INDEPENDENT ASSORTMENT

During meiosis (gametogenesis)
Independent assortment of two gene pairs is due to them being on **different chromosomes**. Because each allelic set segregates with equal probability
Random chance determines which cell heterozygous pairs segregate.

See illustration on p 104: Aa/Bb selfed:
Note that a genotype Aa/Bb produces four different genotypes of gametes

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>AB</td>
<td>Ab</td>
</tr>
<tr>
<td>aB</td>
<td>ab</td>
</tr>
</tbody>
</table>

each with equal frequency in the gamete (1/4th each)

This variation is **set up at meiosis metaphase I**, and fixed at **anaphase I**.

A **TEST CROSS** is used to demonstrate this frequency or to test for heterozygosity:

(Aa/Bb x aa/bb) or (A?/B? x aa/bb)  (page109)

Note that half of the progeny is different that the parents, = recombinant.

rec. freq:  number of recombinant phenotypes/ total progeny = 50%

**Polygenic inheritance:**
if more than one set of genes contribute to the phenotype, it can lead to continuous variation:

\[ R_1R_1/R_2R_2 \text{ (deep red)} \times r_1r_1/r_2r_2 \text{ (white)} \]

\[ F_1: R_1r_1/R_2r_2 \text{ (Pink)} \]

\[ F_2: \text{range from having contributing to redness of wheat seed (Nilsson-Ehle). A form of gene dosage.} \]

<table>
<thead>
<tr>
<th>genotype</th>
<th>phenotype</th>
<th>frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>four R genes</td>
<td>Deep red</td>
<td>1/16 ((R1R1/R2R2))</td>
</tr>
<tr>
<td>Three</td>
<td>Dark pink</td>
<td>4/16</td>
</tr>
<tr>
<td>Two</td>
<td>Pink</td>
<td>6/16</td>
</tr>
<tr>
<td>One</td>
<td>Light pink</td>
<td>4/16</td>
</tr>
<tr>
<td>None</td>
<td>White</td>
<td>1/16 ((r1r1/r2r2))</td>
</tr>
</tbody>
</table>

Note bell shaped curve on p 111.

Skin color in humans is an example, siblings can have continuous variation of darkness (if 3 genes, seven phenotypes)

**ORGANELLE INHERITANCE:**
**INDEPENDENT OF NUCLEUS**

Best example is mitochondrial inheritance in humans:

**Maternal inheritance**
mitochondria have their own DNA, only mitochondria in eggs are inherited, sperm mitochondria excluded.
P 117 maps mtDNA mutations, inherited through maternal line.
(Pedigree on p 118: 100% progeny of affected mother)