The test is positive:
But what are the odds it's wrong?

Interpreting Evidence

For these problems, use a different representation in each case to help you analyse the information given. You may find it helpful to use more than one representation to ensure that you have correctly understood the information.

1. In a sample of 100 40-year-old women, one has breast cancer. It is very likely that a mammogram will give a positive diagnosis for her. For women who do not have breast cancer, the rate of false positive tests is 9%.

   Show this information on a contingency table, tree diagram or Venn diagram.

   What is the probability that a positive test means the woman actually has breast cancer?

2. The probability that a person aged 50 or more has colo-rectal cancer is about 0.3%. If a person has colo-rectal cancer, the probability that s/he will test positive for it is 50%. If s/he does not have colo-rectal cancer, the probability that s/he will test positive is 3%.

   Show this information on a contingency table, tree diagram or Venn diagram.

   What is the probability that a positive test means the person actually has colo-rectal cancer?

3. An expert witnesses testifies in a court of law that there were about 10 million men who could have been the perpetrator of the crime. 10 of these man have a DNA profile which appears to be a match for the trace of DNA recovered from the crime scene. It is virtually certain that the guilty person's DNA will be a match, otherwise the chance of a match is 100 in 10 million.

   Using appropriate diagrams to help you, calculate the probability that the suspect is guilty, given that his DNA matches that of the sample from the crime scene.

http://motivate.maths.org/content/MathsHealth/PositiveTest
Produced by Motivate, part of the Millennium Mathematics Project at the University of Cambridge, with grant funding from the Wellcome Trust