TB or Not TB *KEY*

Part I

If you ever had chicken pox, measles, rubella, or other viruses, then for the rest of your life you will have antibodies for those diseases in your blood, and a simple blood test will be able to detect the presence of those antibodies. In a similar way, if someone has tuberculosis, then they will have antibodies for tuberculosis in their blood.

Blood tests are designed to detect the presence of specific antibodies, but the tests are not perfect. Sometimes, even if there are no antibodies present, other factors will trigger the test to come back positive. So, a positive test result isn't absolute evidence that the person has the disease.

To test for tuberculosis (TB) patients are administered a skin test which involves injecting a bubble of serum underneath the skin, then several days later, observing the skin to see if the person has shown a reaction to the serum. A skin reaction indicates the presence of TB antibodies. Suppose that a young adult with no prior evidence of tuberculosis has a skin reaction to the serum. The person wonders ***"Do I really have tuberculosis?"*** Below are the test results from a large sample of people from countries with insufficient health care.

	Test is Positive	Test is Negative	Total
Has tuberculosis antibodies (TB)	361	***19***	380
Doesn't have tuberculosis antibodies (TB)	***62***	558	***620***
Total	423	***577***	***1000***

Complete the missing parts of the table. Based on this large sample find the following values:

1) What percent of the population of people represented on this table have tuberculosis antibodies?
380/1000 = .38 = 38%

2) What percent of individuals represented on this table will have a positive test result?
423/1000 = .423 = 42.3%

How accurate is the tuberculosis (TB) test?

Various answers can be used to support that the TB skin test sometimes gives false results. It is obvious from the percentages calculated in questions 1 & 2 that more people are testing positive than actually have the antibodies.

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Part II

Identify the cells in the table that show counts for the number of individuals who got inaccurate test results. Put a big frowny face on those cells.

To answer the person who asks "Do I <u>really</u> have tuberculosis?" we will explore some probabilities.

1) Out of all those who tested positive, what percent of individuals actually had tuberculosis antibodies? (The test accurately detected the disease.)
361/423 = .8534, or about 85%

2) Out of all those who tested negative, what percent of individuals didn't have TB antibodies? (The test accurately said they were TB free.)
558/577 = .9671, or about 96.7%

3) What percent of those with tuberculosis tested negative? (The test said they were TB free, but they really had the disease. This is called a false negative.)
19/380 = .05, or 5%

4) What percent of those who tested positive, didn't have tuberculosis (The test said they had TB, but they really didn't. This is called a false positive.)
62/423 = .1466, or 14.7%

5) Which is worse, a false negative or a false positive? Why? ***A false negative. Answers such as: "People who may need treatment would not be detected."***

6) Most health tests are designed to be very sensitive, so sensitive that they often come back with false positive results. Why do you suppose tests are planned to be that way? ***Answers such as: "The tests are designed to reduce the false negatives, so that people with the disease will be identified."***

7) What will you answer the young adult who tested positive and asks, "Do I really have TB?" ***Answers such as: "Since 14.7% of tests are false negatives, then you might not have TB. You should probably have follow-up tests done."***