

**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

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

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:

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

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

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

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:

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

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