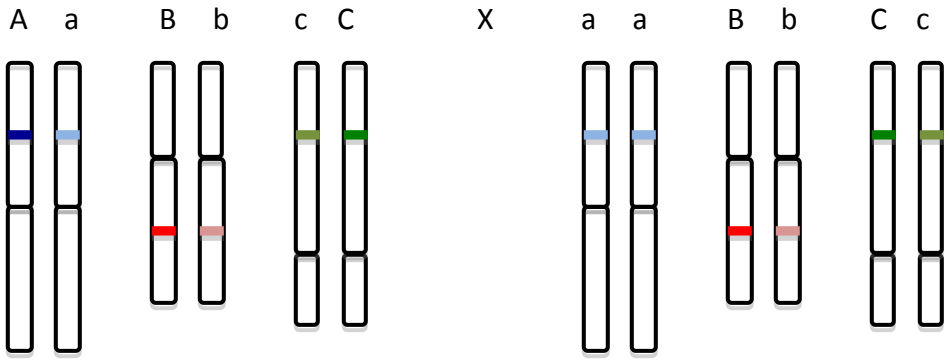
SDB 2012 Boot Camp
HandOut for M^2 Session on Teaching

One of the LEARNING OBJECTIVES for a unit in a Genetics course

4. Be able to perform problems similar to those we've done in class, in Problem Set 1, and those at the end of each chapter covered. In summary,

    (a) be able to predict the phenotypic classes and their ratios from a monohybrid cross involving dominant and recessive alleles;
    (b) be able to predict the phenotypic classes and their ratios from a cross involving co-dominant or incompletely dominant alleles;
    (c) be able to predict the ratio of a specific genotype and/or phenotype from a cross involving multiple independently assorting genes (with each gene exhibiting only dominant and recessive alleles);
    (d) be able to recognize when two interacting genes are influencing the expression of each other (e.g. epistatically), which will be reflected in the numbers and ratios of phenotypic classes of the F2 progeny resulting from a dihybrid cross (alterations of a 9:3:3:1 ratio);
    (e) given the phenotypes of parents and the phenotypes and ratios of F1 and/or F2 progeny, be able to distinguish between a trait that is determined by two alleles at one gene manifesting incomplete dominance versus two genes interacting with each other epistatically;

An EXAM QUESTION from the same unit
7. [6 pts] Consider the genetic cross represented below:



What is the probability of producing offspring that are heterozygous at all three loci (*Aa Bb Cc*)?
ANSWER (in the form of a decimal or fraction): _____

What is the probability of producing offspring that are phenotypically dominant for the traits encoded by all three loci (*A_ B_ C_*)? ANSWER (in the form of a decimal or fraction):
_____

Bloom's Taxonomy of the Cognitive Domain

1. **Factual knowledge**: remember and recall factual information
2. **Comprehension:** demonstrate understanding of ideas, concepts
3. **Application:** apply comprehension to unfamiliar situations
4. **Analysis:** break down concepts into parts
5. **Synthesis:** transform, combine ideas to create something new
6. **Evaluation:** think critically about and defend a position

Which Bloom Level?

1. The lipid bilayer of the cell membrane is comprised mostly (in terms of number of molecules) of

   (a) carbohydrates
   (b) phospholipids
   (c) proteins
   (d) nucleic acids

2. In veggieflies, wildtype eyes are red whereas psychedelic eyes *(pe-)* is an autosomal recessive trait. What proportion of offspring would be expected to exhibit psychedelic eyes if a heterozygous fly (*pe+/pe-*) was crossed with a homozygous recessive psychedelic fly?
   (a) 25%
   (b) 50%
   (c) 75%
   (d) 100%
   (e) none of the above

3. The growth factor Superman stimulates growth of muscle cells. The receptor that binds Superman is a receptor tyrosine kinase. Mice with a certain mutation build up twice as much muscle as normal wildtype mice. These mutant mice have been named Popeye. Which of the following types of mutations would be expected to produce the Popeye phenotype?
   (a) One that prevents localization of the Superman receptor to the plasma membrane.
   (b) One that prevents dimerization of the Superman receptor.
   (c) One that destroys the kinase activity of the Superman receptor
   (d) One that reduces recognition of the Superman receptor by phosphatases
   (e) One in which production of Superman is reduced.

4. During a semester abroad in Australia, you collect some sea urchins from the Great Barrier Reef, and decide it would be fun to spawn them and observe development. The first three rounds of cell divisions seem similar to what you remember from studying *Arbacia punctulata* in D-Bio class, but then much to your surprise you note that all the cells of the 8-cell stage divide meridionally and equally, giving rise to two layers of 8 equal sized cells. At the next division (giving rise to the 32-cell stage), all the cells divide synchronously, equally, and equatorially. (A) What question might be raised with regards to cell fate specification by your observations? State a hypothesis you would like to experimentally test concerning development in the Australian species. (B) Describe one experiment to test your hypothesis. (C) Describe one control for your experiment. (D) Describe one result that would be consistent with your hypothesis. (E) Describe one result that would be inconsistent with your hypothesis.