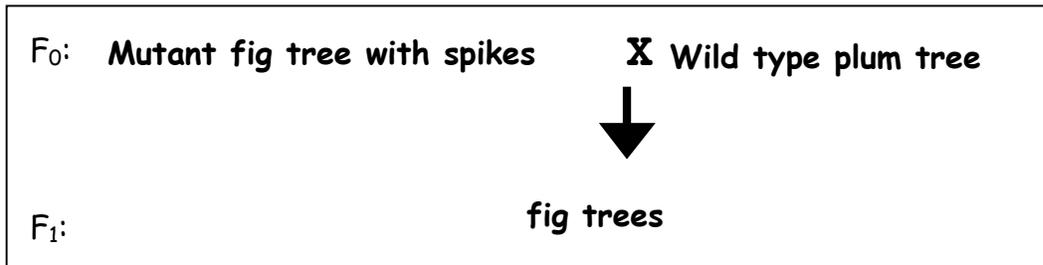


## Question 2

Harry studies plum tree genetics.

He had a pure-breeding mutant strain of plum trees that has two unusual characteristics; the mutant tree produces figs instead of plums and there are huge spikes growing out of the branches. Harry crossed the mutant with a pure-breeding wild-type plum tree. The  $F_1$  progeny produce figs, but have no spikes.



a) For each pair, circle the dominant phenotype.

Plums   Figs

Spikes   No spikes

b) Harry performed a backcross of an  $F_1$  individual with an  $F_0$  individual from the mutant strain. If there are **32** progeny trees from this cross how many trees have each of the following phenotypes?

Figs, spikes \_\_\_\_\_

Figs, no spikes \_\_\_\_\_

Plums, spikes \_\_\_\_\_

Plums, no spikes \_\_\_\_\_

Harry performed a test cross of an  $F_1$  individual (from the very first cross) with a tree exhibiting both of the phenotypes that you have identified as recessive. He got progeny with the following characteristics.

Phenotype	# of individuals in $F_2$ generation
Figs, spikes	897
Figs, no spikes	97
Plums, no spikes	903
Plums, spikes	103

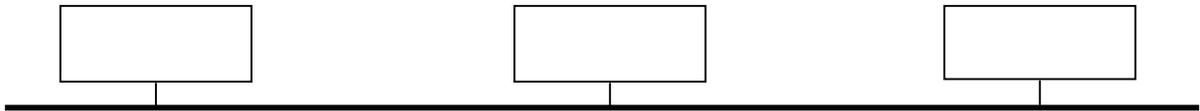
c) What is the recombination frequency between the "fig" and the "spike" genes? Show your work.

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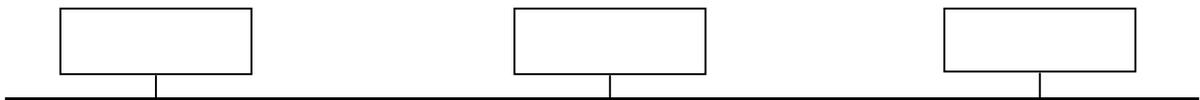
Harry had previously identified a mutant plum tree whose branches are magical, and can be used to make magic wands. The gene that produces this phenotype (the "wand" gene) was previously determined to be 6 map units away from the "spike" gene on one chromosome.

d) Based on the above data, there are two possible arrangements for the "fig", "spike", and "wand" genes on the chromosome. Draw them below naming the genes in the boxes and indicating between them the distances in map units.

*Arrangement 1:*



*Arrangement 2:*

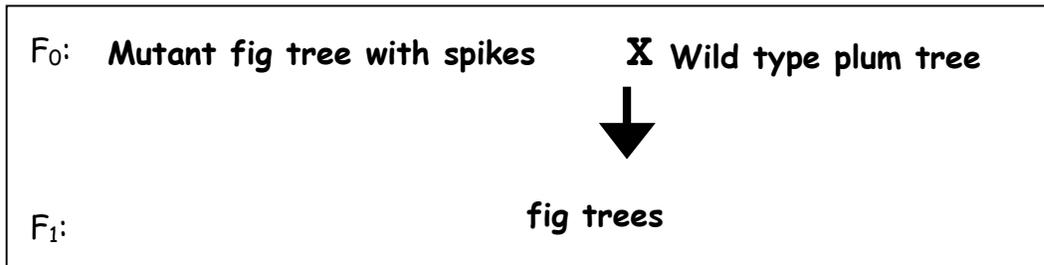


e) What experiment could Harry perform to distinguish between these two possibilities?

## Question 2

Harry studies plum tree genetics.

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a) For each pair, circle the dominant phenotype.

Plums   Figs

Spikes   No spikes

b) Harry performed a backcross of an  $F_1$  individual with an  $F_0$  individual from the mutant strain. If there are **32** progeny trees from this cross how many trees have each of the following phenotypes?

Figs, spikes \_\_\_\_\_ 16 \_\_\_\_\_

Figs, no spikes \_\_\_\_\_ 16 \_\_\_\_\_

Plums, spikes \_\_\_\_\_ 0 \_\_\_\_\_

Plums, no spikes \_\_\_\_\_ 0 \_\_\_\_\_

Harry performed a test cross of an  $F_1$  individual (from the very first cross) with a tree exhibiting both of the phenotypes that you have identified as recessive. He got progeny with the following characteristics.

Phenotype	# of individuals in $F_2$ generation
Figs, spikes	897
Figs, no spikes	97
Plums, no spikes	903
Plums, spikes	103

c) What is the recombination frequency between the "fig" and the "spike" genes? Show your work.

$$97+103 / 103+97+903+897 = 200/2000 \rightarrow 10\%$$

\_\_\_\_\_10%\_\_\_\_\_

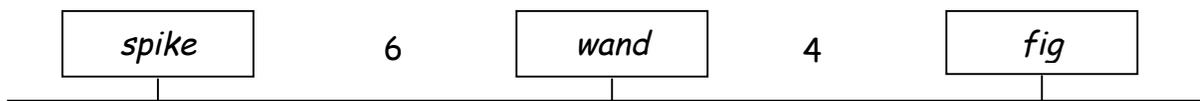
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*Arrangement 1:*



*Arrangement 2:*



e) What experiment could Harry perform to distinguish between these two possibilities?

*A cross to determine the distance between fig and wand. A tree heterozygous at both the wand and fig loci crossed with the double recessive homozygote will lead to information to determine the correct orientation.*