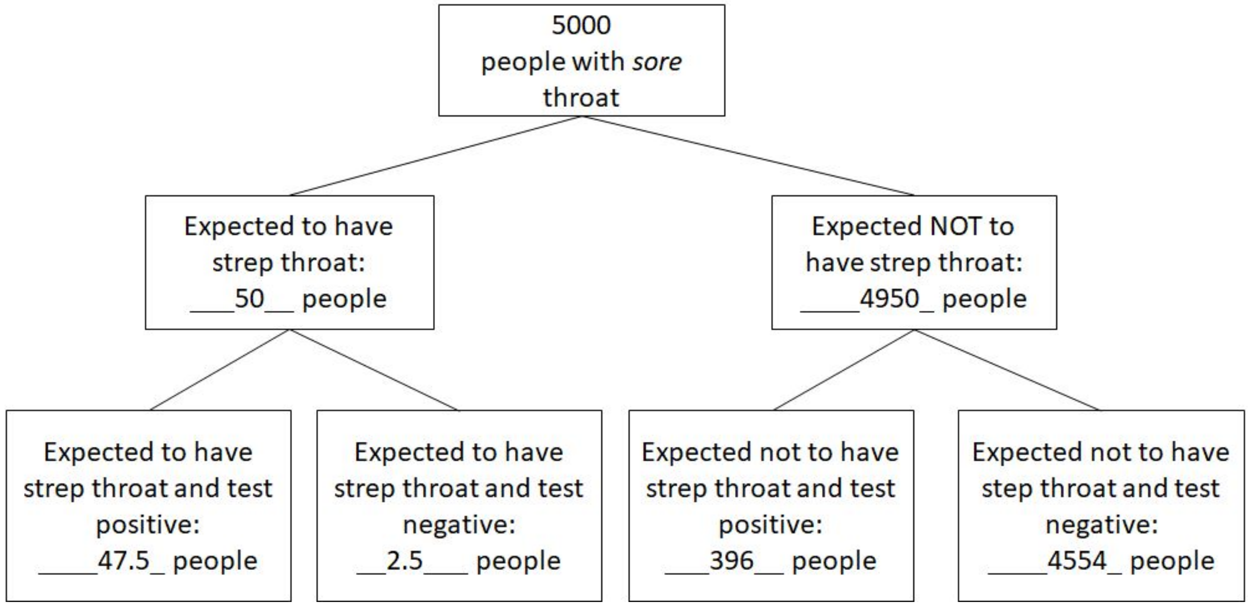
**Example 1:**




True positives False Negatives False positives True negatives

PPV = # true positives/(# true positives + # false positives) = 47.5/(47.5+394) ~ 0.107
NPV = # true negatives/(# true negatives + # false negatives) = 4554/(4554+2.5) ~ 0.999

Suppose Gwenn has sore throat, goes to the doctor, takes the test, and receives a positive result.

There is a __**10.7**__ % chance that Gwenn has strep throat (PPV).

There is a __**89.3**_ % chance that Gwenn does not have strep throat.

Suppose Sam has sore throat, goes to the doctor, takes the test, and receives a negative result.

There is a __**0.1**_ % chance that Sam has strep throat.

There is a __**99.9**_% chance that Sam does not have strep throat (NPV).

Using the values above, out of every 20,000 people who test positive for strep throat, we'd expect _**2140**_ to actually have strep throat, and the other _**17,860**_ to not have strep throat.

**Example 2.** How many 12 oz cans of soda are consumed during the 7 fall semester home football games on MSU's campus?

Assume that there are about 60,000 who have tickets and about 5,000 who just go on campus for tailgating but do not go to the stadium. Assume that about 60% of them drink two cans of soda (on average).
7 games x 2 cans per person per games x 0.6 x 65 000 people = 546 000 cans

**About half a million cans of soda** are consumed during football games on campus during a fall semester.

**Example 3.** How much money (in US dollars) does the average working adult spend on gas for 1 year?

A working adult uses about 1 tank of gas per week on average, which is about 15 gal. Gas costs about $3/gal. There are about 50 work weeks in the year.
15 gal/week x $3/gal x 50 weeks = $2500

**The average working adult spends about $2500 on gas per year.**

**Example 4.** *Is the following statement reasonable or unreasonable:* It would only take you 10 hours to count to one million. *Explain your answer below.*

*Unreasonable--even if it only took 1 second per number, that would still be 1,000,000 seconds which is much longer than 10 hours.*

**Example 5:**

a. In 1970, whites in the top 10% of the income distribution earned 6.3 times as much as whites in the bottom 10%.
b. From 1970 to 2016, the median income of Hispanics increased by 36%.
c. In 2016, Asians in the 10th percentile of the income distribution earn $12,478.
d. In 1970, Americans in the 10th percentile of the income distribution earned $9,212.
e. From 1970 to 2016, the income of Americans in the 90th percentile of the income distribution increased by 73%.
f. From 2000 to 2016, the income of Americans in the 50th percentile of the income distribution decreased by 2%.
g. In 2016, the ratio of the income of blacks at the 90th percentile to income of blacks at the 10th percentile is 9.8. That is, in 2016, blacks in the top 10% of the income distribution earned 9.8 times as much as blacks in the bottom 10%.
h. In 2000, Hispanics at the 5th percentile of the income distribution earned 54% as much as whites at the 5th percentile.

**Example 6:**
According to Fig. B, the income of whites in the 90th percentile of the income distribution in 2016 increased by 80% from 1970. According to Fig. C, in 2016, the income of whites in the 90th percentile of the income distribution was $117,986.

We can use this to determine the income of the 90th percentile of whites in 1970.
1.8 x = $117,986… solve for x by dividing both sides by 1.8. x ~ $65,548.
This means that in 1970, the income of whites in the 90th percentile of the income distribution was approximately $65,548.

**Example 7:** No, the largest decrease in income may not be the largest percent decrease. For example, if an income of $100,000 decreased by $10,000, this would be a 10% decrease. If an income of $50,000 decreased by $6,000, this would be an 12% decrease. The amount of the decrease in the second case is less, but the percent decrease would be higher.

**Example 8:**

a. FALSE
b. You cannot add percents or percent changes across different categories.

**Example 9:** In 1970, the income of Asians in the 5th percentile of the income distribution made 96% as much as whites in the 5th percentile of the income distribution.

**Example 10:**

a. TRUE
b. FALSE
c. FALSE

**Example 11:**

a. ~69%
b. ~23%

**Example 12:** No, this does not mean that people in the United States were happier than people in Great Britain. The standard deviation just gives us information about the deviation in answers regarding reported happiness. It does not give us information about the average reported happiness. If the standard deviation of happiness is small, then this means that the data is less spread out--overall, people are of similar happiness; happiness inequality is smaller. If the standard deviation is large, the data is more spread out which means that happiness inequality is larger. If the standard deviation of happiness of people in the US is greater than the standard deviation of happiness scores, we can only say that happiness inequality is greater, but not anything about whether or not the average person is happier in the US.

**Example 13:**

a. If the bar is higher than the dash, that means that the proportion of people who reported an “8” for happiness score in Latin America & Caribbean is higher than the proportion of people in the world who reported a score of 8 over the whole world.
b. This means that people in all countries displayed in this figure underestimated their peers’ happiness. The self-reported happiness was higher than the average guess of the share of countrymen that answered “very happy” or “rather happy.” For example, In the Philippines, almost 90% of people answered that they were “very happy” or “rather happy,” whereas Filipinos guessed that only about 59% of their fellow countrymen would rate themselves as “very happy” or “rather happy.”
c. This means that the standard deviation of reported happiness is increasing--so happiness inequality is increasing.
d. The size of the circle represents the population size of the country. The larger the circle, the greater the population size.
e. Hong Kong’s GDP per capita is approximately $60,000 and the reported average life satisfaction is about 5.5
f. The two variables appear to be positively correlated. It is possible that a higher GDP per capita results in a higher life satisfaction.  A lurking variable could be that countries with a higher GDP per capita are more developed nations and have better healthcare, higher employment rates, etc… which are metrics that could contribute to both.
g. The second plot in Fig. 5 shows reported life satisfaction of women for a number of years before and after marriage. The trend seems to show that leading up to marriage there is

an increase in reported happiness with the maximum reported happiness being during the year of the marriage. After the marriage, reported happiness appears to be decreasing back to the value where it was 3-4 years before marriage. The bars/whiskers denote the range of confidence around the estimate. The longer the whiskers, the higher the variation in reported answers. Since in graph 2 the bars were shorter, answers were pretty consistent, compared to graph 1 which has very long whiskers and so much higher variation in responses.

**Example 14:** No, this does not mean that more South Koreans rated themselves “rather happy” or “very happy.” Russia and South Korea have different population sizes, so we cannot determine whether or not a higher percent also corresponds to a higher number, unless we know the population sizes.