HANDOUT I.1: **Random mating = Random Union of Gametes**

Cross	Frequency	Offspring:		
		AA	Aa	aa
$AA \times AA$	P_{AA}^2	P_{AA}^2	0	0
$AA \times Aa$	$P_{AA}P_{Aa}$	$\frac{1}{2}P_{AA}P_{Aa}$	$\frac{1}{2}P_{AA}P_{Aa}$	0
$AA \times aa$	$P_{AA}P_{aa}$	0	$P_{AA}P_{aa}$	0
$Aa \times AA$	$P_{AA}P_{Aa}$	$\frac{1}{2}P_{AA}P_{Aa}$	$\frac{1}{2}P_{AA}P_{Aa}$	0
$Aa \times Aa$	P_{Aa}^2	$\frac{1}{4}P_{Aa}^2$	$\frac{1}{2}P_{Aa}^2$	$\frac{1}{4}P_{Aa}^2$
$Aa \times aa$	$P_{Aa}P_{aa}$	0	$\frac{1}{2}P_{Aa}P_{aa}$	$\frac{1}{2}P_{Aa}P_{aa}$
$aa \times AA$	$P_{AA}P_{aa}$	0	$P_{AA}P_{aa}$	0
$aa \times Aa$	$P_{Aa}P_{aa}$	0	$\frac{1}{2}P_{Aa}P_{aa}$	$\frac{1}{2}P_{Aa}P_{aa}$
$aa \times aa$	P_{aa}^2	0	0	P_{aa}^2

Offspring Genotype Frequencies:

AA : $P_{AA}^2 + \frac{1}{2}P_{AA}P_{Aa} + \frac{1}{2}P_{AA}P_{Aa} + \frac{1}{4}P_{Aa}^2 = P_{AA}^2 + P_{AA}P_{Aa} + \frac{1}{4}P_{Aa}^2$

$\quad = \left(P_{AA} + \frac{1}{2}P_{Aa}\right)^2$

$\quad = p^2$

Aa : $\frac{1}{2}P_{AA}P_{Aa} + P_{AA}P_{aa} + \frac{1}{2}P_{AA}P_{Aa} + \frac{1}{2}P_{Aa}^2 + \frac{1}{2}P_{Aa}P_{aa} + P_{Aa}P_{aa} + \frac{1}{2}P_{Aa}P_{aa}$

$\quad = 2P_{AA}P_{aa} + P_{AA}P_{Aa} + P_{Aa}P_{aa} + \frac{1}{2}P_{Aa}^2$

$\quad = P_{Aa}\left(P_{aa} + \frac{1}{2}P_{Aa}\right) + 2P_{AA}\left(P_{aa} + \frac{1}{2}P_{Aa}\right)$

$\quad = \left(2P_{AA} + P_{Aa}\right)\left(P_{aa} + \frac{1}{2}P_{Aa}\right)$

$\quad = 2\left(P_{AA} + \frac{1}{2}P_{Aa}\right)\left(P_{aa} + \frac{1}{2}P_{Aa}\right)$

$\quad = 2p(1-p)$

aa : similarly (Suggested Exercise).

Conclude: Diploid random mating is equivalent to random union of (haploid) gametes.