ANSC 305 Study Guide Exam 1

I. Format
   A. 4 open ended/essay questions
      i. Each worth 25pts
      ii. 1 on relationship coefficients, 1 on LOC calculations and probability of being homozygous dominant, 1 on hog colors/ probabilities, and 1 on discussing terms like breeds or genetic abnormalities

II. Producers
   A. Seedstock producers-> commercial producers-> stocker operations->feedlots->packers->retailers-> consumers
      i. Seedstock- some part in selling breeding stock (main objective). Breeding animals sold to commercial producers.
      ii. Commercial operations sell calves to stockers
      iii. Stocker calves raised on forage to go into feedlot(concentrate, high energy diets)
      iv. With poultry and swine a lot of breeding animals come from large breeding company not seedstock
   B. Seedstock
      i. The seedstock business exists as a business only because of the demands of the commercial livestock industry
      ii. Seedstock always has more expenses than commercial
   C. There was a handout in class that covers this extensively but none of the old exams have questions from this section so I only briefly outlined it. I would not spend a lot of time studying this section.

III. Genetic Relationships
   A. Measures of genetic relationships are measures of expected genetic similarity.
      i. Two broad categories of relationships:
         1. Direct ancestor: the older animal is an ancestor of the younger animal(i.e. the older animal is in the younger animal's pedigree)
         2. Common ancestry: some other animal (the common ancestor) is an ancestor of both of them(i.e. it is in both of their pedigrees)
   B. Relationship is recorded in pedigrees
      i. Conventional pedigree:
         1. Relationship shown by the location on the pedigree(sire to the right and above the animal itself, dam shown to the right and below the animal itself)
         2. The same animal (ancestor) can be in the conventional pedigree more than one time
      ii. Arrow diagram:
         1. Animal is only in it once (unlike conventional!)
         2. Relationship is shown by arrows(sires by solid arrows and dams by broken arrows)
         3. Any particular ancestor is in the arrow diagram only one time
   C. Measures of genetic relationships are measures of expected genetic similarity due to:
      i. Genes that one of the animals(the younger one) received from the animal and/or
      ii. Genes that they both received from one or more common ancestor

D. Relationship coefficient (Rxy)
   i. Between 2 animals, x and y, is the best estimate, based on pedigree, of the fraction of the two animals' genes that are the same due to direct ancestry, common ancestry, or both.
   ii. Relationship covariance (covXY) between 2 animals is another measure of genetic relationships and it is calculated as an intermediate term in the calculation of the relationship coefficient between the same animals, x and y. Range from 0 to 2.

E. Inbreeding
   i. The mating of related animals.
   ii. The genetic effect of inbreeding is increased homozygosity
   iii. Fx, the inbreeding coefficient, of animal x, is the best estimate, based on pedigree, of the fraction of the animal's gene pairs that are homozygous due to inbreeding(that would have been heterozygous in an average, non-inbred animal of the same herd. Measure from 0 to 1.
   iv. Can inbred parents produce non-inbred offspring? Yes. Can non-inbred parents produce inbred offspring? Yes.
   v. Effects of inbreeding on expected genetic similarities among animals:
      1. Unrelated inbred animals tend to be more genetically different from each other than unrelated, non-inbred animals are from each other.
      2. Related inbred animals will, of course, have genetic similarities due to common ancestry, direct ancestry, or both, however, they will have some genetic difference due to being inbred.
      3. These differences are accounted for in the denominator of the relationship coefficient.
      4. The offspring of inbred animals tend to be more genetically similar to each other than the offspring of non-inbred animals are to each other, because at the loci that are homozygous due to inbreeding, the inbred animal transmits the same allele to every one of its offspring.

F. Rxy= covXY/ $\sqrt{(1+Fx)(1+Fy)}$
   A. Fx=1/2cov(parents)
   B. Sxy= $\sum \text{¿} of \frac{contributions\square^2}{2n}$
      $\sqrt{\text{¿}}$
   C. For the question on the test, you will be calculating covariance, coefficients and inbreeding coefficients. You need to actually practice working these out.

IV. Selection against
   A. A dominant gene – easy, if the frequency is extremely high, there may be few animals that are homozygous recessive or known heterozygoted, but as they are found or produced, the process is simple (you can see dominant individuals easily)
   B. A gene where the heterozygotes are distinguishable from the alternative homozygotes(who are distinguishable from each other)- easy

C. A recessive gene- if the frequency of the recessive gene is very high, selection can be very effective for 2 or 3 generations, but then becomes more and more difficult as progress continues
    i. The difficulty in selecting against a recessive gene is determining which animals are heterozygous and which ones are homozygous dominant.
D. Cases where a phenotypically dominant animal is known to be a heterozygote:
    i. One of the parents is homozygous recessive (pedigree information)
    ii. One or more of its progeny is homozygous recessive (progeny information)
E. Progeny testing for recessive genes
    i. Any mating of a phenotypically dominant animal, X, that could be homozygous dominant to animals that could produce homozygous recessive offspring if X is a heterozygote
    ii. Can be considered to be a progeny test for a recessive gene (regardless of whether or not that was the original intent)
    iii. In a progeny test for a recessive gene, a phenotypically dominant (normal) animal, X, is mated to animals that could produce homozygous offspring if X is a heterozygote
    iv. The possible outcomes of a progeny test:
        1. All the offspring are phenotypically dominant (normal). Conclusion: probability that X is homozygous dominant has increased, how much it increased depends on how good the test was
        2. One or more of the offspring are homozygous recessive. Conclusion: animal X is a heterozygote
    v. Probability of detection (LOC) of a recessive gene. LOC= 1- probability(that all offspring would have been phenotypically dominant if X were a heterozygote
F. Best way to study for this part: Work out problems from old exams (question 2 usually) using the formulas from the handout for Po, LOC, etc. Work through this section

V. Hog Colors
A. The handout covers everything you need to know about this. There really isn't a way for me to help you understand this. Use punnett squares if necessary and take it one locus at a time.

VI. Breeds/ Abnormalities
A. Know 3-4 things about each of the following for the 4th question of the test (not too much detail, just basics)
    i. Angus
    ii. Hereford
    iii. Shorthorn
    iv. Charolais
    v. Simmental
    vi. Gelbvieh
    vii. Limousin
    viii. Chianina
    ix. Braunvieh
    x. Holstein
    xi. Jersey