LESSON MAKER PRO

Trait Chance Lab

Predict inheritance patterns and interpret disease risk

HIGH SCHOOL · BIO.11

BIO.11 "Use probability and statistical models to explain the variation of expressed traits within a population. a. Use mathematics and computational thinking to predict patterns of inheritance, including dominance, recessiveness, codominance..."

NAME _____ DATE _____

COUNT THE PAIRINGS

Each parent passes one allele to an offspring. List the equally likely allele-pairing outcomes, then count the outcomes that match the trait you want to predict. To find an expected number of offspring, multiply that probability by the total number of offspring.

WORKED EXAMPLE

In chickens, B and W are codominant. BW chickens have both black and white feathers. Use the table for a BW × WW cross. If 70 chicks hatch, how many white chicks would you expect?

ALLELE-PAIRING OUTCOMES

	B	W
W	BW	WW
W	BW	WW

1. Count 2 WW outcomes out of 4 equally likely pairings.
2. The probability of a white chick is 2/4 = 1/2.
3. Multiply 70 × 1/2 = 35.

Answer: Expect 35 white chicks.

PRACTICE 6 problems

1 In mice, D is dominant over d. For a DD × dd cross, what percentage of offspring will have genotype Dd?

ANSWER _____

2 In beetles, E is dominant over e. For an Ee × Ee cross, what is the probability of an offspring with the recessive trait?

ANSWER _____

3 In cattle, R and W are codominant. RW cattle have both red and white hairs. Use the table to find the probability that an offspring has both colors.

ALLELE-PAIRING OUTCOMES

	R	W
R	RR	RW
W	RW	WW

ANSWER _____

4 In snapdragons, flower color shows incomplete dominance: RR is red, WW is white, and RW is pink. For an RW × RW cross, what is the probability of a red flower?

ANSWER _____

5 For an RW × WW snapdragon cross, what is the probability of a white flower? If 28 seeds sprout, how many white flowers would you expect?

ANSWER _____

6 Two offspring are produced independently from a Gg × Gg cross. What is the probability that both have genotype gg? Show the multiplication.

ANSWER _____

APPLY IT Show your work

1 Your school's aquarium club breeds fish with codominant color alleles. RR fish are red, GG fish are gold, and RG fish show both colors. For an RG × RG cross, the club expects 48 fry. How many fry of each type would you expect?

WORK SPACE

ANSWER _____

2 A student reads about a recessive inherited disease. Two parents are healthy carriers with genotype Hh; only hh causes this disease. If they have two children, what is the probability that neither child has the disease? Treat the two births as independent.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A parent has one copy of an inherited variant that raises disease risk and one copy without it. Each child has a 1/2 chance of inheriting the variant. In a simplified model for children who share the same environment, the table gives each group's chance of developing the disease. These chances already include the possible effects of environmental exposures and somatic mutations. What is a child's overall chance of developing the disease? Show your calculation, then explain in one sentence why inheriting the variant does not guarantee disease.

DISEASE-RISK MODEL

Inherited variant?	Chance of disease
Yes	1/4
No	1/8

WORK SPACE AND ANSWER

Trait Chance Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	In mice, D is dominant over d. For a DD × dd cross, what percentage of offspring will have genotype Dd?	**100%**
2	In beetles, E is dominant over e. For an Ee × Ee cross, what is the probability of an offspring with the recessive trait?	**1/4**
3	In cattle, R and W are codominant. RW cattle have both red and white hairs. Use the table to find the probability that an offspring has both colors.	**1/2**
4	In snapdragons, flower color shows incomplete dominance: RR is red, WW is white, and RW is pink. For an RW × RW cross, what is the probability of a red flower?	**1/4**
5	For an RW × WW snapdragon cross, what is the probability of a white flower? If 28 seeds sprout, how many white flowers would you expect?	**1/2; expect 14 white flowers.**
6	Two offspring are produced independently from a Gg × Gg cross. What is the probability that both have genotype gg? Show the multiplication.	**1/4 × 1/4 = 1/16**

PART 2 · APPLY IT

1. **Expect 12 red, 24 with both colors, and 12 gold fry.** The four equally likely pairings are RR, RG, RG, and GG. Multiply 48 by 1/4, 2/4, and 1/4.
2. **9/16** Each child has a 3/4 probability of not having the disease. Multiply 3/4 × 3/4 = 9/16.

CHALLENGE

(1/2 × 1/4) + (1/2 × 1/8) = 1/8 + 1/16 = 3/16. Inheriting the variant does not guarantee disease because the model gives carriers a 1/4 chance, and environmental exposures and somatic mutations can also affect whether disease develops.

Accept equivalent fractions or percentages. Expected offspring counts are predictions, not guaranteed outcomes.