

# Insta-Review: Genetics Problems

AP Biology Insta-Review @apbiopenguins

# Instagram Live Session

# Thursday (11/12) at

# 8:30pm



# Genetic Practice Problem #1

AP Biology Insta-Review @apbiopenguins

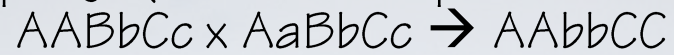
What is the probability that each of the following pairs of parents will produce the indicated offspring? (Assume independent assortment of all gene pairs)

$AABbCc \times AaBbCc \rightarrow AAbbCC$





Genetic Practice Problem #1: What is the probability that each of the following pairs of parents will produce the indicated offspring? (Assume independent assortment of all gene pairs)



AP Biology Insta-Review @apbiopenguins

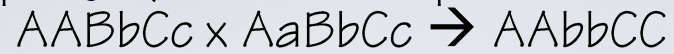
Step 1: Complete the cross for the  $AA \times Aa$

	A	A
A	AA	AA
a	Aa	Aa

$$P(AA) = \frac{1}{2}$$



Genetic Practice Problem #1: What is the probability that each of the following pairs of parents will produce the indicated offspring? (Assume independent assortment of all gene pairs)



AP Biology Insta-Review @apbiopenguins

Step 2: Complete the cross for the Bb x Bb

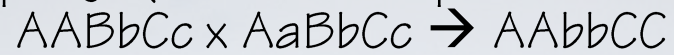
	B	b
B	BB	Bb
b	Bb	bb

$$P(bb) = \frac{1}{4}$$





Genetic Practice Problem #1: What is the probability that each of the following pairs of parents will produce the indicated offspring? (Assume independent assortment of all gene pairs)



AP Biology Insta-Review @apbiopenguins

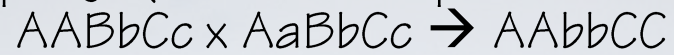
Step 3: Complete the cross for the  $Cc \times Cc$

	$C$	$c$
$C$	$CC$	$Cc$
$c$	$Cc$	$cc$

$$P(CC) = \frac{1}{4}$$



Genetic Practice Problem #1: What is the probability that each of the following pairs of parents will produce the indicated offspring? (Assume independent assortment of all gene pairs)



AP Biology Insta-Review @apbiopenguins

Step 4: Multiply each probability

$$P(AA) = \frac{1}{2} \quad P(bb) = \frac{1}{4} \quad P(CC) = \frac{1}{4}$$

$$P(AA) \times P(bb) \times P(CC) =$$

$$\frac{1}{2} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{32}$$





# Genetic Practice Problem #2

AP Biology Insta-Review @apbiopenguins

Incomplete dominance:  $C^R C^R$  (red)  $\times$   $C^W C^W$  (white)  $\rightarrow$   $C^R C^W$  (pink)

Complete dominance: axial (dominant) vs. terminal (recessive)

What will be the phenotypic ratio of  $F_2$  generation resulting from the cross:

axial-red (true-breeding)  $\times$  terminal-white?



Genetic Practice Problem #2: Incomplete dominance:  $C^R C^R$  (red) x  $C^W C^W$  (white)  $\rightarrow$   $C^R C^W$  (pink)

Complete dominance: axial (dominant) vs. terminal (recessive)

What will be the phenotypic ratio of  $F_2$  generation resulting from the cross:  
axial-red (true-breeding) x terminal-white?

AP Biology Insta-Review @apbiopenguins

Step 1: Solve for the  $F_1$  generation

	$C^R$	$C^R$
$C^W$	$C^R C^W$	$C^R C^W$
$C^W$	$C^R C^W$	$C^R C^W$

	A	A
a	Aa	Aa
a	Aa	Aa





Genetic Practice Problem #2: Incomplete dominance:  $C^R C^R$  (red) x  $C^W C^W$  (white)  $\rightarrow$   $C^R C^W$  (pink)

Complete dominance: axial (dominant) vs. terminal (recessive)

What will be the phenotypic ratio of  $F_2$  generation resulting from the cross:  
axial-red (true-breeding) x terminal-white?

AP Biology Insta-Review @apbiopenguins

Step 2: Solve for the  $F_2$  generation

	$C^R$	$C^W$
$C^R$	$C^R C^R$	$C^R C^W$
$C^W$	$C^R C^W$	$C^W C^W$

	A	a
A	AA	Aa
a	Aa	aa



Genetic Practice Problem #2: Incomplete dominance:  $C^R C^R$  (red) x  $C^W C^W$  (white)  $\rightarrow$   $C^R C^W$  (pink)

Complete dominance: axial (dominant) vs. terminal (recessive)

What will be the phenotypic ratio of  $F_2$  generation resulting from the cross:  
axial-red (true-breeding) x terminal-white?

AP Biology Insta-Review @apbiopenguins

### Step 3: Calculate for each phenotype

$$\text{Red, Axial} = P(\text{red}) \times P(\text{axial}) = \frac{1}{4} \times \frac{3}{4} = \frac{3}{16}$$

$$\text{Pink, Axial} = P(\text{pink}) \times P(\text{axial}) = \frac{1}{2} \times \frac{3}{4} = \frac{6}{16}$$

$$\text{White, Axial} = P(\text{white}) \times P(\text{axial}) = \frac{1}{4} \times \frac{3}{4} = \frac{3}{16}$$

$$\text{Red, Terminal} = P(\text{red}) \times P(\text{terminal}) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

$$\text{Pink, Terminal} = P(\text{pink}) \times P(\text{terminal}) = \frac{1}{2} \times \frac{1}{4} = \frac{2}{16}$$

$$\text{White, Terminal} = P(\text{white}) \times P(\text{terminal}) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$





# Genetic Practice Problem #3

AP Biology Insta-Review @apbiopenguins

In mice, black color ( $B$ ) is dominant to white ( $b$ ). At a different locus, a dominant allele ( $A$ ) produces a band of yellow just below the top of each hair in mice with black fur. This gives a frosted appearance known as agouti. Expression of the recessive allele ( $a$ ) results in a solid coat color. If mice that are heterozygous at both loci are crossed, what is the expected phenotypic ratio of their offspring?



Genetic Practice Problem #3: In mice, black color (B) is dominant to white (b). At a different locus, a dominant allele (A) produces a band of yellow just below the top of each hair in mice with black fur. This gives a frosted appearance known as agouti. Expression of the recessive allele (a) results in a solid coat color. If mice that are heterozygous at both loci are crossed, what is the expected phenotypic ratio of their offspring?

AP Biology Insta-Review @apbiopenguins

## Step 1: Solve the Crosses

	B	b
B	BB	Bb
b	Bb	bb

	A	a
A	AA	Aa
a	Aa	aa





Genetic Practice Problem #3: In mice, black color (B) is dominant to white (b). At a different locus, a dominant allele (A) produces a band of yellow just below the top of each hair in mice with black fur. This gives a frosted appearance known as agouti. Expression of the recessive allele (a) results in a solid coat color. If mice that are heterozygous at both loci are crossed, what is the expected phenotypic ratio of their offspring?

AP Biology Insta-Review @apbiopenguins

Step 2: Calculate for each phenotype

$$\text{Black, Yellow} = P(\text{black}) \times P(\text{yellow}) = \frac{3}{4} \times \frac{3}{4} = \frac{9}{16} \quad \text{agouti}$$

$$\text{White, Yellow} = P(\text{white}) \times P(\text{yellow}) = \frac{1}{4} \times \frac{3}{4} = \frac{3}{16} \quad \text{white}$$

$$\text{Black, No Y} = P(\text{black}) \times P(\text{no Y}) = \frac{3}{4} \times \frac{1}{4} = \frac{3}{16} \quad \text{black}$$

$$\text{White, No Y} = P(\text{white}) \times P(\text{no Y}) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16} \quad \text{white}$$

