LESSON MAKER PRO

Inheritance by Chance

Use Punnett squares to predict traits.

HIGH SCHOOL · BIO.11.a

BIO.11.a "Use mathematics and computational thinking to predict patterns of inheritance, including dominance, recessiveness, codominance, and incomplete dominance."

NAME _____ DATE _____

COUNT THE OUTCOMES

Put each parent's alleles along the edges of a Punnett square. Combine them in the boxes, then count the outcomes to find a fraction. A dominant trait shows with one dominant allele, while a recessive trait needs two recessive alleles. With incomplete dominance, the heterozygote has an intermediate trait; with codominance, both traits appear.

WORKED EXAMPLE

In a model of plant height, T for tall is dominant to t for short. Cross TT x tt. What percent of offspring are tall?

TT X TT

	T	T
t	Tt	Tt
t	Tt	Tt

1. The TT parent makes T gametes, and the tt parent makes t gametes.
2. Combine one allele from each parent in every box.
3. All four boxes are Tt, so every offspring shows the dominant tall trait.

Answer: 100% tall

PRACTICE 6 problems

1 Complete the Punnett square for Pp x Pp. In this model, purple flowers P are dominant to white flowers p. What fraction of offspring have white flowers?

PP X PP

	P	p
P		
p		

ANSWER _____

2 In a model of rabbit fur color, B for black is dominant to b for brown. Cross Bb x bb. What fraction of offspring have black fur?

ANSWER _____

3 In a model of flower color with incomplete dominance, RR flowers are red, WW flowers are white, and RW flowers are pink. Cross RW x RW. What fraction of offspring are pink?

ANSWER _____

4 In this model of cattle coat color, RR is red, WW is white, and RW is roan, with both red and white hairs. Use the Punnett square for RW x RW. Give the genotype ratio RR:RW:WW and the fraction of offspring that are roan.

RW X RW

	R	**W**
R	RR	RW
W	RW	WW

ANSWER _____

5 In a model of fish scales, G for gold is dominant to g for silver. Cross Gg x gg. What genotype must an offspring with gold scales have?

ANSWER _____

6 In a model of hamster fur, H for smooth is dominant to h for rough. Cross Hh x hh. If two offspring inherit their alleles independently, what is the probability that both have smooth fur?

ANSWER _____

APPLY IT Show your work

1 A reptile conservation club studies a model in which stripe allele S is dominant to plain allele s. Two striped lizards are Ss. What is the chance that one hatchling is plain? If the pair has 40 hatchlings, how many plain hatchlings would you predict?

WORK SPACE

ANSWER _____

2 A school greenhouse grows snapdragons. In this model of incomplete dominance, RR flowers are red, WW flowers are white, and RW flowers are pink. The club crosses a pink flower with a white flower. Out of 24 seedlings, how many pink and how many white flowers would you predict?

WORK SPACE

ANSWER _____

CHALLENGE One step up

In a model of a fictional pet species, dark fur B is dominant to light fur b, and long ears L are dominant to short ears l. The genes assort independently. Two BbLl parents mate. What is the probability that an offspring has light fur and long ears? Explain by finding the probability of each trait and multiplying.

WORK SPACE AND ANSWER

Inheritance by Chance

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Complete the Punnett square for Pp x Pp. In this model, purple flowers P are dominant to white flowers p. What fraction of offspring have white flowers?	**1/4**
2	In a model of rabbit fur color, B for black is dominant to b for brown. Cross Bb x bb. What fraction of offspring have black fur?	**1/2**
3	In a model of flower color with incomplete dominance, RR flowers are red, WW flowers are white, and RW flowers are pink. Cross RW x RW. What fraction of offspring are pink?	**1/2**
4	In this model of cattle coat color, RR is red, WW is white, and RW is roan, with both red and white hairs. Use the Punnett square for RW x RW. Give the genotype ratio RR:RW:WW and the fraction of offspring that are roan.	**RR:RW:WW = 1:2:1; roan = 1/2**
5	In a model of fish scales, G for gold is dominant to g for silver. Cross Gg x gg. What genotype must an offspring with gold scales have?	**Gg**
6	In a model of hamster fur, H for smooth is dominant to h for rough. Cross Hh x hh. If two offspring inherit their alleles independently, what is the probability that both have smooth fur?	**1/4**

PART 2 · APPLY IT

1. **1/4; predict 10 plain hatchlings** The cross Ss x Ss produces ss in 1 of 4 outcomes. Multiply 40 by 1/4 to predict 10 plain hatchlings.
2. **Predict 12 pink and 12 white flowers** The cross RW x WW produces pink RW and white WW offspring in equal fractions. Half of 24 is 12 for each color.

CHALLENGE

The chance of light fur, bb, is 1/4. The chance of long ears, LL or Ll, is 3/4. Because the genes assort independently, multiply: 1/4 x 3/4 = 3/16.

Accept equivalent fractions or percentages. Predicted counts are expected outcomes, not guaranteed counts.