

Linkage analysis of multiple traits with visible markers  
javelin bristle, striped body, pink eyes

3-point test cross:  $jv/+ \ str/+ \ pi/+ \ \text{♀} \times \ jv/jv \ str/str \ pi/pi \ \text{♂}$

♂ gametes	♀ gametes	progeny phenotype	#progeny
$jv \ str \ pi$	$jv \ + \ +$	javelin	294
$jv \ str \ pi$	$+ \ str \ pi$	striped, pink	287
$jv \ str \ pi$	$jv \ str \ pi$	javelin, striped, pink	140
$jv \ str \ pi$	$+ \ + \ +$	wild type	139
$jv \ str \ pi$	$+ \ + \ pi$	pink	66
$jv \ str \ pi$	$jv \ str \ +$	javelin, striped	65
$jv \ str \ pi$	$jv \ + \ pi$	javelin, pink	4
$jv \ str \ pi$	$+ \ str \ +$	striped	5

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$jv \ str \ pi$	$jv \ str \ pi$	javelin, striped, pink	140
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parentals (red text)

recombinant (blue text)

double crossover (green text)

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$jv, str:$

$$RF_{jv, str} = (140 + 139 + 66 + 65)/1000$$

$$= 410/1000$$

$$= 0.41$$

$$\text{distance} = RF \times 100 = 0.41 \times 100 = 41 \text{ m.u.}$$

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jv str pi	+ + +	wild type	139
jv str pi	+ + pi	pink	66
jv str pi	jv str +	javelin, striped	65
jv str pi	jv + pi	javelin, pink	4
jv str pi	+ str +	striped	5

$$\begin{aligned} \text{RF}_{jv, pi} &= (140 + 139 + 4 + 5)/1000 \\ &= 288/1000 \\ &= 0.288 \end{aligned}$$

$$\text{distance} = \text{RF} \times 100 = 0.288 \times 100 = 28.8 \text{ m.u.}$$

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jv str pi	+ str pi	striped, pink	287
jv str pi	jv str pi	javelin, striped, pink	140
jv str pi	+ + +	wild type	139
jv str pi	+ + pi	pink	66
jv str pi	jv str +	javelin, striped	65
jv str pi	jv + pi	javelin, pink	4
jv str pi	+ str +	striped	5

$$\begin{aligned} \text{RF}_{str, pi} &= (66 + 65 + 4 + 5)/1000 \\ &= 140/1000 \\ &= 0.14 \end{aligned}$$

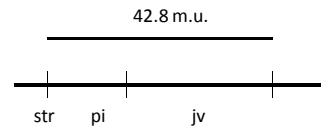
$$\text{distance} = \text{RF} \times 100 = 0.14 \times 100 = 14 \text{ m.u.}$$

assembling the map:

jv---str: 41

jv---pi: 28.8

str---pi: 14



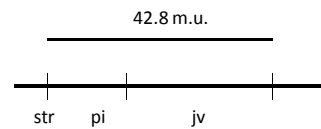
♂ gametes	♀ gametes	progeny phenotype	#progeny		
jv str pi	jv + +	javelin	294	parentals	
jv str pi	+ str pi	striped, pink	287		
jv str pi	jv str pi	javelin, striped, pink	140	recombinant	
jv str pi	+ + +	wild type	139		
jv str pi	+ + pi	pink	66		
jv str pi	jv str +	javelin, striped	65		
jv str pi	jv + pi	javelin, pink	4		
jv str pi	+ str +	striped	5		
					double crossover

assembling the map:

jv---str: 41

jv---pi: 28.8

str---pi: 14



$$RF_{jv-str} = (140 + 139 + 66 + 65 + 2[4 + 5])/1000$$

$$= 0.428$$

double x-over correction

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jv str pi	jv str pi	javelin, striped, pink	140
jv str pi	+ + +	wild type	139
jv str pi	+ + pi	pink	66
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three possible gene orders:

jv—str—pi      str—pi—jv      pi—jv—str

compare parentals to double crossovers

jv + + and + str pi  
vs jv + pi and + str +      correct order is jv—pi—str