

MONOHYBRID PROBLEMS

In questions 1-3, assume tall (TT or Tt) is dominant over dwarf (tt) in garden pea plants. For each of the crosses below, give the probable offspring by answering the following questions (a) – (e). Write your answers on the lines provided.

- (a) Number of tall plants (out of 4)?
- (b) Number of dwarf plants (out of 4)?
- (c) Number of hybrid plants (out of 4)?
- (d) Number of offspring that can pass on the tall trait to their own offspring (out of 4)?
- (e) Number of offspring that can pass on the dwarf trait to their own offspring (out of 4)?

1. Two homozygous tall parents.

- (a) _____
- (b) _____
- (c) _____
- (d) _____
- (e) _____

2. Two heterozygous tall parents.

- (a) _____
- (b) _____
- (c) _____
- (d) _____
- (e) _____

3. One tall heterozygous and one dwarf parent.

- (a) _____
- (b) _____
- (c) _____
- (d) _____
- (e) _____

In questions 4-5, assume in guinea pigs that short hair (HH or Hh) is dominant over long hair (hh). Write the probable F₁ for each of the following:

- (a) Number of homozygous offspring (out of 4)?
- (b) Number of hybrid offspring (out of 4)?
- (c) Number of black offspring (out of 4)?
- (d) Number of brown offspring (out of 4)?
- (e) Phenotypic ratio of offspring?
- (f) Genotypic ratio of offspring?

4. One heterozygous short-haired and one homozygous short-haired parent.

- (a) _____
- (b) _____
- (c) _____
- (d) _____
- (e) _____
- (f) _____

5. One homozygous short-haired and one homozygous long-haired parent.

- (a) _____
- (b) _____
- (c) _____
- (d) _____
- (e) _____
- (f) _____

6. Albinism occurs commonly in animals, and it is always recessive to normal. 6 brown and 5 albino mice were born to parents, which are brown and albino. What are the genotypes of **both** parents? _____

7. In humans, being able to roll the tongue is dominant to being unable to roll the tongue.

- (a) Could 2 people unable to roll their tongues produce a child who can? _____
- (b) Could a marriage between a man who is homozygous for being able to roll his tongue and a woman who cannot roll her tongue have any children who cannot roll their tongues? _____
- (c) Could 2 people who can roll their tongues ever have a child who cannot? _____

8. In fruit flies, long wing (L) is dominant to short wing (l). Two long-winged flies produced 49 short-winged and 148 long-winged offspring.

- (a) What are the genotypes of the parents? _____
- (b) What fraction of the long-winged offspring should be homozygous dominant? _____
- (c) What fraction of all offspring should be heterozygous? _____

9. In dogs, short hair is dominant to long hair. A short-haired male mates with a long-haired female. They have 8 offspring. All are short-haired.

What are the possible genotypes of each dog in the family?

- (a) What is/are the possible genotype(s) for the mother? _____
- (b) What is/are the possible genotype(s) for the father? _____
- (c) What is/are the possible genotype(s) for offspring? _____

10. Two flowers are both heterozygous for round seeds. They are crossed, and the offspring's seeds are all wrinkled.

- (a) How is this explained? _____
- (b) What are the chances that their next offspring will have round seeds? _____
- (c) What are the chances that their next offspring will have wrinkled seeds? _____

11. In a certain plant, yellow fruit (Y) is dominant to white fruit (y). A heterozygous plant is crossed with a plant with white fruit.

- (a) What is the probable genotypic ratio resulting from this cross? _____
- (b) What is the phenotypic ratio resulting from this cross? _____
- (c) If the plants have 180 offspring, how many of them will theoretically have white fruit? _____
- (d) If the plants have 180 offspring, how many of them will theoretically have yellow fruit? _____

12. The genetic disease called cystic fibrosis is inherited through a recessive gene. If both parents are heterozygous for this trait, what is the probability that they will have a child who suffers from this disease?

13. In fruit flies, long wing is dominant over vestigial wing. If two flies heterozygous for this trait are crossed, what is the probability that their offspring will be heterozygous?

14. In peas, yellow seed color is dominant over green seed color. If a heterozygous yellow plant is crossed with a green plant, what is the probability that the offspring will be green?

15. A breeder performs a testcross to determine whether an Alaskan malamute is homozygous dominant (DD) or heterozygous dominant (Dd) for a recessive dwarf allele. Half the offspring appear dwarf. What is the genotype of the unknown dog? Complete a Punnett square to verify your answer.

16. What results would be expected if the unknown dog was homozygous dominant (DD)? Complete a Punnett square to verify your answer.

10. A blue-eyed man, both of whose parents are brown-eyed, marries a brown-eyed woman whose father was brown-eyed and whose mother was blue-eyed. They have one child who is blue-eyed.

What are the most probable genotypes of the individuals mentioned?

- (a) What is the probable genotype for the mother's mother? _____
- (b) What are the probable genotypes for the mother's father? _____
- (c) What is the probable genotype for mother? _____
- (d) What is the probable genotype for the father's mother? _____
- (e) What is the probable genotype for the father's father? _____
- (f) What is the probable genotype for the father? _____