Pooled Standard Deviation

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Pooled Standard Deviation

- If it is impossible to make many repeated measurements with the same sample
- Then precision can be estimated during longer time in the form of **pooled standard deviation**
- Pooled standard deviation can be used to calculate:
  - Repeatability
  - Within-lab reproducibility

Pooled Standard Deviation

- General formula for the case when experiment is done with different samples, each measured repeatedly:

$$s_{pooled} = \sqrt{\frac{(n_1-1)s_1^{\,2} + (n_2-1)s_2^{\,2} + \ldots + (n_k-1)s_k^{\,2}}{n_1 + n_2 + \ldots + n_k - k}}$$

- Symbols:
  - k number of samples
  - s_1, s_2, etc are within sample standard deviations
  - n_1, n_2, etc are numbers of measurements made for different samples

Pooled Standard Deviation

- If the number of measurements made with each sample was the same:

$$s_{pooled} = \sqrt{\frac{s_1^{\,2} + s_2^{\,2} + \ldots + s_k^{\,2}}{k}}$$

- Symbols:
  - k number of samples
  - s_1, s_2, etc are within sample standard deviations
  - n_1, n_2, etc are numbers of repeated measurements with every sample

Pooled standard deviation in practice

- How to set up experiment for **repeatability** s_r evaluation using s_{pooled}?
- How to set up experiment for **within-lab long-term reproducibility** s_{RW} evaluation using s_{pooled}?