Name:_____

Welcome to the Oompahs: MONOHYBRID CROSSES

1. Oompahs generally have blue faces, which is caused by a dominant gene. The recessive condition results in an orange face. Develop a "key" to show the possible genotypes and phenotypes for the Oompah's face colours.

2. Two heterozygous Oompahs are crossed. What proportion of the offspring will have orange faces?

3. A blue faced Oompah (homozygous) is married to an orange faced Oompah. They have 8 Oompah children. How many of those children will have blue faces?

4. Otis Oompah has an orange face and is married to Ona Oompah who has a blue face. They have 60 Oompah children, 30 of those children have orange faces. What is Ona & Otis Oompah's genotype?

5. Odie Oompah has a blue face, in fact everyone in Odie's family has a blue face, and the family likes to brag that they are a "pure" line. Much to his families horror, he married Ondi Oomah, who "GASP" has an orange face. What will the phenotypes and genotypes of Ondi & Odie's children be? Will Odie's line still be pure?

6. Otis Oompah (from #4) dies leaving Ona a widow (with 60 kids). Ona remarries, after grieving to Otto Oompah. Otto has an orange face. What is the probability that Ona and Otto's children will have an orange face?

Name:_____

Welcome to the Oompahs: ~~CODOMINANCE~~ Incomplete Dominance

1. Oompahs can have red, blue or purple hair. The allele that controls this trait is CODOMINANT, and purple hair is caused by the heterozygous condition. Show a "key" for the genotypes and phenotypes of hair colour.

2. Orville Oompah has purple hair and is married to Opal Oompah who brags that she has the bluest blue hair in the valley. How many of Opal's children will be able to brag about their blue hair also?

3. One of Opal's children is born with shocking red hair. Is Orville Oompah the father of this child? Show a punnett square to prove yes or no. But wait, Opal swears that she has been faithful, she claims the hospital goofed and got her baby mixed with someone else's. Based on genetics, is this a likely story?

4. Olga Oompah has red hair and marries Oliver Oompah who has blue hair. They have 32 children. What is the colour of these children's hair?

5. Olivia Oompah is married to Odo Oompah. Both of them have purple hair. They have 100 children. What is the hair colour of their children and in what proportion?

6. In the land of Oompah, blue hair is highly valued. Blue haired Oompahs get special benefits. Oscar Oompah has purple hair but he wants a wife that will give him children with blue hair. What colour hair should he look for in a wife? If he cannot find this type of Oompah what should his second choice be?

Problems - Dihybrid Crosses: Genetic Crosses that involve 2 traits.

In Llamas, floppy ears are dominant to pointy ears. Also in Llamas, bowlegs are recessive.

1) Develop a "Key" showing the letters used to describe the two traits. (Each trait should have a different letter – choose your letters carefully). Also, show all possible genotypes using your letters.

2) A Llama with floppy ears (Ff) and bowlegs (be observant for this genotype) is crossed with one that is heterozygous for both traits. Show the genotypes of these two parents.
3) Draw a punnett square showing the resulting offspring.
4) Show the ratios of the resulting phenotypes using fractions.

5) A Llama that has pointy ears and bowlegs is crossed with one that is homozygous dominant for both traits. Show the genotypes of the parents.
6) Draw a punnett square showing the resulting offspring. **(Use back of sheet)**
7) Show the ratios of the resulting phenotypes using fractions.

8) A Llama that is heterozygous for both traits is crossed with another Llama that is heterozygous for both traits. Show the genotypes of the two parents.
9) Draw a punnett square showing the resulting offspring.
10) Show the ratios of the resulting phenotypes using fractions.

11) **BONUS QUESTION**: Design a test cross to prove the genotype of a floppy eared Llama as FF or Ff.

Mendelian Principles:

Monohybrid Cross:

1) Two red flowering plants are crossed. Both plants are heterozygous for the gene that determines flower colour. Red is dominant and white is recessive.
    a) Will all flowers in the F1 generation be red?
    b) What are the possible gametes that these red flowers produce?
    c) Give the genotypic & phenotypic ratios for the F1.

2) Use the info from the above question to do this one:
    a) What would result in the F1 if a white flower & true-breeding red flower were crossed?
    b) If any 2 members of the F1 were crossed, what colour of flower would result the F2 generation?
    c) How does this demonstrate Mendel's 1st Law of Dominance?

Dihybrid Cross:

1) In "4 o'clock" flowers, red is dominant to white and tall stem is dominant to dwarf. When a pure red, heterozygous tall plant is crossed with a pure white short-stemmed plant you are to find the expected F1 genotypic & phenotypic ratio.

2) When mountain sheep of poor eyesight are crossed with pure sharp-sighted sheep, all of the offspring are sharp-sighted. When 2 heterozygous white-coated sheep are crossed they give a 3 white to 1 grey phenotypic ratio.
    a) Identify the genotype of both parents.
    b) Give the gamete possibilities for both parents.
    c) Perform a cross and give the phenotypic ratio of the F1 generation.

3) In humans, deafness can be the result of many things. There are 2 forms of congenital deafness (inherited) where the genes are located in 2 different regions. One gene prevents the middle-ear bones form forming properly and the other results is a poorly developed auditory nerve to the brain. If expressed, either situation above would result in deafness. Both of these forms of deafness result from recessive inheritance (individuals need to inherit 2 recessive forms of the genes to become deaf). When 2 normal hearing parents, both of which are carriers of the recessive form for both traits mate, what is the phenotypic ratio expected of the F1.

4) In shorthorn cattle, normal hoof is dominant to abnormal hoof. Red & White coat colour shows codominance, (RR = red, Rr = roan (red & white hairs), rr = white). Heterozygous individuals for both traits are crossed together give the expected phenotypic ratio of the F1.

Crosses involving a Dominance Hierarchy: A multiple allele situation!

Sample:

The inheritance of coat colours of cattle involves a multiple allelic series with a dominance hierarchy as follows:

$$S > s^h > s^c > s$$

- The *S* allele puts a band of white colour around the middle of the animal and is refered to as a Dutch belt
- The s^h allele produces Hereford-type spotting
- Solid colour is the result of the s^c allele
- Holstein-type spotting is due to the s allele

Homozygous Dutch belt males are crossed to Holstein-type spotted females. The F_1 females are crossed to a Hereford-Type spotted male of the genotype $s^h s^c$.

Predict the genotypic and phenotypic frequencies in the progeny.