

MAPPING: THREE POINT TEST CROSSES

rvsd 1/26/94, 1/23/95, 1/26/96, 1/27/97, 21 Jan 00, 23 Jan 02, 23 Jan 04, 23Jan06, 23 Jan 08, 23Jan08, 23Jan09, 22Jan10
 [SGML P 103-] gmslg: p. 128-, 7th: p 150-151, 9th: pp 129-165

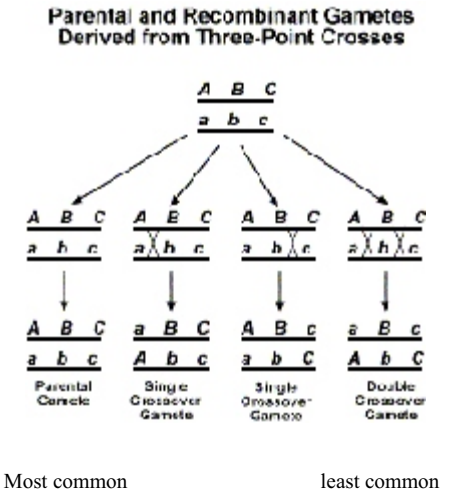
Three point test cross allows the ordering of three linked genes:
 recombination of the middle gene with retention of the two outer parental genes **requires double cross over**,
much less likely.

HOW TO DETERMINE GENE ORDER FR. THREE POINT TEST CROSS:

- 1) identify the two parental types fr the **eight** phenotypes possible (largest class)
- 2) identify the two double cross overs (smallest class)
- 3) pick one double cross over, and the parent it most closely resembles.
 The recombined gene (the one which differs from the parent) is located in the middle.

Example: Cross AA/BB/CC x aa/bb/cc = F1: Aa/Bb/Cc

Test cross F1 times aa/bb/cc	ABC	parental
Get 2 x 2 x 2 = 8 progeny phenotypes:	ABc	
pick out middle gene	AbC	double cross over
without any calculations.	Abc	
Parental = two largest classes	aBc	double cross over
double recomb. = two smallest classes	abC	
Can usually on inspection of data	abc	parental



If order is a-b-c, then double crossovers required for which phenotypes?

Drosophila cross:

<i>v</i>	vermillion eyes
<i>cv</i>	crossveinless
<i>ct</i>	cut wing edges

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Cross: $v^+v^+ \cdot cv^+cv \cdot ct/ct$, x $v/v \cdot cv^+/cv^+ \cdot ct^+/ct^+$ (**nB:** Parental = +, ct, cv and v, +, +)

$F_1 = v^+v \cdot cv^+cv \cdot ct^+/ct$ is test crossed, progeny counted:

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test cross progeny:

$v^+ + +$	580	(parental)
$+ cv ct$	592	(parental)
$v cv ct$	89	
$+ + +$	94	
$v cv +$	45	
$+ + ct$	40	
$v + ct$	3	These show double crossovers
$+ cv +$	5	should be counted twice in RF

total: 1448

To map: count the number of cross overs between two markers and divide by total progeny.

recombinant types:

between markers	recom types	number	% recombination frequency
for v and cv:	$v cv$ and $+ +$	268	RF = 18.5* (Apparent, important, see below)
for v and ct:	$v ct$ and $+ +$	191	RF = 13.2
for cv and ct:	$cv +$ and $+ ct$	93	RF = 6.4

* For outside markers (v&cv): **must add double cross overs** ($v^+ + ct$ and $+ cv^+$) times two:

$$89 + 94 + 45 + 40(3 \times 2) + (5 \times 2) = 284$$

$$284/1448 = 19.6 \text{ map units}$$