Mitosis: produces two daughter cells with the same number of chromosomes as the parent cell and as each other.

Meiosis: usually produces four daughter cells, each with half the number of chromosomes as the parent cell.

Importance of Meiosis:

In sexual reproduction, two gametes fuse to give rise to new offspring. If each gamete had a full set of chromosomes (diploid number) then the cell that they produce has double this number (92). **Humans diploid number is 46, which means this cell would have 92 chromosomes.**

In order to maintain a constant number of chromosomes in the adults of a species, number of chromosomes must be halved at some stage in their life. **This halving occurs through meiosis (often in the formation of gametes).**

Every diploid cell of an organism has two complete sets of chromosomes (one set from each parent). During meiosis, homologous pairs of chromosomes separate so that only one chromosome from each pair enters a daughter cell. This is the haploid number of chromosomes which is 23 in humans.

When two haploid gametes fuse at fertilisation, the diploid number of chromosomes is restored.

Meiosis

The Process:

1. **in the first meiotic division (meiosis 1) homologous chromosomes pair up and their chromatids wrap around each other. Equivalent portions of these chromatids may be exchanged in a process called crossing over. By the end of the division the homologous pairs have separated with the chromosomes from each pair going into one of the two daughter cells.**
2. **In the second meiotic division (meiosis 2) the chromatids move apart. At the end of meiosis 2, four cells have usually been formed. In humans each of these cells contains 23 chromosomes.**

Meiosis also produces genetic variation among offspring, which may lead to adaptations that improve survival chances. It does this by:

1. **independent segregation of homologous chromosomes**
2. **New combinations of maternal and paternal alleles by crossing over**

Independent segregation of homologous chromosomes:

During meiosis 1 each chromosome lines up alongside its homologous partner. **When these pairs arrange themselves in this line they do so at random. One of each pair will pass to each daughter cell. Which one of the pair goes into the daughter cell and with which one of any of the other pairs, depends on how the pairs are lined up in the parent cell. Since the pairs line up at random the combination of chromosomes of maternal and paternal origin that go into the daughter cell at meiosis 1 is also a matter of chance = independent segregation.**