PUNNETT SQUARES— CROSSES INVOLVING ONE TRAIT

Name _____

In a certain species of animal, black fur (B) is dominant over brown fur (b). Using the following Punnett square, predict the genotypes and phenotypes of the offspring whose parents are both Bb or have heterozygous black fur.

	B	b
B		
b		

Genotypes: _____% homozygous black fur (BB)

_____% heterozygous black fur (Bb)

_____% homozygous brown fur (bb)

Phenotypes: _____% black fur

_____% brown fur

Now do the same when one parent is homozygous black and the other is homozygous brown.

Genotypes: _____% homozygous black fur (BB)

_____% heterozygous black fur (Bb)

_____% homozygous brown fur (bb)

Phenotypes: _____% black fur

_____% brown fur

Repeat this process again when one parent is heterozygous black and the other is homozygous brown.

Genotypes: _____% homozygous black fur (BB)

_____% heterozygous black fur (Bb)

_____% homozygous brown fur (bb)

Phenotypes: _____% black fur

_____% brown fur

Quick Lab

Dominant and Recessive Traits

Can you find Mendelian patterns in humans? Look for ratios between these contrasting traits.

Procedure

1. On a separate sheet of paper, draw a table like the one shown here. For each character, circle the trait that best matches your own trait.

Dominant trait	Recessive trait
freckles	no freckles
no cleft	cleft chin
dimples	no dimples

2. Tally the class results to determine how many students in your class share each trait.

Analysis

1. Summarize the class results for each character.

2. Calculate the ratio of dominant traits to recessive traits for each character.

3. Critical Thinking Mathematical Reasoning Are each of the ratios the same? Why is this unlikely to happen?

Name _____

Date _____ Period _____

Dihybrid Crosses

Gregor Mendel, the father of modern genetics, discovered that in pea plants the gene for round seeds (R) is dominant to the gene for wrinkled seeds (r). He also discovered that yellow seed color (Y) is dominant to green seed color (y). He then made the following cross:

P RRYY X rryy

1. What would be the **genotype** for all the F_1 offspring? _____
2. What would be the **phenotype** for the F_1 offspring? _____
3. Show Mendel's F_1 cross below. (See the answer to question #1.)

F_1 _____ Male X _____ Female

4. What are the 4 possible gametes (pollen grains or eggs) from these plants?

_____

5. Complete the Punnett square of this cross below

6. What are the chances of having offspring with round, yellow seeds? _____
7. What are the chances of having offspring with round, green seeds? _____
8. What are the chances of having offspring with yellow seeds? _____
9. What are the chances of having offspring with , green seeds? _____
10. What are the chances of having offspring with pure round, pure yellow seeds? _____

In humans free earlobes (E) is dominant to attached earlobes (e), and tongue rolling (R) is dominant to non-rolling (r).

11. What are **all the possible genotypes** of a person with free earlobes who can roll his tongue?

_____

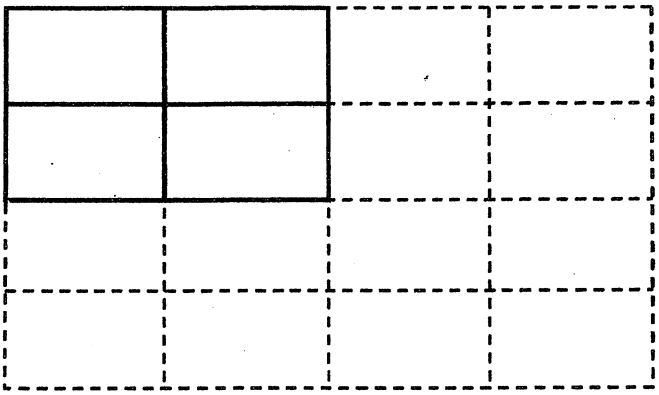
12. What is the **genotype** of a girl with attached earlobes but she cannot roll her tongue? _____
13. What are **all the possible genotypes** of a person with free earlobes who cannot roll her tongue?

_____

In cats, the gene for black fur (B) is dominant to the gene for brown (b), and the gene for short hair (S) is dominant to the gene for long hair (s). Complete the Punnett square below for the following cross:

BBSs X Bbss

Hint: If you're clever, you will only need to use four of the boxes!



14. What proportion of the offspring from the cross shown above would be expected to be black with short hair?

_____

In tomato plants, the gene for purple stems (A) is dominant to the gene for green stems (a), and the gene for red fruit (R) is dominant to the gene for yellow fruit (r). If two tomato plants heterozygous (AaRr) for both traits are crossed, state what proportion of the offspring are expected to have:

15. red fruit _____ 16. green stems and red fruit _____

17. purple stems and red fruit _____

You may want to draw a 16-box Punnett square.

If 640 seeds resulting from the above tomato cross are collected and planted, how many would be expected to grow into plants with:

18. purple stems and yellow fruit? _____ 19. green stems and yellow fruit? _____

20. green stems and red fruit? _____

You are a geneticist working for a large seed company. One of your colleagues is fired before she can finish some important experiments she was working on. The company president has turned this project over to you. All you know is that your former colleague was working with a rare type of flower that comes in two colors, red and blue and that the plant has either a short stem or a long stem. You do not know which traits are dominant or recessive; however, you do have a bunch of these plants that have red flowers and long stems that you can cross. After many months of work, you finally print up the results of your crosses.

	Red/Long	Red/Short	Blue/Long	Blue/Short
Trial 1	2140	713	714	240
Trial 2	1006	336	335	110
Trial 3	874	292	291	100
Trial 4	866	289	289	100
Trial 5	739	248	244	80

21. Which traits are probably dominant? _____

22. Which traits are probably recessive? _____

23. Do you think that the original plants that you were given were heterozygous for both traits? _____

24. Why do you say this? _____