Sample Genetics Problems

After Lab 11:

1. In humans, the allele for six fingers (F) is dominant to the allele for five fingers (f). If both parents are heterozygous for six fingers, what is the probability that their first child will be "normal" (have five fingers)?

2. If the father is heterozygous for six fingers and the mother has five fingers, what percentage of their children should have six fingers?

3. In horses, black color (B) is dominant to the gene for chestnut color (b). The trotting gait (T) is dominant to the gene for pacing gait (t). A cross is made between a horse homozygous for black color and the pacing gait and a horse homozygous for chestnut color and the trotting gait. What is the probability that an offspring will be a black trotter?

4. If an offspring from the previous problem is mated with a horse of the genotype bbTt, what will be the phenotypic ratio of the offspring?

5. In the radish plant, the long and round traits are incompletely dominant and result in an oval shape. Red color is dominant to white color. If an oval white radish is crossed with a round red radish that is heterozygous for color, what percent of their offspring should be round and white?

6. In some types of wheat, color is caused by two sets of genes, Both dominant genes A and E are needed for red color. White results from both recessive genes in the homozygous state (aaee). Other combinations will produce brown wheat grains. A strain with the genotype Aaee is crossed with a strain having the genotype AaEe. What will be the frequency of red offspring? What will the phenotypic ratio be in that cross?

After Lab 12:

7. In humans, the condition for normal blood clotting is dominant to the condition of hemophilia. These genes are X-linked. If a male hemophiliac has a child with a woman who is a carrier for hemophilia, what are the chances that a son will be normal for blood clotting?

8. In humans, normal color vision is dominant to red-green colorblindness (an X-linked trait). Two parents produce daughters who are all carriers and sons who are all normal. What are the probable genotypes of the parents?

9. Franklin has type O blood and has a child with Gloria who has type A blood. Gloria's mother had type A blood and her father had type B. What is the probability that Franklin and Gloria's first child will have type A blood? What is the probability that their third child will have type O blood?

10. In humans, brachydactylism is the result of a dominant allele. People with this trait have very short fingers. Defective dentine is also the result of a dominant allele but it is carried on the X chromosome. This allele causes the teeth to wear down rapidly and usually only stubs remain by adolescence. Assume a female who has brachydactylism and defective dentine (she is heterozygous for both traits) has a child with a man who has normal fingers and teeth. What is the probability that a son will have both defects? What is the probability that a daughter will have both defects?

<u>Answers</u>

1. 25% 2. 50% 3. 100% 4. 3 black trotter : 3 chestnut trotter : 1 black pacer : 1 chestnut pacer
5. 25% 6. 3/8 should be red, 3 red : 4 brown : 1 white 7. 50% 8. mother $X^C X^C$, father $X^c Y$
9. Type A child 50%, type O child 50% 10. 25% of the sons, 25% of the daughters will have both

Parent Genotypes	Possible Gametes	Punnett Square	Typical Question
♀ Ll ♂ LL			Genotypic Ratio:
♀ BB ♂ bb			% offspring BB:
♀ AADD ♂ aaDD			% offspring AaDD:
♀ RrGg ♂ rrgg			Genotypic Ratio:
♀ FfEE ♂ Ffee			Genotypic Ratio:
♀ BbQq ♂ BbQq			% offspring Bbqq: