

Linkage analysis of multiple traits  
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        |

| ♂ gametes       | ♀ gametes       | progeny phenotype      | #progeny |
|-----------------|-----------------|------------------------|----------|
| $jv \ str \ pi$ | $jv \ + \ +$    | javelin                | 294      |
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parentals

recombinant

double crossover

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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 | jv + +    | javelin                | 294      |         |
| jv str pi | + str pi  | striped, pink          | 287      | jv, pi: |
| 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        |         |

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

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

| ♂ gametes | ♀ gametes | progeny phenotype      | #progeny |          |
|-----------|-----------|------------------------|----------|----------|
| jv str pi | jv + +    | javelin                | 294      |          |
| jv str pi | + str pi  | striped, pink          | 287      | str, pi: |
| 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        |          |

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

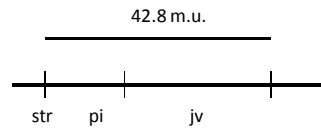
$$\text{distance} = \text{RF} \times 100 = 0.14 \times 100 = 14 \text{ m.u.}$$

assembling the map:

jv---str: 41

jv---pi: 28.8

str---pi: 14



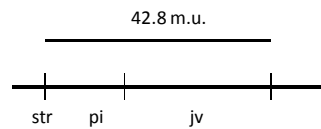
| ♂ gametes   | ♀ gametes | progeny phenotype      | #progeny |             |
|---|-----------|------------------------|----------|-------------|
| jv str pi   | jv + +    | javelin                | 294      | parentals   |
| jv str pi   | + str pi  | striped, pink          | 287      |             |
| 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        |             |
| $\begin{array}{c} \text{jv} \quad + \quad + \\ \hline \text{x} \quad \text{x} \\ \hline + \quad \text{pi} \quad \text{str} \end{array}$ |           | double crossover       |          |             |

assembling the map:

jv---str: 41

jv---pi: 28.8

str---pi: 14



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

$$= 0.428$$

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| jv str pi | jv str pi | javelin, striped, pink | 140      |
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| jv str pi | jv str +  | javelin, striped       | 65       |
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| jv str pi | + str +   | striped                | 5        |

three possible gene orders:

ju-str-pi

str-pi-ju

pi-ju-str

compare parentals to double crossovers

ju + + and + str pi

vs ju + pi and + str +