Q.1 a)

> d = c(50.0, 36.5, 43.0, 44.5, 38.9, 38.1, 32.6, 38.7, 41.7, 41.1, 33.8)
>

Q. 1 b)

> ts.plot(d)
>

May 2, 2013
Q.1 c) d)

> d1=ts(d, start=1948)
>
> ts.plot(d1,xlab="year", ylab= "Average Monthly Production")
> title("Time series of coal production")
>
General downward trend, periodicity of about 5 years.

Qn.2

```r
> f1 = filter(d, rep(1/5, 5))
> f2 = filter(d, c(1/8, rep(1/4, 3), 1/8))
```

Qn.3

```r
> ts.plot(cbind(d, f1, f2), lty = c(1, 2, 3))
> legend("topleft", c("Coal Production", "5 year moving avg", "4 year moving avg"), lty = c(1, 2, 3))
```
Coal Production,
5 year moving ave
4 year moving ave

Time

[Graph showing coal production over time with different moving averages.]
Qn. 4.

```R
> ts.plot(dat1)
```

![Time series plot](image)
Monthly red wine sales. Upward trend (probably linear), seasonal periodicity (12), plus noise.

> ts.plot(dat2)

Sales recorded in 4 week periods, 54 items, so about 4 years worth of data. Perhaps slight downward linear trend. Periodicity looks to be about 6 or 7 (i.e. 6 monthly). Seasonal periodicity would be $52/4=13$.

> ts.plot(dat3)

>
IBM common stock closing prices, daily. Looks to be a quadratic trend. Perhaps a piecewise linear trend (i.e. first down, then up). Such a trend could be removed by a single differencing, perhaps leaving close to a stationary process.