Seeds Before Sprouts

Predict offspring traits from two pea plant crosses

BIO.3B.2 "Apply Mendel's law of independent assortment to interpret dihybrid crosses."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the parent genotypes in both crosses. Circle the four gametes in the table to track the combinations made by independent assortment.

What Will the Seeds Grow?

1. A greenhouse team crosses two pea plants that are each purple-flowered and tall. For this model, purple flowers (P) are dominant to white flowers (p), and tall stems (T) are dominant to short stems (t). Both parents have genotype PpTt. The team wants to predict the mix of offspring before any seeds sprout.

2. During meiosis, each parent passes one allele for flower color and one for stem height into each gamete. In this model, the genes assort independently: either flower-color allele can travel with either height allele. The table shows the four equally likely gametes from a PpTt parent. To predict an offspring, pair one gamete from each parent.

GAMETES FROM A PPTT PARENT

Gamete	Chance
PT	1/4
Pt	1/4
pT	1/4
pt	1/4

3. A second team crosses a PpTt plant with a pptt plant, which makes only pt gametes. The same inheritance rules apply, but the possible offspring change when one parent has two recessive pairs. For either cross, use each parent's gamete chances to find the chance of a genotype, then apply dominance to name its visible traits.

2 ANSWER WITH EVIDENCE

Use the passage

1. In the first cross, what fraction of offspring are expected to have white flowers and short stems? Show which gametes must pair.

2. In the first cross, what fraction of offspring are expected to have purple flowers and short stems? Explain how you found it.

3. In the second cross, what fraction of offspring are expected to have white flowers and tall stems? Name the gamete each parent contributes.

4. Which cross is more likely to produce a purple-flowered, tall offspring? Compare the expected fractions.

3 YOUR TURN

Your own words

In a model species, black fur (B) is dominant to brown fur (b), and long ears (L) are dominant to short ears (l). For a BbLl × bbll cross, predict the fraction of offspring with each of the four trait combinations and explain how independent assortment produces your results.

ANSWER KEY

Seeds Before Sprouts

PART 1 · READ AND MARK

Underline the parent genotypes in both crosses. Circle the four gametes in the table to track the combinations made by independent assortment. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In the first cross, what fraction of offspring are expected to have white flowers and short stems? Show which gametes must pair.	**1/16. Both parents must contribute pt gametes: 1/4 × 1/4 = 1/16.**
2	In the first cross, what fraction of offspring are expected to have purple flowers and short stems? Explain how you found it.	**3/16. Both parents must pass t, and at least one must pass P. The qualifying pairs are Pt with Pt, Pt with pt, and pt with Pt.**
3	In the second cross, what fraction of offspring are expected to have white flowers and tall stems? Name the gamete each parent contributes.	**1/4. The PpTt parent contributes pT, and the pptt parent contributes pt, producing ppTt.**
4	Which cross is more likely to produce a purple-flowered, tall offspring? Compare the expected fractions.	**The PpTt × PpTt cross: 9/16 of its offspring are expected to be purple and tall, compared with 1/4 for PpTt × pptt.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Black fur, long ears: 1/4. Black fur, short ears: 1/4. Brown fur, long ears: 1/4. Brown fur, short ears: 1/4. Independent assortment gives the BbLl parent four equally likely gametes, BL, Bl, bL, and bl, while the bbll parent contributes only bl.

Accept equivalent fractions or percentages. For the first cross, students may use a Punnett square or multiply the probabilities for the two independently assorting traits.