Selection index - exercises

1. The heritability (h^2) is 0.3 for one trait and the repeatability (r) 0.4. Does performance testing based on two repeated registrations on the trait, give higher or lower accuracy than a selection based on registrations on 7 progenies (half-sibs) of the individual?

2. The breeding value for a wool trait, measured objectively, is going to be estimated. The heritability of the trait is 0.60.

Calculate the b-value in the index equation $I = b(P-\mu)$ and the correlation between the index and the true breeding value (r_{TI}) when:

a) The trait is registered on the ram itself.

b) The trait is registered on 10 progenies to the ram.

3. a) Set the normal equations and calculate the b-values in the selection index equations when we have one record on the cow itself (α) and one rerecord on her mother. The recorded trait is also the trait we want to improve. $h^2 = 0.20$. Ignore the permanent environmental effects.

b) Calculate the accuracy, r_{TI}, for this index

c) What do we loose in accuracy if we only consider the information from the cow itself?

4. a) Set the selection index equation and the normal equations for a situation when we have one record on the cow itself (α), one record on the dam and one on a maternal sister of the cow. The trait for which we want to estimate the cow's breeding value, is also the trait that is recorded. $h^2 = 0.20$. Do not consider permanent environmental effects and do not solve the equations.

b) If the b-values are solved in the equation system above we get $b_1 = 0.191$, $b_2 = 0.078$ and $b_3 = 0.033$. Calculate r_{TI} for this situation and compare the result with the answer from exercise 8.5.

5. We want to select hens with regard to number of eggs and weight of eggs, when the two traits are registered on the hens themselves. The following parameters have been estimated:

Trait	σ_P^2	σ_A^2	**Economic weight**
1 = Number of eggs	187.7	88.2	1
2 = Weight of eggs	15.2	5.2	4

r_p = -0.05; r_g = -0.54.

a) Calculate the heritabilities and the genetic and phenotypic covariances between the traits.

b) Set the index equations and the normal equations for calculation of the b-values when both traits are recorded (included in I) and both are included in the breeding goal (T). Do not solve the equations.

c) Set the normal equations when both traits are included in I but only weight of eggs is included in the breeding goal.