2016 Tutorial 3
Problems to attempt prior to class:

3.1 Population Variance and Heritability. We have collected a pedigree dataset for a large sample of ravens in which the total phenotypic variance for intelligence is 148.0. Using the resemblance between brothers and sisters, we estimate the genetic variance for this trait as 76.5. Looking at parent-offspring resemblance offers an estimate of genetic variance as 38.0. On the basis of these estimates (and assuming no common environment effects or G x E):

(a) Complete the following table
(b) Estimate both broad sense (H^2) and narrow sense (h^2) heritability.

V_A	
V_{D+I}	
V_G	
V_E	
V_P	

3.2 Population variance and heritability. Draw a circle diagram that illustrates all of the above components of variance in correct relationship to one-another. The circles don't have to be drawn to scale, but write the variances in at the appropriate places.

3.3 Deriving h^2 from data. After several years of highly intensive study, we were able to measure sprint speed (km/h) across two generations of Thompson's gazelles. We did this for 10 families. The data are thus:

Family	Sire	Dam	Son	Daughter
1	88.00	81.00	85.00	84.00
2	90.00	82.00	86.00	86.00
3	88.00	83.00	86.00	85.00
4	86.00	84.00	85.00	85.00
5	84.00	85.00	85.00	84.00
6	82.00	86.00	82.00	86.00
7	80.00	87.00	86.00	88.00
8	84.00	88.00	86.00	87.00
9	86.00	89.00	86.50	87.00
10	88.00	90.00	89.00	89.00

(a) Calculate h^2 by using the similarity between mid-parent offspring means.
(b) Now calculate h^2 by just looking at the similarity between sire versus mean offspring, and dam versus offspring mean. What would you conclude from this in relation to the inheritance of genes for sprinting speed? Think about (and come prepared to discuss) how this pattern could arise.
(c) For bonus points: in which, if any, case(s) are the heritability estimates significantly different from zero?