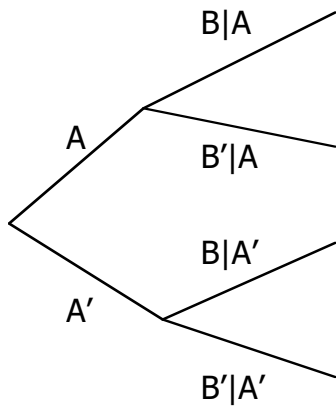


The Multiplication Rule

$$P(B \cap A) = P(B | A) \times P(A)$$



A bag contains red and green discs. Two discs are removed at random without replacement.

A is the event "The 1st disc is red."

B is the event "The 2nd disc is red."

A AND B occurs if A occurs and then B occurs.

We're only interested in B occurring given that A occurs first.

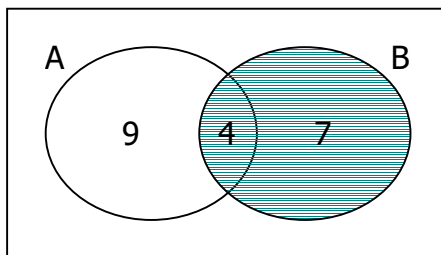
In the tree diagram on the left we would multiply the probabilities along the top branches.

Exercise

Put actual numbers into the example above.

Draw out the tree diagram.

Can you connect the answers from your example with the general principles explained above?



Say we want to find the probability of an event A occurring given that an event B has occurred.

Well, if event B has occurred then we are considering the shaded section in the diagram.

If event A also has to occur then we must be talking about the intersection – it's the only place A can occur given that we are looking at B.

So, in our example, the probability of being in A given that we're in B is 4 out of 11

$$P(A | B) = \frac{P(A \cap B)}{P(B)}$$