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In [4]:
```python
# 1. A Python script containing the function implementation

def posterior_probability(prior, sensitivity, specificity):

    false_positive_rate = 1 - specificity

    p_test_positive = (sensitivity * prior) + (false_positive_rate * (

    posterior = (sensitivity * prior) / p_test_positive
    return posterior
```

2. Explanation

This function applies **Bayes' theorem** to compute the probability that a person actually has the disease given that they tested positive.

Bayes' theorem states:

$$P(D|T^+) = \frac{P(T^+|D) \cdot P(D)}{P(T^+)}$$

Where: P(D|T^+) is the Posterior Probability: The probability of having the disease (D) given a positive test result (T^+).

P(T+|D) is the Sensitivity (0.99): The probability of testing positive if you have the disease.

P(D) is the Prior (0.0001): The prior probability of having the disease (1 in 10,000).

P(T+) is the total probability of testing positive.

True Positive: Having the disease AND testing positive.

False Positive: Not having the disease AND testing positive.

Finally, the function returns the posterior probability (P(Disease | Test+)).

Code Explanation:

The Python function posterior_probability automates this calculation:

- Inputs: It accepts prior, sensitivity, and specificity as floating-point numbers.
- Complements: It calculates the complement of the prior (P(No Disease)) and the False Positive Rate (1- Specificity).
- Total Probability: It sums the probability of a True Positive and a False Positive to find the total probability of a positive test result.
- Bayesian Update: It divides the True Positive probability by the Total Probability to return the final posterior percentage.

Analysis of the Result

Using the provided data:

prior: 1/10000

Sensitivity: 0.99

Specificity: 0.95

The result is approximately **0.197%**

In [5]:
```
#3. An example of how to use your function with the provided scenario

prior = 1 / 10000
sensitivity = 0.99
specificity = 0.95

# Calculate posterior probability
posterior = posterior_probability(prior, sensitivity, specificity)

print(f"Probability of having the disease given a positive test: {post
```

```
Probability of having the disease given a positive test: 0.001976
```