The Hardy-Weinberg law for 2 alleles (A and a):

3 genotypes are possible:
   AA, Aa, aa

If the frequencies of the 2 alleles are p & q, respectively, the equilibrium frequencies of the 3 genotypes will be:

\[(p+q)^2 = p^2 + 2pq + q^2,\]

For, AA, aA and aa, respectively:

<table>
<thead>
<tr>
<th>Paternal frequency</th>
<th>Maternal frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(A)</td>
<td>q(a)</td>
</tr>
<tr>
<td>p (A)</td>
<td>P2 (AA)</td>
</tr>
<tr>
<td>q (a)</td>
<td>pq (Aa)</td>
</tr>
</tbody>
</table>

Process of gene frequency changes

1. Mutation (and reversion)
2. Migration (gene “flow”)
   (local changes of populations)
3. Genetic “drift” – generation to generation change via non-ideal Hardy-Weinberg behavior

Balance between drift and migration
   Related to reproductive isolation

Examples:
1. Ecological Isolation (plate tectonics)
2. Temporal Isolation (seasonal differences in reproduction)
3. Behavioral Isolation
4. Mechanical Isolation (copulation is not possible: mouse – elephant)
5. Gametic Isolation