from data TO DECISION

Critical Thinking: Interpreting medical test results

All of us undergo medical tests at various times in our lives. Some of us are tested for drug use when we apply for jobs, some of us are tested for disease when we exhibit fever or other symptoms, some of us are tested for a variety of disorders when we undergo routine physical examinations, and some of us undergo tests for pregnancy. Because such tests typically provide some wrong results, it is important that we, along with our physicians, understand how to correctly interpret results. We should know that a positive test result does not necessarily mean that a condition is present, and we should know that a negative test result does not necessarily mean that the condition is not present.

West Nile Virus (WNV) is potentially serious and is sometimes fatal. Humans commonly acquire this virus through a mosquito bite. The table below includes results based on tests given to subjects in Queens, New York (based on data from the Centers for Disease Control and Prevention).

West Nile Virus Test

	Positive Test Result (West Nile Virus Is Indicated)	Negative Test Result (West Nile Virus Is Not Indicated)
Subject Is Infected	17 (True Positive)	6 (False Negative)
Subject Is Not Infected	2 (False Positive)	652 (True Negative)

Analyzing the Results

1. **False Positive** Based on the results in the table, find the probability that a subject is not infected, given that the test result is positive. That is, find P(false positive).
2. **True Positive** Based on the results in the table, find the probability that a subject is infected, given that the test result is positive. That is, find P(true positive).
3. **False Negative** Based on the results in the table, find the probability that a subject is infected, given that the test result is negative. That is, find P(false negative).
4. **True Negative** Based on the results in the table, find the probability that a subject is not infected, given that the test result is negative. That is, find P(true negative).
5. **Sensitivity** Find the *sensitivity* of the test by finding the probability of a true positive, given that the subject is actually infected.
6. **Specificity** Find the *specificity* of the test by finding the probability of a true negative, given that the subject is not infected.
7. **Positive Predictive Value** Find the *positive predictive value* of the test by finding the probability of a true positive, given that the test yields a positive result.
8. **Negative Predictive Value** Find the *negative predictive value* of the test by finding the probability of a true negative, given that the test yields a negative result.
9. **Confusion of the Inverse** Find the following values, then compare them. In this case, what is confusion of the inverse?
   - P(subject is infected | positive test result)
   - P(positive test result | subject is infected)