

Name: _____ Period: _____ Date: _____

Test Cross Worksheet (A.K.A. Back-Cross)

INTRODUCTION:

In plants and animals, organisms exhibiting the dominant trait may be either hybrid (heterozygous) or homozygous dominant. Since we cannot see an organism's genes upon external inspection, and in breeding selectively it may be important to know the exact genotype, a test (or back) cross may be helpful. To make a test cross, the organism whose genotype is being tested is crossed with an organism known to be homozygous recessive for the trait in question. Every offspring from such a mating would receive one recessive allele from the homozygous recessive parent. If an offspring received a recessive allele from the other parent as well, then it would show the recessive phenotype. From these results we would know that the other parent was hybrid and not pure for the dominant characteristic.

Test crosses are used extensively in animal husbandry to help maintain hereditary "vigor" in population. (mink, chinchilla, foxes, hamsters, rabbits, guinea pigs, etc.)

TEST-CROSS RULES:

- A. Always cross the unknown genotype with a homozygous recessive**
- B. Observe (count) large numbers of offspring to ensure accuracy in determining the unknown genotype.**

PROBLEMS:

1. In fruit flies, red eyes are dominant over sepia (brownish) eyes. Being the great genetic student that you are, you happen to have a culture of pure red eye and pure sepia eye flies in your laboratory. While working in your lab late one night, a cute, fuzzy, and fantastically friendly, red eyed fruit fly came in for a crash landing on your banana. Wanting (naturally) to know more about your new friend, you decide to run a test-cross on your little, buzzing buddy.

- a. Give the phenotypes of the flies in your test-cross: _____ X _____
- b. If all of the offspring turn out to be red-eyed (all 347 of them!!!) what would the genotypes of the flies used in your test-cross? (Use "R" and "r")

_____ X _____ Diagram the cross:

Genotypic ratio= _____

Phenotypic ratio= _____

- c. If about 179 of the 347 show up with sepia eyes, what was the actual genotype of your new found friend? _____

2. Let's say you decide to make your living as a mink farmer. In mink, black fur is dominant over white fur. Since the market for black mink coats is higher than white mink, you (being the entrepreneur that you are) decide to only raise black mink. Everything is going well but the guy you bought your mink from seemed a little crooked! You want to make sure they are pure breeds so you run a test-cross.

- a. Give the phenotypes of the mink in your test-cross:

_____ X _____

- b. In your first test-cross, 30 out of 60 offspring are black and the rest are white! No wonder you got such a good deal! What are the genotypes of the mink used in your test-cross? (Use "B" and "b")

_____ X _____ Diagram the cross:

Genotypic ratio= _____

Phenotypic ratio= _____

- c. Was the black-furred mink you chose for your test-cross a pure breed? What is his genotype? _____

3. Since you have many mink and there may only be one bad one in the bunch, you decide to do a second test-cross on a different mink. This time out of 55 offspring, every last one is black! What are the genotypes of the mink used in this test-cross?

_____ X _____ Diagram the cross:

Genotypic ratio= _____

Phenotypic ratio= _____

- 4. Are you still in the mink business? Or is fake fur the way to go? _____

Test Cross Worksheet (A.K.A. Back-Cross)

INTRODUCTION:

In plants and animals, organisms exhibiting the dominant trait may be either hybrid (heterozygous) or homozygous dominant. Since we cannot see an organism's genes upon external inspection, and in breeding selectively it may be important to know the exact genotype; a test (or back) cross may be helpful. To make a test cross, the organism whose genotype is being tested is crossed with an organism known to be homozygous recessive for the trait in question. Every offspring from such a mating would receive one recessive allele from the homozygous recessive parent. If an offspring received a recessive allele from the other parent as well, then it would show the recessive phenotype. From these results we would know that the other parent was hybrid and not pure for the dominant characteristic.

Test crosses are used extensively in animal husbandry to help maintain hereditary 'vigor' in population. (mink, chinchilla, foxes, hamsters, rabbits, guinea pigs, etc.)

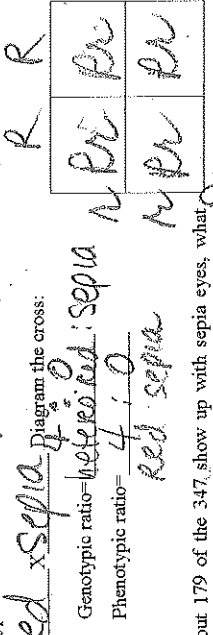
TEST-CROSS RULES:

- A. Always cross the unknown genotype with a homozygous recessive
- B. Observe (count) large numbers of offspring to ensure accuracy in determining the unknown genotype.

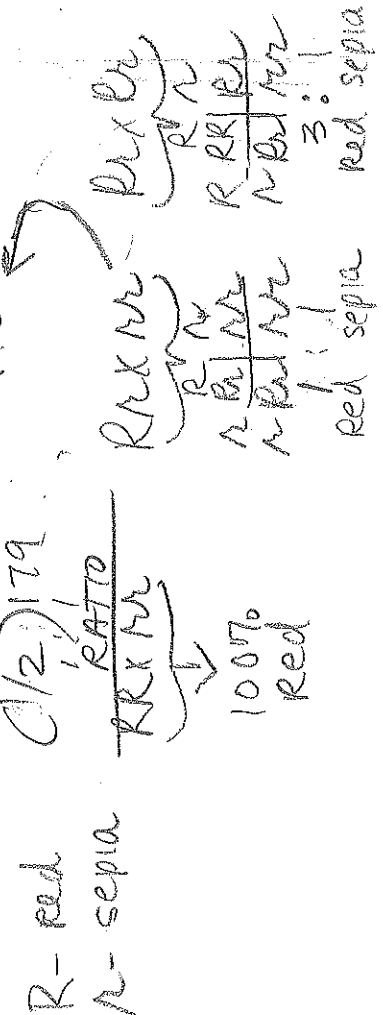
PROBLEMS:

1. In fruit flies, red eyes are dominant over sepia (brownish) eyes. Being the great genetic student that you are, you happen to have a culture of pure red eye and pure sepia eye flies in your laboratory. While working in your lab late one night, a cute, fuzzy, and fantastically friendly, red eyed fruit fly came in for a crash landing on your banana. Wanting (naturally) to know more about your new friend, you decide to run a test-cross on your little, buzzing buddy.

- a. Give the phenotypes of the flies in your test-cross: RR x rr
- b. If all of the offspring turn out to be red-eyed (all 347 of them!!!) what would the genotypes of the flies used in your test-cross? (Use "R" and "r")



c. If about 179 of the 347, show up with sepia eyes, what was the actual genotype of your new found friend?

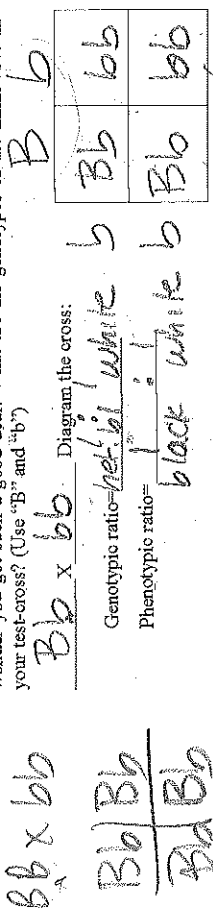


2. Let's say you decide to make your living as a mink farmer. In mink, black fur is dominant over white fur. Since the market for black mink coats is higher than white mink, you (being the entrepreneur that you are) decide to only raise black mink. Everything is going well but the guy you bought your mink from seemed a little crooked! You want to make sure they are pure breeds so you run a test-cross. B - black b - white

a. Give the phenotypes of the mink in your test-cross:

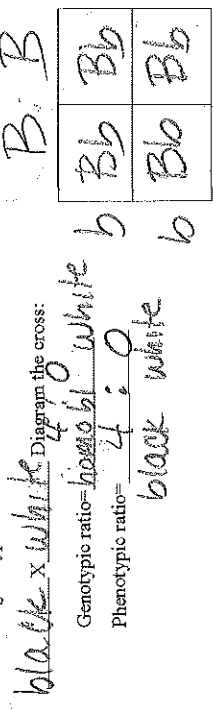
black x white

b. In your first test-cross, 30 out of 60 offspring are black and the rest are white! No wonder you got such a good deal! What are the genotypes of the mink used in your test-cross? (Use "B" and "b")



c. Was the black-furred mink you chose for your test-cross a pure breed? What is his genotype? NO = Bb

3. Since you have many mink and there may only be one bad one in the bunch, you decide to do a second test-cross on a different mink. This time out of 35 offspring, every last one is black! What are the genotypes of the mink used in this test-cross?



4. Are you still in the mink business? Or is false fur the way to go?
That's your choice - do you want to kill a living animal if a fake fur is available?