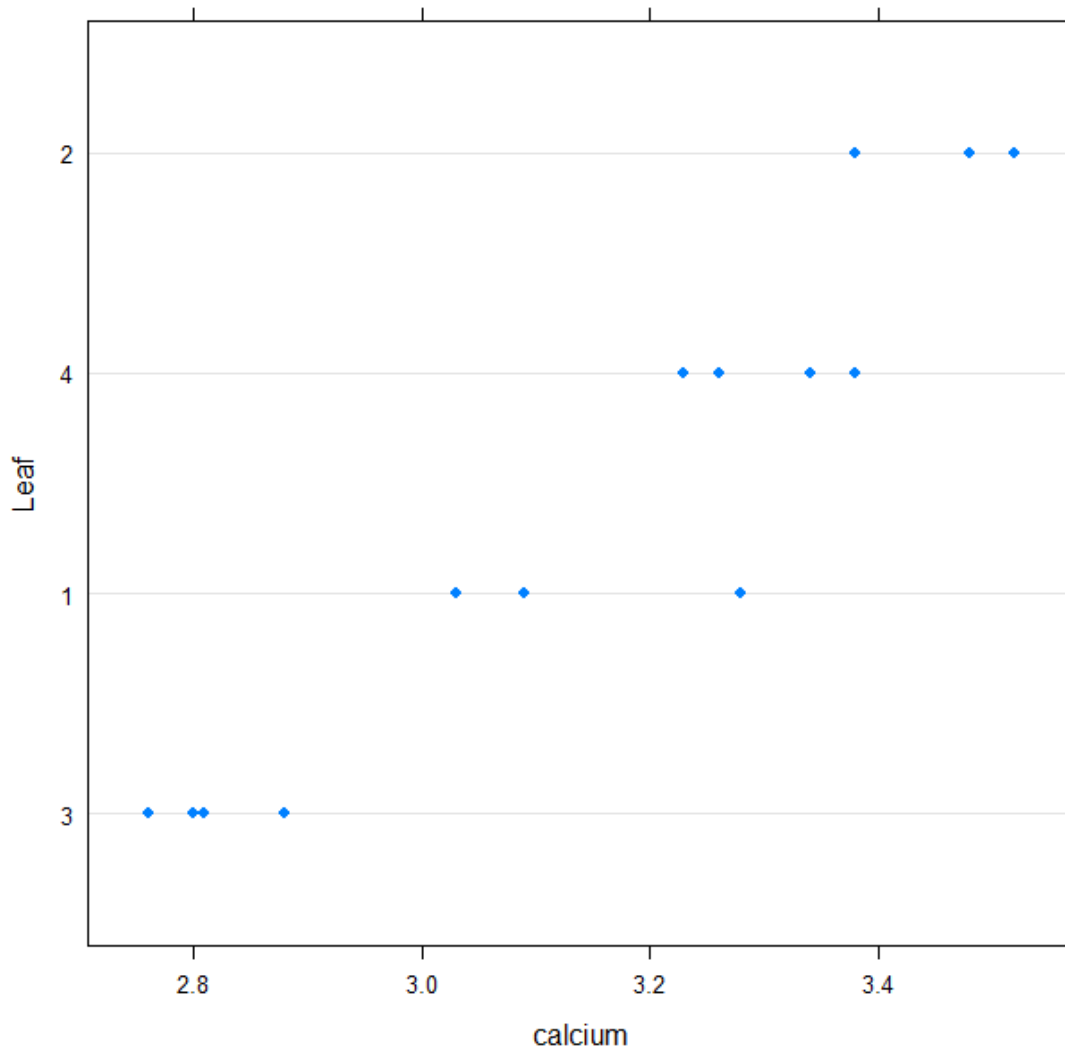


Output from turnip.R

```
> # turnip.R
>
> library(nlme)
> library(car)
>
> turnipdata <- read.table(file="turnip.dat",header=T) # read the data in
> head(turnipdata)
  leaf calcium
1    1    3.28
2    1    3.09
3    1    3.03
4    1    3.03
5    2    3.52
6    2    3.48
> turnipdata$Leaf <- factor(turnipdata$leaf) # Leaf is a factor
>
> turnip2 <- groupedData(calcium~1|Leaf, data=turnipdata)
>
> plot(turnip2)
```



```
>
```

```

> m1 <- lme(calcium~1,data=turnip2, random= ~1|Leaf)
> summary(m1)
Linear mixed-effects model fit by REML
Data: turnip2
      AIC      BIC    logLik
-12.55464 -10.43049  9.277319

Random effects:
Formula: ~1 | Leaf
      (Intercept)  Residual
StdDev:   0.2690357  0.08125321

Fixed effects: calcium ~ 1
      Value Std.Error DF   t-value p-value
(Intercept) 3.165625 0.1360429 12 23.26931     0

Standardized Within-Group Residuals:
      Min      Q1      Med      Q3      Max
-0.9697575 -0.6831156 -0.2410296  0.6091412  2.1070443

Number of Observations: 16
Number of Groups: 4
> # notice that the summary of model m1 gives estimates of sigma_a and
> # sigma, not sigma^2_a and sigma^2. These estimates are given in the
> # following portion of the summary:
>
> # Random effects:
> # Formula: ~1 | Leaf
> #      (Intercept)  Residual
> #StdDev:   0.2690357  0.08125321
>
> # These values agree with the estimates given by SAS (see turnip.sas) since
> # 0.2690357^2 = .07238, and 0.08125321^2 = .006602
>
> # Confidence intervals for sigma_a and sigma are given by the following
> # command. Note these are for sigma_a and sigma, not sigma^2_a and sigma^2
> # Furthermore, they are obtained with a different method than the one used in
> # SAS and presented in the lecture notes, so these intervals don't agree with
> # those given by PROC MIXED. E.g., you can't square the endpoints of these
> # intervals to get the intervals given by SAS. I recommend using the intervals
> # that are given by SAS and in my lecture notes rather than those given by
> # the intervals() function as illustrated below.
>
> intervals(m1,which="var-cov")
Approximate 95% confidence intervals

Random Effects:
Level: Leaf
      lower      est.      upper
sd((Intercept)) 0.1186738 0.2690357 0.6099089

Within-group standard error:
      lower      est.      upper
0.05446148 0.08125321 0.12122482
>

```