Gene-specific answers will be distributed separately.
A single refseq protein for each Arabidopsis gene is provided online at clfs.umd.edu/classroom/CBMG688I/Gene.html.

7. You obtain a SALK line T-DNA insertion line. You grow up a single plant, which (unbeknownst to you) is heterozygous for each of two distinct T-DNA insertions, both of which confer kanamycin resistance. If these two insertions are unlinked, what proportion of the progeny seedlings would be expected to show kanamycin resistance.

15/16. Kanamycin resistance is a dominant trait, so this is the standard ratio from a dihybrid cross.

	T-DNA1; T-DNA2	T-DNA1; +	+; T-DNA2	+; +
T-DNA1; T-DNA2	Kan resistant	Kan resistant	Kan resistant	Kan resistant
T-DNA1; +	Kan resistant	Kan resistant	Kan resistant	Kan resistant
+; T-DNA2	Kan resistant	Kan resistant	Kan resistant	Kan resistant
+; +	Kan resistant	Kan resistant	Kan resistant	**Kan sensitive**

The 16 squares in this table represent equally likely outcomes from the cross. Only the case in the lower right (1/16) is expected to be kanamycin-sensitive, so the remaining 15/16 will be kanamycin-resistant.

8. What if the two insertions are linked, but 40 cM. apart? (neglect interference).

86.8%

Here you must apply the mapping function. $RF = \frac{1}{2}(1 - e^{-m})$
where *m* is the mean number of crossovers,which is twice the genetic distance.
Here, the genetic distance is 40 cM. or 0.4, so *m* = 0.8.
RF = 0.5 (1 - $e^{-0.8}$) = 0.275. Thus, 72.5% of the gametes will be nonrecombinant.

	T-DNA1; T-DNA2 **0.362**	T-DNA1; + **0.138**	+; T-DNA2 **0.138**	+; + **0.362**
T-DNA1; T-DNA2 **0.362**	Kan resistant $(0.362)^2 = 0.132$	Kan resistant 0.050	Kan resistant 0.050	Kan resistant $(0.362)^2 = 0.132$
T-DNA1; + **0.138**	Kan resistant 0.050	Kan resistant 0.019	Kan resistant 0.019	Kan resistant 0.050
+; T-DNA2 **0.138**	Kan resistant 0.050	Kan resistant 0.019	Kan resistant 0.019	Kan resistant 0.050
+; + **0.362**	Kan resistant $(0.362)^2 = 0.132$	Kan resistant 0.050	Kan resistant 0.050	**Kan sensitive $(0.362)^2 = 0.132$**

Half of those (36.2% of the total) will be lacking both transgenes (the other half will have both transgenes), so the exprected frequency of plants that do not show kanamycin resistance is $(.362)^2$ = .132 or 13.2%. Of course, this is intermediate between the answer in problem 7 (1/16 = 6.25%) and the case of tight linkage, where the two transgenes segregate together as though they were a single insertion (1/4 = 25%). The fraction that are resistant will therefore be 1-0.132 or

about 0.868. Many of you used the mapping function but didn't know how to get from the recombination fraction to the expected fraction of kanamycin sensitive plants (1 pt. of the 2).