A new test has been developed to diagnose a particular disease. If a person has the disease, the test has a 95% chance of identifying them as having the disease.

If a person does not have the disease, the test has a 1% chance of identifying them as having the disease. 5% of the population have this disease. Suppose we select a person at random from the population.

Q1 - What is the probability that the test will identify them as having the disease?

Q2 - What is the probability that the person has the disease given that the test identifies them as having the disease?

**Solutions**

* Let ***P*** signify that a test will give a “positive” result
* Let ***N*** signify that a test will give a “negative” result
* Let ***D*** signify that the person in question has the disease
* Let ***H*** signify that the person doesn’t have the disease ( or in other words , is healthy)

We are asked to determine the following

1) The probability of a positive test - ***p(P)***

2) The probability that they have the disease given that they have tested positive – ***p(D|P)***

We are given the following three pieces of information



We know that D and H are complements, so we can work out the probabilities of these too. (P and N are complements also)



People who test positive are made up of two groups

1. People who test positive and who do have the disease (P and D)
2. People who test positive and who don’t have the disease ( P and H)



Bayes Rule is given in the Formulae 

We can rearrange it as follows 

We can now write our equation in terms of all the information we have :

 **ANS**

For the second part, we simply use Bayes Rule again, using information we have determined previously

 **ANS**