A.P. Biology Mr. Tesoro

- Homework Reminder:
- Do Now: In a sexually reproducing organism, a somatic cell contains 50 chromosomes, what is its diploid and haploid number of this organism? What is the difference between a somatic cell and a gamete?

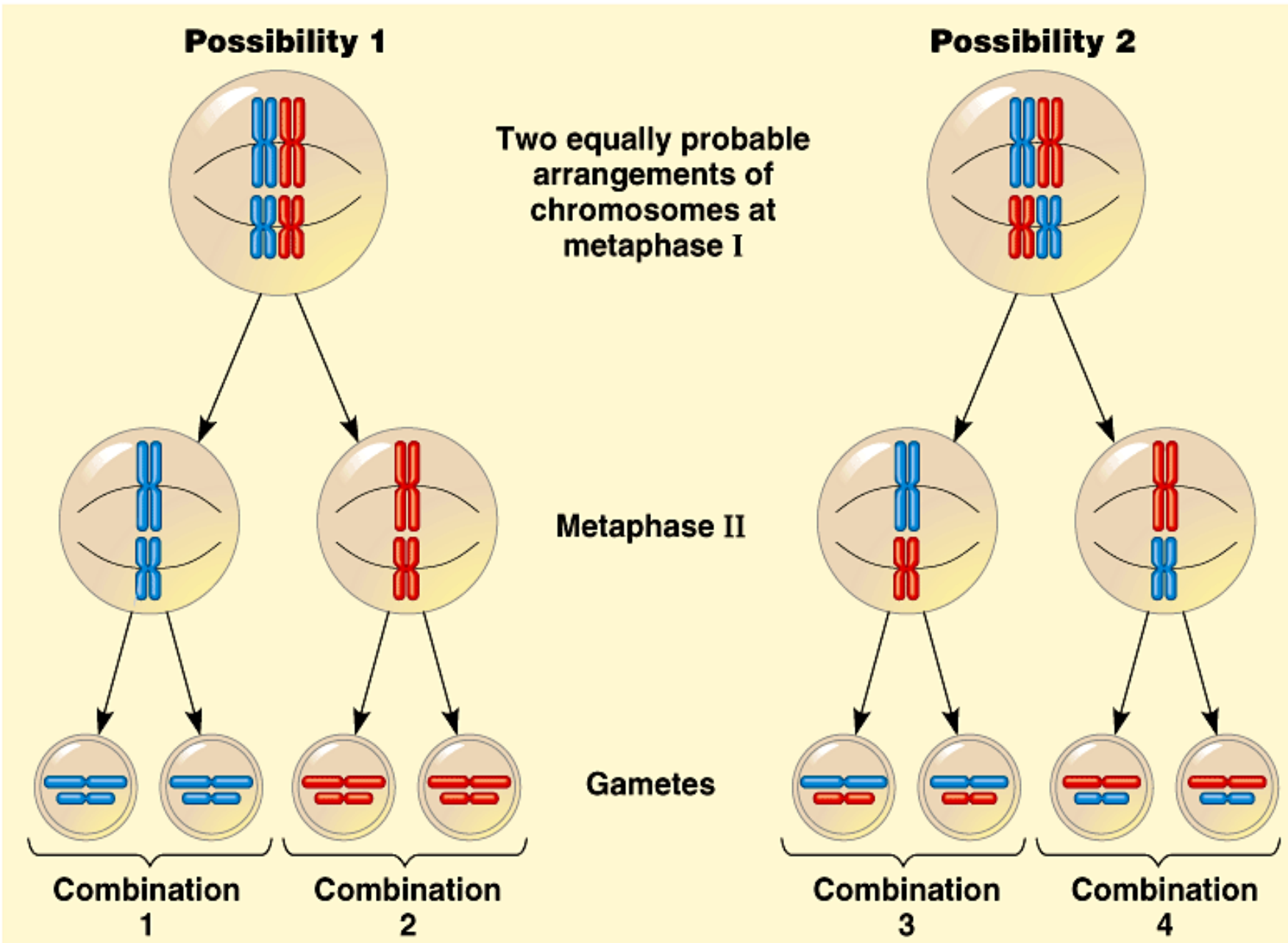
Aim: What are the origins of genetic variation?

Sexual life cycles produce genetic variation among offspring

- **Three mechanisms contribute to genetic variation:**
  - **independent assortment**
  - **crossing over**
  - **random fertilization**
- **They reshuffle the various genes carried by individual members of a population.**
- **Mutations (changes in DNA sequences) are what ultimately create a population's diversity of genes.**

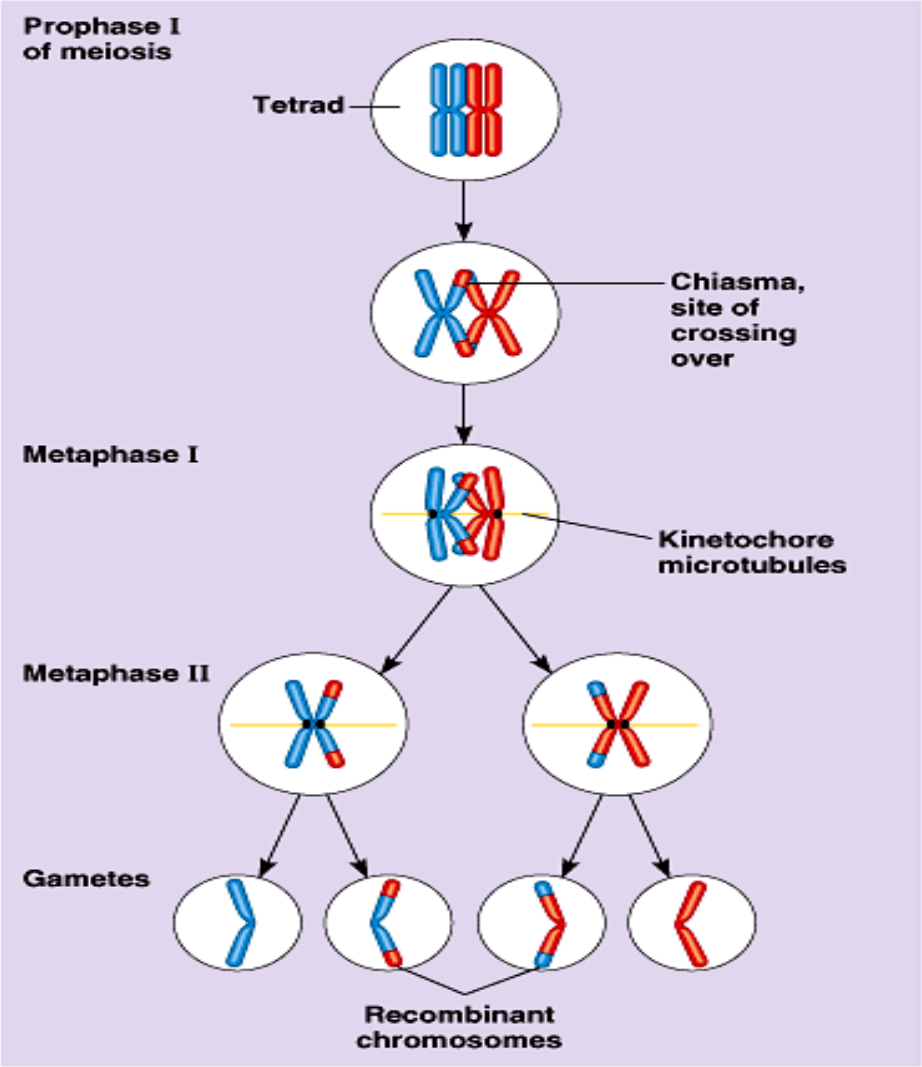
Independent Assortment

- genetic variability due to the random orientation of tetrads at the metaphase plate
- The number of combinations possible when chromosomes assort independently into gametes is 2^n, where n is the haploid number of the organism.


Possibility 1
Possibility 2
Two equally probable arrangements of chromosomes at metaphase I
Metaphase II
Gametes
Combination 1
Combination 2
Combination 3
Combination 4

Crossing Over during Meiosis

- Crossing over produces recombinant chromosomes which combine genes inherited from each parent.
- In crossing over, homologous portions of two nonsister chromatids trade places.
  - For humans, this occurs two to three times per chromosome pair.



Random Fertilization

- **Any sperm can fuse with any egg.**
  - **The zygote has a unique genetic identity.**
  - **An ovum is one of approximately 8 million possible chromosome combinations (actually 2^{23}).**
  - **The successful sperm represents one of 8 million different possibilities (actually 2^{23}).**
  - **The resulting zygote is composed of 1 in 70 trillion ($2^{23} \times 2^{23}$) possible combinations of chromosomes.**
  - **Crossing over adds even more variation to this.**