In certain plant stem length, stem texture and seed shape are controlled with alleles of 3 linked genes:

(S) for Long stem **(s) for short stem**

(W) for Rounded seed **(w) for wrinkled seed**

(R) for Smooth stem **(r) for rough stem**

Construct a chromosome map showing the relative position for these linked genes knowing that a test cross for a trihybrid plant resulted in:

Phenotype	Number of individuals
Long stem, Rounded seed and Smooth stem	310
short stem, wrinkled seed and rough stem	310
Long stem, wrinkled seed and rough stem	100
short stem, Rounded seed and Smooth stem	100
Long stem, wrinkled seed and Smooth stem	90
short stem, Rounded seed and rough stem	90

Parents: SsWwRr X sswwrr

Gametes: ??? swr

Offspring: ?s?w?r

Phenotype	Genotype	Number of individuals
Long stem, Rounded seed and Smooth stem	Ss Ww Rr	310
short stem, wrinkled seed and rough stem	ss ww rr	310
Long stem, wrinkled seed and rough stem	Ss ww rr	100
short stem, Rounded seed and Smooth stem	ss Ww Rr	100
Long stem, wrinkled seed and Smooth stem	Ss ww Rr	90
short stem, Rounded seed and rough stem	ss Ww rr	90

Stem length and seed shape:

Number of individuals carrying SW or sw > Number of individuals carrying Sw or sW

310 + 310 100 +100 + 90 +90

Thus SW/sw is the parental combination for genes of Stem length and seed shape while Sw/sW is the new combination.

$$\text{Recombinant frequency} = \frac{\text{Number of recombinant progeny}}{\text{Total number of progeny}} \times 100$$

$$\text{Recombinant frequency} = \frac{100 + 100 + 90 + 90}{1000} \times 100 = 38\%$$

Thus the distance between S and W is 38 centimorgan.

Stem length and stem texture:

Number of individuals carrying SR or sr > Number of individuals carrying Sr or sR

310 + 310 + 90 + 90 100 +100

Thus SR/sr is the parental combination for genes of Stem length and seed shape while Sr/sR is the new combination.

$$\text{Recombinant frequency} = \frac{\text{Number of recombinant progeny}}{\text{Total number of progeny}} \times 100$$

$$\text{Recombinant frequency} = \frac{100 + 100}{1000} \times 100 = 20\%$$

Thus the distance between S and R is 20 centimorgan.

Seed shape and stem texture:

Number of individuals carrying WR or wr > Number of individuals carrying Wr or wR

310 + 310 + 100 +100 90 +90

Thus WR/wr is the parental combination for genes of Stem length and seed shape while Wr/wR is the new combination.

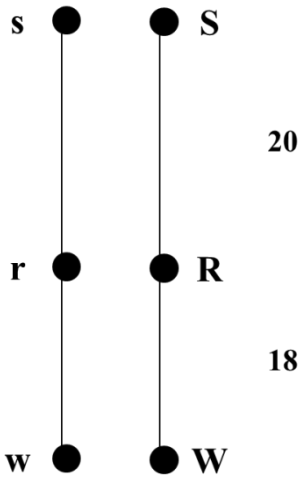
$$\text{Recombinant frequency} = \frac{\text{Number of recombinant progeny}}{\text{Total number of progeny}} \times 100$$

$$\text{Recombinant frequency} = \frac{90 + 90}{1000} \times 100 = 18\%$$

Thus the distance between W and R is 18 centimorgan.

Distance between S and W = (Distance between S and R) + (Distance between W and R)

38 = 20 + 18



In certain plant stem length, stem texture and seed shape are controlled with alleles of 3 linked genes:

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(R) for Smooth stem **(r) for rough stem**

Construct a chromosome map showing the relative position for these linked genes knowing that a test cross for a trihybrid plant resulted in:

Phenotype	Number of individuals
Long stem, wrinkled seed and Smooth stem	310
short stem, Rounded seed and rough stem	310
Long stem, Rounded seed and rough stem	100
short stem, wrinkled seed and Smooth stem	100
Long stem, Rounded seed and Smooth stem	90
short stem, wrinkled seed and rough stem	90

Parents: SsWwRr X sswwrr

Gametes: ??? swr

Offspring: ?s?w?r

Phenotype	Genotype	Number of individuals
Long stem, wrinkled seed and Smooth stem	Ss ww Rr	310
short stem, Rounded seed and rough stem	ss Ww rr	310
Long stem, Rounded seed and rough stem	Ss Ww rr	100
short stem, wrinkled seed and Smooth stem	ss ww Rr	100
Long stem, Rounded seed and Smooth stem	Ss Ww Rr	90
short stem, wrinkled seed and rough stem	ss ww rr	90

Stem length and seed shape:

Number of individuals carrying Sw or sW > Number of individuals carrying SW or sw

310 + 310 100 +100 + 90 +90

Thus Sw/sW is the parental combination for genes of Stem length and seed shape while SW/sw is the new combination.

$$\text{Recombinant frequency} = \frac{\text{Number of recombinant progeny}}{\text{Total number of progeny}} \times 100$$

$$\text{Recombinant frequency} = \frac{100 + 100 + 90 + 90}{1000} \times 100 = 38\%$$

Thus the distance between S and W is 38 centimorgan.

Stem length and stem texture:

Number of individuals carrying SR or sr > Number of individuals carrying Sr or sR

310 + 310 + 90 + 90 100 +100

Thus SR/sr is the parental combination for genes of Stem length and seed shape while Sr/sR is the new combination.

$$\text{Recombinant frequency} = \frac{\text{Number of recombinant progeny}}{\text{Total number of progeny}} \times 100$$

$$\text{Recombinant frequency} = \frac{100 + 100}{1000} \times 100 = 20\%$$

Thus the distance between S and R is 20 centimorgan.

Seed shape and stem texture:

Number of individuals carrying Wr or wR > Number of individuals carrying WR or wr

310 + 310 + 100 +100 90 +90

Thus Wr/wR is the parental combination for genes of Stem length and seed shape while WR/wr is the new combination.

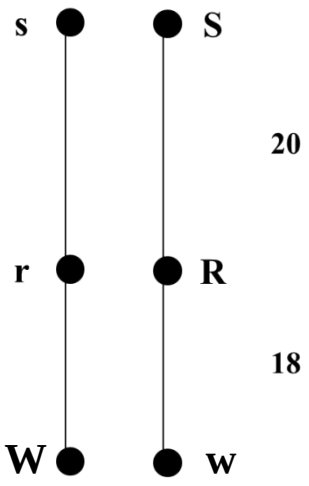
$$\text{Recombinant frequency} = \frac{\text{Number of recombinant progeny}}{\text{Total number of progeny}} \times 100$$

$$\text{Recombinant frequency} = \frac{90 + 90}{1000} \times 100 = 18\%$$

Thus the distance between W and R is 18 centimorgan.

Distance between S and W = (Distance between S and R) + (Distance between W and R)

38 = 20 + 18



In certain plant stem length and stem texture are controlled with alleles of 2 linked genes separated with 20 centimorgan:

(S) for Long stem **(s) for short stem**

(R) for Smooth stem **(r) for rough stem**

What are the predicted ratios for phenotypes result from test cross of a dihybrid plant having SR/sr genotype?

- SR/sr means that S and R are located on one chromosome while s and r on the other chromosome.
- 20 centimorgan between S and R = 20% recombination frequency between S and R

Thus

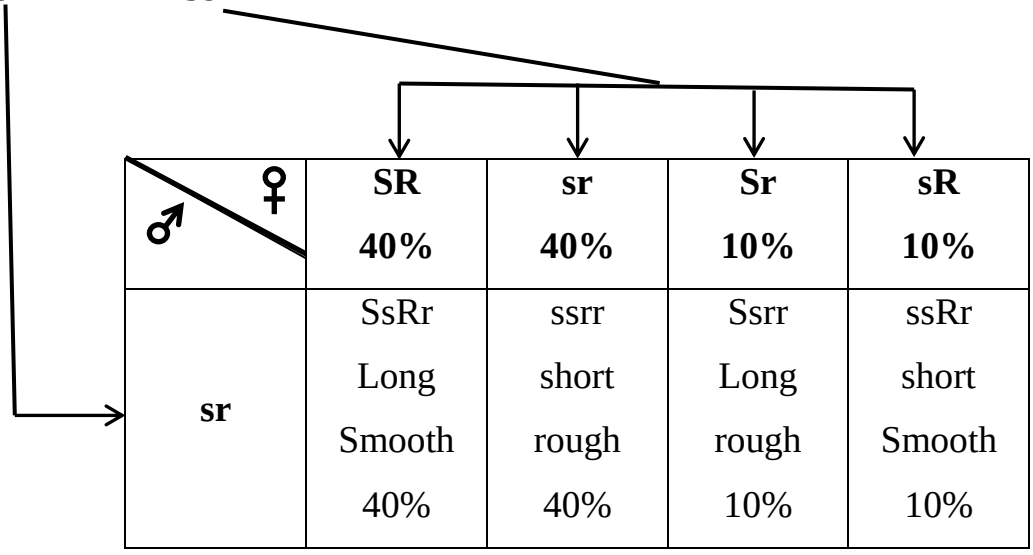
20% of gametes

will carry new combination Sr (10%) and sR (10%)

80% of gametes will carry parental combination SR (40%) and sr (40%)

Test cross

Parents: ssrr X SsRr



♂ \ ♀	**SR** **40%**	**sr** **40%**	**Sr** **10%**	**sR** **10%**
sr	SsRr Long Smooth 40%	ssrr short rough 40%	Ssrr Long rough 10%	ssRr short Smooth 10%

Predicted ratios for phenotypes result from self cross of a dihybrid plant having Sr/sR genotype.

- Sr/sR means that S and r are located on one chromosome while s and R on the other chromosome.
- 20 centimorgan between S and R = 20% recombination frequency between S and R

Thus

20% of gametes

will carry new combination SR (10%) and sr (10%)

80% of gametes will carry parental combination Sr (40%) and sR (40%)

Complete