Genetic Analysis Problem Set.

- 1. In a mutagenized population of pea plants, you found a plant that produces wrinkled seeds. This phenotype is found to be heritable and segregate like a single recessive nuclear mutation. You hypothesize that this phenotype is due to a mutation in the R gene that, as we discussed in tutorial, is known to encode SBEI. Briefly describe 3 experiments you could do to test your hypothesis that the newly discovered mutant has a mutation in the R gene indicating the result that would support it.
- 2. A genetics technician identified two mutants from a mutagenized population of Arabidopsis that lacked the lipid trans 16:1. Both mutants bred true for the phenotype when self-fertilized. To determine if the two mutants were homozygous for a mutation in the same gene he crossed the two mutants. The F1 progeny lacked trans 16:1 so the technician concluded that the mutations were indeed in the same gene that he named NOT (**no t**rans 16:1). When the technician described the experiment to his supervisor he was fired. Why?
- 3. A population of plants has been transformed with a fragment of DNA carrying a gene that confers antibiotic resistance (resistance is a dominant phenotype). One plant from the M2 population has an *ap2* mutant phenotype, segregates like a single recessive nuclear mutation when crossed to wild type and fails to complement a known ap2 mutant. You hypothesize that the transformed DNA has inserted into the AP2 gene resulting in a loss of function mutation. If so you can use the line to clone the AP2 gene. To check whether the transformed DNA fragment is actually in the AP2 gene you cross the new ap2 mutant from the transformed population to wild type and select 30 ap2 mutants from the F₂ population. Seed from each of the *ap2* mutants is tested for resistance to the antibiotic and the floral phenotype. 100% of the progeny from all plants had an ap2 mutant phenotype. One hundred percent of the seed from 27 plants was resistant to the antibiotic. Seed from the other 3 plants was 75% resistant and 25% sensitive to the antibiotic. Is the new ap2 mutant caused by an insertion of the transformed DNA into the AP2 gene? Explain your reasoning.