**Meiosis Stages**

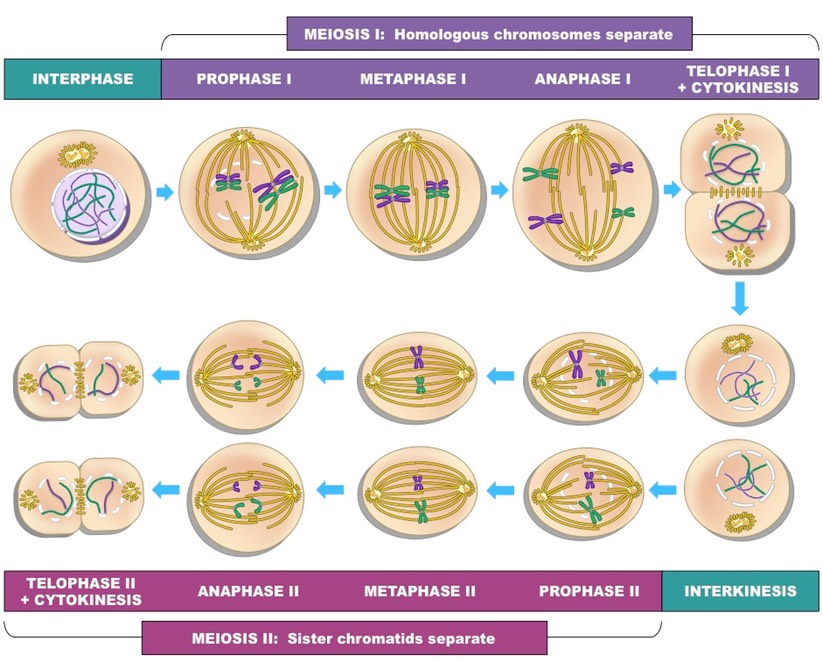
**Division 1**

|  |  |  |
| --- | --- | --- |
| **Stage** | **Picture** | **Description** |
| **Interphase** |  | * DNA replication occurs |
| **Prophase 1** |  | * Spindle fibres begin to appear * Nuclear membrane begins to disappear * Chromosomes (X) pair up with other chromosomes (X) of the same size – **HOMOLOGOUS CHROMOSOMES** |
| **Metaphase 1** |  | * **Homologous chromosomes** line up at the centre (equator) of the cell. * Each homologous pair of chromosomes is attached to a spindle |
| **Anaphase 1** |  | * Homologous chromosomes are pulled apart to opposite poles of the cell |
| **Telophase 1** |  | * Nuclear membrane begins to form around the chromosomes (X) * The cell begins to separate * 2 new cells have formed. Each cell contains one chromosome from each homologous pair. |

**Division 2**

**No DNA Replication occurs!**

|  |  |  |
| --- | --- | --- |
| **Stage** | **Picture** | **Description** |
| **Prophase 2** |  | * Spindle fibres begin to appear * Nuclear membrane begins to disappear |
| **Metaphase 2** |  | * **Chromosomes** line up at the centre (equator) of the cell. * Each chromosome is attached to a spindle |
| **Anaphase 2** |  | * **Chromosomes** are pulled apart to opposite poles of the cell |
| **Telophase 2** |  | * Nuclear membrane begins to form around the chromosomes * The cell begins to separate * 4 new cells have formed. Each cell contains half the number of chromosomes as the parent cell |

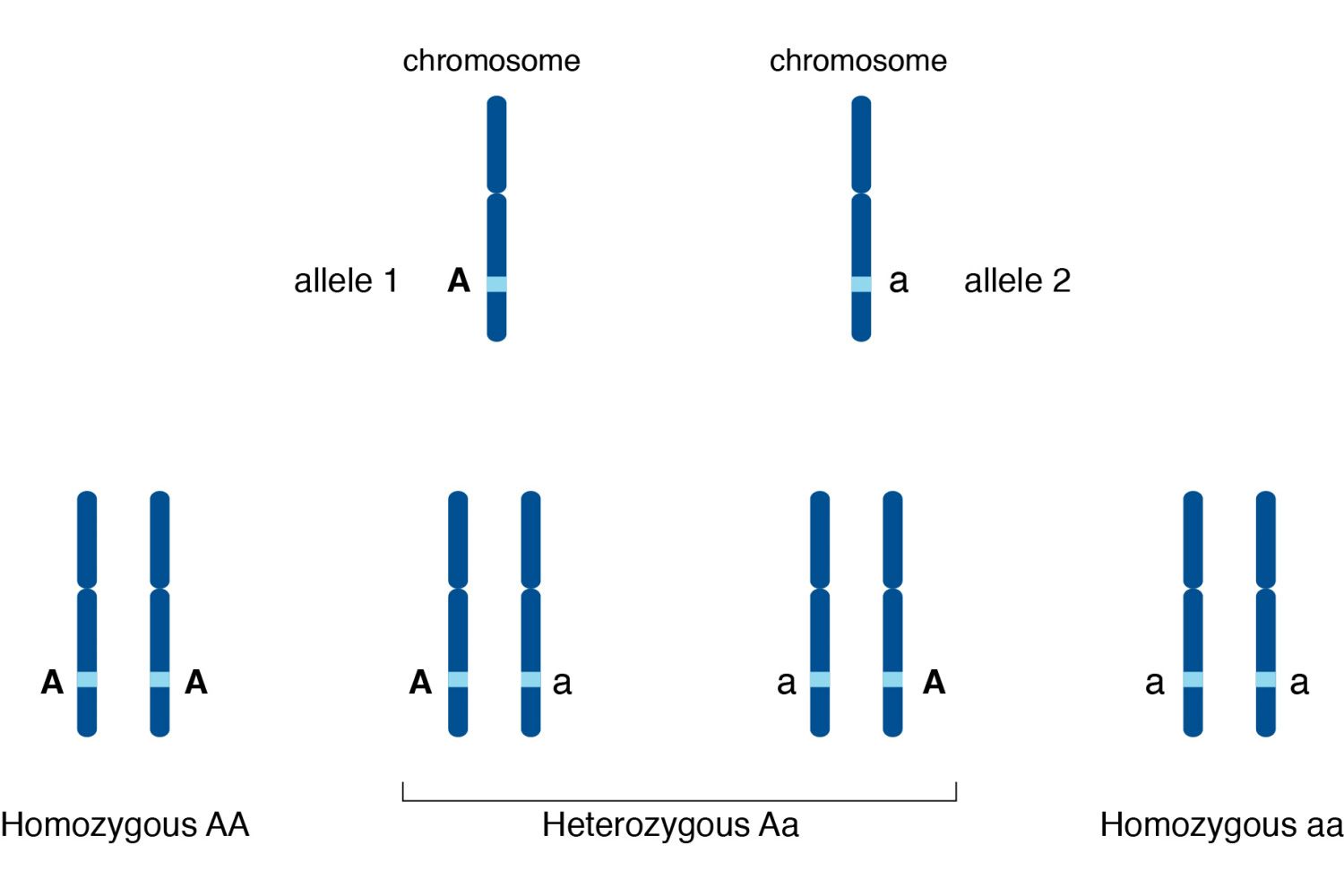


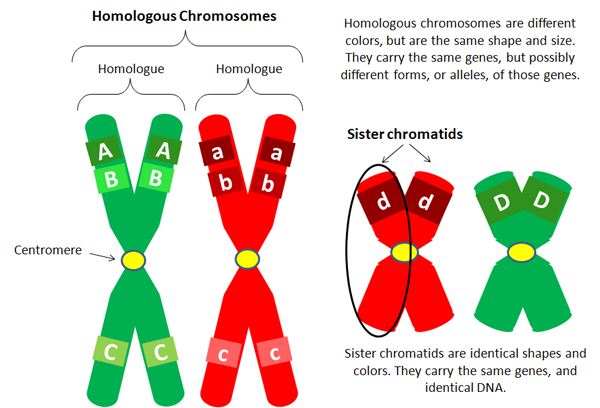
**Genes - Recap**

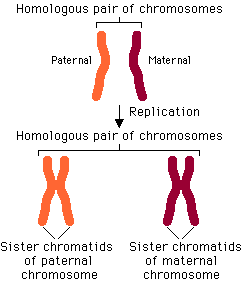
We receive information for each trait (gene) from both our mother and our father. **Alleles are alternate forms of a gene**. For each gene we receive **one allele from our mother (contained in the egg) and one from our father (contained in the sperm).**

Alleles from our mother = **Maternal**

Alleles from our father = **Paternal**



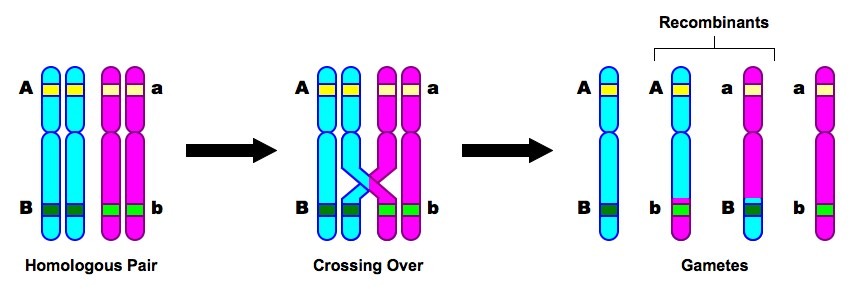
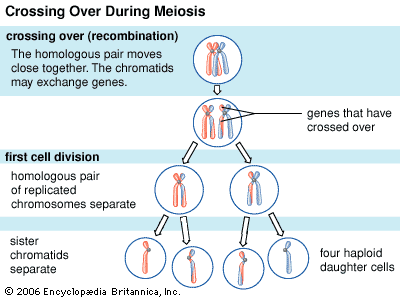
**Homologous Chromosomes** 



**Crossing Over**

Occurs between **prophase 1 and metaphase 1** - Homologous chromosomes **exchange** alleles (codes for particular genes) causing a **recombination** of genetic information on each homologous chromosome.

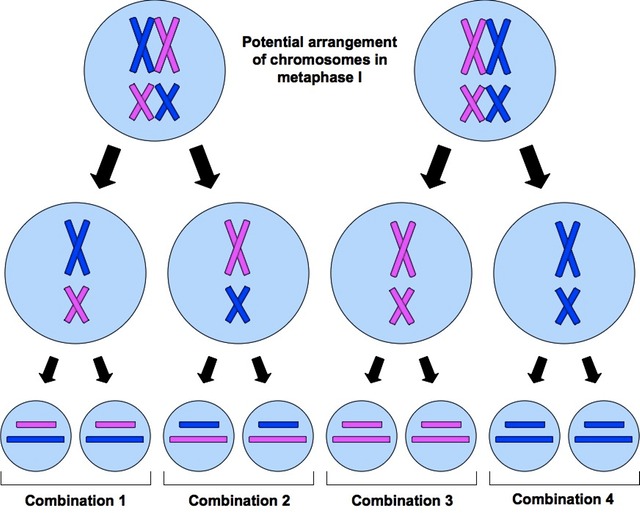
After the second division the sister chromatids separate and **4 recombinant chromosomes** result. This **increases genetic variation** as a different combination of alleles for each gene is represented in each gamete.



**Random assortment of chromosomes**

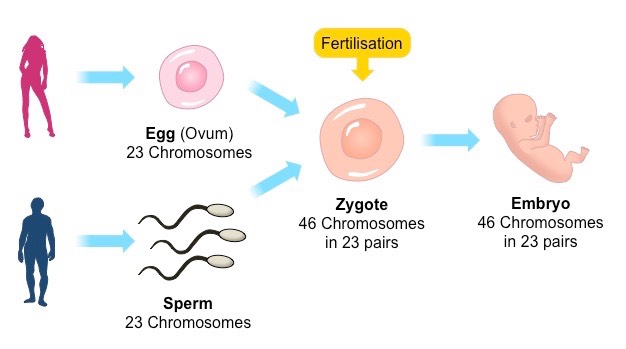
Occurs when homologous chromosomes are paired up and separated **(metaphase and anaphase 1)** to form two haploid cells. The separation is **random** – meaning that not all maternal and paternal chromosomes are separated into the same cell.

This **increases genetic variation** as a different combination of alleles for each gene is represented in each gamete.



**Random fusion of gametes**

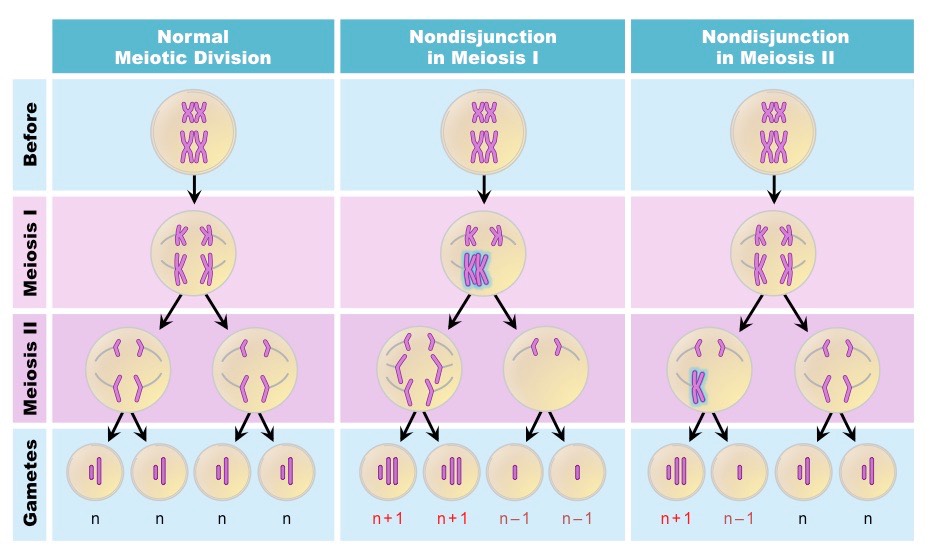
When **fertilisation** occurs one sperm is responsible for fertilising an egg. Semen contains millions of sperm. Each sperm (gamete) contains a random assortment of chromosomes (as does each egg that is released). Once the sperm are deposited inside the female, each sperm has an equal chance of fertilising the egg (the race is on!!). This is known as random fusion of gametes and is responsible for **increasing genetic variation**.



**When meiosis goes wrong….**

**Non disjunction** is the failure of homologous chromosomes or sister chromatids to separate correctly during **anaphase 1 or 2**. This results in an abnormal amount of chromosomes in the resulting daughter cells.

A daughter cell (gamete) can either have **too many or too few** chromosomes…



Non disjunction can be seen in **karyotypes**…

