STAT 463: Homework 6

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PROBLEM 1

a)

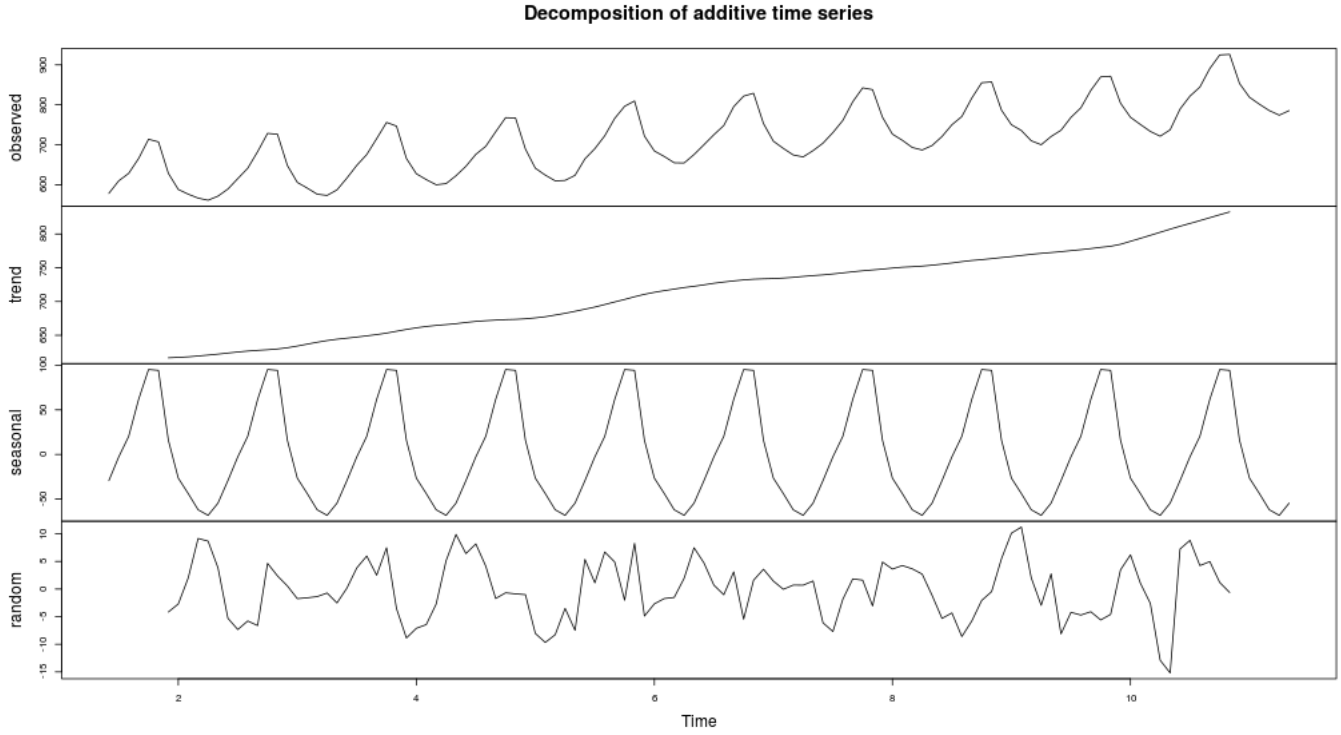
Jan	Feb	Mar	Apr	May	Jun
−26.572454	−43.842824	−62.040972	−68.294213	−54.585880	−29.352083

Jul	Aug	Sep	Oct	Nov	Dec
−2.661343	20.316435	61.704398	95.226620	94.238194	15.864120

b)

From part A we see that the seasonal component in october is 95.226620, therefore we estimate: 735 − 95.226620 = 639.7734

c)



d)

Jan	Feb	Mar	Apr	May	Jun
0.9620649	0.9377279	0.9124330	0.9041807	0.9237109	0.9591797

Jul	Aug	Sep	Oct	Nov	Dec
0.9967548	1.0291274	1.0866728	1.1335675	1.1316645	1.0229160

e)

Again, using the values from part D: 735 − 1.1335675 = 733.8664

f)

Jan	Feb	Mar	Apr	May	Jun
−25.20140	−42.42644	−60.70301	−67.78958	−54.83162	−30.25224

Jul	Aug	Sep	Oct	Nov	Dec
−3.32284	18.97656	60.09124	95.17590	93.89978	16.38364

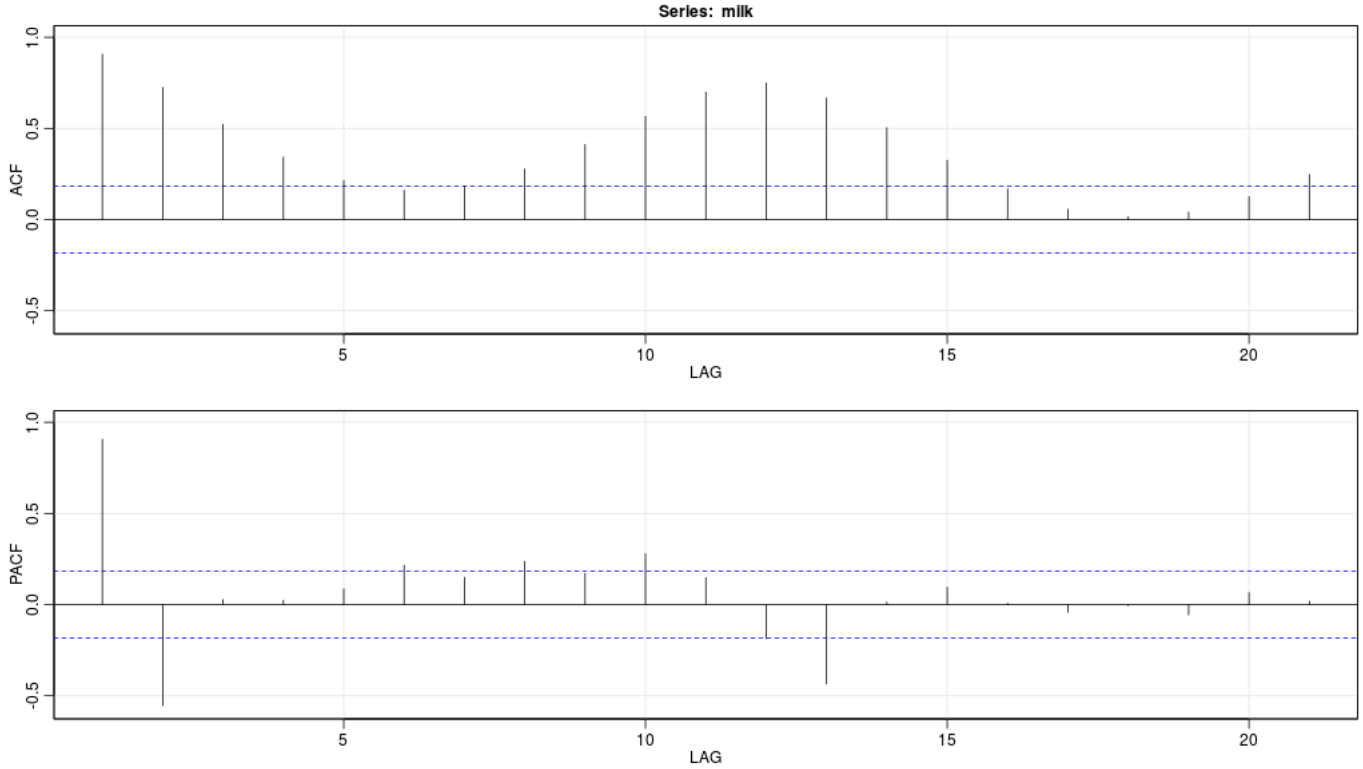
g)

Yes, the trend is linear, not exponential or polynomial so the additive decomposition is suitable.

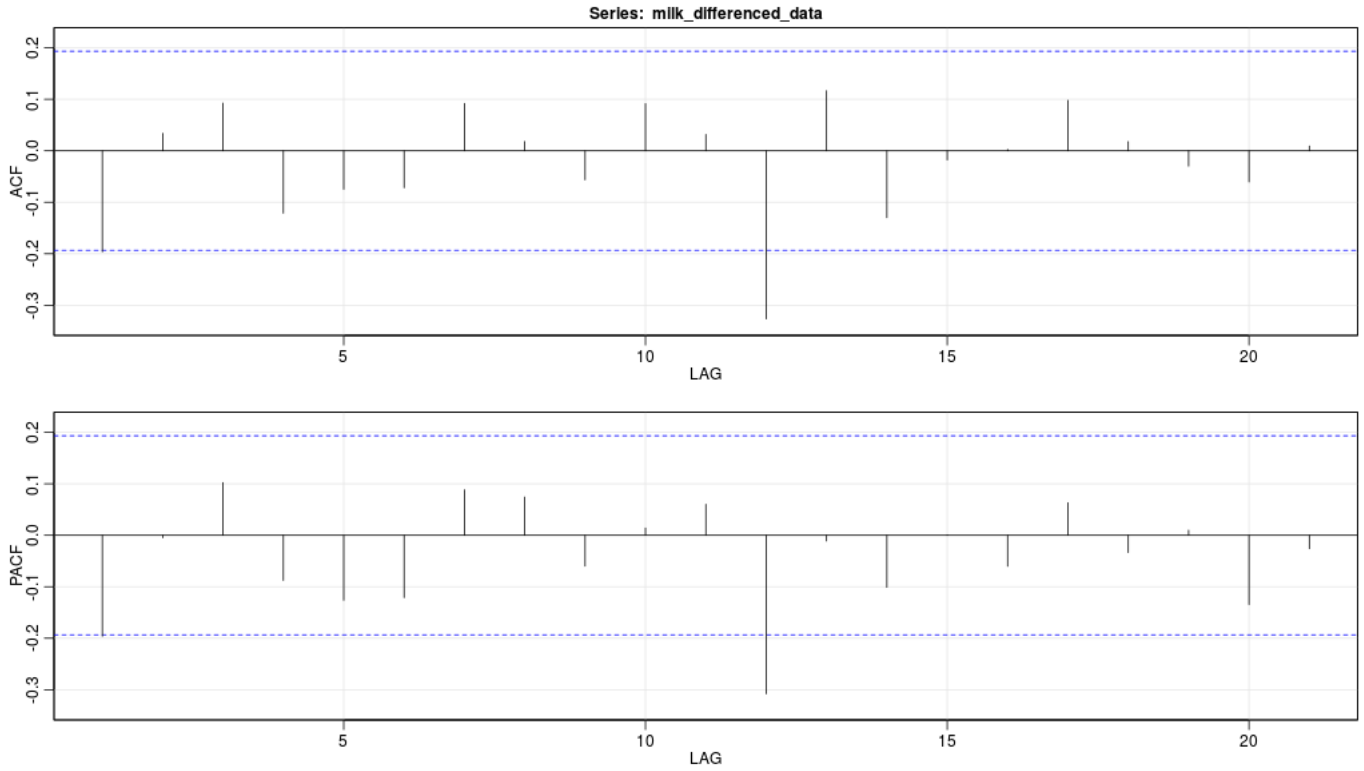
PROBLEM 2

a)

Looking at the ACF and plots of the raw data, there appears to be a seasonality and linear trend to the dataset.

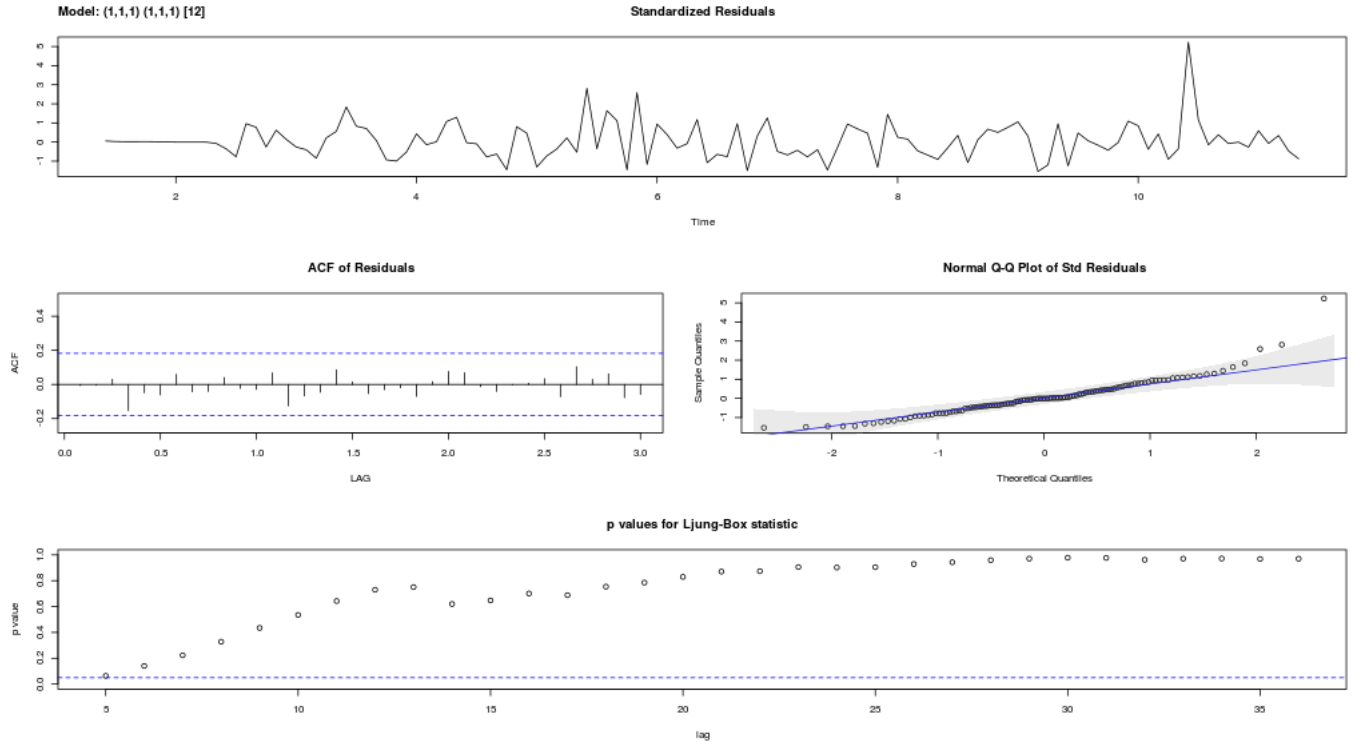


Because of these trends, a first difference was made for all of the data followed by a seasonal difference of 12 months. The result is the following ACF plot:



b)

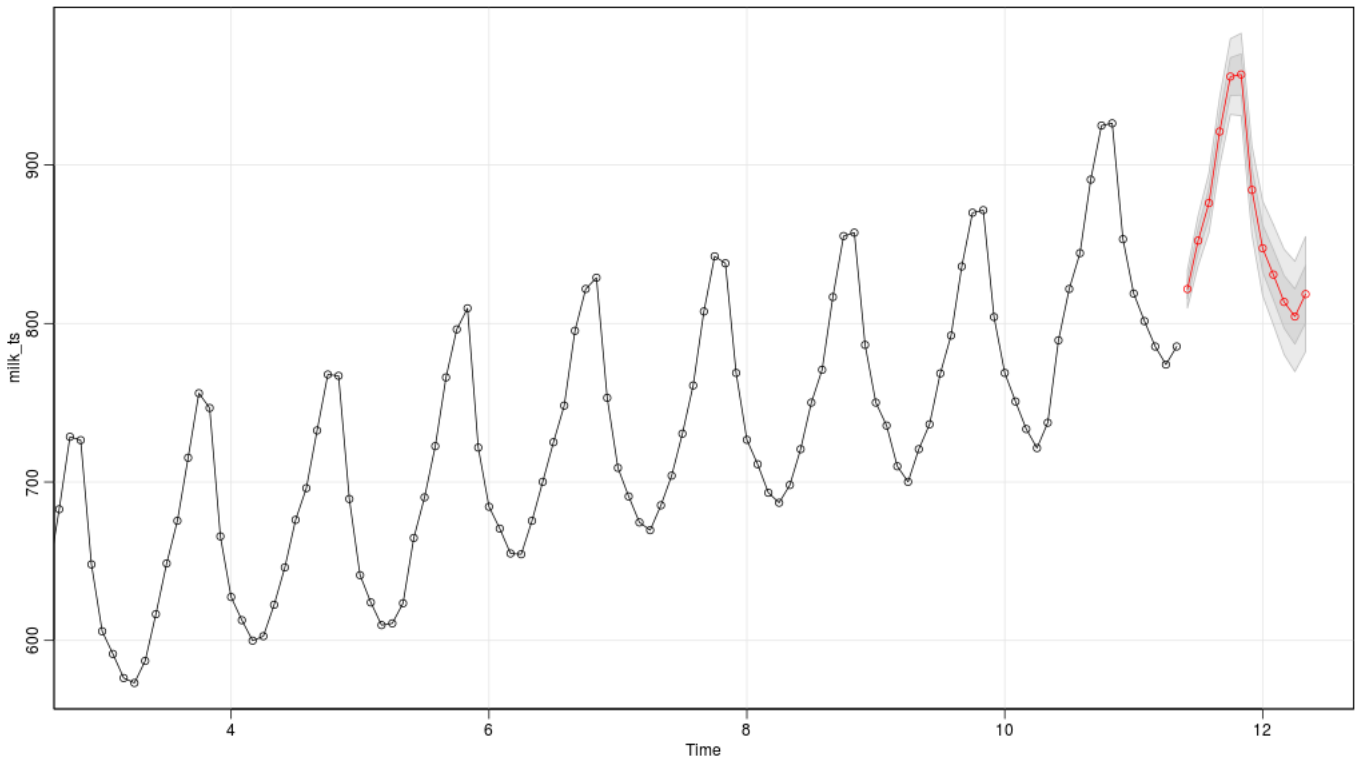
Based on the above ACF and PACF plots, a SARIMA model of (1,1,1)(1,1,1)[12] was used. This model is potentially valuable because there is a single spike in the early lags of both the PACF and ACF, followed by a significant spike after 12 months and no others.



c)

Jan	Feb	Mar	Apr	May	Jun
847.5065	830.8423	813.5733	804.4358	818.5226	821.7226

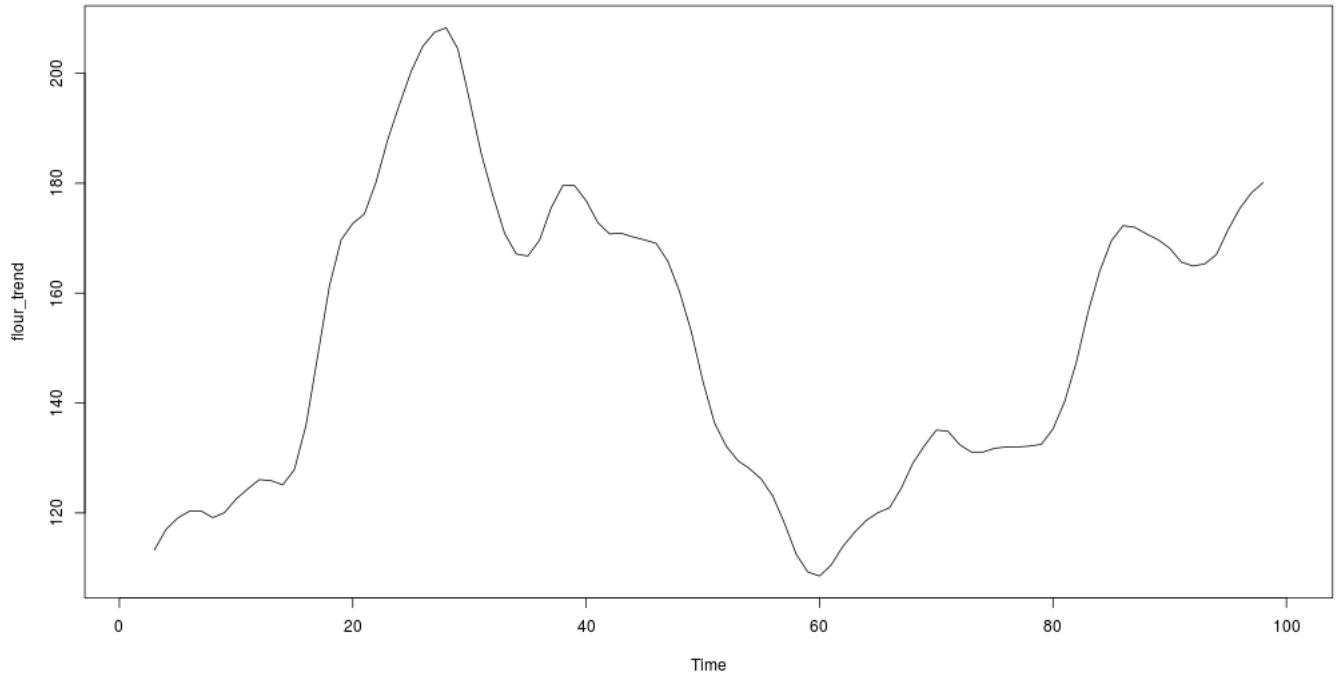
Jul	Aug	Sep	Oct	Nov	Dec
852.3358	875.9912	921.1258	955.8050	957.1497	884.2901



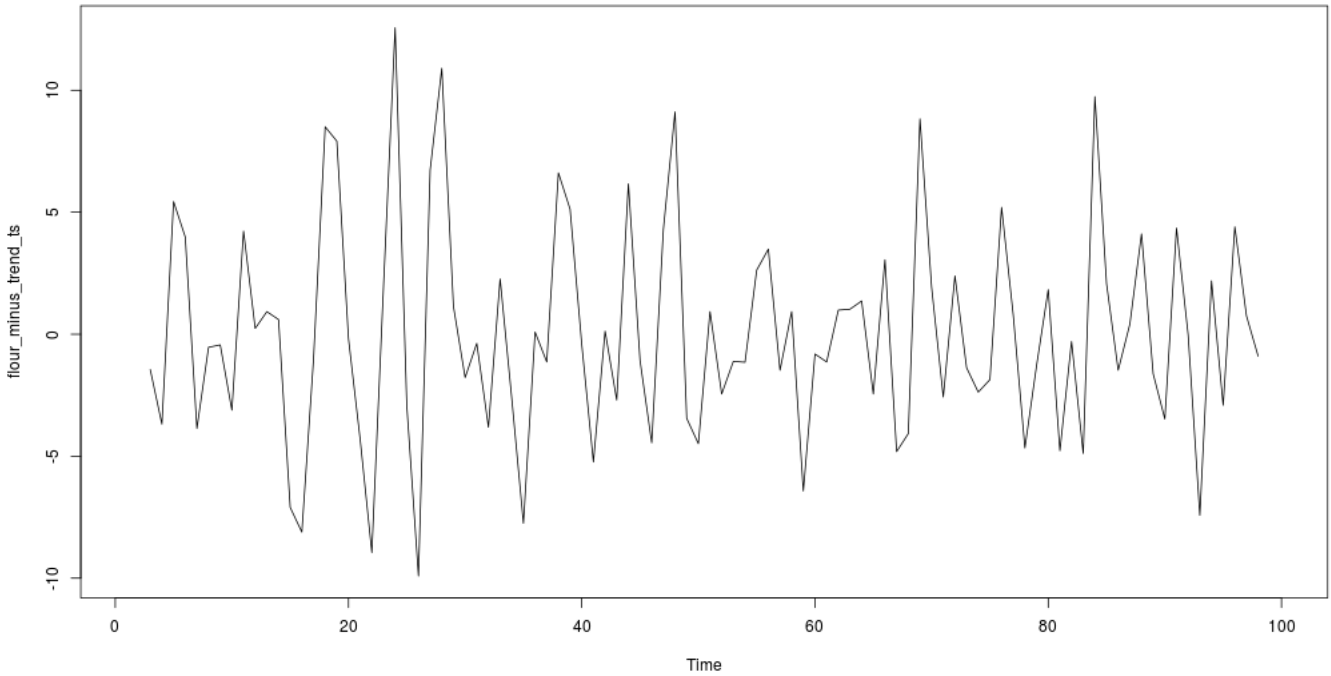
PROBLEM 3

a)

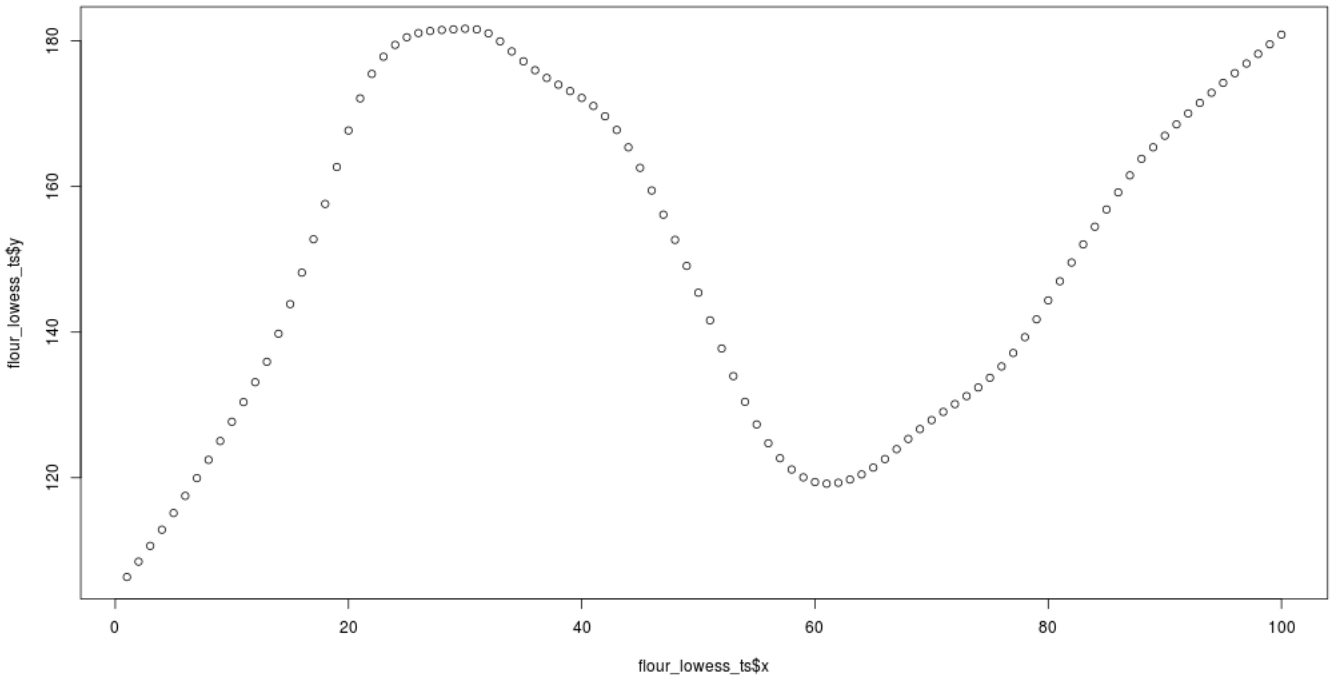
Plotting the data and observing the trends shows that there is possibly a quarterly or 4-month trend as well as a possible 5 year trend, although there is not enough future data to prove this. Using a set of weights of $\{\frac{1}{8}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{8}\}$ found through trial and error, the following plot was obtained:



b)

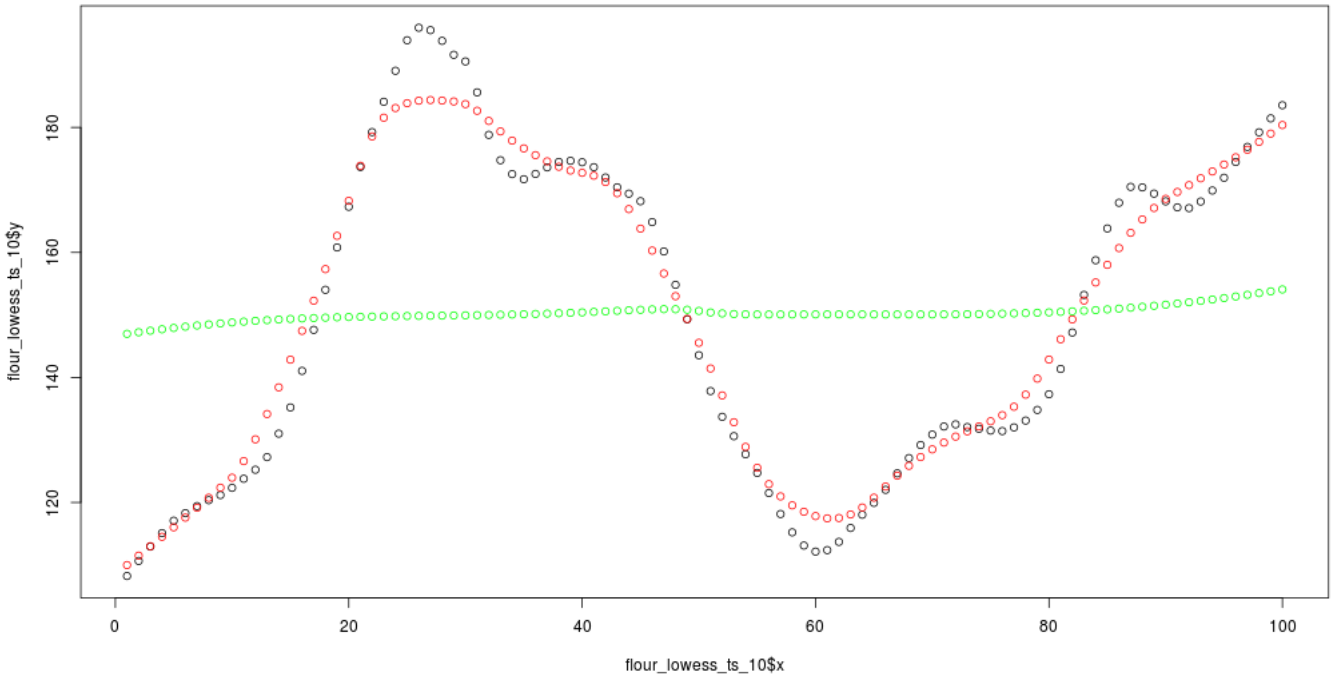


c)



d)

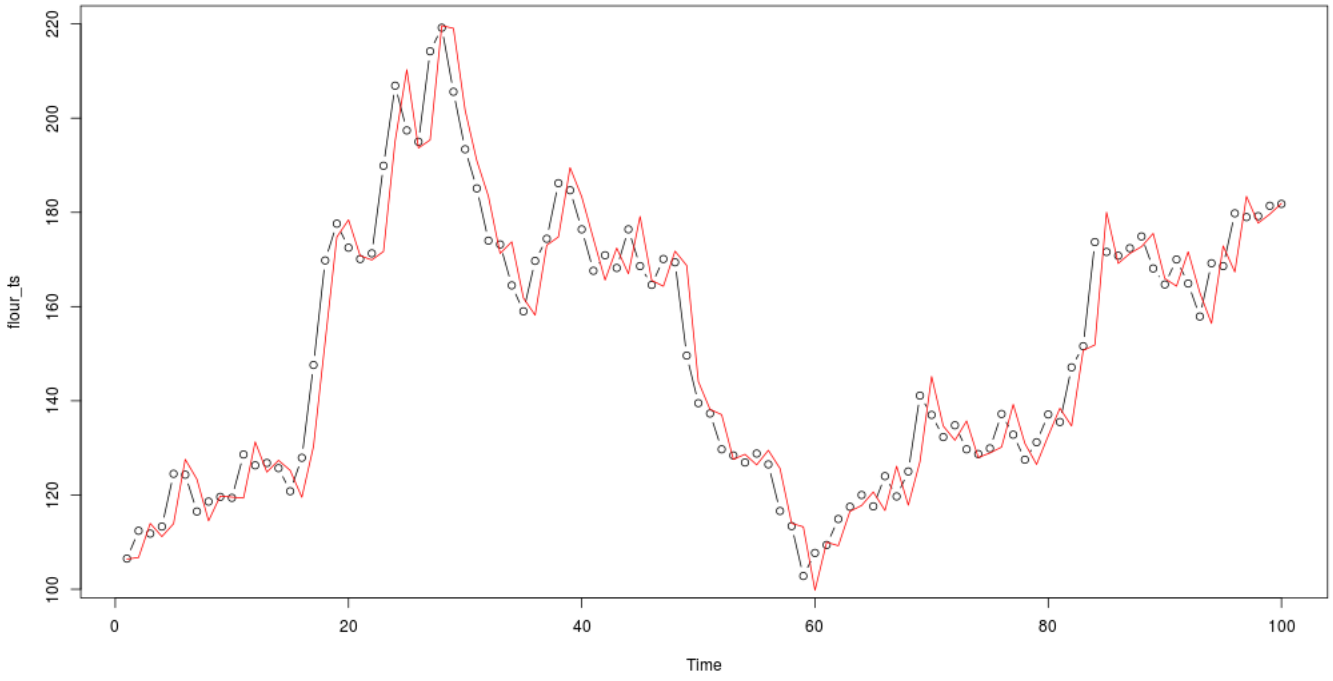
As f increases, the plot approaches a straight line at the mean



e)

The MA coefficient is 0.2891139 and the alpha value is 1.2891139

f)



g)

The prediction for $t = 101$ is $(1.2891139 * 181.8) - (0.2891139 * 181.8) = 181.7673$