155.74570	155.74570	163.98549	179.09177	181.83837	183.21167	170.85198
##	2486	2487	2488	2489	2490	2491	2492
##	166.73208	151.62580	152.99910	155.74570	146.13261	142.01271	146.13261
##	2493	2494	2495	2496	2497	2498	2499
##	144.75931	151.62580	169.47868	147.50591	147.50591	165.35879	169.47868
##	2500	2501	2502	2503	2504	2505	2506
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##	2507	2508	2509	2510	2511	2512	2513
##	151.62580	140.63941	150.25250	154.37240	151.62580	152.99910	155.74570
##	2514	2515	2516	2517	2518	2519	2520
##	154.37240	148.87921	132.39962	133.77292	133.77292	135.14622	139.26612
##	2521	2522	2523	2524	2525	2526	2527
##	148.87921	142.01271	142.01271	142.01271	157.11900	154.37240	146.13261
##	2528	2529	2530	2531	2532	2533	2534
##	143.38601	140.63941	139.26612	140.63941	137.89282	139.26612	135.14622
##	2535	2536	2537	2538	2539	2540	2541
##	128.27973	124.15983	124.15983	135.14622	133.77292	132.39962	117.29334
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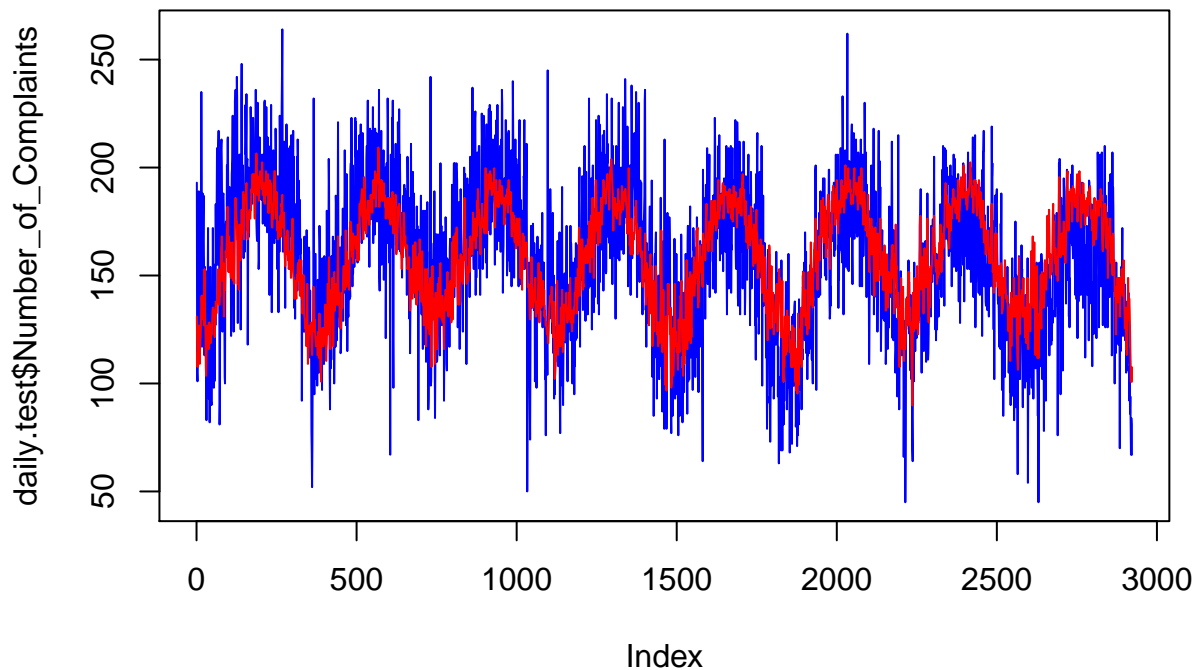
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##	135.14622	131.02633	133.77292	126.90643	121.41324	135.14622	133.77292
##	2591	2592	2593	2594	2595	2596	2597
##	121.41324	118.66664	131.02633	139.26612	133.77292	148.87921	124.15983
##	2598	2599	2600	2601	2602	2603	2604
##	115.92004	133.77292	128.27973	128.27973	128.27973	136.51952	124.15983
##	2605	2606	2607	2608	2609	2610	2611
##	126.90643	147.50591	161.23889	144.75931	136.51952	148.87921	155.74570
##	2612	2613	2614	2615	2616	2617	2618
##	168.10538	154.37240	135.14622	142.01271	152.99910	165.35879	148.87921
##	2619	2620	2621	2622	2623	2624	2625
##	124.15983	113.17345	115.92004	129.65303	147.50591	152.99910	154.37240
##	2626	2627	2628	2629	2630	2631	2632
##	128.27973	111.80015	113.17345	117.29334	117.29334	111.80015	124.15983
##	2633	2634	2635	2636	2637	2638	2639
##	132.39962	131.02633	136.51952	139.26612	150.25250	131.02633	125.53313
##	2640	2641	2642	2643	2644	2645	2646
##	144.75931	151.62580	135.14622	142.01271	140.63941	150.25250	142.01271
##	2647	2648	2649	2650	2651	2652	2653
##	135.14622	139.26612	151.62580	157.11900	146.13261	155.74570	144.75931
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##	143.38601	147.50591	157.11900	168.10538	177.71847	172.22528	158.49229
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##	158.49229	159.86559	180.46507	170.85198	157.11900	148.87921	159.86559
##	2668	2669	2670	2671	2672	2673	2674
##	150.25250	152.99910	157.11900	154.37240	151.62580	158.49229	168.10538
##	2675	2676	2677	2678	2679	2680	2681
##	179.09177	183.21167	162.61219	165.35879	174.97188	159.86559	157.11900
##	2682	2683	2684	2685	2686	2687	2688
##	155.74570	162.61219	151.62580	150.25250	155.74570	157.11900	158.49229
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##	158.49229	147.50591	158.49229	163.98549	173.59858	187.33156	195.57135
##	2696	2697	2698	2699	2700	2701	2702
##	188.70486	162.61219	163.98549	158.49229	166.73208	166.73208	159.86559
##	2703	2704	2705	2706	2707	2708	2709
##	169.47868	169.47868	169.47868	161.23889	159.86559	172.22528	174.97188
##	2710	2711	2712	2713	2714	2715	2716
##	172.22528	168.10538	166.73208	166.73208	155.74570	161.23889	165.35879
##	2717	2718	2719	2720	2721	2722	2723
##	172.22528	184.58496	191.45146	196.94465	198.31795	185.95826	176.34517
##	2724	2725	2726	2727	2728	2729	2730
##	170.85198	176.34517	187.33156	188.70486	185.95826	185.95826	184.58496
##	2731	2732	2733	2734	2735	2736	2737
##	190.07816	187.33156	184.58496	179.09177	174.97188	176.34517	183.21167

##	2738	2739	2740	2741	2742	2743	2744
##	191.45146	187.33156	190.07816	190.07816	187.33156	187.33156	181.83837
##	2745	2746	2747	2748	2749	2750	2751
##	181.83837	185.95826	181.83837	184.58496	190.07816	194.19805	196.94465
##	2752	2753	2754	2755	2756	2757	2758
##	174.97188	184.58496	187.33156	188.70486	191.45146	196.94465	198.31795
##	2759	2760	2761	2762	2763	2764	2765
##	195.57135	192.82475	183.21167	173.59858	172.22528	177.71847	179.09177
##	2766	2767	2768	2769	2770	2771	2772
##	187.33156	179.09177	180.46507	185.95826	192.82475	187.33156	187.33156
##	2773	2774	2775	2776	2777	2778	2779
##	185.95826	181.83837	176.34517	173.59858	179.09177	183.21167	184.58496
##	2780	2781	2782	2783	2784	2785	2786
##	184.58496	177.71847	185.95826	183.21167	177.71847	188.70486	184.58496
##	2787	2788	2789	2790	2791	2792	2793
##	187.33156	190.07816	183.21167	188.70486	191.45146	184.58496	180.46507
##	2794	2795	2796	2797	2798	2799	2800
##	177.71847	176.34517	177.71847	176.34517	170.85198	174.97188	180.46507
##	2801	2802	2803	2804	2805	2806	2807
##	166.73208	163.98549	168.10538	177.71847	185.95826	172.22528	169.47868
##	2808	2809	2810	2811	2812	2813	2814
##	169.47868	166.73208	169.47868	170.85198	174.97188	181.83837	184.58496
##	2815	2816	2817	2818	2819	2820	2821
##	181.83837	184.58496	183.21167	177.71847	181.83837	183.21167	184.58496
##	2822	2823	2824	2825	2826	2827	2828
##	181.83837	187.33156	190.07816	188.70486	184.58496	187.33156	174.97188
##	2829	2830	2831	2832	2833	2834	2835
##	165.35879	162.61219	161.23889	166.73208	168.10538	170.85198	181.83837
##	2836	2837	2838	2839	2840	2841	2842
##	183.21167	181.83837	183.21167	181.83837	181.83837	174.97188	162.61219
##	2843	2844	2845	2846	2847	2848	2849
##	162.61219	172.22528	176.34517	159.86559	148.87921	163.98549	168.10538
##	2850	2851	2852	2853	2854	2855	2856
##	169.47868	172.22528	172.22528	173.59858	176.34517	165.35879	157.11900
##	2857	2858	2859	2860	2861	2862	2863
##	155.74570	165.35879	168.10538	154.37240	150.25250	150.25250	169.47868
##	2864	2865	2866	2867	2868	2869	2870
##	166.73208	150.25250	157.11900	157.11900	142.01271	140.63941	144.75931
##	2871	2872	2873	2874	2875	2876	2877
##	132.39962	122.78654	133.77292	139.26612	137.89282	140.63941	148.87921
##	2878	2879	2880	2881	2882	2883	2884
##	137.89282	142.01271	147.50591	137.89282	148.87921	143.38601	131.02633
##	2885	2886	2887	2888	2889	2890	2891
##	139.26612	148.87921	143.38601	142.01271	142.01271	152.99910	143.38601
##	2892	2893	2894	2895	2896	2897	2898
##	144.75931	140.63941	142.01271	143.38601	157.11900	148.87921	136.51952
##	2899	2900	2901	2902	2903	2904	2905
##	131.02633	125.53313	126.90643	131.02633	135.14622	115.92004	117.29334
##	2906	2907	2908	2909	2910	2911	2912
##	113.17345	122.78654	128.27973	136.51952	148.87921	139.26612	129.65303
##	2913	2914	2915	2916	2917	2918	2919
##	139.26612	139.26612	133.77292	125.53313	115.92004	109.05355	100.81376
##	2920	2921	2922				
##	103.56036	107.68025	100.81376				

Running a prediction using the testing dataset.

Comparing predicted vs actual values





The test number of crime complaints is in blue and the predictin is in red.

Finding the accuracy

```
daily.rmse <- sqrt(mean(daily.pred - Daily$Number_of_Complaints)^2)
daily.rmse
```

```
## [1] 2.46279e-13
```

The accuracy of this model is found by using the RMSE(Root Mean Square Deviation). The RMSE is 2.46279e-13

Looking into the monthly dataset

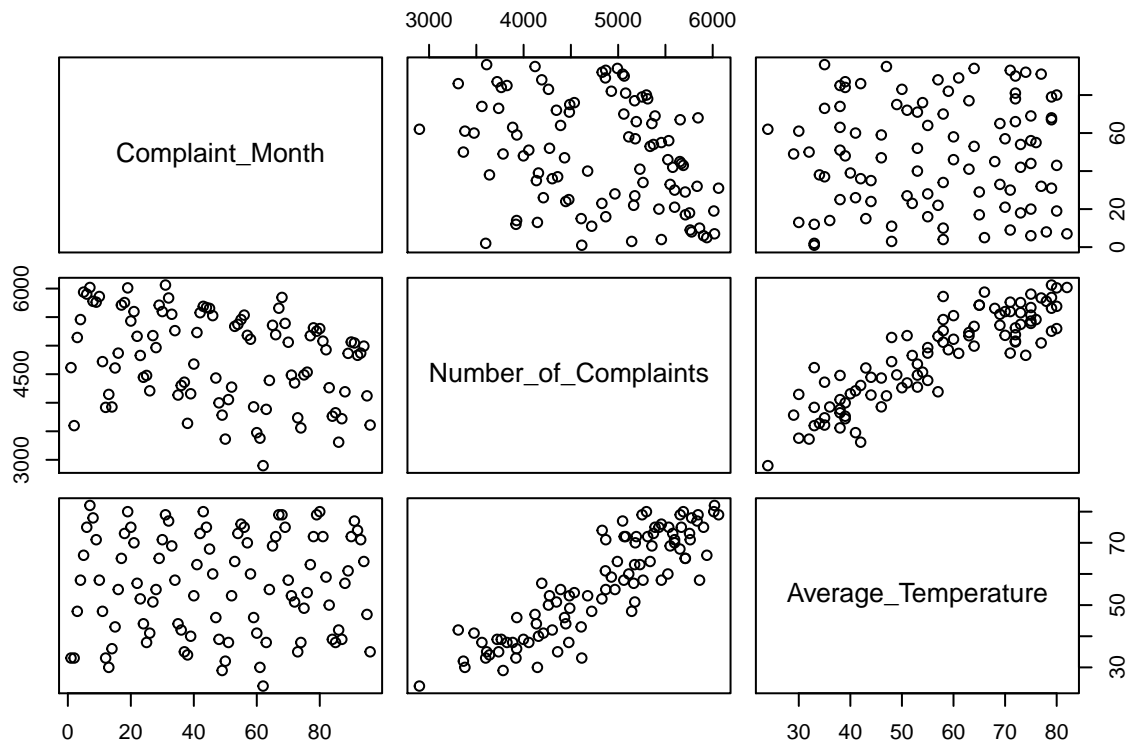
```
## 'data.frame': 96 obs. of 3 variables:
## $ Complaint_Month : Factor w/ 96 levels "2010-01","2010-02",...: 1 2 3 4 5 6 7 8 9 10 ...
## $ Number_of_Complaints: int 4615 3599 5143 5457 5938 5903 6019 5777 5762 5861 ...
## $ Average_Temperature : int 33 33 48 58 66 75 82 78 71 58 ...

## Complaint_Month Number_of_Complaints Average_Temperature
## 2010-01: 1 Min. :2898 Min. :24.00
```

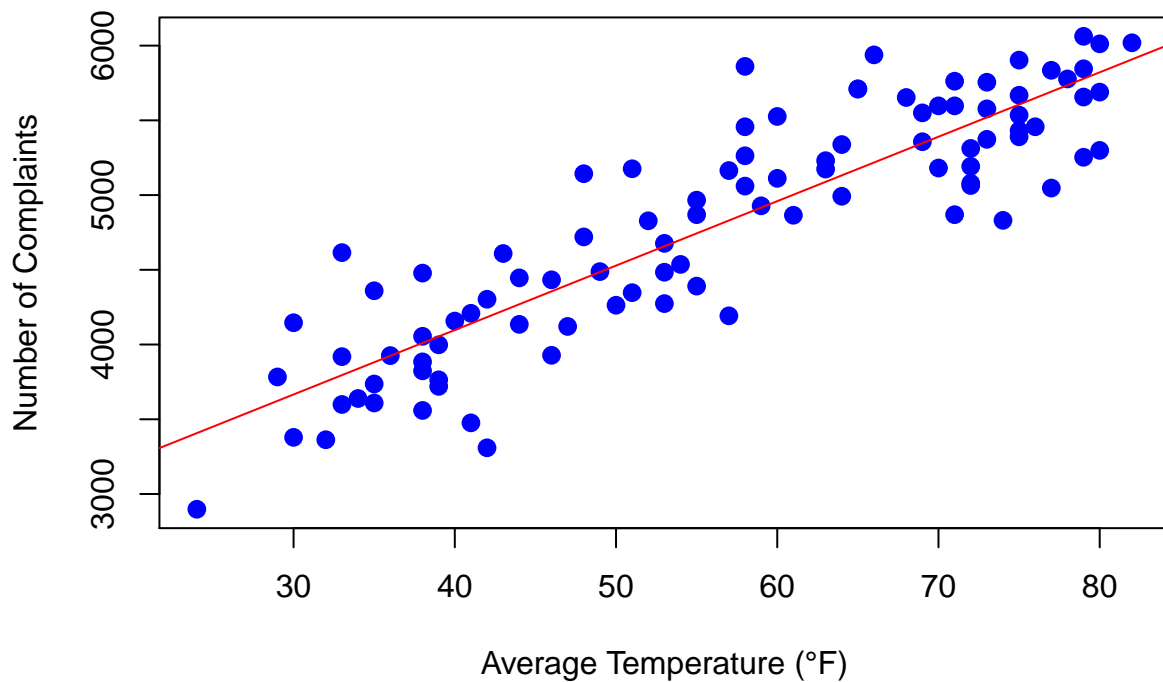
```

## 2010-02: 1      1st Qu.:4183      1st Qu.:41.75
## 2010-03: 1      Median :4947      Median :57.50
## 2010-04: 1      Mean   :4809      Mean   :56.52
## 2010-05: 1      3rd Qu.:5457      3rd Qu.:72.00
## 2010-06: 1      Max.    :6062      Max.    :82.00
## (Other):90

```



Monthly Number of Complaints vs. Average Temperature



In the Monthly Number of Complaints vs. Average Temperature plot, the best fit line is shown as red.

Splitting the data into training and test data

```
set.seed(314)
monthly.split <- sample.split(Monthly, SplitRatio = 0.7)
monthly.train <- subset(Monthly, split = "TRUE")
monthly.test <- subset(Monthly, split = "FALSE")
```

Again the data is splitted into training set and a testing set. 70% is in the training dataset and 30% is in the testing dataset.

Creating the model

```
monthly.model <- lm(Number_of_Complaints ~ Average_Temperature, data = monthly.train)
summary(monthly.model)
```

```
##
## Call:
## lm(formula = Number_of_Complaints ~ Average_Temperature, data = monthly.train)
```

```
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -874.28 -217.97   15.69   206.41   987.97
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2372.711    136.173   17.42  <2e-16 ***
## Average_Temperature  43.109      2.318   18.59  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 363 on 94 degrees of freedom
## Multiple R-squared:  0.7862, Adjusted R-squared:  0.784
## F-statistic: 345.8 on 1 and 94 DF,  p-value: < 2.2e-16
```

Again the average temperature is very significant due to the significant code. The multiple R-squared is 0.7862. The monthly model have a better correlation between average temperature and number of crime complaints than the daily model.

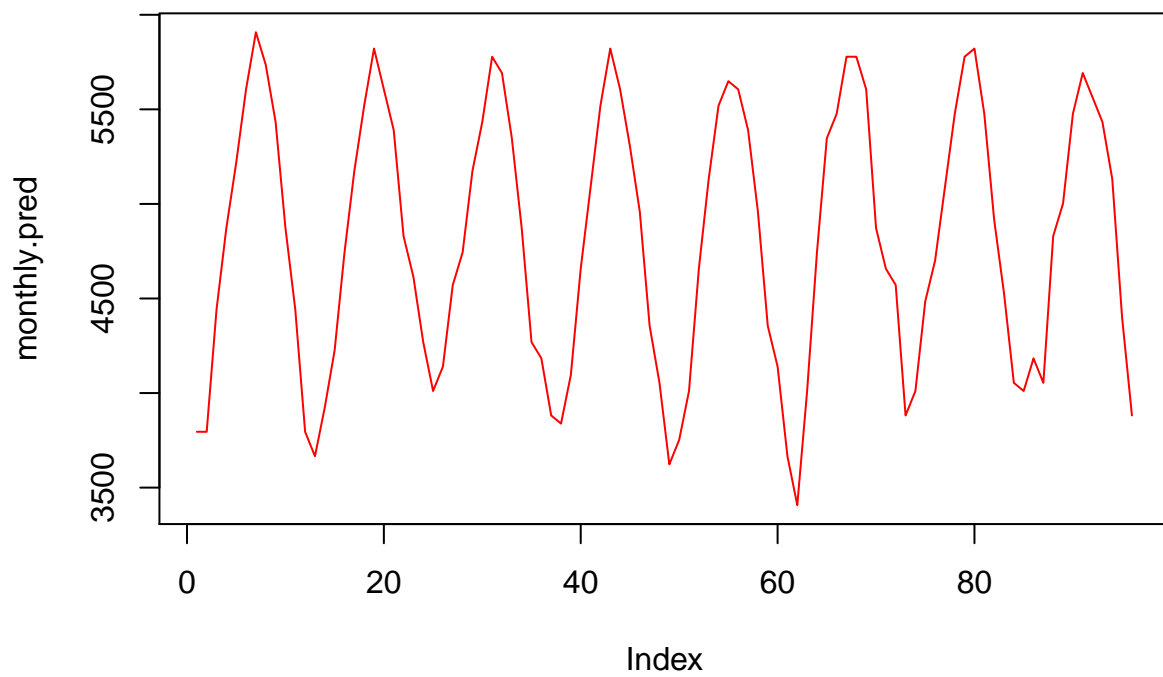
Prediction

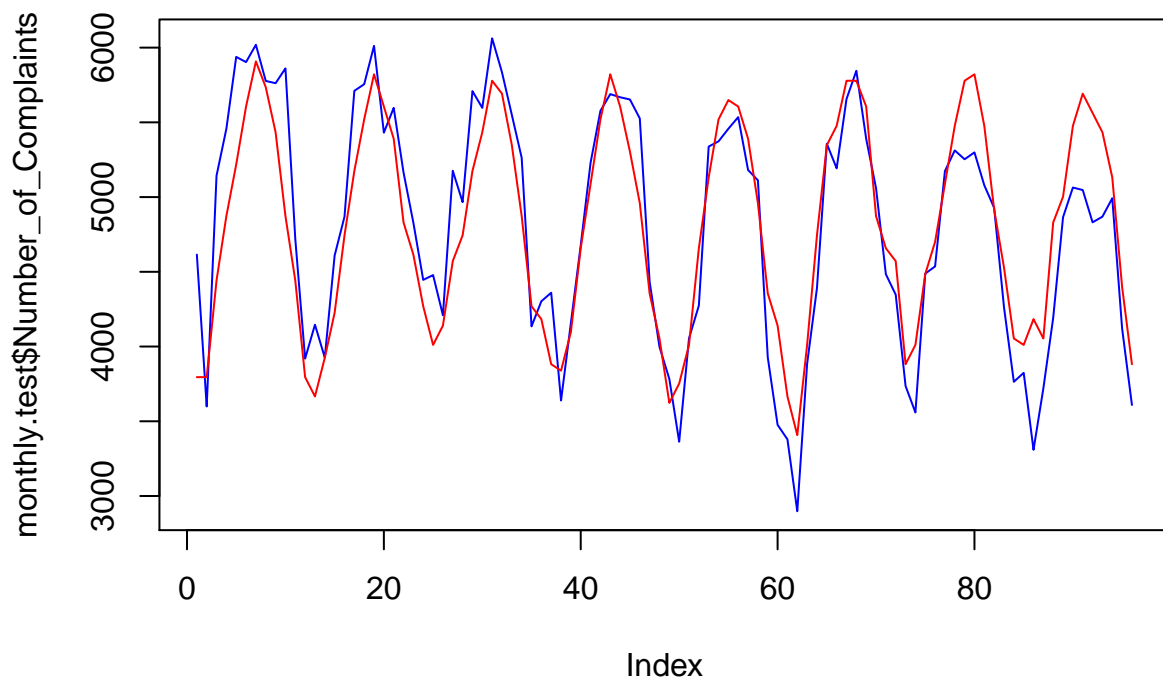
```
monthly.pred <- predict(monthly.model, monthly.test)
monthly.pred
```

```
##      1      2      3      4      5      6      7      8
## 3795.304 3795.304 4441.937 4873.026 5217.897 5605.877 5907.639 5735.203
##      9     10     11     12     13     14     15     16
## 5433.441 4873.026 4441.937 3795.304 3665.977 3924.630 4226.392 4743.699
##     17     18     19     20     21     22     23     24
## 5174.788 5519.659 5821.421 5605.877 5390.332 4829.917 4614.372 4269.501
##     25     26     27     28     29     30     31     32
## 4010.848 4140.175 4571.263 4743.699 5174.788 5433.441 5778.312 5692.094
##     33     34     35     36     37     38     39     40
## 5347.223 4873.026 4269.501 4183.284 3881.521 3838.413 4097.066 4657.481
##     41     42     43     44     45     46     47     48
## 5088.570 5519.659 5821.421 5605.877 5304.114 4959.243 4355.719 4053.957
##     49     50     51     52     53     54     55     56
## 3622.868 3752.195 4010.848 4657.481 5131.679 5519.659 5648.985 5605.877
##     57     58     59     60     61     62     63     64
## 5390.332 4959.243 4355.719 4140.175 3665.977 3407.324 4010.848 4743.699
##     65     66     67     68     69     70     71     72
## 5347.223 5476.550 5778.312 5778.312 5605.877 4873.026 4657.481 4571.263
##     73     74     75     76     77     78     79     80
## 3881.521 4010.848 4485.046 4700.590 5088.570 5476.550 5778.312 5821.421
##     81     82     83     84     85     86     87     88
## 5476.550 4916.135 4528.155 4053.957 4010.848 4183.284 4053.957 4829.917
##     89     90     91     92     93     94     95     96
## 5002.352 5476.550 5692.094 5562.768 5433.441 5131.679 4398.828 3881.521
```

Running a prediction using the testing dataset.

Comparing predicted vs actual values





The test number of crime complaints is in blue and the predictin is in red.

Finding the accuracy

```
monthly.rmse <- sqrt(mean(monthly.pred - Monthly$Number_of_Complaints)^2)
monthly.rmse
```

```
## [1] 5.7327e-13
```

The RMSE of the monthly model is 5.7327e-13 . The monthly model is have a better accuracy than the daily model.