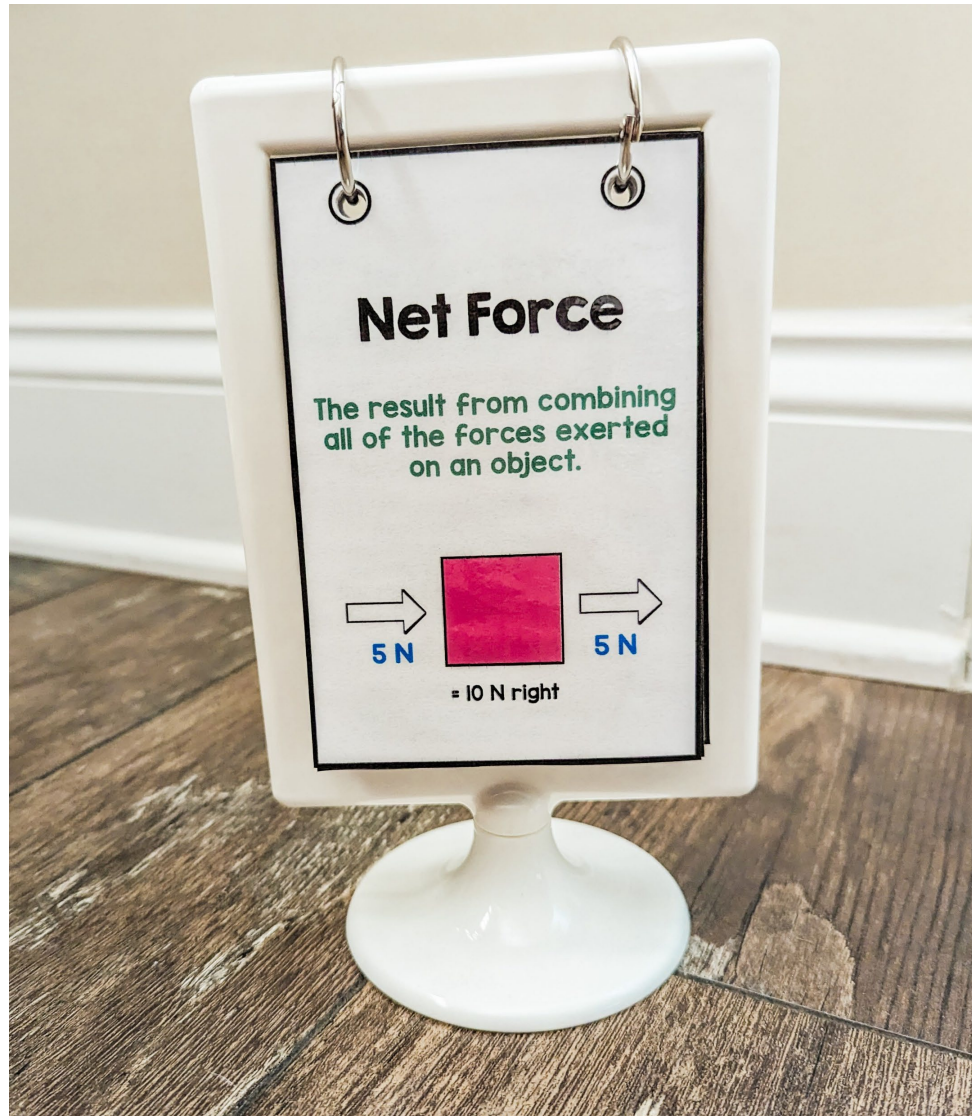


This set of science anchor charts was designed to accompany those adorable white frames from [IKEA/Amazon](#), but they also work great for bulletin boards and interactive notebooks!



# Heredity

the passing of traits from parents to offspring



# Genetics

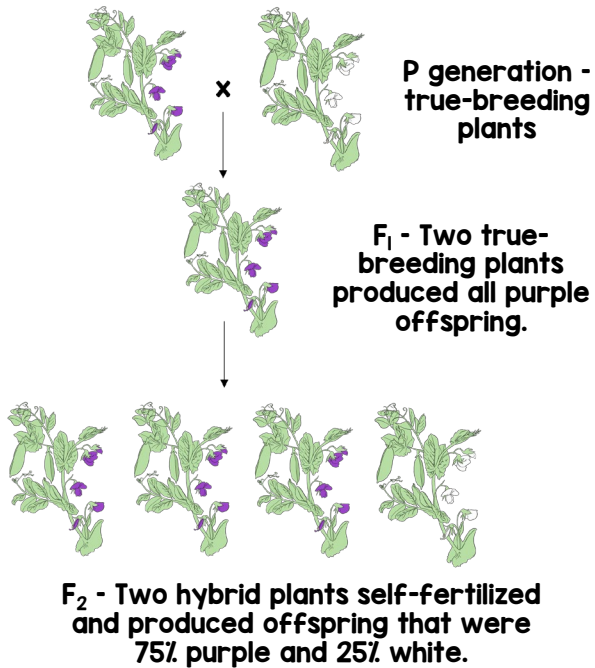
the study of how traits are passed from parents to offspring

# Gregor Mendel



- “the father of genetics”
- Austrian monk and biologist
- late 1850s: grew and studied pea plants
- work not recognized until the turn of the 20<sup>th</sup> century

# Mendel's Experiments

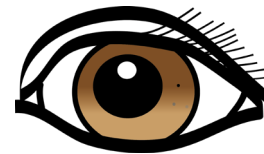


## Dominant Trait

genetic factor that blocks another genetic factor

## Recessive Trait

genetic factor that is blocked by the presence of a dominant factor



dominant



recessive

# Homozygous

alleles are the **same**



WW



ww

# Heterozygous

alleles are **different**



Ww

# Genotype

combination of genes

WW

ww

Ww

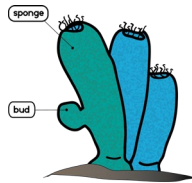
# Phenotype

observable characteristics



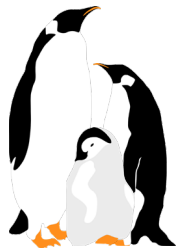
## Asexual Reproduction

A single parent has offspring that are genetically identical to the parent.



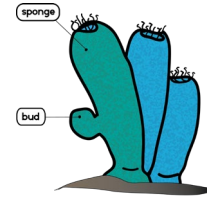
## Sexual Reproduction

Reproduction in which sex cells from two parents unite to produce offspring that share traits from both parents.



## Asexual Reproduction

A single parent has offspring that are genetically identical to the parent.



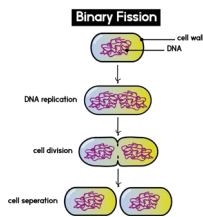
### Advantages:

- fast and efficient
- does not require a male and a female organism

### Disadvantages:

- no genetic diversity

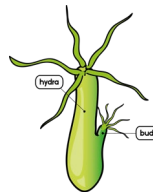
## Binary Fission



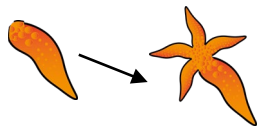
one cell divides into two equal parts

## Budding

when part of the parent organism pinches off and forms a new organism

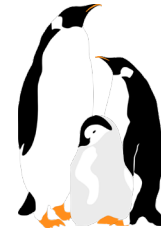


## Fragmentation



Parts of an organism break off and then develop into a new individual that is identical to the original one.

## Sexual Reproduction



reproduction in which sex cells unite to produce offspring that share traits from both parents

### Advantages:

- genetic diversity
- allows for the adaptations in species

### Disadvantages:

- takes a lot of energy

## Fertilization (in humans)

Occurs when **male (sperm) and female (egg) sex cells (gametes) unite.**

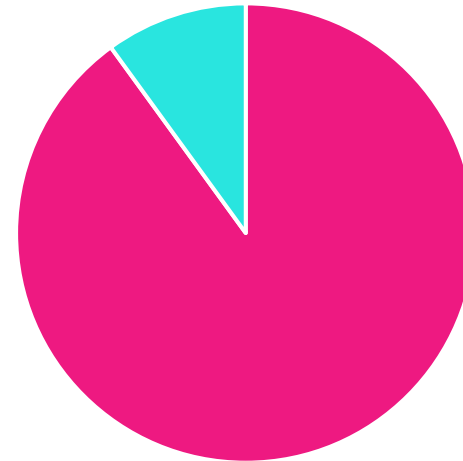


The fertilized egg is called a **zygote (46 chromosomes).**



Through mitosis, the offspring continues to grow.

## The Cell Cycle



- Interphase
- Mitosis and Cytokinesis

# Major Stages of the Cell Cycle

growth, replication,  
and division of a cell

1. Interphase

2. Mitotic Phase

(Mitosis and  
Cytokinesis)



The **DNA** in a cell is  
organized into  
structures called  
**chromosomes**.



DNA

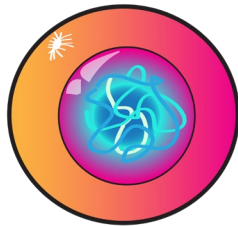


chromosome

Human body cells have  
**46 chromosomes**  
(23 pairs).

# Interphase

growth, DNA replication,  
cell functions

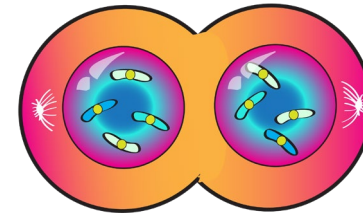


- during cell cycle → cell is usually in the interphase stage

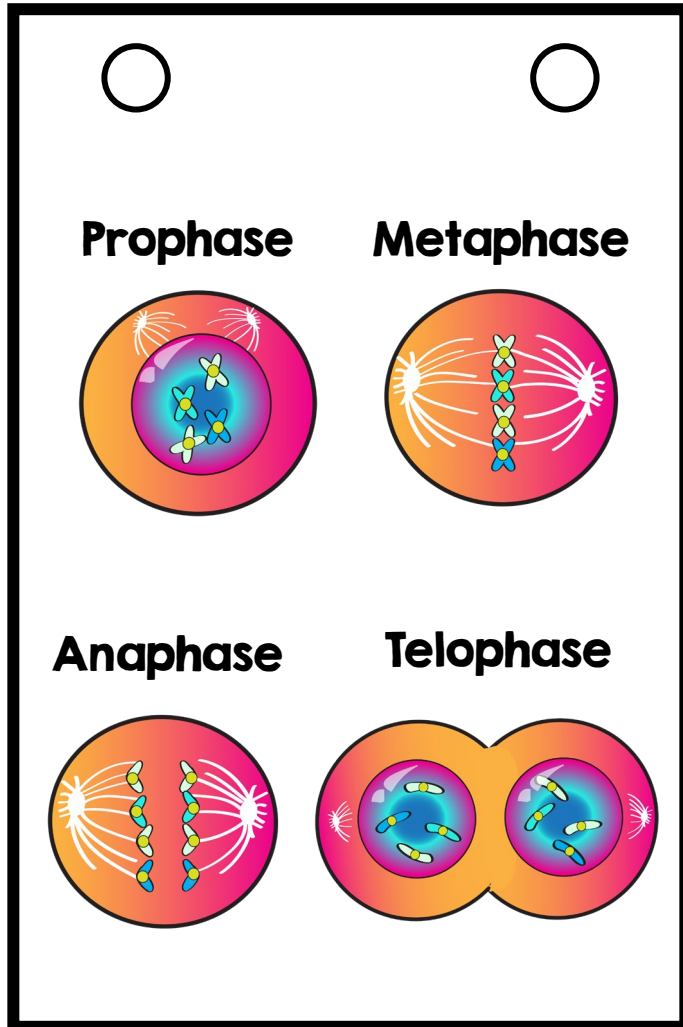
**The cell carries out its normal activities and genetic material is duplicated.**

# Mitosis

repair and growth



- makes body cells
- makes identical cells
- stages: prophase, metaphase, anaphase, telophase
- One cell becomes 2 daughter cells.



# Prophase

1<sup>st</sup> phase of mitosis

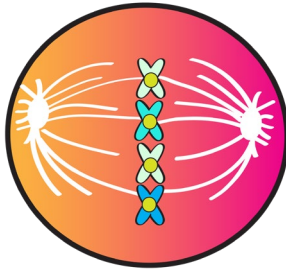
- cell is beginning to get ready to divide
- duplicated DNA (chromosomes) are visible and condensed; nuclear membrane and nucleolus break down
- mitotic spindle also formed
- nucleus begins to disappear

The image shows a single diagram of a cell in the Prophase stage of mitosis. The cell is depicted with a pink and orange gradient background. The nucleus is shown as a blue circle containing chromosomes. Spindle fibers are represented by white lines extending from the poles of the cell. The text 'Prophase' is written in large black letters, and '1<sup>st</sup> phase of mitosis' is written in blue. Below the diagram is a list of four bullet points describing the characteristics of this stage.



# Metaphase

2<sup>nd</sup> phase of mitosis

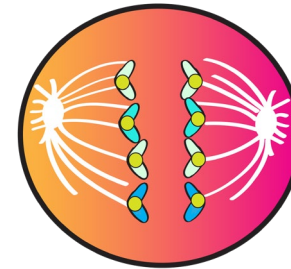


- DNA (chromosomes) align in the **middle of the cell** in order to prepare to split
- nucleus is no longer in the cell
- chromosomes pulled by spindle fibers



# Anaphase

3<sup>rd</sup> phase of mitosis

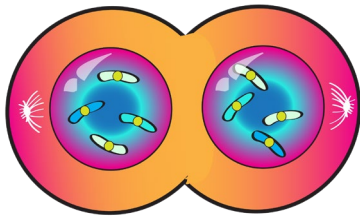


- separation of cells begins
- **sister chromatids separated** and pulled to opposite poles by spindle fiber - moving away from center
- cell begins to stretch out



# Telophase

4<sup>th</sup> phase of mitosis

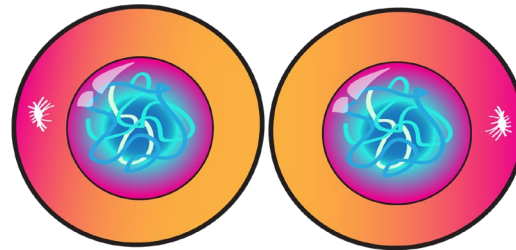


- chromosomes are at complete opposite ends of cell
- new nuclei form on each of these sides around the chromosomes; chromosomes uncoil
- goal of mitosis → form two identical cells; cells begin to split



# Cytokinesis

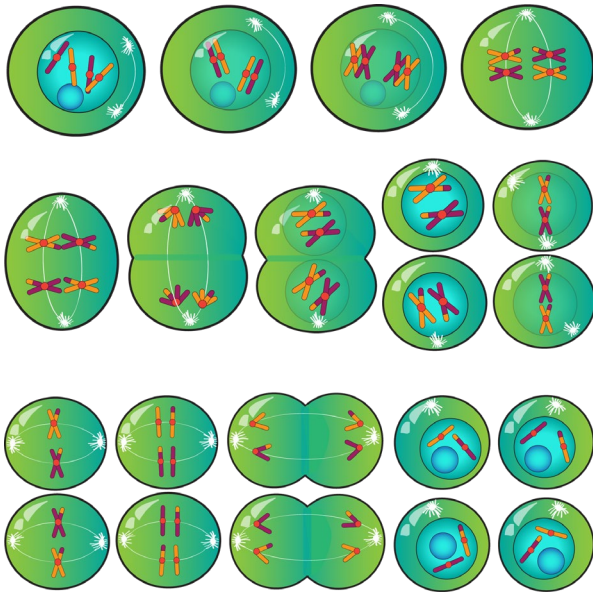
two daughter cells formed



- final separation of the two identical daughter cells
- cells turn into two by splitting the cytoplasm after four mitosis stages
- new cells both contain a new nucleus

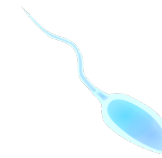


# Meiosis

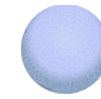


# Meiosis

cell division that  
produces gametes  
(sex cells)



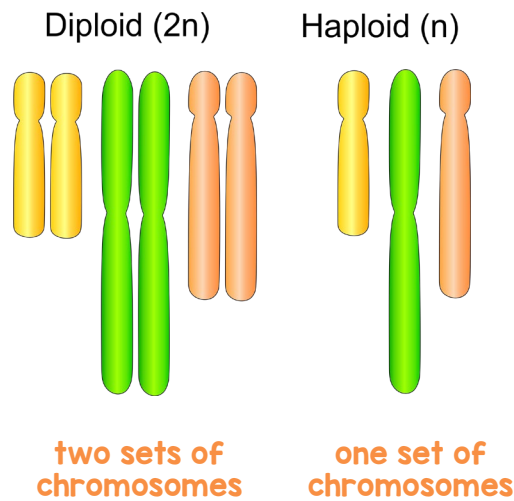
sperm



egg

makes 4 non-identical  
gametes that are  
important for  
genetic variety

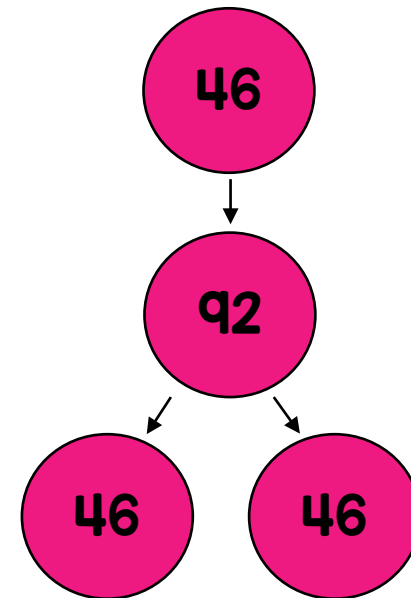
# Haploid and Diploid



Both mitosis and meiosis **begin** with a **diploid** cell (2n). This means that it has two sets of chromosomes.

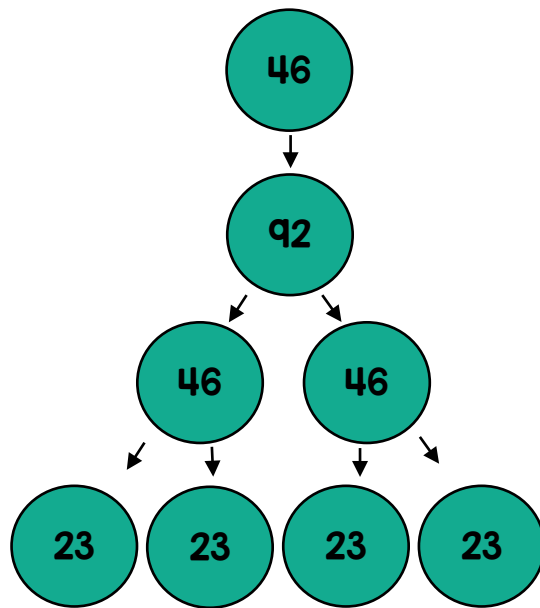
# Mitosis

**PMAT x I**



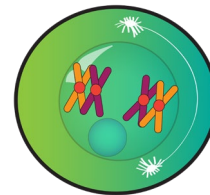
# Meiosis

PMAT x 2

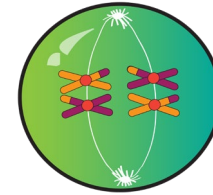


# Meiosis I

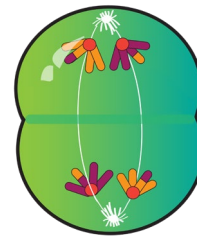
Prophase I



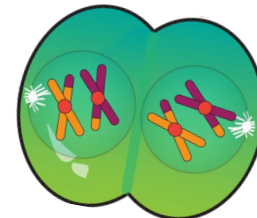
Metaphase I



Anaphase I

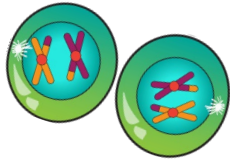


Telophase I and Cytokinesis

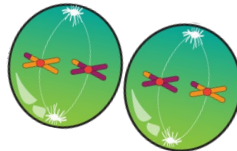


# Meiosis II

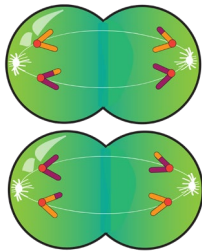
Prophase II



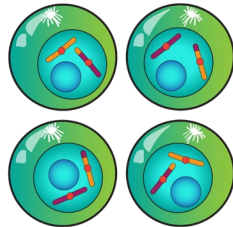
Metaphase II



Anaphase II



Telophase II and Cytokinesis



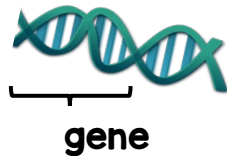
# Key Differences

	Mitosis	Meiosis
Types of Cells Produced	makes identical body cells	makes non-identical sex cells (gametes)
Number of Cells Produced	2	4
Function	growth and repair	genetic variety/ reproduction
PMAT	x 1	x 2
Haploid or Diploid?	diploid (2n)	haploid (n)
Chromosome # in Daughter Cells	46	23

# Gene

one set of instructions  
for an inherited trait

Example:  
genes that  
code for your  
eye color



# Allele

different forms of a gene

Example:  
dominant  
allele for  
brown eye  
color

Example

Bb

brown

blue

# Steps to Creating a Punnett Square

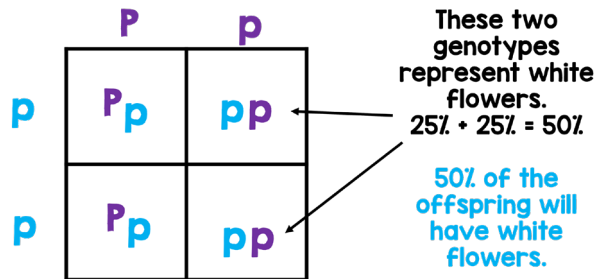
1. Determine the **genotypes of the parent organisms** and write down the "cross".
2. Draw a **2 x 2 square**.
3. "**Split**" the **genotypes**, and place one on the top of the square and the other on the left of the square.
4. Boxes will **inherit the letter** from their row and column.
5. Interpret the Punnett square → **each square is worth 25%**.

# Punnett Square Example

P: purple flower p: white flower

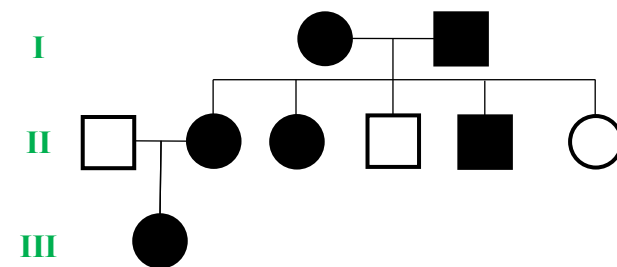
Cross Pp x pp

What is the probability the offspring will have white flowers?


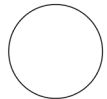




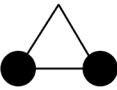
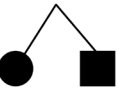
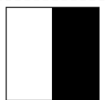
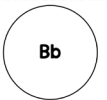


# Pedigree Chart

uses symbols to represent people to show the inheritance of a single trait over generations



# Pedigree Chart Symbols

 unaffected male	 unaffected female	 affected male	 affected female
 marriage line/ reproduction	 connects parents to children	 represents identical twins	 represents non-identical twins
 male that carries the trait	 heterozygous female	<b>II</b> represents 2 <sup>nd</sup> generation	<b>I2</b> represents 1 <sup>st</sup> generation, 2 <sup>nd</sup> individual

# Inherited Traits

are passed from parents to offspring by genetic transmission

Inherited traits are determined **before birth** and **cannot be changed permanently**.

Some examples include: eye color, skin color, dimples, and toe length.



# Learned Traits

People receive learned traits, also called acquired traits, through **choices** and their interactions with the **environment**.

Some examples include: dislikes of certain foods, mannerisms, and speech.



# Mutations

a change in a living things DNA

- **gene mutations:** change in one or more DNA bases
- **chromosome mutations:** change in the structure or number of chromosomes

