10.1.1 Possibility Trees

- Suppose that there is a sequence of events occurring in a specific order. Then, starting at a point, we draw a line out from that point for all possible outcomes of the first event. From the end of each of these lines, we then draw a line for each possible outcome from the next event and so on until we reach the final outcome of all events. We call such a diagram a possibility tree for that sequence of events..

Ex. 10.1.1 : Suppose that there are two cups, each containing an equal number of yellow and green balls. You take one ball from one cup and then one ball from the other cup. Sketch the probability tree to determine all possible outcomes.

Soln. :

Technically speaking, we need a branch of the tree for every possibility (meaning if there are 50 green and 50 yellow balls in the first cup, there are 100 possibilities, and similarly with the second set of branches). However, since three are equal numbers of balls in each cup, we note that it is equally likely that either are drawn in both drawings, and so we restrict branches to the two possibilities. This gives tree we sketched above.

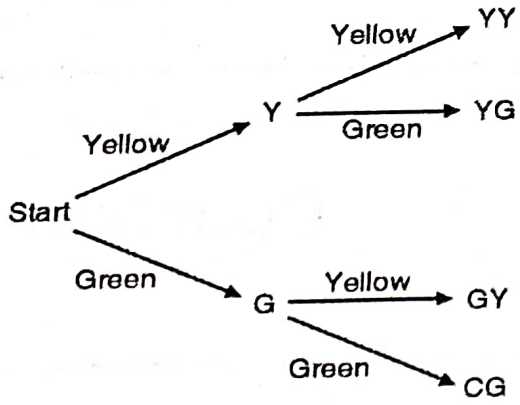

Fig. P. 10.1.1

Ex. 10.1.2 : Now suppose there is one cup containing two yellow and two green balls. You take one ball from the cup and then take another from the same cup. Sketch the probability tree to determine all possible outcomes.

Soln. :

In this case we need to be a little more careful since the second drawing will depend upon the first. Specifically, if we draw a green ball, then on the second draw, we will have two possibilities where a yellow ball is drawn as opposed to one possibility that a green ball is drawn. To illustrate the possibilities, we need a bigger tree diagram, with a branch to represent each possible choice.

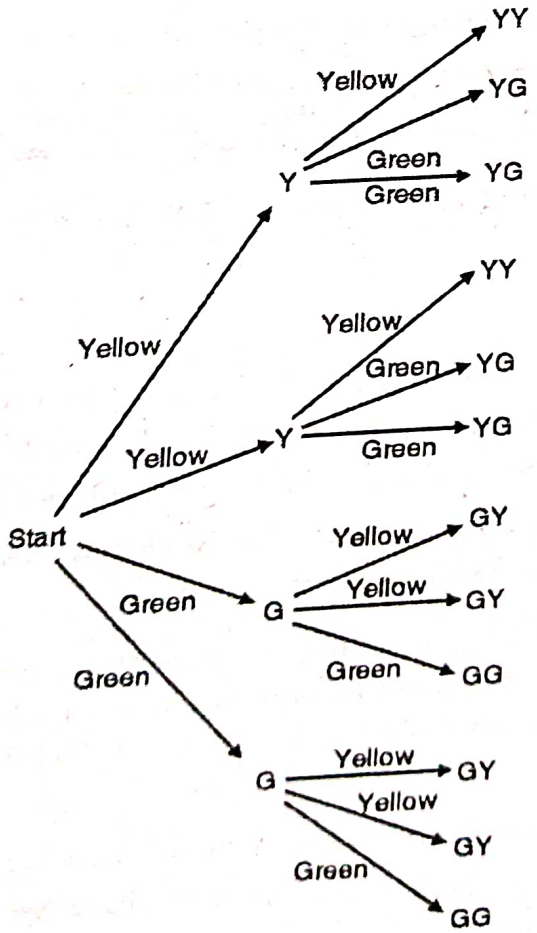

Fig. P.10.1.2

From the probability tree, we see that there are a total of 12 possible outcomes

Ex. 10.1.3 : Suppose that three officers, a president, treasurer and secretary, must be chosen from four people: Alice, Bob, Clive and Dan. However, Dan does not have the qualifications to be treasurer and Neither Clive nor Bob have the time to act as president. Determine the number of possible ways the officers can be chosen and decide who is most likely to be president.

Soln. :

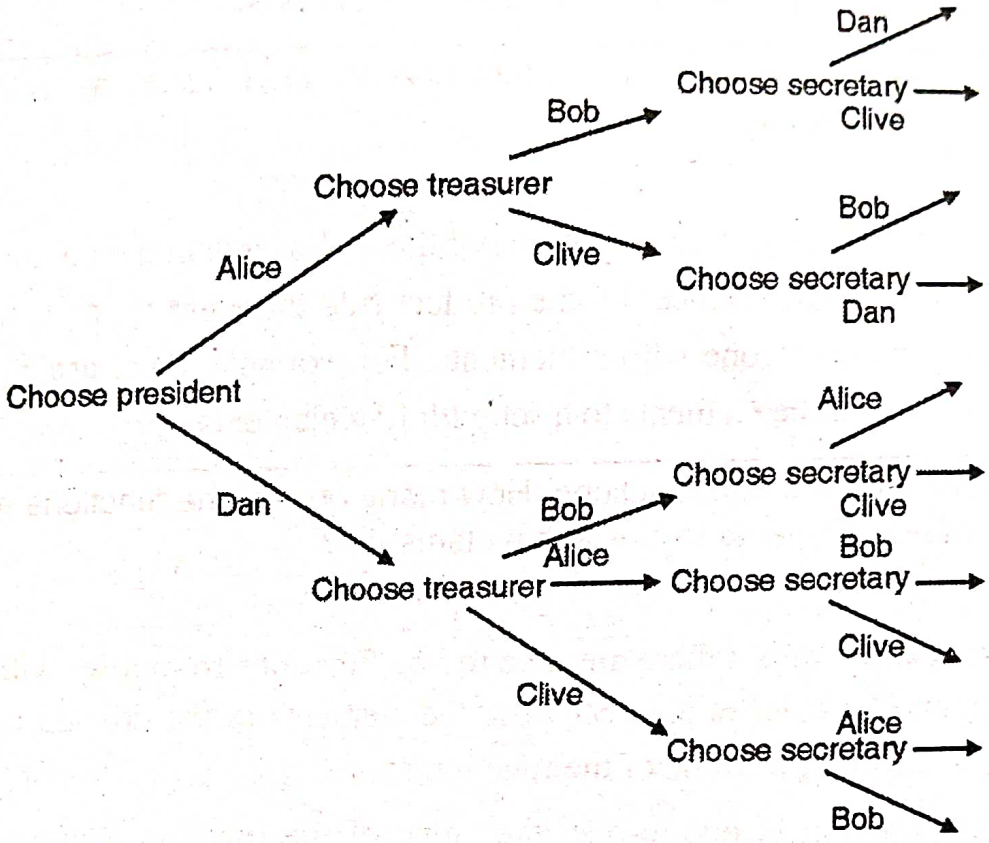

Fig. P. 10.1.3