Livestock Breeding and Genomics - Exercise 5

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Problem 1: Own Performance

Given is the dataset with weight observations for 12 animals. The heritability (h^2) for the trait is 0.2025. The population mean μ can assumed to be the mean of the weights in the table below.

‘

Animal

Weight

1

285

2

282

3

278

4

280

5

281

6

282

7

285

8

282

9

281

10

287

11

281

12

282

Your Tasks

- Compute the breeding values for all animals given in the table above
- Compute the accuracies of the breeding values of all animals shown in the table above.

Problem 2: Breeding Value Prediction Based on Repeated Observations

```
geb_gew <- 52
mu2 <- 170
rep <- 0.65
h2 <- 0.45
y <- 320
mu <- 250
```

Elsa has observations for her birth weight (52 kg) and some more repeated measures for her weight. We assume the heritability to be $h^2 = 0.45$. 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.

```
nr_measure <- 10
wean_weight <- y
slope <- (wean_weight-geb_gew)/(nr_measure-1)
measure <- c(1:nr_measure)
weight <- round(slope*(measure-1) + geb_gew, digits = 0)
mean_weight <- mean(weight)
dfWeightTable <- data.frame(Measurement = measure, Weight = weight)
knitr::kable(dfWeightTable, booktabs = TRUE, longtable = TRUE)
```

Measurement	Weight
1	52
2	82
3	112
4	141
5	171
6	201
7	231

8

260

9

290

10

320

a) Predict the breeding value for Elsa based on the repeated weight records.
b) What is the reliability for the predicted breeding value from 2a)?
c) Compare the reliability from 2b) with the reliability that would result from a prediction of breeding values based on own performance.

Problem 3: Predict Breeding Values Based on Progeny Records

```
n_nr_progeny <- 5
```

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 offpsring records listed in the following table.

Offspring

Weaning Weight

1

320

2

319

3

320

4

320

5

321

The mean and the heritability can be taken the same as in Problems 1 and 2 resulting in

$h^2 = 0.45$ and $\mu = 250$