

## GENETICS PROBLEMS SET 1

- 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", with 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) dominates chestnut color (b). The trotting gait (T) dominates the pacing gait (t). A cross is made between a horse homozygous for the 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 two offspring from the above problem are mated, what is the expected phenotypic ratio of their offspring?
- 5) In the radish plant, the long and round traits are incompletely dominant allowing for an oval shape from the heterozygous condition. Red color dominates 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 humans, the condition for normal blood clotting dominates the condition for non-clotting (hemophilia). These genes are sex-linked. If a male hemophiliac marries a woman who is a carrier for the trait, what are the chances that their male child will be normal for blood clotting?
- 7) 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 strains. A strain with the genotype Aaee is crossed with a strain having the genotype AaEd. What will be the frequency of red offspring?
- 8) In humans, normal color vision dominates red-green colorblindness. This is a sex-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) Assume a male with type O blood mates with a female who has type A blood. The female's mother had type A blood and her father had type B. What is the probability that their 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. Individuals that suffer from this trait have very short fingers. Defective dentine is also the result of a dominant allele, but is carried on the X chromosomes. The allele causes the teeth to wear down rapidly and usually only stubs remain by adolescence. Assume a female who has brachydactylism and defective dentine (heterozygous for both traits) mates with a male who has normal fingers and teeth. What is the probability that a son will have both brachydactylism and defective dentine? What is the probability that a daughter will have both defects?

ANSWERS: 1)  $\frac{1}{4}$  or 25% 2)  $\frac{1}{2}$  or 50% 3) 100% (all) 4) 9 black trotter: 3 black pacer: 3 chestnut trotter: 1 chestnut pacer 5)  $\frac{1}{4}$  or 25% 6)  $\frac{1}{2}$  or 50% 7)  $\frac{3}{8}$  or 37.5% 8) mother  $X^N X^N$ , father  $X^n Y$  9) Type A child 50%, type O child 50% 10) son 25%, daughter 25%