On this page I will take you step-by-step through meiosis.   Ready?

**Meiosis I**

**Purpose:**

    Meiosis I has two main purposes:

1. It is the reduction division, so it reduces the number of chromosomes in half, making the daughter cells haploid (when the parent cell was diploid).
2. It is during meiosis I that most of the genetic recombination occurs.

**Phases:**

    Keep in mind that before meiosis begins at all, the DNA undergoes replication, just like it did before mitosis started.  So, when you first see chromosomes in meiosis I, they have sister chromatids, just like in mitosis.  It is just that in meiosis I, we will be talking about tetrads becoming visible, lining up, separating, and decondensing (rather than chromosomes, like in mitosis).  Finally, cytokinesis occurs, too, any time after the tetrads have moved out of the equator (just like in mitosis).

**Prophase I**

    Just like in mitosis, during prophase, DNA condensation occurs, the nuclear envelope and nucleoli disappear, and the spindle starts to form.  The big difference is what is going on with the chromosomes themselves.

    As DNA condensation proceeds and the chromosomes first become visible, they are visible as **tetrads**.  So, tetrads become visible during prophase.

**Metaphase I**

    Tetrads line up at the equator.  The spindle has completely formed.

    It is during prophase I and metaphase I that **genetic recombination** is occurring.  Take a look at the genetic recombination page to find out about how that happens here.  Keep in mind that it only happens when there are tetrads, so as soon as anaphase I gets going, genetic recombination is over.

**Anaphase I**

    Tetrads pull apart and chromosomes with two chromatids move toward the poles.

**Telophase I**

    Chromosomes with two chromatids decondense and a nuclear envelope reforms around them.  Each nucleus is now haploid.

    Keep in mind that it is not the number of chromatids per chromosome that determine whether a cell is diploid or haploid, but, it is the number of chromosomes and whether they are paired that determines this.

**Meiosis II**

**Purpose:**

    At the end of meiosis I, each chromosome still had two chromatids.   That is double the amount of DNA that a cell should have.  So, the entire reason to go through meiosis II is to reduce the amount of DNA back to normal-- basically, to split the chromosomes so that each daughter cell has only one chromatid per chromosome (the normal genetic content).

**Phases:**

    As you read through the phases of meiosis II, you will see that it looks just like mitosis.  It is really similar to mitosis-- so keep that in mind.   The only difference is that the two chromatids per chromosome are not necessarily identical due to genetic recombination occuring in meiosis I.

**Prophase II**

    Chromosomes with two chromatids become visible as they condense (and the nuclear envelope and nucleoli disappear, and the spindle is forming).

**Metaphase II**

    Chromosomes with two chromatids line up at the equator.  The spindle is fully formed.

    Although genetic recombination primarily occurs during meiosis I, the way the chromosomes line up during metaphase II can also help to make unique daughter cells.  I mention this on the genetic recombination page.

**Anaphase II**

    Chromosomes split, so that a chromosome with only one chromatid heads toward each pole.

**Telophase II**

    Chromosomes with only one chromatid decondense and get surrounded by new nuclear envelopes.  The four daughter cells are now all haploid and have the right amount of DNA.  They are ready to develop into sperm or eggs now.



    For a pretty good link on meiosis, go to this [meiosis](http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookmeiosis.html) page.  It has some word definitions and pictures that will help you, but it has more information in it than you need. Other meiosis links that may help you are: [Meiosis and Genetic Recombination](http://web.mit.edu/esgbio/www/mg/meiosis.html), [Meiosis Tutorial](http://www.biology.arizona.edu/cell_bio/tutorials/meiosis/page3.html), [Meiosis Tutorial-- main page](http://www.biology.arizona.edu/cell_bio/tutorials/meiosis/main.html). Check out those that seem interesting, and don't bother with those that don't; one of them may not work...

    Here is a really nice drawing of meiosis, taken from the [Access Excellence](http://www.gene.com/ae/AB/GG/meiosis.html) web pages.   The only problem is that it uses the word "bivalents" instead of tetrads (and I can't figure out why they do that!).  In this diagram, one chromosome from each homologous pair is drawn in blue and the other chromosome of the same pair is drawn in red.  This helps to indicate that the homologous pairs of chromosomes that we have in our own diploid cells came into being when the egg and the sperm of our parents fused into they zygote that divided and eventually generated us.  So, one homologue of each pair was given to us by our mothers (maybe the red one) and the other homologue was given to us by our fathers (maybe the blue one).

