LESSON MAKER PRO

Traits by Chance

Use allele pairs to predict traits in offspring.

HIGH SCHOOL · BIO.3B

BIO.3B "Students will analyze and interpret data collected from probability calculations to explain the variation of expressed traits within a population..."

NAME _____ DATE _____

THE BIG IDEA

Each parent passes one allele for a gene to an offspring. Put one parent's possible alleles across the top of a Punnett square and the other parent's down the side, then combine them in the boxes. If one allele is dominant, any pair with that allele shows the dominant trait.

WORKED EXAMPLE

In pea plants, tall (T) is dominant to short (t). Cross TT x tt. Among 24 offspring, how many are expected to be tall, and what genotype will they have?

TT X TT

	T	**T**
t	Tt	Tt
t	Tt	Tt

1. Put T and T across the top, and t and t down the side.
2. Combine the alleles. Every box shows Tt.
3. Every Tt plant is tall, so all 24 offspring are expected to be tall.

Answer: 24 tall offspring, all with genotype Tt

PRACTICE 6 problems

1 In pea plants, purple flowers (P) are dominant to white flowers (p). Cross Pp x pp. Fill in the square. What fraction of offspring are expected to have purple flowers?

PP X PP

	p	**p**
P		
p		

ANSWER _____

2 In pea plants, round seeds (R) are dominant to wrinkled seeds (r). Cross Rr x Rr. Fill in the square. Give the genotype ratio RR:Rr:rr and the trait ratio round:wrinkled.

RR X RR

	R	**r**
R		
r		

ANSWER _____

3 In a simple mouse fur-color model, black fur (B) is dominant to brown fur (b). Cross BB x Bb. Fill in the square. Among 18 offspring, how many are expected to have genotype Bb?

BB X BB

	B	**b**
B		
B		

ANSWER _____

4 In pea plants, green pods (G) are dominant to yellow pods (g). Cross Gg x gg. Fill in the square. What fraction of offspring are expected to have yellow pods? What is the expected ratio of green to yellow pods?

GG X GG

	g	**g**
G		
g		

ANSWER _____

5 In a sunflower seed model, smooth (S) is dominant to rough (s). Cross Ss x Ss. Use the table to find how many rough seeds you would expect in a group this size. Why might the observed count differ?

OBSERVED SEEDS

Texture	**Count**
Smooth	29
Rough	11

ANSWER _____

6 In a beetle model, spots (D) are dominant to no spots (d). Cross Dd x dd. Fill in the square. If two offspring are born, what is the probability that both have spots?

DD X DD

	d	**d**
D		
d		

ANSWER _____

APPLY IT Show your work

1 A school garden club grows pea plants with inflated pods (I), which are dominant to constricted pods (i). The club crosses Ii x Ii. If 80 pods form, how many are expected to be inflated?

WORK SPACE

ANSWER _____

2 For an animal shelter genetics exhibit, use a simple model in which short fur (L) is dominant to long fur (l). Two short-furred cats are both Ll. What is the chance that one kitten has long fur? Out of 32 kittens, how many are expected to have long fur?

WORK SPACE

ANSWER _____

CHALLENGE One step up

In pea plants, axial flowers (A) are dominant to terminal flowers (a), and yellow seeds (Y) are dominant to green seeds (y). The genes assort independently. Cross AaYy x AaYy. What fraction of offspring are expected to have axial flowers and green seeds? Explain using the probability for each trait.

WORK SPACE AND ANSWER

Traits by Chance

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	In pea plants, purple flowers (P) are dominant to white flowers (p). Cross Pp x pp. Fill in the square. What fraction of offspring are expected to have purple flowers?	**1/2**
2	In pea plants, round seeds (R) are dominant to wrinkled seeds (r). Cross Rr x Rr. Fill in the square. Give the genotype ratio RR:Rr:rr and the trait ratio round:wrinkled.	**RR:Rr:rr = 1:2:1; round:wrinkled = 3:1**
3	In a simple mouse fur-color model, black fur (B) is dominant to brown fur (b). Cross BB x Bb. Fill in the square. Among 18 offspring, how many are expected to have genotype Bb?	**9 offspring**
4	In pea plants, green pods (G) are dominant to yellow pods (g). Cross Gg x gg. Fill in the square. What fraction of offspring are expected to have yellow pods? What is the expected ratio of green to yellow pods?	**Yellow: 1/2; green:yellow = 1:1**
5	In a sunflower seed model, smooth (S) is dominant to rough (s). Cross Ss x Ss. Use the table to find how many rough seeds you would expect in a group this size. Why might the observed count differ?	**10 rough seeds expected; chance can make the observed count differ from the prediction.**
6	In a beetle model, spots (D) are dominant to no spots (d). Cross Dd x dd. Fill in the square. If two offspring are born, what is the probability that both have spots?	**1/4**

PART 2 · APPLY IT

1. **60 inflated pods** The cross predicts inflated pods in 3/4 of offspring. 3/4 of 80 is 60.
2. **1/4 chance; 8 long-furred kittens expected** An Ll x Ll cross produces ll in 1/4 of cases. 1/4 of 32 is 8.

CHALLENGE

3/16. The chance of axial flowers is 3/4, and the chance of green seeds is 1/4. Because the genes assort independently, multiply: 3/4 x 1/4 = 3/16.

Accept equivalent fractions, percentages, or ratios where appropriate. Expected counts are predictions, not guaranteed outcomes.