

Non-Mendelian Genetics



Incomplete Dominance (In Between)

- Neither allele is **dominant** or **recessive**.
- When heterozygous, a third blending **intermediate** phenotype appears
- Use ALL capital letters



Example: If red flowers (RR) are incompletely dominant to white flowers (WW), show the offspring of a cross between 2 pink flowers (RW)

Phenotypic Ratio:

Red _____, Pink _____, White _____

What is the probability that these two parents will produce pink offspring? _____

If blue flowers (BB) are incompletely dominant to red flowers (RR), show the offspring of a cross between one purple and one red flower.

Phenotypic Ratio:

Blue _____, Purple _____, Red _____

What is the probability that these two parents will produce purple offspring? _____

Co-dominance (Both Show)

- Both alleles are **expressed** and both contribute to the phenotype (both show up)
- When heterozygous, both phenotypes are represented separately
- Use two different letters, but ALL capital!



If black chickens (BB) are codominant to white chickens (WW), show a cross between a black chicken and a black and white chicken (BW).

Phenotypic Ratio:

Black _____, Black and White _____,
White _____

What is the probability that these two chickens will produce white offspring? _____

If purple flowers (PP) are codominant to orange flowers (OO), show a cross between two orange and purple flowers (PO).

Phenotypic Ratio:

Purple _____, Purple and Orange _____,
Orange _____

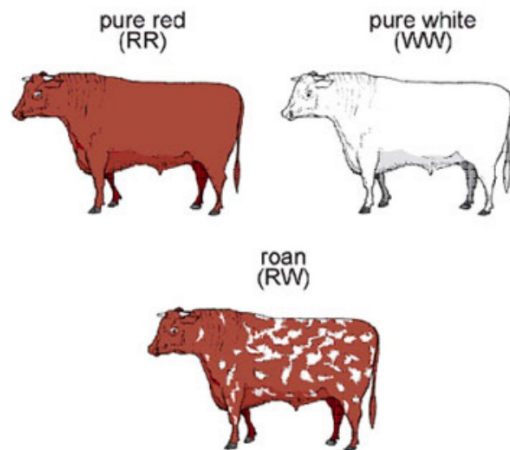
What is the probability that these two flowers will produce orange offspring? _____

★ Roan (co-dominance)

RR - Red

WW - White

RW - Roan



Erminette Chickens

BB - Black

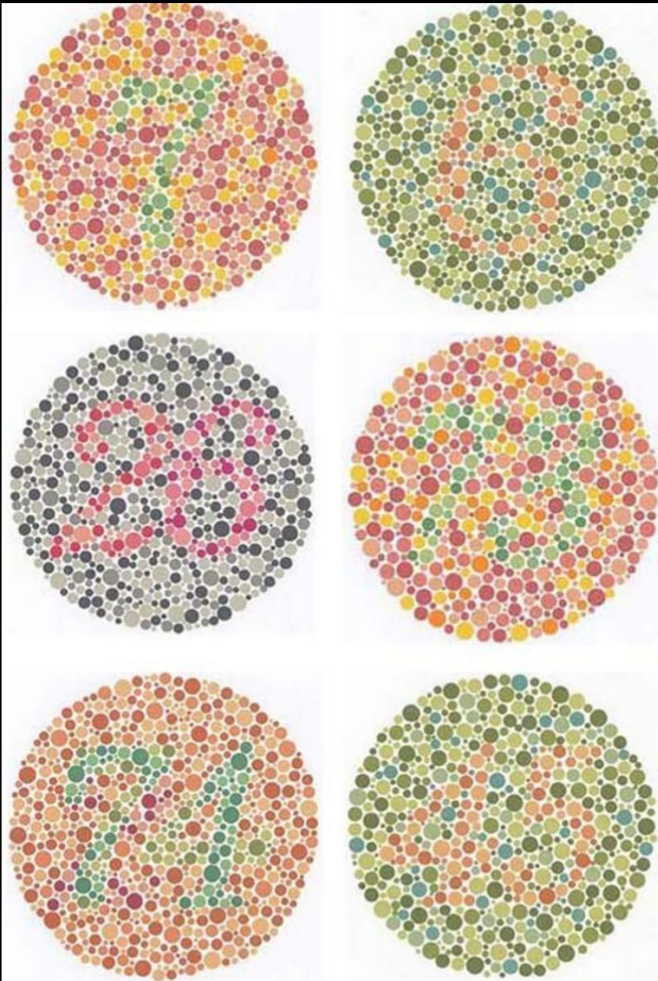
WW - white

BW - Erminette



Sex Linked Inheritance

- Trait found on the **X** chromosome
- More frequent in **males** because they get only **one** copy of the X chromosome
- “Normal” trait is usually **dominant** and sex-linked trait is usually **recessive**.
- Examples of sex-linked traits: Hemophilia, color blindness, baldness





Normal



Protanopia (no red)



Deutanopia (no green)



Tritanopia (no blue)



Protanomally (low red)



Deuteranomally (low green)



Tritanomally (low blue)



Typical Monochromacy



Atypical Monochromacy

Possible Genotypes for Woman:

$X^N X^N =$ Normal Female

* $X^N X^n =$ Carrier Female

$X^n X^n =$ Diseased Female

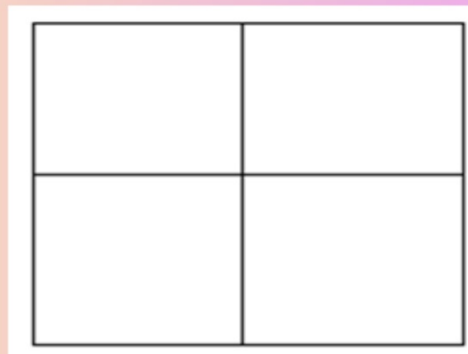
Possible Genotypes for Man:

$X^N Y =$ Normal Male

$X^n Y =$ Diseased Male

Can a man be a carrier? No

Example: A colorblind woman (X^bX^b) and a man with normal vision (X^BY) want to know what chance a son will have normal vision.



Phenotypes:

Both females are _____ (have normal vision but could pass the trait to their offspring)

Both males are _____

What is the probability that these two people will have a colorblind son?

You try! Hemophilia is a sex-linked recessive disorder that is carried on the X chromosome. A female carrier $X^H X^h$ married a man with Hemophilia $X^h Y$. What percentage of *daughters* will have hemophilia?

Multiple Alleles

- More than 2 alleles are available for each gene
- But each individual can still only have 2 (1 from each parent)- there are just more possible phenotypes

Example: Human blood types have 3 alleles: A, B, O
*- "A" and "B" are **codominant**, while "O" is recessive*

Blood Type	Genotypes
A	$I^A I^A, I^A i$
B	$I^B I^B, I^B i$
AB	$I^A I^B$
O	ii

Hair Color



Example problem: Mr. Jones has blood type A and Mrs. Jones has blood type AB. What is the probability that they will have a child with blood type A if both of Mr. Jones's parents were AB? Show the Punnett Square!!

