Additional Inheritance Problems

1. Cowlicks are tufts of hair on the top of the head that are difficult to comb flat. The direction of the whorl is determined by a single gene pair. A dominant allele (D) causes hair to swirl in a clockwise pattern. The recessive condition (d) causes a counterclockwise pattern. A couple produces 8 children, 4 of whom have cowlicks swirling in the clockwise direction and the other 4 swirl in the counterclockwise direction. What are the genotypes of the parents?

Answer: Parents must be dd + Dd

4/8 clock = 1/2

4/8 counter = 1/2

	d	d
d	dd	dd
D	Dd	Dd

1/2 dd

1/2 Dd

2. Ability to roll the tongue is controlled by a dominant allele (R). A woman is homozygous dominant for the rolling tongue. Will any of her children be able to roll their tongue, and if so, what percentage?

Answer: 100% because woman will contribute R to all children

woman = RR

	R	R
R	R?	R?
R	R?	R?

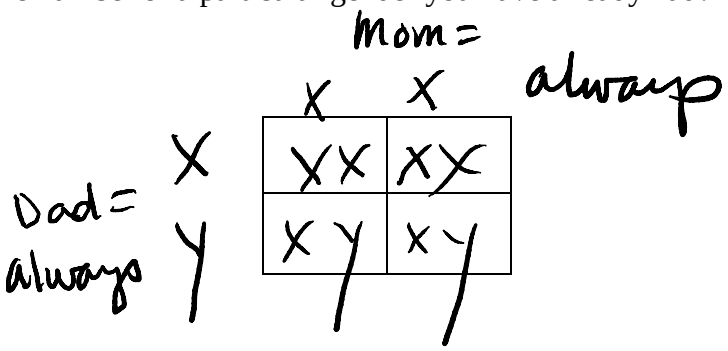
3. Cystic fibrosis is caused by a recessive allele (f). It is the most prevalent genetic disease among Americans, affecting 1 in 2,000 births. If both parents are "carriers" of the cystic fibrosis gene, what are the chances that they will produce a child which suffers from the disorder? 25% What percentage of offspring will be carriers? 50%

1/4 = disease (ff)

2/4 = carriers (Ff)

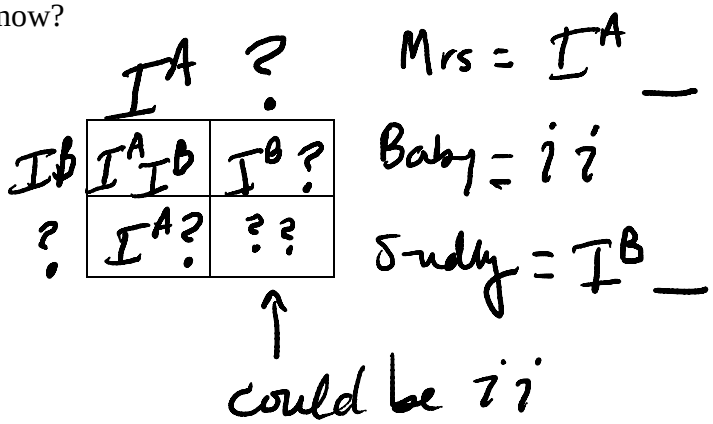
	F	f
F	FF	Ff
f	Ff	ff

4. Theoretically, what are the chances of producing a male child? 50%
   Does this probability change with the number of a particular gender you have already had?
   NO.



5. Ms. Swinger, who has blood type A, has a baby with blood type O. She accuses Mr. Studly, who has blood type B, of being the father of the baby. Could Mr. Studly be the father? Or is Mr. Studly absolutely the father? How do you know?

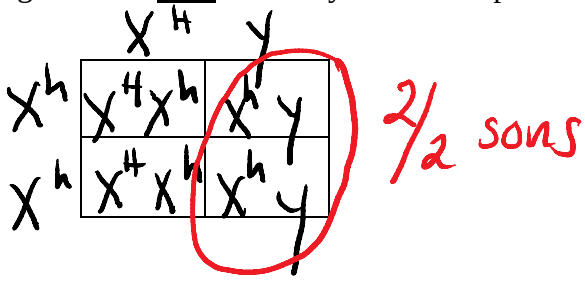
Answer: Studly could be the father, but only if he was $I^B i$ to contribute to baby



6. Hemophilia is a sex-linked clotting recessive trait (X^h). Individuals who are hemophiliacs do not produce blood clotting factor and tend to bleed for a longer period of time than those who have blood clotting factor (X^H). If a woman who is hemophiliac conceives a child with a man who is not a hemophiliac, then what percentage of their **sons** are likely to be hemophiliacs?

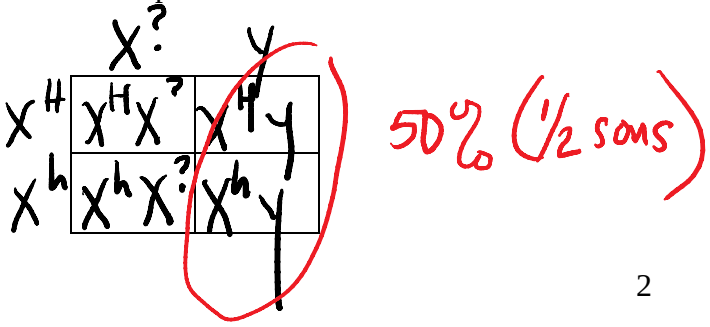
Answer: 100% of sons

woman = $X^h X^h$
man = $X^H Y$



In the second generation when the daughters of this union marry and conceive offspring, what percentage of their **sons** are likely to be hemophiliacs?

Answer: 50%



7. What gametes are possible for a person with the genotype SsWwGG?

Answer: SWG, SwG, sWG, swG

8. When two long-winged flies mated, the offspring included 77 with long wings and 24 with short wings. Is the short-winged condition the dominant or the recessive trait? 3:1

recessive

What were the genotypes of the parents?

Parent 1: Ww

Parent 2: Ww } only way to get 3:1 or 3/4 long 1/4 short

	W	w
W	WW	Ww
w	Ww	ww short

9. Color-blindness is a sex-linked recessive trait. If a colorblind woman marries a man who has normal vision, what would be the expected phenotypes of their children with respect to this characteristic?

woman = X^bX^b

man = X^BY

Girls = 100% (2/2) carriers

Boys = 100% colorblind (2/2)

	X^b	X^b
X^B	X^BX^b	X^BX^b
Y	X^bY	X^bY

2/4 of children Colorblind (50%)

10. A rooster with grey feathers is mated to a hen with the same phenotype. Among their chicks 15 are grey, 6 are black and 8 are white. What is the simplest explanation for the mode of inheritance of these colors? Incomplete dominance

What offspring would you expect from a grey rooster mating with a black hen?

Answer: 2/4 (50%) Black chicks, 2/4 (50%) grey chicks.

0/4 white.

Black hen

grey rooster

	B	b
B	BB	Bb
B	BB	Bb

11. If a woman with a genotype of AaBbcc has offspring with a man that is AABbcc, what is the probability of the following genotypes for their offspring?

	A	A
A	AA	AA
a	Aa	Aa

	B	b
B	BB	Bb
b	Bb	bb

	c	c
c	cc	cc
c	cc	cc

a. AABbcc

$$\frac{2}{4} \times \frac{2}{4} \times \frac{4}{4} = \frac{16}{64}$$

b. AaBBcc

Corrected →

$$\frac{2}{4} \times \frac{1}{4} \times \frac{4}{4} = \frac{8}{64}$$

c. aaBbcc

$$\frac{0}{4} \times \frac{2}{4} \times \frac{4}{4} = \frac{0}{64}$$ (NONE)

d. Aabbcc

$$\frac{2}{4} \times \frac{1}{4} \times \frac{4}{4} = \frac{8}{64}$$

AA = 2/4

Aa = 2/4

BB = 1/4

Bb = 2/4

bb = 1/4

cc = 4/4