Discussion to Dr. Petr Šimeček´s contribution

By Dieter Rasch

Petr put the problem that there are exactly 255 milk sheep. Change of temperature will be measured and a comparison has to be made between machine milking and hand milking by a two-sided *t*-test.

The variance of hand milking is 0.3272 and that of machine milking 0.04025. Hand milking should be used by as few sheep as possible because it is expensive.

The precision is defined as follows:

The risk of the first kind is $\alpha = 0.05$ and the probability not to detect a difference of $\delta = 0.5$ or larger should be below $\beta = 0.1$.

How many of the 255 sheep should now be used by hand milking?

With the CADEMO module MEANS, we use "test – two means – from normal distributions and obtain:

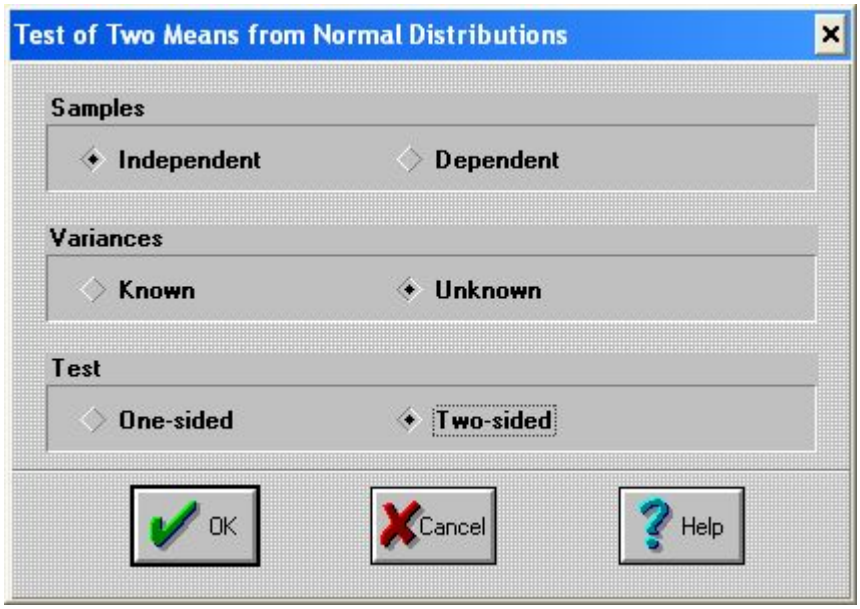

Figure 1

ok leads to (where our case is already given – unequal variances branch) an unsatisfactory distribution between the two methods (Figure 2)

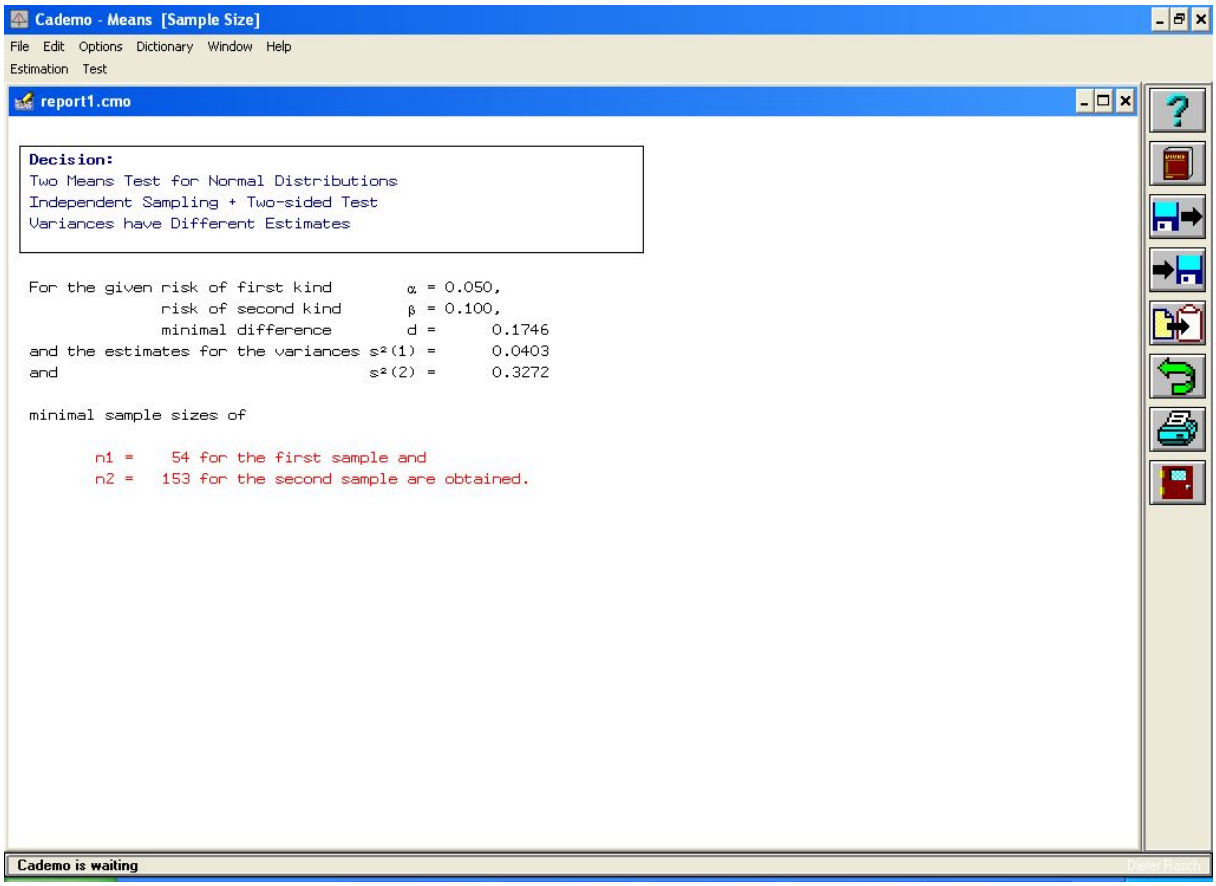

Figure 2

We have to press the button “Option” in the first line of figure 2 and than go to “Module settings”. This gives us

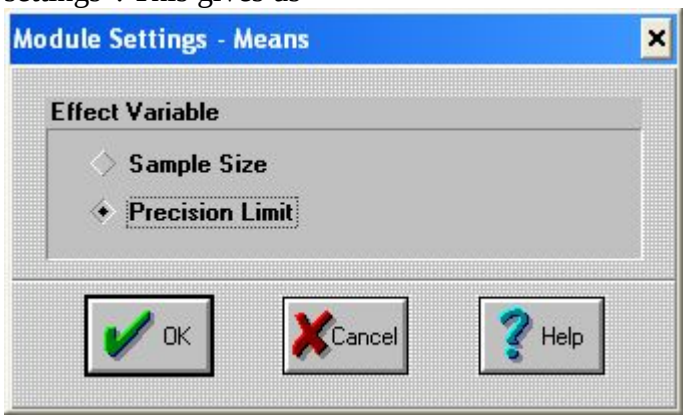

Figure 3

where we change from “sample size” (as the target) to “precision limit”.

Then we receive

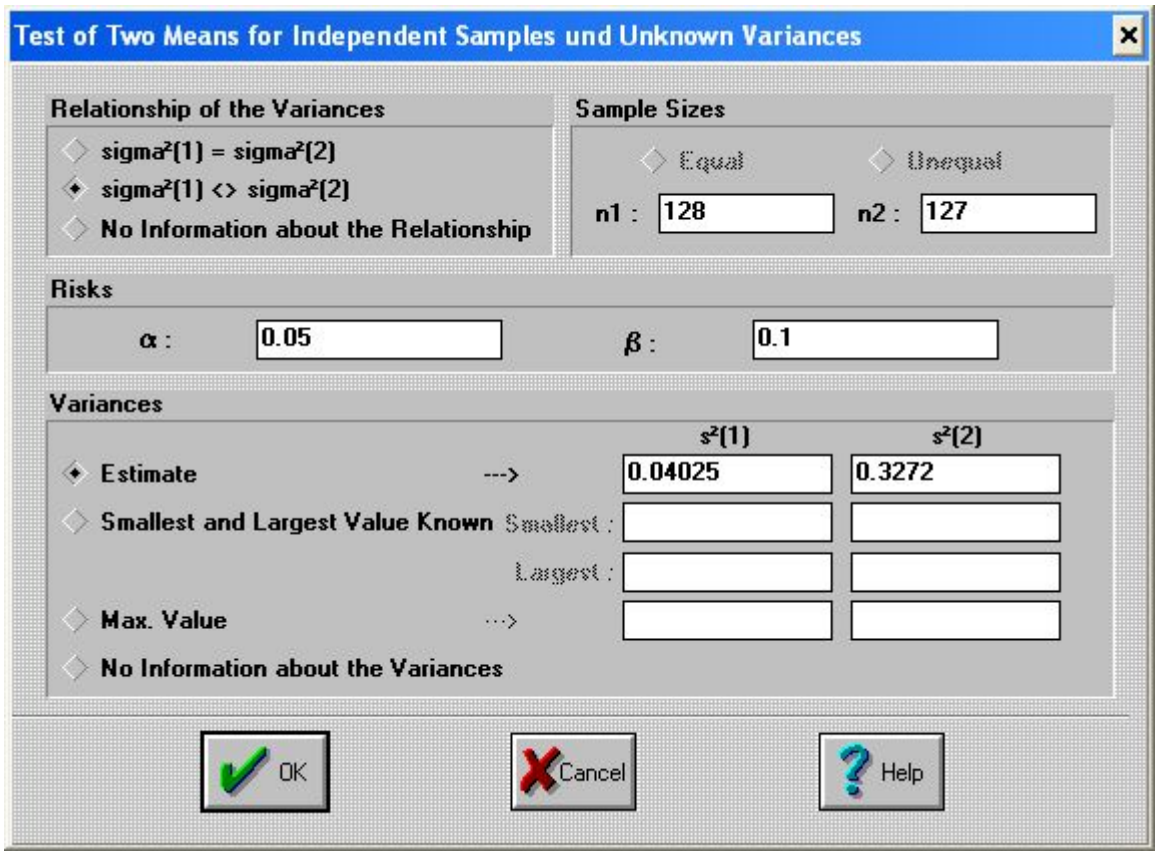

Figure 4

where we already have chosen the button “unequal variances”. Now we enter the sizes for the minimum δ by choosing the two sample sizes as equal as possible (already done in Figure 4)

This gives us the information

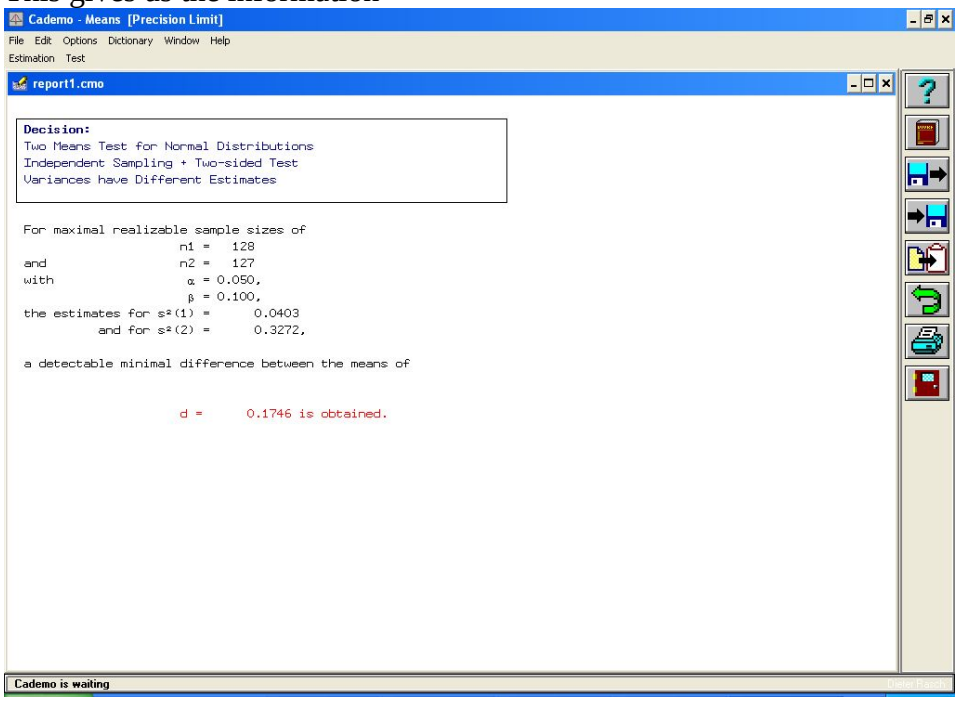

Figure 5

that we can detect differences of $\delta = 0.1746$ or larger with at least a probability of 0.9.

Because we will be satisfied if we can detect a difference of at least 0.5 we use a “Dedekindschen Schnitt” to find the minimum number of hand milking sheep for this precision.

At first we go into the middle of the least favourable case (117) and the most favourable case (2) i.e, 60. Then we have

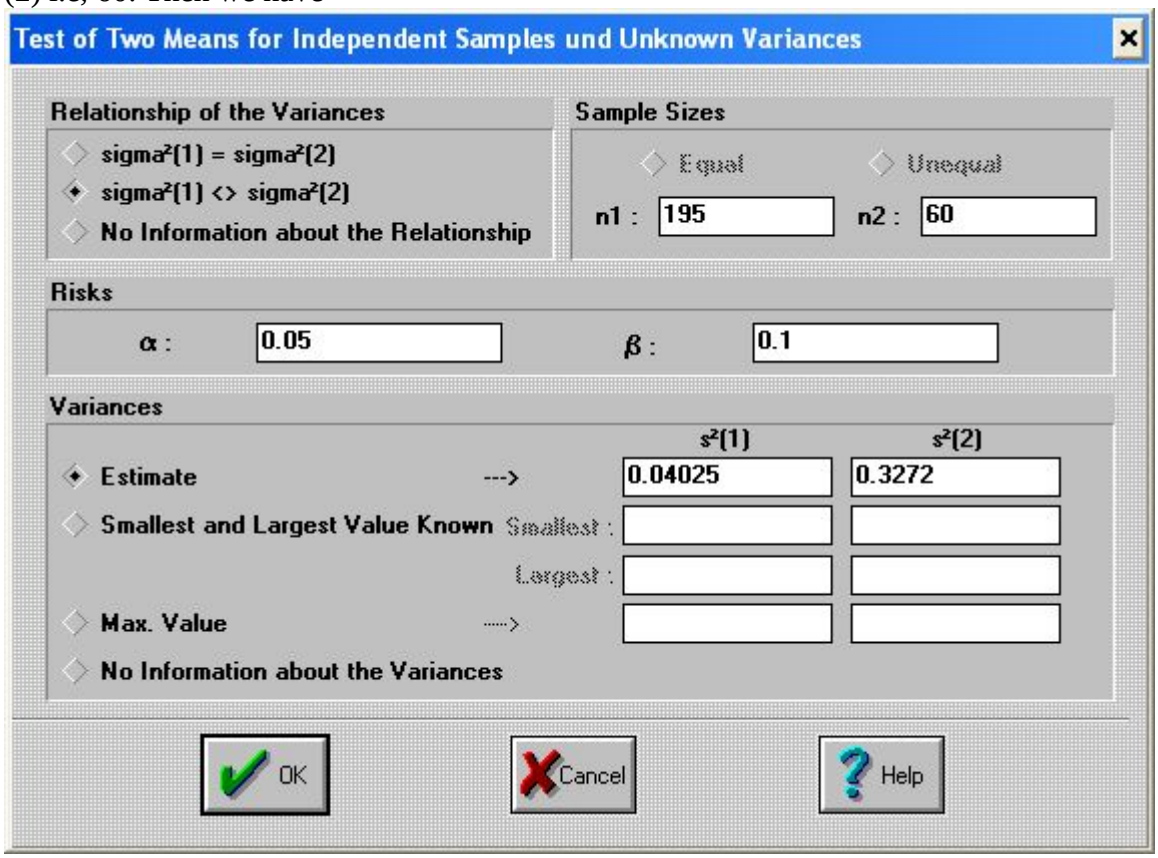

Figure 6

This leads to $\delta = 0.2442$ what is too small, we can have less hand milking sheep.
As the next trial in Figure 6 we again can go into the middle of 60 and 2 let say 29 and a ratio 226:29. This gives us $\delta = 0.3474$. Now we can again decrease the number of hand milking sheep. We go on as it is shown in the Table.

n_1	n_2	δ
128	127	0.1746
195	60	0.2442
226	29	0.3474
240	15	0.4811
247	8	0.6575
243	12	0.5375
242	13	0.5165
241	14	0.4979

Thus we need 14 sheep for hand milking. The whole calculation is done in less than 2 minutes.