False Positive Paradox

Mammography data for women age 50-70 in the UK:

- 1% of women have breast cancer and 99% of women do not have breast cancer
- Of women with breast cancer, 85% will test positive (true positive) and 15% of women will test negative (false negative)
- Of women without breast cancer, 10% of women will test positive (false positive) and 90% of women will test negative (true negative)

Consider 1000 women age 50-70 who have been given mammograms. Round your answers to the nearest woman.

1. How many women have breast cancer?
   
   (a) How many of these women will test positive?
   
   (b) How many of these women will test negative?

2. How many women do not have breast cancer?
   
   (a) How many of these women will test positive?
   
   (b) How many of these women will test negative?
3. Fill in the following tree representation of the data:

```
1000 women

___ have breast cancer

___ test positive
   (true positive)

___ test negative
   (false negative)

___ do not have breast cancer

___ test positive
   (false positive)

___ test negative
   (true negative)
```

4. How many women overall test positive for breast cancer?

5. What percent of women who test positive for breast cancer actually have breast cancer?

6. Is your answer to #5 surprising? Can you explain this result?