Meiosis:

The reason you are not a clone of your mom or dad.

Thank you Meiosis.

Meiosis

Meiosis is the type of cell division that creates gametes (eggs and sperm) .

One parent cell produces 4 genetically different daughter cells.

Daughter cells have half the number of chromosomes found in the original parent cell

Meiosis

Before meiosis, DNA replicates ***once***

But during Meiosis the nucleus divides *twice*.

Meiosis

The division of the nucleus can be divided into 4 stages.

4 stages X 2 divisions = 8 phases

Whew. Math is hard.

Meiosis I

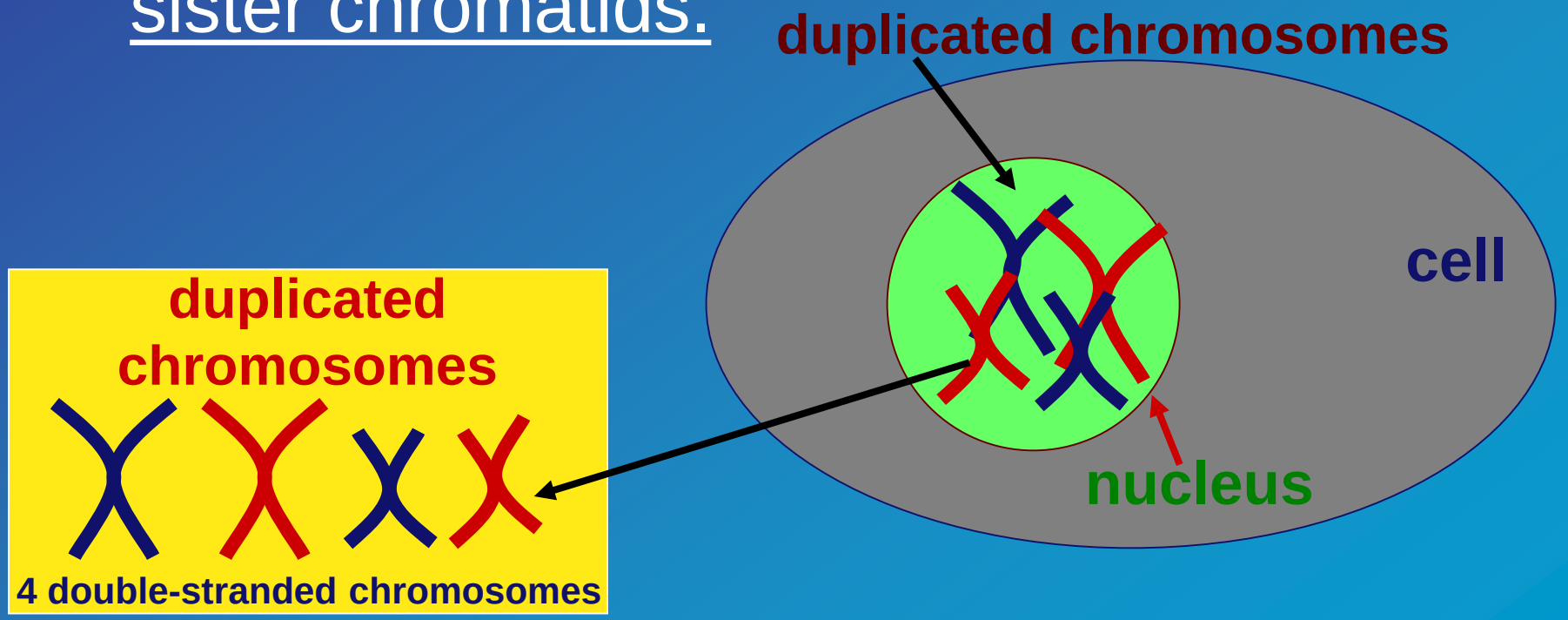
First division of meiosis

First Division of Meiosis

- **Prophase 1:** Each chromosome duplicates and remains closely associated. These are called sister chromatids.
- **Metaphase 1**: Chromosomes align at the center of the cell.
- **Anaphase 1**: Chromosome pairs separate with sister chromatids remaining together.
- **Telophase 1**: Two daughter cells are formed with each daughter containing only one chromosome of the chromosome pair.

Prophase I

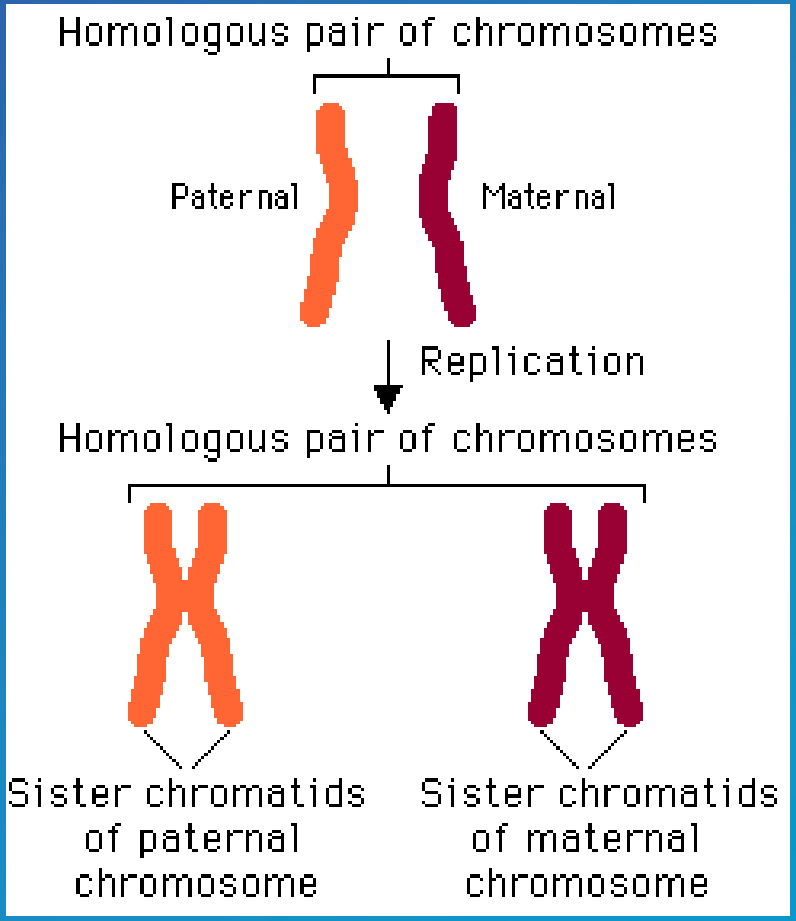
- **Prophase 1:** Each chromosome has duplicated (interphase) and remains attached with it's copy. These are called <u>sister chromatids.</u>



Prophase I

- Prophase I: Homologous chromosomes pair up.

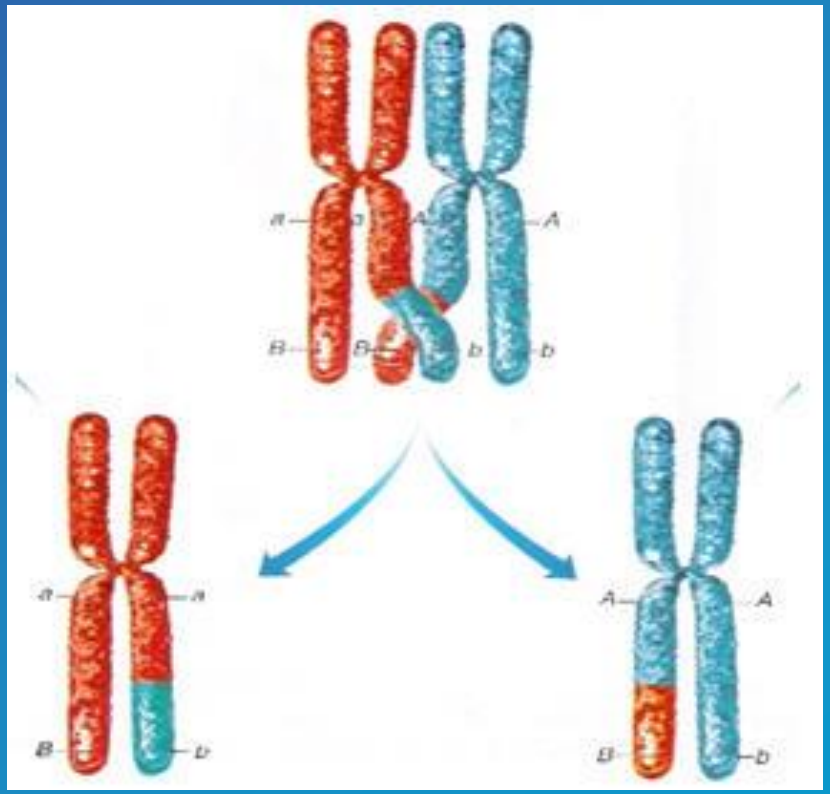
Pair =One from mom + one from dad



Prophase I

- Prophase I: Homologous pairs line up for crossing over where they swap parts of the DNA.

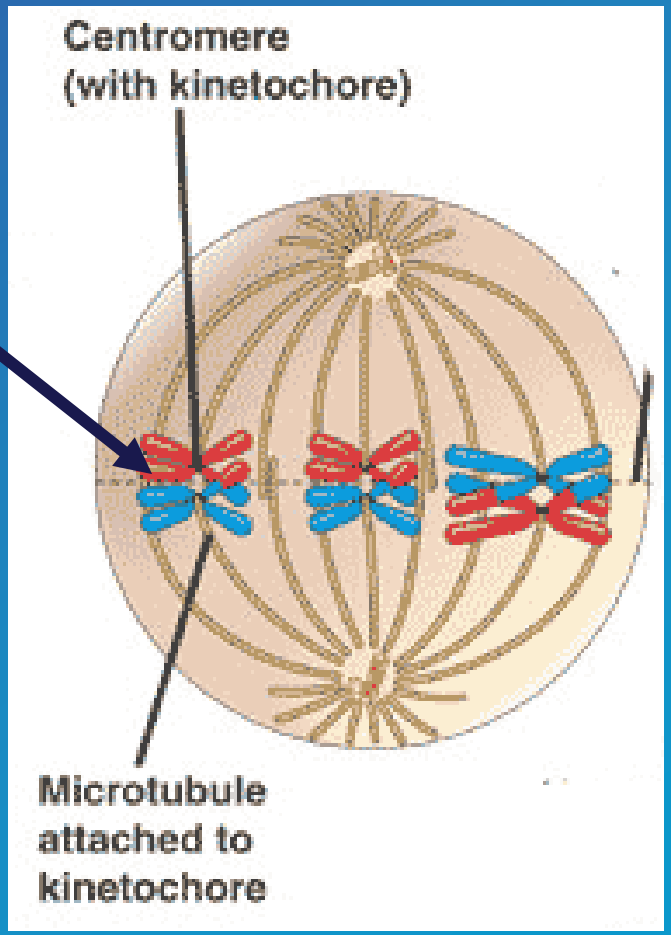
Chromosomes are now a *mix* of mom and dad



Metaphase I

- **Metaphase 1**: *Homologous pairs* align at the center of the cell.

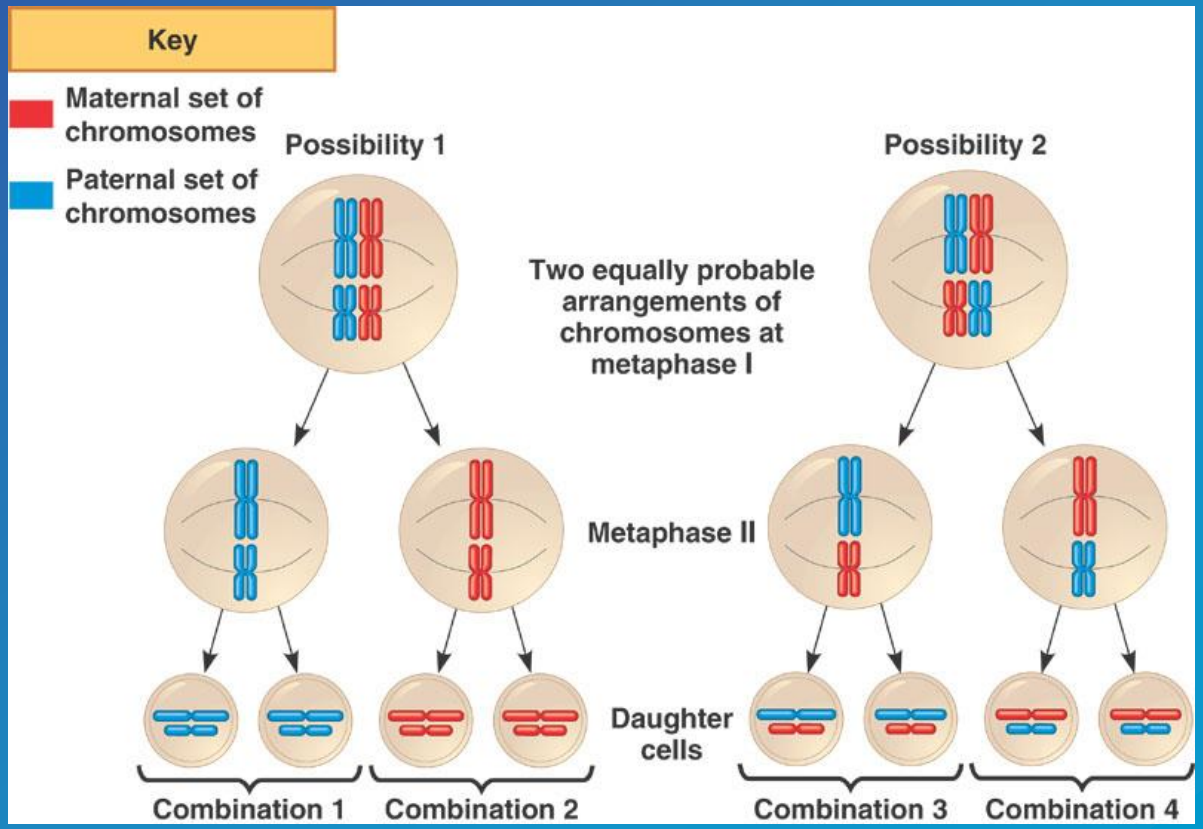
Tetrads



Metaphase I

- Metaphase I: How homologous pairs align is completely random! Independent orientation (assortment).

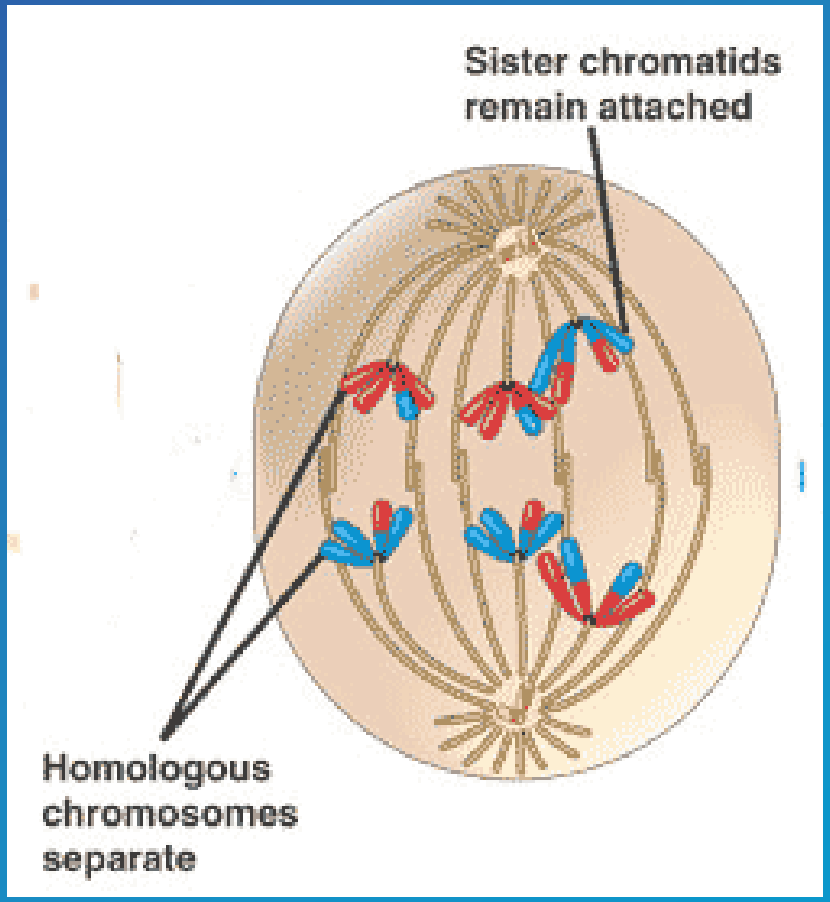
Genetic variability!



Anaphase I

- **Anaphase 1**: *Homologous pairs* separate with sister chromatids remaining together.

This is how chromosome number is cut in half.
(Diploid to haploid)

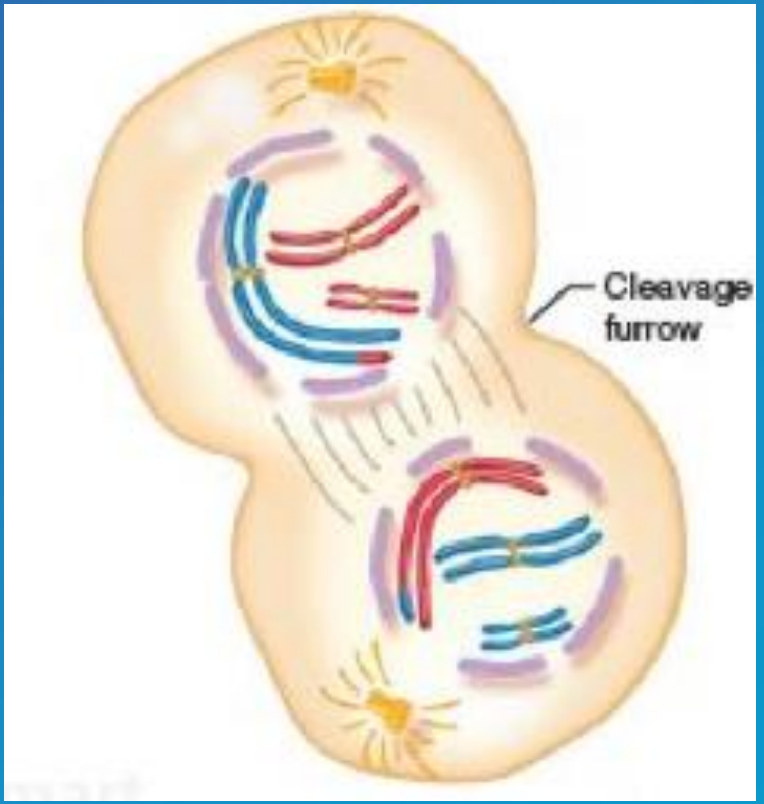


Telophase I & Cytokenesis

- **Telophase 1**: Two daughter cells are formed with each daughter containing half the chromosomes as the parent cell.

Cell went from 6 to 3 chromosomes. (Diploid to haploid)

Cells are also genetically different than the original parent cell



Meiosis

Second Division of Meiosis:

- Déjà vu of mitosis (2 cells going through mitosis at once)
- Going from double to single stranded chromosomes.
- Sister chromatids say goodbye ☹.

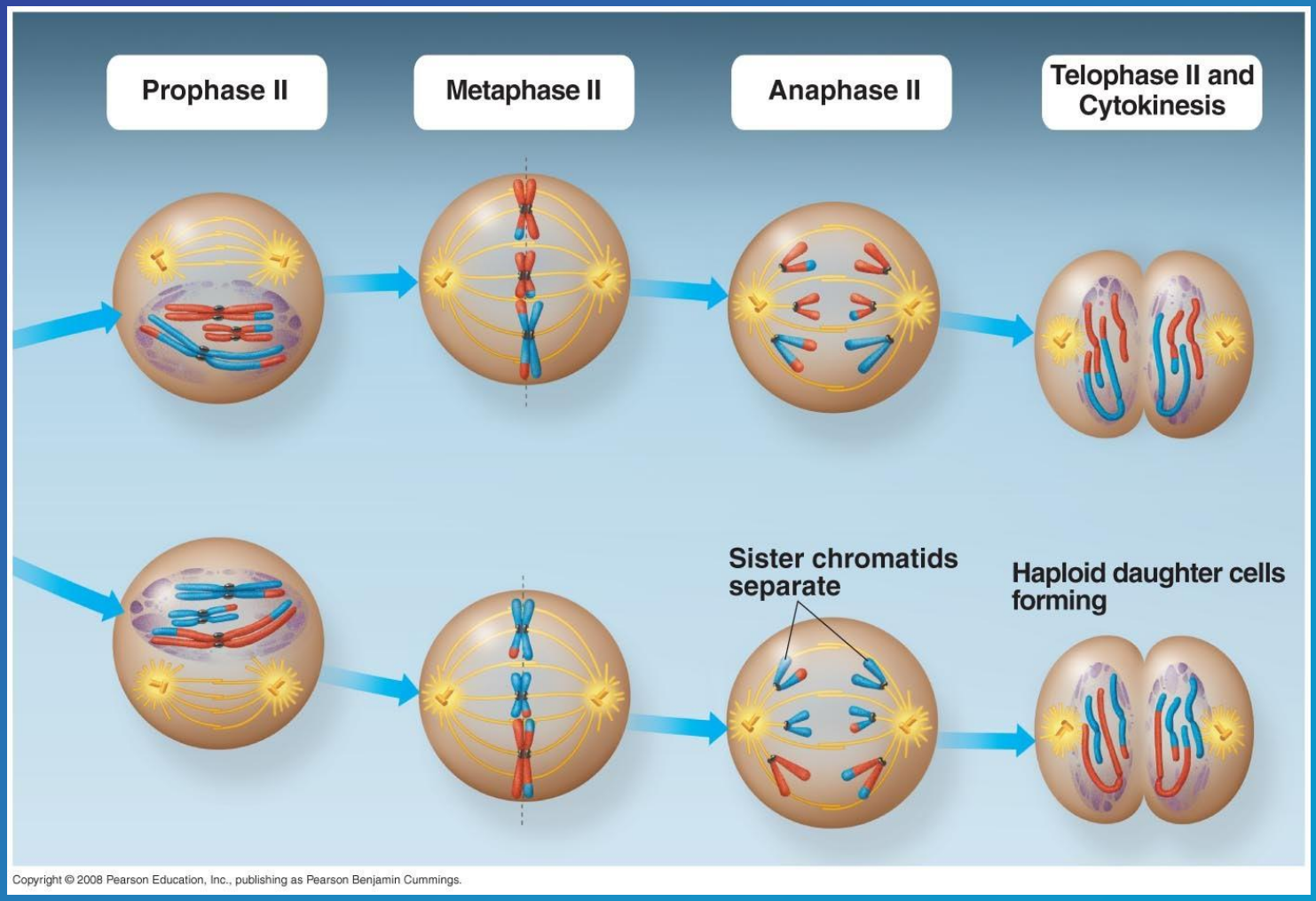
Second Division of Meiosis

- **Prophase 2**: DNA does not replicate again.
- **Metaphase 2**: Chromosomes line up at the center of the cell
- **Anaphase 2**: Chromosomes divide and sister chromatids move separately to each pole.
- **Telophase 2**: Cell division is complete.

Four haploid daughter cells are formed.

Meiosis II

2 cells dividing at once

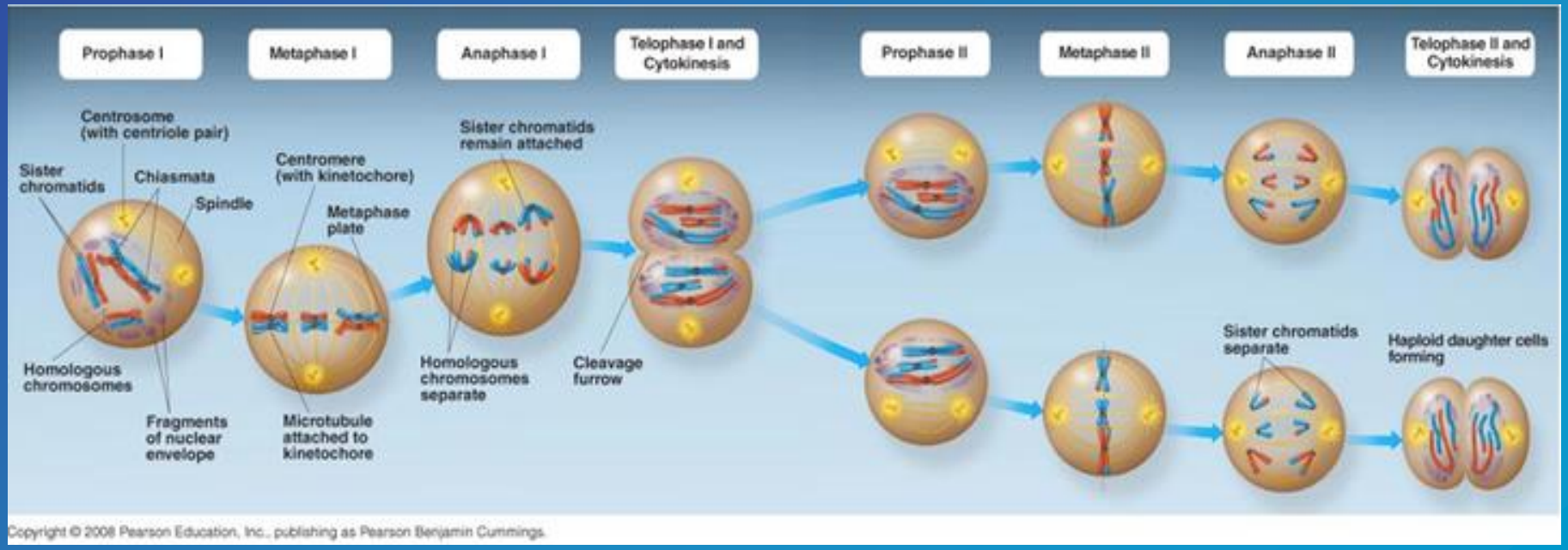


Differences in Mitosis & Meiosis

- Mitosis
  - Asexual reproduction
  - Cell divides once
  - Two diploid daughter cells
  - Genetic information is identical to original cell
- Meiosis
  - Sexual reproduction
  - Cell divides twice
  - Four haploid daughter cells
  - Genetic information is different from original cell

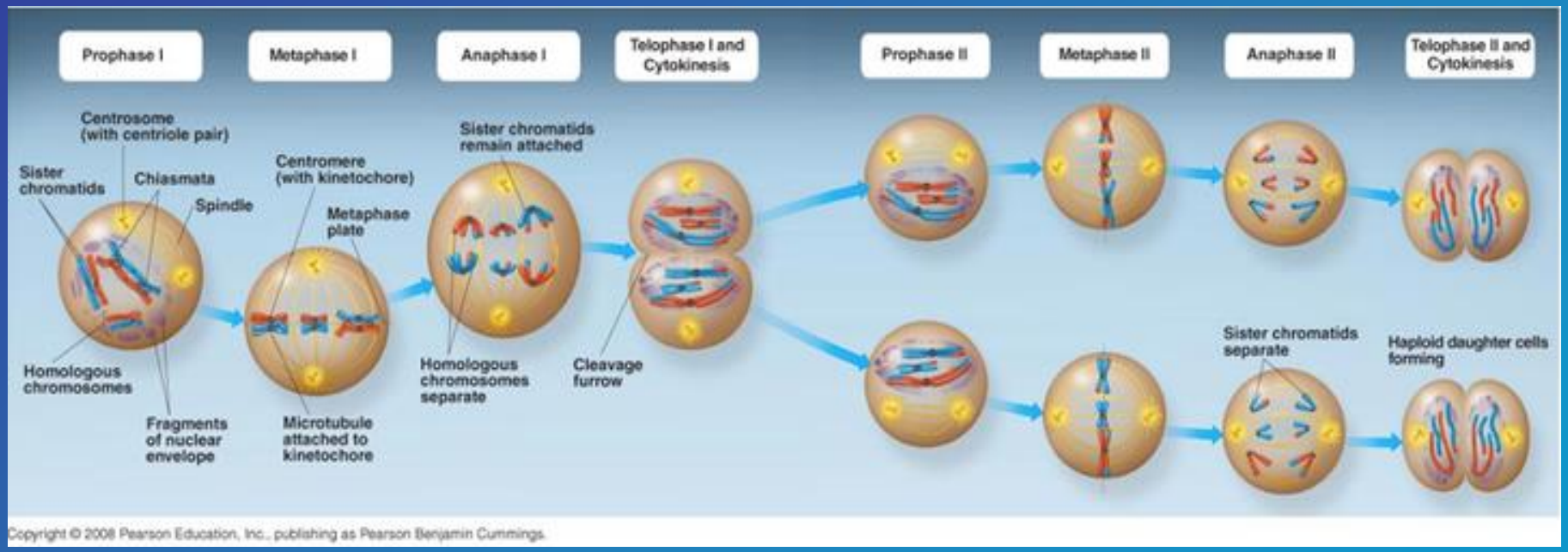
Differences in Meiosis I and Meiosis II

- Meiosis I
  - Crossing over in prophase
  - Homologous pairs align in metaphase
- Meiosis II
  - No crossing over
  - Chromosomes align in metaphase



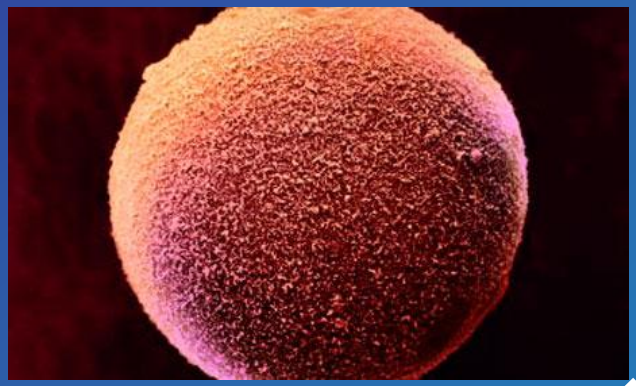
Meiosis In a Nut Shell

- One cell ⟶ 4 genetically different cells with ½ the DNA

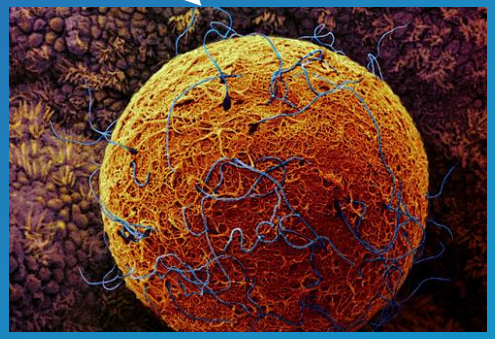


So, What's the Point?

- In females the cells become eggs



- In males the cells become sperm



Mitosis!