LESSON MAKER PRO

Trait Predictions

Use allele pairs to predict offspring traits.

HIGH SCHOOL · GEN.4.1

GEN.4.1 "Demonstrate Mendel's law of dominance and segregation using mathematics to predict phenotypic and genotypic ratios."

NAME _____ DATE _____

THE BIG IDEA

Each parent passes one allele to an offspring. A dominant allele masks a recessive allele when an offspring has one of each. Use the four equally likely boxes in a Punnett square to find expected ratios and counts.

WORKED EXAMPLE

In a model species, black fur (B) is dominant to brown fur (b). Two Bb parents have 12 offspring. Predict the number with each genotype and fur color.

BB X BB

	B	**b**
B	BB	Bb
b	Bb	bb

1. Count the boxes: 1 BB, 2 Bb, 1 bb.
2. Divide 12 by 4 to get 3 offspring per box.
3. Multiply each box count by 3. BB and Bb have black fur.

Answer: Expected genotypes: 3 BB, 6 Bb, 3 bb. Expected fur colors: 9 black, 3 brown.

PRACTICE 4 problems

1 In peas, purple flowers (P) are dominant to white flowers (p). For Pp x pp, give the genotype ratio Pp:pp and the flower-color ratio purple:white.

ANSWER _____

2 In peas, round seeds (R) are dominant to wrinkled seeds (r). For Rr x Rr, give the genotype ratio RR:Rr:rr. Out of 20 seeds, how many are expected to be wrinkled?

ANSWER _____

3 In peas, tall plants (T) are dominant to short plants (t). For TT x Tt, give the genotype ratio TT:Tt and the height ratio tall:short.

ANSWER _____

4 In peas, yellow seeds (Y) are dominant to green seeds (y). For Yy x yy, how many of 32 seeds are expected to be yellow? How many are expected to be green?

ANSWER _____

APPLY IT Show your work

1 Your school garden crosses two tall pea plants with genotype Tt. Tall (T) is dominant to short (t). Of 40 new plants, how many are expected to be tall and how many short?

WORK SPACE

ANSWER _____

2 In a breeding video game, silver scales (S) are dominant to gold scales (s). You cross Ss x ss. For 50 offspring, predict the silver and gold counts and the genotype ratio Ss:ss.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two plants with genotype Aa are crossed. A is dominant to a. What is the probability that exactly one of their next two offspring shows the recessive trait? Explain your reasoning.

WORK SPACE AND ANSWER

Trait Predictions

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	In peas, purple flowers (P) are dominant to white flowers (p). For Pp x pp, give the genotype ratio Pp:pp and the flower-color ratio purple:white.	**Pp:pp = 1:1; purple:white = 1:1.**
2	In peas, round seeds (R) are dominant to wrinkled seeds (r). For Rr x Rr, give the genotype ratio RR:Rr:rr. Out of 20 seeds, how many are expected to be wrinkled?	**RR:Rr:rr = 1:2:1; 5 wrinkled seeds.**
3	In peas, tall plants (T) are dominant to short plants (t). For TT x Tt, give the genotype ratio TT:Tt and the height ratio tall:short.	**TT:Tt = 1:1; tall:short = 1:0.**
4	In peas, yellow seeds (Y) are dominant to green seeds (y). For Yy x yy, how many of 32 seeds are expected to be yellow? How many are expected to be green?	**16 yellow; 16 green.**

PART 2 · APPLY IT

1. **30 tall; 10 short.** Tt x Tt gives a 3:1 tall-to-short ratio. Divide 40 by 4, then multiply by 3 for tall plants.
2. **25 silver; 25 gold; Ss:ss = 1:1.** Half the offspring are Ss and silver; half are ss and gold. Half of 50 is 25.

CHALLENGE

3/8. Each offspring has a 1/4 chance of showing the recessive trait and a 3/4 chance of showing the dominant trait. Either offspring could be the recessive one, so 1/4 x 3/4 + 3/4 x 1/4 = 3/8.

Accept equivalent ratios and fractions. Counts are predictions, not guaranteed results.