Human Genetics:
Problem Set I

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Abstract

This work contains the solutions to the problem set I of Human Genetics 2015 course at New York University.

Question 1.

Solution. a. As the gamete from the YY pea must be Y, the peas in the F_1 generation must contain at least 1 Y allele. Since we are given that YY and Yy genotypes result in yellow color, we have that the peas in the F_1 generation must be yellow. In other words, the expected frequency of yellow peas in the F_1 generation of a cross between YY and yy is 1.

b. Notice that the argument of The expected frequency of yellow peas in

c.

Question 2.
Solution.

Question 3.
Solution. a. As the father is type AB, we know that his genotype is $I^A I^B$. For the case of the mother, since O is the recessive trait, her genotype is $I^O I^O$.

b. The genotype of their children can be either $I^A I^O$ or $I^B I^O$. Since I^A and I^B are both dominant to I^O, the phenotype of their children can be either A or B.

c. Since the father is type A, he can have either $I^A I^A$ or $I^A I^O$ for his genotype. As the mother is type B, she can have either $I^B I^B$ or $I^B I^O$. We see that the possible genotypes of their children, created through the process of segration, are $I^A I^O$, $I^B I^O$, $I^A I^B$, and $I^O I^O$, which respectively corresponds to the phenotype A, B, AB and O. Hence, the possible blood types among their children are A, B, AB, and O.

Question 4.
Solution. a. Notice that none of the parents possess a I^B allele. As the AB phenotype requires a possession of a I^B allele, their first child cannot have the phenotype AB for the I locus. Hence, the probability that their first child will have the phenotype $AB+$ is 0.

b. Notice that one parent has DD genotype for the Rh locus. Hence, their first child will always possess a D allele, which makes the recessive trait $Rh-$ not a possibility. Therefore, the probability that their first child will have the phenotype $A-$ is 0.

c. Hence, the probability that their first child will have the phenotype $A+$ is 1.