False Positive

Almost all medical tests have a small chance of a ‘false positive’ or a ‘false negative’.

- **False positive**: The test says you **do** have the condition when you really **don’t**. *(you’re fine, but the test thinks you’re sick)*
- **False negative**: The test says you **don’t** have the condition when you really **do**. *(you’re sick, but the test thinks you’re fine)*

- The test for a particular disease has a **false positive rate** of 5%.
  *This means that 5% of people who **don’t** have the disease will be told that they **do**.*
- The test has a **false negative rate** of 1%.
  *This means that 1% of people who **do** have the disease will be told that they **don’t**.*

Assuming this particular disease affects 10% of people, complete the tree diagram below:

Use the tree diagram to calculate the probabilities for each of the four outcomes:

<table>
<thead>
<tr>
<th>Healthy</th>
<th>Sick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested Positive</td>
<td>You’re sick, and the test was correct</td>
</tr>
<tr>
<td>Tested Negative</td>
<td>You’re fine, and the test was correct</td>
</tr>
<tr>
<td></td>
<td>You’re sick, but the test thinks you’re fine</td>
</tr>
<tr>
<td></td>
<td>FALSE NEGATIVE: You may not get the treatment you need.</td>
</tr>
<tr>
<td></td>
<td>You’re fine, but the test thinks you’re sick</td>
</tr>
<tr>
<td></td>
<td>FALSE POSITIVE: You may get treatment you don’t need, or be worried for no reason.</td>
</tr>
</tbody>
</table>

If the test says I’m sick, what is the chance that I really am?

Hint: Imagine 1000 people take the test. Work out how many would test positive, and out of those people, how many are really sick?
False Positive SOLUTIONS

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- **False positive**: The test says you do have the condition when you really don’t.  
  *(you’re fine, but the test thinks you’re sick)*

- **False negative**: The test says you don’t have the condition when you really do.  
  *(you’re sick, but the test thinks you’re fine)*

- The test for a particular disease has a false positive rate of 5%.  
  *This means that 5% of people who don’t have the disease will be told that they do.*

- The test has a false negative rate of 1%.  
  *This means that 1% of people who do have the disease will be told that they don’t.*

Assuming this particular disease affects 10% of people, complete the tree diagram below:

![Tree Diagram](image)

Use the tree diagram to calculate the probabilities for each of the four outcomes:

- \[0.9 \times 0.05 = 0.045\]
- \[0.9 \times 0.95 = 0.855\]
- \[0.1 \times 0.99 = 0.099\]
- \[0.1 \times 0.01 = 0.001\]

<table>
<thead>
<tr>
<th>Tested Positive</th>
<th>Tested Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy</td>
<td>Sick</td>
</tr>
<tr>
<td>4.5%</td>
<td>9.9%</td>
</tr>
<tr>
<td>85.5%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

If the test says I’m sick, what is the chance that I really am?

For every 1000 people, \(45 + 99 = 144\) of the population will test positive. Of that 144, 99 are genuinely sick.

\[
\frac{99}{144} = 0.6875 = 68.75\% \text{ chance that you’re really sick.}
\]