When is the usual variance estimator based on simple random sampling a
good approximation for a systematic sample?

It is often recommend to use the estimate of variance based on simple ran-
dom sampling without replacement when a systematic sample is drawn. The
following code computes the true variance under both designs of sample mean
as an estimate of the population mean. The function *varsystematic* returns
the true variance for the systematic design first which is followed by the true
variance under simple random sampling without replacement. <p> If $N$ is the
population size and $n$ is the sample size then $k = N/n$ is the number of possible
systematic samples.

```
> varsystematic<-function(y,n,k)
+   {
+     N<-length(y)
+     if(N!=n*k) stop("length(y) does not equal n times k")
+     dum<-seq(1,(n-1)*k + 1, k)
+     mn<-mean(y)
+     ans<-0
+     for(i in 1:k){
+        ans<-ans + (mean(y[dum + (i-1)]) - mn)^2
+     }
+     ans.sys<-ans/(k-1)
+     ans.srs<-(1-n/N)*var(y)/n
+     return(c(ans.sys,ans.srs))
+   }
> y<-rnorm(500,333,33)
> varsystematic(y,25,20)

[1] 38.42229 41.33158
```