Sample Problem 1. In guinea pigs, straight hair (H) is dominant to curly hair (h). What would be the results of a mating between a curly-haired guinea pig and heterozygous straight-haired guinea pig?

Here are the steps are needed to solve problem 1:

Step 1: Write the <u>genotype</u> for each parent. Remember to use a capital letter for dominant traits and lowercase letters for recessive traits.

The curly haired parent must be **hh**. The only way to show the recessive trait is to have two copies of it. The straight-haired parent is heterozygous and therefore has two different sized letters: **Hh**.

The genotypes for the cross (or mating) are:

RR X rr

Step 2: Determine the gametes the parents can produce.

The hh parent will only produce gametes with the h gene.
The Hh parent will produce both H and h gametes.

Step 3: Construct your Punnett square and add the parent gametes.
Draw a square and separate it into four equal parts as shown below. Write the possible gametes of one parent (hh) across the top, as you can see here:

	h	h

Write the possible gametes of the other parent (Hh) down the side, as shown:

	h	h
H		
h		

Step 4: Combine gametes from each parent in the inner "offspring" squares. This process represents fertilization (sperm + egg = zygote). *Always write capital letters first.*

Each inner "offspring" square should have two letters now; one letter came from the top of the column, while the other letter came from the row.

	h	h
H	Hh	Hh
h	hh	hh

Repeat same pattern to fill out bottom two squares

This Punnett square above now shows you all the possible offspring that could result from this cross!

Step 5: Determine the Results of the Cross: State Genotype and Phenotype Ratios of Offspring

Count the number of each possible letter (or allele) combinations present in your Punnett Square. *These are the offspring genotypes.*

2 combinations: Hh and hh

Determine the phenotypes of the offspring.
- **Hh offspring will be straight-haired because they contain at least one dominant (H) allele.**
- **hh offspring will have curly hair since they have two copies of the recessive trait (h.)**

Record the probability ratio for the offspring from this cross. You determine the numbers based on how many squares (of the four total) were occupied by each kind of genotype or phenotype.

Genotype ratio: 2 Hh: 2hh
Phenotype ratio: 2 straight-haired: 2 curly-haired