

Livestock Breeding and Genomics - Exercise 4

Peter von Rohr

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Problem 1: Prediction of Breeding Value and Reliability

Heifer Elsa has a weaning weight of 320 kg. The population mean of the same trait is at 250 kg. The heritability (h^2) of the trait weaning weight is assumed to be 0.45.

- What is the predicted breeding value \hat{a}_i for Elsa for weaning weight?
- Compute the reliability of \hat{a}_i from 1a)

Problem 2: Breeding Value Prediction Based on Repeated Observations

Besides the weaning weight Elsa has also an observation for her birth weight (52 kg) and some more repeated measures for her weight. We assume the heritability ($h^2 = 0.45$) to be the same as in Problem 1. The population mean for the repeated observations of the weight is 170 kg. The repeatability of the weight measurements is $t = 0.65$.

The following tables contains all observed values for the weight.

Measurement	Weight
1	52
2	82
3	112
4	141
5	171
6	201
7	231
8	260
9	290
10	320

- Predict the breeding value for Elsa based on the repeated weight records.
- What is the reliability for the predicted breeding value from 2a)?
- Compare the reliability from 2b) with the reliability from Problem 1.

Problem 3: Predict Breeding Values Based on Progeny Records

A few years later Elsa was the dam of 5 offspring. Each of the offspring has a record for weaning weight. Predict the breeding value of Elsa for weaning weight based on the offspring records listed in the following table.

Offspring	Weaning Weight
1	319
2	319
3	320
4	322
5	320

The mean and the heritability can be taken the same as in Problems 1 and 2 resulting in $h^2 = 0.45$ and $\mu = 250$