

Genetic Problems (III)

SEX LINKED INHERITANCE & PEDIGREES

1. What are the expected phenotypic and genotypic ratios in the F1 generation?

Where hemophilia is a sex linked recessive trait.

- Where a male with hemophilia marries a woman non-carrier of the hemophilia trait.
- Where a male with hemophilia marries a woman carrier of the hemophilia trait.
- Where a normal male without hemophilia marries a woman with hemophilia.

2. If you cross a red eyed female fly with a white eyed male what is the probability of...?

Where eye color is sex linked, the female is hybrid and red eyed is wild type.

- white eyed offspring
- red eyed male
- white eyed female

3. Determine the parents genotypes/phenotypes or the possible genotypes/phenotypes.

Where eye color is sex linked, red eyed is wild type and white eyed is a mutant.

- In a cross that results in all red eyed females and 1 red : 1 white ratio in males
- In a cross that results in 1 red : 1 white ratio in females and 1 red : 1 white ratio in males
- In a cross that results in all red females and all white males

4. If you cross a red eyed female fly with a white eyed male what is the probability of...?

Where eye color is sex linked, the female is hybrid and red eyed is wild type.

- white eyed female followed by a red eyed male
- 3 red eyed males
- 2 white eyed females and 1 red eyed female
- 2 red eyed flies and 2 white eyed flies

5. If a normal female marries a male with hemophilia what is the probability of...?
Where hemophilia is sex linked recessive and the female's father had hemophilia.

- a. a child with hemophilia
- b. 2 children both without hemophilia
- c. a boy with hemophilia
- d. that their newborn son has hemophilia

6. Pseudohypertrophic muscular dystrophy is an inherited disorder that causes gradual deterioration of the muscles. It is seen almost exclusively in boys born to apparently normal parents and usually results in death in the early teens.

- a. Is this disorder caused by a dominant or recessive allele?
- b. Is this disorder autosomal or sex linked?
- c. How do you know?
- d. Explain why this disorder is almost never seen in girls.

7. What are the expected phenotypic ratios?

Where a mutant sex linked condition called "notch" is lethal in *Drosophila* when hemizygous in males or homozygous in females. Heterozygous females have small notches in the tips of their wings. Homozygous recessive females or hemizygous males have normal wings (wild type).

- a. In a cross between a wild type male and a notched female.
- b. In a cross between a wild type male and a wild type female.

8. What is the probability of...?

If you were to cross a F1 male with a F1 female from problem 7a.

- a. losing a male to the lethal condition
- b. normal male
- c. normal female
- d. notched female

9. What are the expected F1 phenotypes, when a homozygous wild type female is crossed with a white eyed male due to the interaction between the brown and vermilion loci?

Where a recessive sex linked gene in *Drosophila* (*v*) produces vermilion eye color when homozygous in females or when hemizygous in males. An autosomal recessive on chromosome 2 (*bw*) produces brown eye color while the dominant allele produces the wild type color. Individuals who are homozygous recessive at both the brown and vermilion eye loci have white eyes.

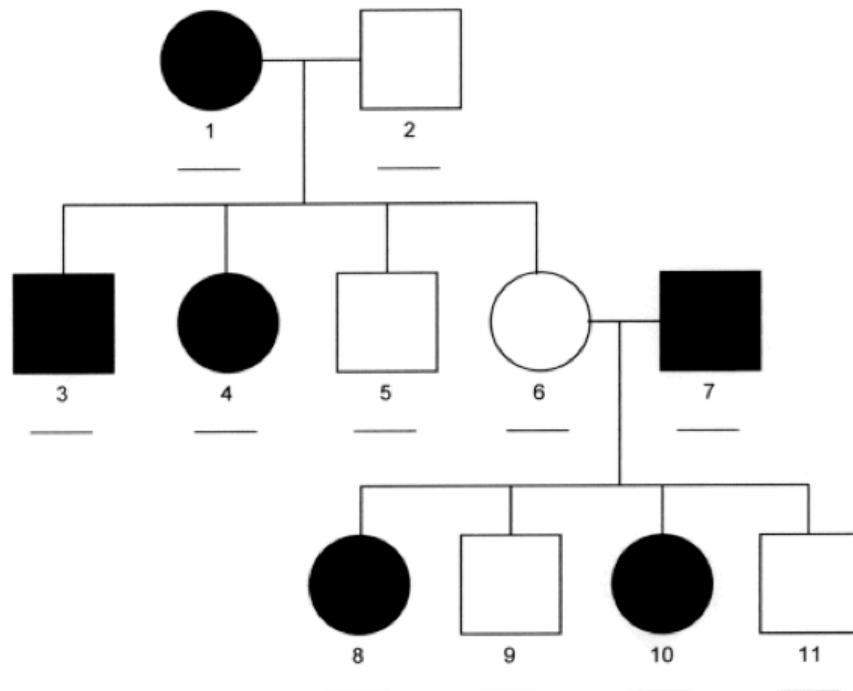
- a. of female offspring
- b. of male offspring

10. What are the expected F2 phenotypes, when cross a F1 female and F1 male from question number 9 above?

Where a recessive sex linked gene in *Drosophila* (*v*) produces vermilion eye color when homozygous in females or when hemizygous in males. An autosomal recessive on chromosome 2 (*bw*) produces brown eye color while the dominant allele produces the wild type color. Individuals who are homozygous recessive at both the brown and vermilion eye loci have white eyes.

- a. of female offspring
- b. of male offspring

11. Analyze the pedigree and determine if the trait is recessive or dominant, autosomal or sex-linked.

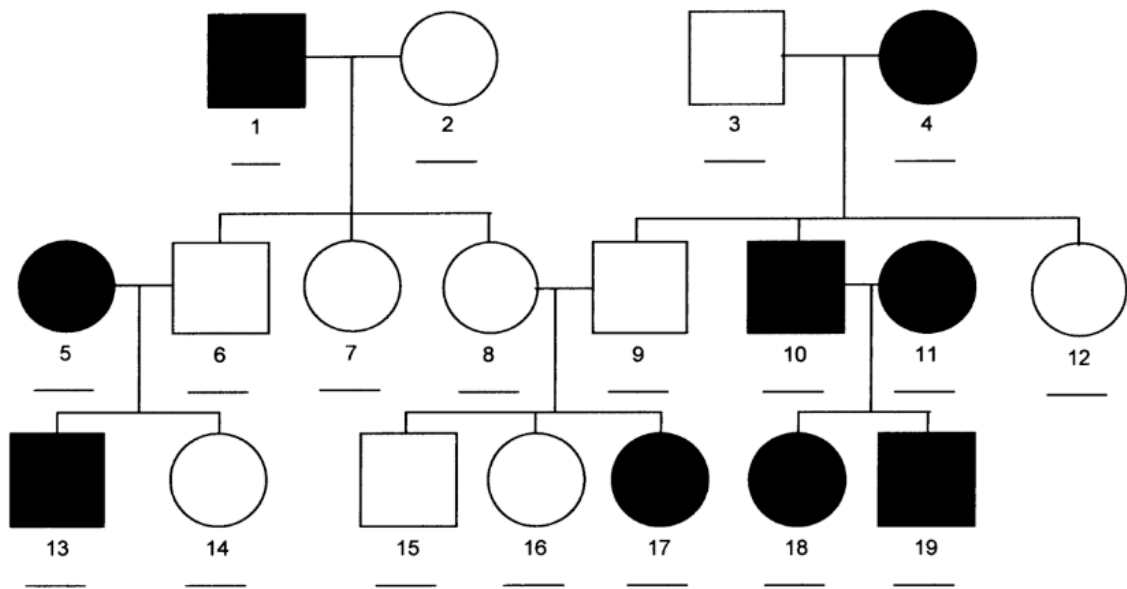


12. Determine and write the genotypes for all individuals in question #11 pedigree.

13. Analyze the pedigree in question #11.

- What is the probability that individuals 6 and 7 have an affected child?
- What is the probability that individuals 6 and 7 have an affected boy?
- What is the probability that individual 3 marries and their daughter is affected?

14. Analyze the pedigree and determine if the trait is recessive or dominant, autosomal or sex-linked.

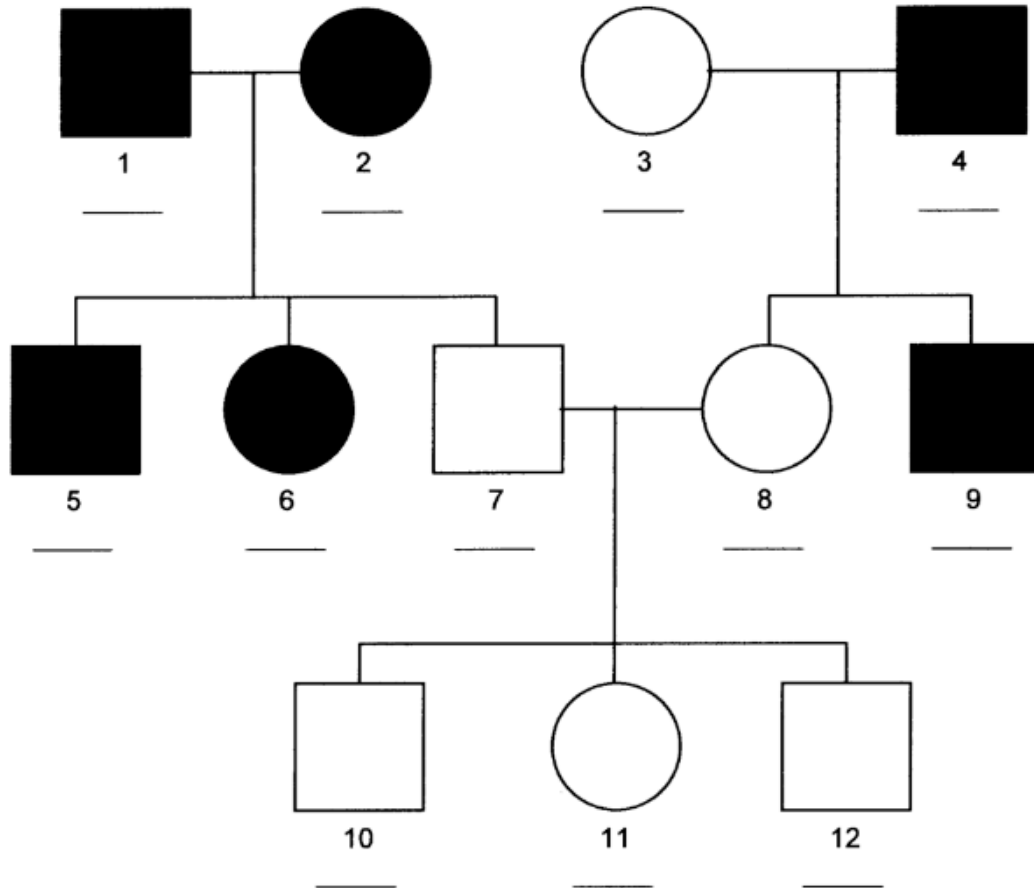


15. Determine and write the genotypes for all individuals in question #14 pedigree.

16. Analyze the pedigree in question #14.

- What is the probability that individuals 10 and 11 have a non-affected girl?
- What is the probability that individuals 10 and 11 have an affected girl?
- What is the probability that individuals 13 and 16 have 2 non-affected children?
- How many grandchildren do individuals 3 and 4 have?

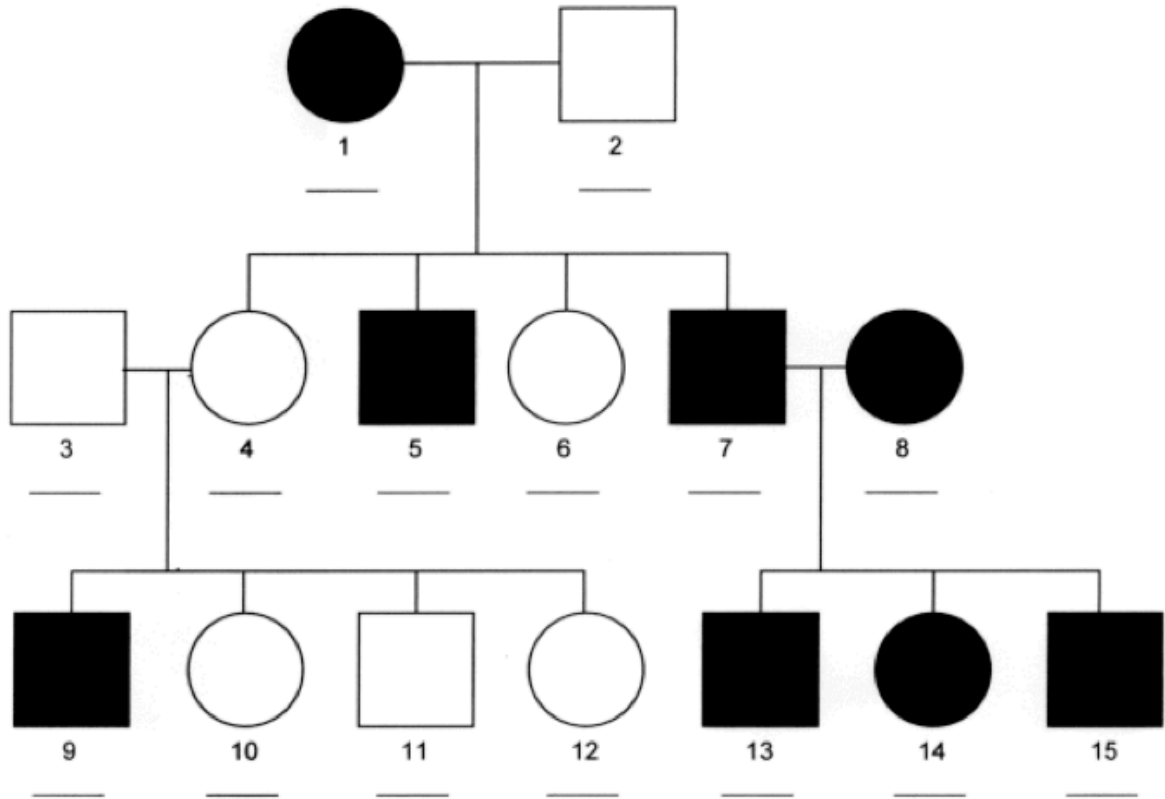
17. Analyze the pedigree and determine if the trait is recessive or dominant, autosomal or sex-linked.



18. Determine and write the genotypes for all individuals in question #17 pedigree.

19. Analyze the pedigree in question #17.

- What is the probability that individual 5 is homozygous?
- What is the probability that if individuals 5 and 8 were to marry they would have an affected child?
- What is the probability that individuals 7 and 8 have 2 more kids (1 boy, 1 girl) both unaffected?



20. Analyze the pedigree and determine if the trait is recessive or dominant, autosomal or sex-linked.

21. Determine and write the genotypes for all individuals in question #20 pedigree.

22. Analyze the pedigree in question #20.

a. What is the probability that individual 10 is homozygous?

b. What individuals married into this family?

c. If individual 9 were to marry what is the probability that he would pass the gene to his son?