

Step 1. It makes little difference where one begins to solve this kind of problem, so we shall begin at the top. The $Gr-Rc$ distance is 25 map units, and the $Gr-S$ distance is 1 unit. Therefore, the relationship of these three genes may be either

$$(a) \frac{S(1)Gr \quad (25) \quad Rc}{\text{or}} \\ (b) \frac{Gr(1)S \quad (24) \quad Rc}{\text{or}}$$

The table, however, tells us that the distance $S-Rc$ is 26 units. Therefore, alternative (a) must be correct, i.e., Gr is between S and Rc .

Step 2. The $Gr-Y$ distance is 19 units. Again, two alternatives are possible:

$$(c) \frac{S(1)Gr \quad (19) \quad Y \quad (6) \quad Rc}{\text{or}} \\ (d) \frac{Y \quad (18) \quad S(1)Gr \quad (25) \quad Rc}{\text{or}}$$

In the table we find that the distance $Y-Rc = 6$. Hence, possibility (c) must be correct, i.e., Y lies between the loci of Gr and Rc .

Step 3. The distance $Gr-P$ is 7 map units. Two alternatives for these loci are

$$(e) \frac{S(1)Gr \quad (7) \quad P \quad (12) \quad Y \quad (6) \quad Rc}{\text{or}} \\ (f) \frac{P \quad (6) \quad S(1)Gr \quad (19) \quad Y \quad (6) \quad Rc}{\text{or}}$$

The distance $P-S$ is read from the table, and thus alternative (f) must be correct.

Step 4. There are 20 units between Gr and oa . These two genes may be in one of two possible relationships:

$$(g) \frac{P \quad (6) \quad S(1)Gr \quad (19) \quad Y(1)oa \quad (5) \quad Rc}{\text{or}} \\ (h) \frac{oa \quad (13) \quad P \quad (6) \quad S(1)Gr \quad (19) \quad Y \quad (6) \quad Rc}{\text{or}}$$

The table indicates that Y and oa are 1 map unit apart. Therefore, (g) is the completed map.