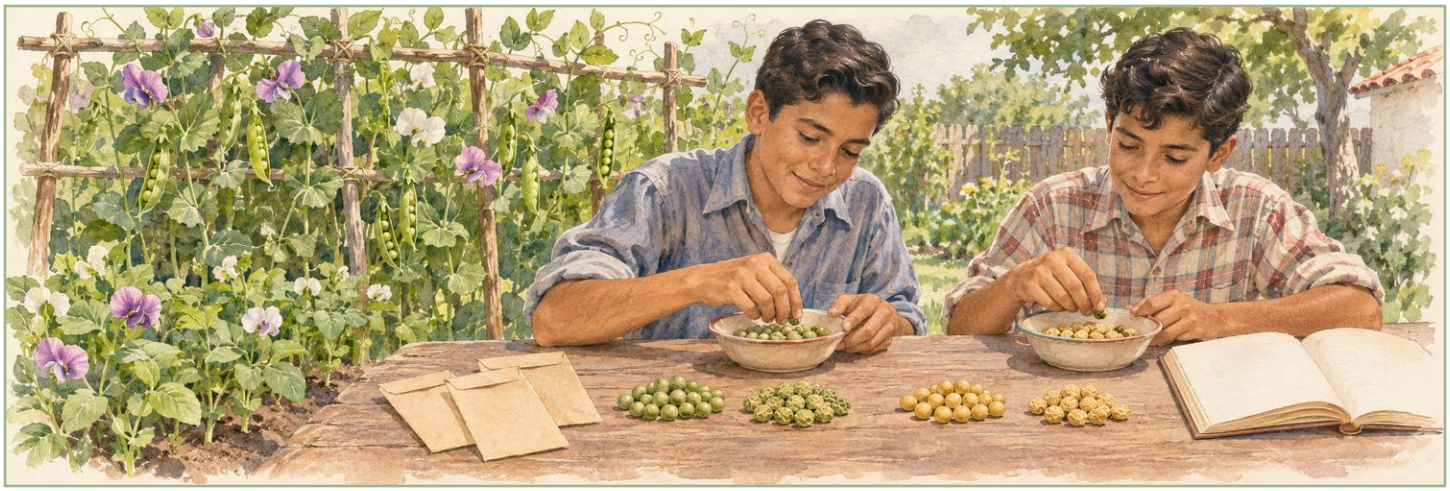

Pea Plant Genetics: Mendel's Peas

Heredity and seed saving for grades 6 to 8

Name _____ Class _____ Date _____

Background. In the 1850s and 1860s, a monk named **Gregor Mendel** grew thousands of pea plants in his monastery garden and kept careful records. He found that each trait is controlled by a pair of **alleles**, one from each parent. A **dominant** allele (written with a capital letter) hides a **recessive** allele (written with a small letter). The pair of letters is the plant's **genotype**; what the plant looks like is its **phenotype**.

Part 1. Mendel's pea traits

Trait	Dominant	Recessive
Seed shape	Round (R)	Wrinkled (r)
Seed color	Yellow (Y)	Green (y)
Plant height	Tall (T)	Short (t)
Flower color	Purple (P)	White (p)
Pod color	Green (G)	Yellow (g)

Genotype	Homozygous or heterozygous?	Phenotype (what it looks like)
TT		
Tt		
tt		
Yy		
rr		

1. A pea plant has purple flowers. What two genotypes could it have? How could you cross it with a white-flowered plant to find out which one it is?

Part 2. Punnett squares

Write one parent's alleles across the top and the other parent's down the side, then fill in each box.

A. Tt × Tt

B. RR × rr

C. Yy × yy

A. Tall plants : short plants = _____

B. What shape are all the seeds? _____

C. Percent yellow seeds: _____

Part 3. Check Mendel's real numbers

Mendel crossed plants that each carried one dominant and one recessive allele. Here is what he counted in the next generation. Divide to find each ratio, rounded to one decimal place.

Trait	Dominant count	Recessive count	Ratio (dominant ÷ recessive)
Seed shape	5,474 round	1,850 wrinkled	
Seed color	6,022 yellow	2,001 green	

2. Both ratios are close to the same number. What is it, and which Punnett square in Part 2 predicts it?

3. Why did Mendel grow so many plants instead of just a few?

Part 4. Seed saving in the garden

Pea flowers pollinate themselves before they even open, so seeds saved from an heirloom pea usually grow into plants just like the parent. A **hybrid** (F1) seed comes from crossing two different parent plants, so seeds saved from a hybrid often grow into plants that look different from each other. Gardeners who save seed choose the best plants year after year. This is **selective breeding**, and over time it changes a whole crop.

4. A gardener saves seed from a hybrid tomato. Next summer the plants are all different sizes and the fruits taste different. Use the word "alleles" to explain why.

5. You want peas that are ready earlier in spring. How could you use seed saving to breed them over several years?

6. Name two traits besides the ones in Part 1 that a gardener might choose when saving seed.

Pea Plant Genetics: Teacher Page and Answer Key

Standards: NGSS MS-LS3-2 (sexual reproduction and genetic variation) and MS-LS4-5 (how people influence inherited traits through selective breeding).

Part 1: TT homozygous, tall. Tt heterozygous, tall. tt homozygous, short. Yy heterozygous, yellow seeds. rr homozygous, wrinkled seeds.

1. PP or Pp. Cross it with a white-flowered plant (pp). If any of the offspring have white flowers, the purple parent was Pp; if all of many offspring are purple, it was almost certainly PP. Scientists call this a test cross.

Part 2, A: TT, Tt, Tt, tt. 3 tall : 1 short. **B:** all Rr, so every seed is round. **C:** Yy, Yy, yy, yy, so 50% yellow and 50% green.

Part 3: seed shape 5,474 ÷ 1,850 = 3.0 (2.96); seed color 6,022 ÷ 2,001 = 3.0 (3.01).

2. About 3 to 1. Punnett square A (Tt × Tt) predicts it.

3. Chance plays a part in which alleles each seed gets. With large numbers, the results come close to the true ratio; with only a few plants, chance could make the numbers misleading.

4. The hybrid's parents were different, so the hybrid carries different alleles for many traits. When its seeds form, the alleles are shuffled into new combinations, so the next plants show different mixes of traits.

5. Plant a mix of peas, mark the plants that flower and make pods first, and save seed only from those. Repeat every year; over several years the crop ripens earlier. This is how landrace gardeners adapt crops to their own gardens.

6. Examples: flavor, disease resistance, cold or heat tolerance, yield, fruit size or color, earliness, and drought tolerance.

Extension: buy a bag of dried whole yellow and green peas from the grocery store and have students sort and count them.