Pea Plant Patterns

Compare two batches of offspring with an expected trait ratio

GEN.4.2 "Illustrate Mendel's law of independent assortment by analyzing multi-trait cross data sets for patterns and trends."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the predicted phenotype ratio in the passage. Then circle the purple-short and white-tall counts in each batch to track how the traits combine.

Two Batches of Peas

1. At a school greenhouse, students cross two pea plants that are each purple-flowered and tall. Each parent has genotype PpTt: P gives purple flowers over white p, and T gives tall stems over short t. The genes are on different chromosomes. Each plant can pass on four allele combinations, PT, Pt, pT, and pt, with equal probability.

2. When these combinations meet at random, independent assortment predicts a 9:3:3:1 phenotype ratio among offspring: purple tall, purple short, white tall, then white short. This ratio is a probability pattern, not a promise about every seed. The greenhouse records two batches from the same type of cross, with 160 plants in A and 320 in B.

OFFSPRING FROM TWO PPTT × PPTT CROSSES

Phenotype	Batch A	Batch B
Purple tall	88	182
Purple short	32	58
White tall	31	61
White short	9	19

3. Look for the pattern across both traits rather than checking only which flower color is most common. If height and color always traveled together, the purple-short and white-tall categories would be missing. Instead, the table includes both. Small gaps from the predicted ratio are normal in finite batches. Similar proportions in two batches support, but cannot prove, independent assortment.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which phenotype is most common and which is least common in both batches? Give their counts in each batch.

2. For batch A, how many white-short plants does the 9:3:3:1 ratio predict? How does that compare with the observed count?

3. Compare the share of purple-tall plants in batches A and B. Give a fraction or percent for each, and state whether the shares are similar.

4. Which counts show that purple flowers can occur with short stems and white flowers with tall stems? Explain how these counts fit independent assortment.

3 YOUR TURN

Your own words

A third batch has 80 offspring from the same cross. Predict the number with each of the four phenotypes, then explain why the real counts might differ without disproving independent assortment.

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PART 1 · READ AND MARK

Underline the predicted phenotype ratio in the passage. Then circle the purple-short and white-tall counts in each batch to track how the traits combine. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which phenotype is most common and which is least common in both batches? Give their counts in each batch.	**Purple tall is most common: 88 in A and 182 in B. White short is least common: 9 in A and 19 in B.**
2	For batch A, how many white-short plants does the 9:3:3:1 ratio predict? How does that compare with the observed count?	**The prediction is 10, or 1/16 of 160. The observed count is 9, one fewer than predicted.**
3	Compare the share of purple-tall plants in batches A and B. Give a fraction or percent for each, and state whether the shares are similar.	**Batch A has 88/160, or 55%; batch B has 182/320, or about 57%. The shares are similar.**
4	Which counts show that purple flowers can occur with short stems and white flowers with tall stems? Explain how these counts fit independent assortment.	**Purple short occurs 32 times in A and 58 times in B; white tall occurs 31 times in A and 61 times in B. Both combinations are expected when the two genes assort independently.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

For 80 offspring, I predict 45 purple tall, 15 purple short, 15 white tall, and 5 white short. The real counts might differ because fertilization is random, and the ratio describes probabilities rather than exact results.

Accept equivalent fractions or rounded percentages in question 3. For the open task, look for counts in a 9:3:3:1 ratio that total 80 and an explanation based on chance variation.