

GENETICS PRACTICE PROBLEMS & ANSWERS

The FOUR STEPS TO SOLVING GENETIC PROBLEMS are shown below. Use these steps **every** time to solve genetic problems.

NOTES:

1) ***Complete Dominance Problems:*** Dominant traits mask recessive traits. Use the same letters, but capital for dominant & lower case for recessive.

2) ***Incomplete Dominance Problems:*** Neither trait is completely dominant, nor are there recessive traits. Use different letters for different genes, and always use capitals.

STEP 1: Choose letters to represent the genes in the cross.

STEP 2: Write the genotypes of the parents being crossed.

STEP 3: Make a Punnett square.

STEP 4: Write the percent probability for each listed genotype and phenotype appearing.

Directions: Solve the following genetic sample problems using the FOUR STEPS we practiced in class. To prepare for Friday's EXAM, I recommend you check your answers for each step with my answers. Make corrections as you go. Try to solve the problem first without looking at the answer until completed.

SAMPLE PROBLEM #1

This is a Complete Dominance problem. A tall hybrid female plant is crossed with a tall hybrid male plant. Tall is dominant.

- A. What percent of the offspring will be tall purebred? _____
- B. What percent of the offspring will be tall hybrid? _____
- C. What percent of the offspring will be short purebred? _____
- D. What percent of the offspring will be tall? _____
- E. What percent of the offspring will be short? _____

SAMPLE PROBLEM #2

This is an Incomplete Dominance problem. Neither red nor white are dominant and a hybrid is pink. A pink flowered male snapdragon is crossed with a white flowered female snapdragon.

- A. What percent of the offspring will be red flowered snapdragons? _____
- B. What percent of the offspring will be white flowered snapdragons? _____
- C. What percent of the offspring will be pink flowered snapdragons? _____
- D. What percent of the offspring will be hybrids? _____
- E. What percent of the offspring will be purebred pink snapdragons? _____

SAMPLE PROBLEM #3

This is a Sex-Linked & Complete Dominance problem. A normal female, but a carrier of the hemophiliac gene is crossed with a normal male. Normal blood clotting is dominant and the hemophiliac gene is recessive.

- A. What percent of the offspring will be female and purebred? _____
- B. What percent of the offspring will be normal female carriers of the hemophiliac gene? _____
- C. What percent of the offspring will have normal blood clotting capabilities? _____
- D. What percent of the offspring will be males? _____
- E. What percent of the offspring will be hemophiliacs? _____

SAMPLE PROBLEM #4

This is a Complete Dominance problem. A brown eyed hybrid female is crossed with a blue eyed male. Brown eyes are dominant.

- A. What percent of the offspring will likely have brown eyes? _____
- B. What percent of the offspring will have blue eyes? _____
- C. What percent of the offspring will be purebred brown eyes? _____
- D. What percent of the offspring will be hybrid brown eyes? _____
- E. What percent of the offspring will be purebred blue eyes? _____

SAMPLE PROBLEM #5

This is an Incomplete Dominance problem. Neither black nor white are dominant and a hybrid is gray. A black mouse is crossed with a gray mouse.

- A. What percent of the offspring will be black? _____
- B. What percent of the offspring will be white? _____
- C. What percent of the offspring will be gray mice? _____
- D. What percent of the offspring will be hybrids? _____
- E. What percent of the offspring will be purebred? _____

SAMPLE PROBLEM #6

This is a Sex-Linked & Complete Dominance problem. A normal female, but a carrier of the colorblind gene is crossed with a colorblind male. Normal vision is dominant and colorblind vision is recessive.

- A. What percent of the offspring will be female and purebred? _____
- B. What percent of the offspring will be normal female carriers of the colorblind gene? _____
- C. What percent of the offspring will have normal vision? _____
- D. What percent of only the males will be colorblind? _____
- E. What percent of only the females will be colorblind? _____

ANSWERS

SAMPLE PROBLEM #1

This is a *Complete Dominance* problem. A tall hybrid female plant is crossed with a tall hybrid male plant. Tall is dominant.

STEP 1:

T = Tall
t = Short

STEP 2:

Tt x Tt

STEP 3:

	T	t
T	TT	Tt
t	Tt	tt

STEP 4:

- | | |
|--|------------|
| A. What percent of the offspring will be tall purebred? | <u>25%</u> |
| B. What percent of the offspring will be tall hybrid? | <u>50%</u> |
| C. What percent of the offspring will be short purebred? | <u>25%</u> |
| D. What percent of the offspring will be tall? | <u>75%</u> |
| E. What percent of the offspring will be short? | <u>25%</u> |

SAMPLE PROBLEM #2

This is an *Incomplete Dominance* problem. Neither red nor white are dominant and a hybrid is pink. A pink flowered male snapdragon is crossed with a white flowered female snapdragon.

STEP 1:

R = Red
W = White

STEP 2:

RW x WW

STEP 3:

	R	W
W	RW	WW
W	RW	WW

STEP 4:

- | | |
|--|------------|
| A. What percent of the offspring will be red flowered snapdragons? | <u>0%</u> |
| B. What percent of the offspring will be white flowered snapdragons? | <u>50%</u> |
| C. What percent of the offspring will be pink flowered snapdragons? | <u>50%</u> |
| D. What percent of the offspring will be hybrids? | <u>50%</u> |
| E. What percent of the offspring will be purebred pink snapdragons? | <u>0%</u> |

SAMPLE PROBLEM #3

This is a *Sex-Linked & Complete Dominance* problem. A normal female, but a carrier of the hemophiliac gene is crossed with a normal male. Normal blood clotting is dominant and the hemophiliac gene is recessive.

STEP 1:

N = Normal blood clotting
n = Hemophiliac gene

STEP 2:

$X^N X^n \times X^N Y$

STEP 3:

	X^N	X^n
X^N	$X^N X^N$	$X^N X^n$
Y	$X^N Y$	$X^n Y$

STEP 4:

- | | |
|---|------------|
| A. What percent of the offspring will be female and purebred? | <u>25%</u> |
| B. What percent of the offspring will be female carriers of the hemophiliac gene? | <u>25%</u> |
| C. What percent of the offspring will have normal blood clotting capabilities? | <u>75%</u> |
| D. What percent of the offspring will be males? | <u>50%</u> |
| E. What percent of the offspring will be hemophiliacs? | <u>25%</u> |
-

SAMPLE PROBLEM #4

This is a *Complete Dominance* problem. A brown eyed hybrid female is crossed with a blue eyed male. Brown eyes are dominant.

STEP 1:

B = Brown eyes
b = Blue eyes

STEP 2:

$Bb \times bb$

STEP 3:

	B	b
b	Bb	bb
b	Bb	bb

STEP 4:

- | | |
|---|------------|
| A. What percent of the offspring will likely have brown eyes? | <u>50%</u> |
| B. What percent of the offspring will have blue eyes? | <u>50%</u> |
| C. What percent of the offspring will be purebred brown eyes? | <u>0%</u> |
| D. What percent of the offspring will be hybrid brown eyes? | <u>50%</u> |
| E. What percent of the offspring will be purebred blue eyes? | <u>50%</u> |

SAMPLE PROBLEM #5

This is an *Incomplete Dominance* problem. Neither black nor white are dominant and a hybrid is gray. A black mouse is crossed with a gray mouse.

STEP 1:

B = Black

W = White

STEP 2:

BB x BW

STEP 3:

	B	B
B	BB	BB
W	BW	BW

STEP 4:

- A. What percent of the offspring will be black?
- B. What percent of the offspring will be white?
- C. What percent of the offspring will be gray mice?
- D. What percent of the offspring will be hybrids?
- E. What percent of the offspring will be purebred?

- 50%
- 0%
- 50%
- 50%
- 50%

SAMPLE PROBLEM #6

This is a *Sex-Linked & Complete Dominance* problem. A normal female, but a carrier of the colorblind gene is crossed with a colorblind male. Normal vision is dominant and colorblind vision is recessive.

STEP 1:

N = Normal vision gene

n = Colorblind vision gene

STEP 2:

X^NXⁿ x XⁿY

STEP 3:

	X ^N	X ⁿ
X ⁿ	X ^N X ⁿ	X ⁿ X ⁿ
Y	X ^N Y	X ⁿ Y

STEP 4:

- A. What percent of the offspring will be female and purebred?
- B. What percent of the offspring will be normal female carriers of the colorblind gene?
- C. What percent of the offspring will have normal vision?
- D. What percent of only the males will be colorblind?
- E. What percent of only the females will be colorblind?

- 25%
- 25%
- 50%
- 50%
- 50%