ONE-FACTOR & TWO-FACTOR CROSSES

DIRECTIONS: *Work each of the problems and be sure to show all your work. To properly set up each problem, you need to show the following:*:

A. Show what each letter represents (make a key)
B. Show the genotypes of the parents in the cross
C. Construct a Punnett square to show the cross
D. Give the phenotypic and genotypic ratios requested

ONE FACTOR CROSSES

1. **In peas, the gene for smooth seed shape is dominant over the gene for wrinkled seed shape**.

A. What symbol would be used for smooth seeds? _____

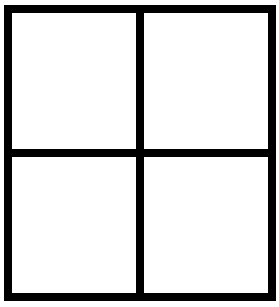
What symbol would be used for wrinkled seeds? _____

What is the genotype for homozygous smooth seeds? _____

What is the genotype for heterozygous smooth seeds? _____

What is the genotype for wrinkled seeds? _____

B. If a pea plant is **heterozygou**s for smooth seeds is crossed with a plant which has wrinkled seeds, what would be the expected genotypic and phenotypic % in the $\mathbf{F_1}$ generation?



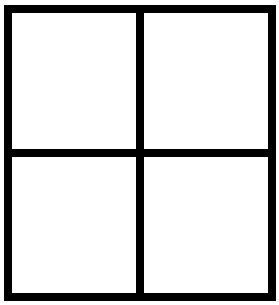
Genotype %:_____

_____

Phenotype %: _____

_____

C. If a pea plant is homozygous for smooth seeds is crossed with a pea plant that has wrinkled seeds, what are the expected genotypic ratios in their grandchildren (the **F_2** generation)?



Genotype %:_____

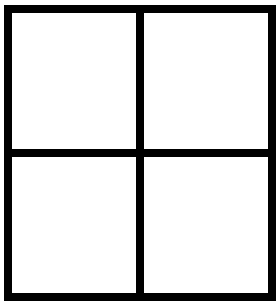
_____

Phenotype %: _____

_____

2. **Dumbo, the elephant, is homozygous dominant for big ears. His wife, Mumbo, is homozygous recessive and has normal size ears (but that means she can't fly).**

A. What will be the genotypic and phenotypic % predicting the size of ears in their little ones?

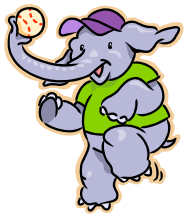


Genotype %:_____

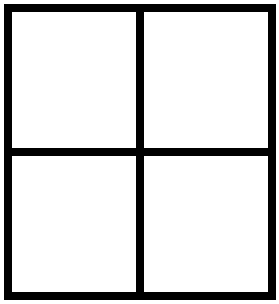
_____

Phenotype %: _____

_____



B. If their baby, **Kimbo**, grows up and marries an elephant that is Heterozygous for big ears, what will be the genotypic and phenotypic % possible for their children?



Genotype %:_____

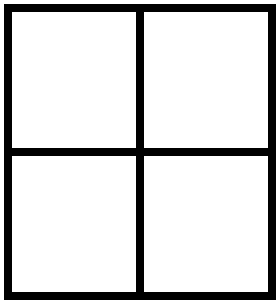
_____

Phenotype %: _____

_____

3. **After the Grinch joined all the Whos down in Whoville for Christmas, one year, he married a Who by the name of Peggy Lou Who. The Grinch is homozygous dominant for green fur; while his wife is recessive and has purple fur.**

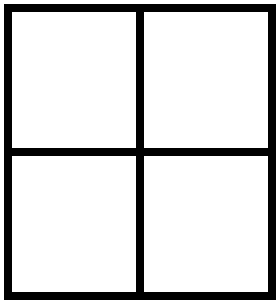
A. What will be the genotypic and phenotypic ratio of their children?



Genotype ratio:_____

Phenotype ratio:_____

B. If one of their children, **Greta Grinch**, marries a **Wh**o, who is heterozygous for green fur, what will be the genotypic and phenotypic ratio possibilities for their children?



Genotype ratio_____

_____

Phenotype ratio: _____

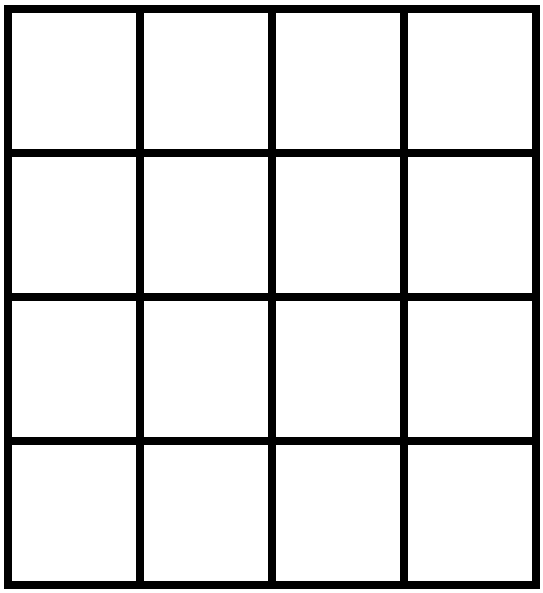
_____

TWO FACTOR CROSSES (Dihybrid Punnett Squares)

Hint: Remember **FOIL (First, Outer, Inner, Last)**

4**. Mendel crossed a homozygous plant that was tall and had yellow seeds with a homozygous plant that was short and had green seeds. Tall is dominant over short, and yellow is dominant over green**.

A. What will be the **genotype** of their offspring (the F_1 generation)? What will be their **phenotype**?



Genotype _____

_____

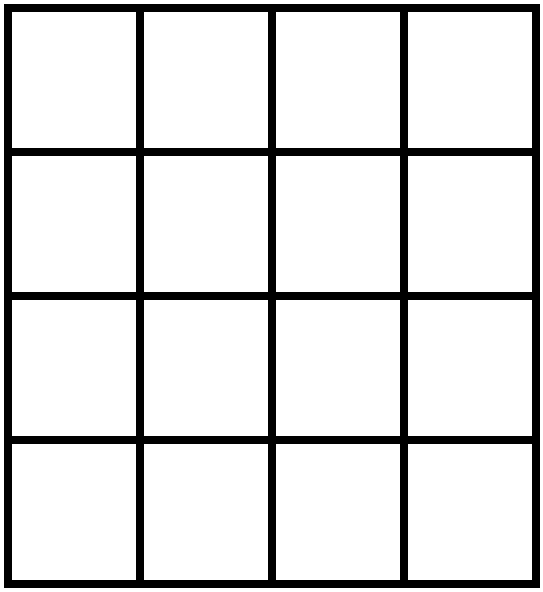
Phenotype _____

_____

B. Mendel allowed the **F_1** plants to self-pollinate and produced an **F_2** generation. **Make a cross** to show the possible offspring in the **F_2** generation.

On your Punnett square, use the following **color code** to show the offspring combinations:

If the offspring is/are **Tall and yellow – color squares yellow**
If the offspring is/are **Tall and green – color squares green**
If the offspring is/are **Short and yellow – color squares red**
If the offspring is/are **Short and green – color squares blue**



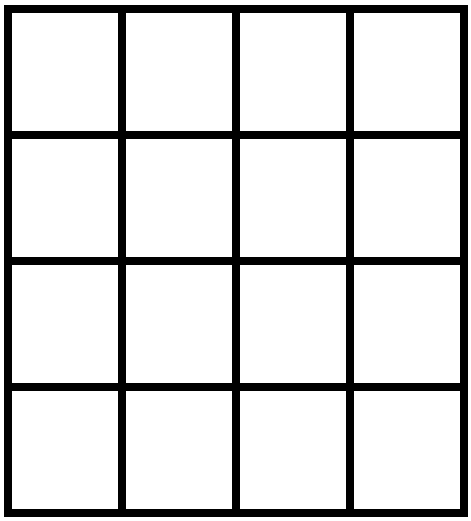
1. What is the phenotypic ratio for this cross?

Phenotype _____

5. **In ostriches, long necks are dominant over short necks and purple eyes are dominant over pink eyes.**

Osgood and Olivia Ostrich have just become the proud parents of a baby daughter, Olive Oyl Ostrich. Osgood is a handsome dude, for sure—he is homozygous for long neck and has pink eyes. What a hunk!! His lovely bride, Olivia, has a short neck and is homozygous for purple eyes. She's really a fine babe!!

A. What will be the genotype of the new baby? What is her phenotype?

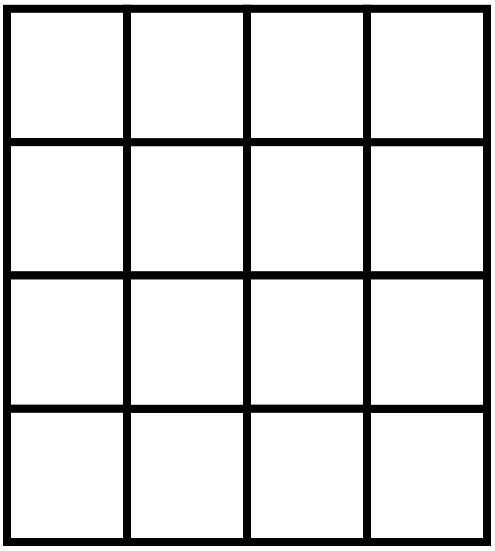


Genotype _____

Phenotype _____

B. Use a Punnett square to show the possible **grandchildren** Osgood and Olivia might expect if their new bundle of feathers (Olive Oyl) were to marry another ostrich with her exact genotype. Give the phenotypic ratio for the cross.

Phenotype _____



THE CHALLENGE:

In humans, right-handedness is dominant over left-handedness. Red hair color is dominant over non-red hair color (black, brown, blond). Freckles are dominant over no freckles.

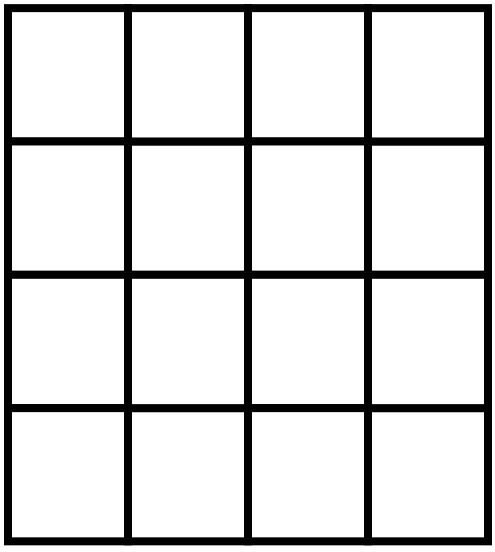
6. Ziegfield (nicknamed **Ziggy** for obvious reasons) is **right-handed**, has **brown hair** and **freckle**s. His mother Zelda, however is left-handed and has red hair, but no freckles. Ziggy met the woman of his dreams, **Zebrina**, at a rock concert. His new love was also **right-handed**, although Zebrina's father was nicknamed Lefty. It was hard to tell under the purple hairspray, but Ziggy discovered that Zebrina's true **hair color was blond**, even though her mother had red hair. She inherited her **freckle**s from her mother because freckles did not run in her father's family.

   A. What is Ziggy's genotype? _____

   B. What is Zebrina's genotype? _____

   C. If Ziggy and Zebrina get married, what are the possible characteristics that their offspring might inherit? You will have to develop a cross to show the possibilities, then give the phenotypic ratio, showing all of the possibilities for their children.

Hint: *There are 8 possible gamete combinations for both Ziggy and Zebrina.*



Phenotype ratio possibilities: _____

_____

_____

_____

_____