Exercise (Baye's Theorem)

Q 3.5.1

	D *(Has the disease)*	$\overline{D}$ *(Dose not has the disease)*	Total
T (+ve result)	**744**	**21**	1390
$\overline{T}$ (-ve result)	31	1359	765
Total	**775**	**1380**	2155

a) In the context of this exercise, what is a false positive?

A false positive is when the person has a +ve result but does not have the disease

b) What is a false negative?

A false positive is when the person has the disease but has the a -ve result

c) Compute the sensitivity of the symptom.

P(T | D) = 744/775 = 0.96

d) Compute the specificity of the symptom.
$P(\overline{T} \mid \overline{D})$= 1359/1380 = 0.9848

e) Suppose it is known that the rate of the diseases in the general population is 0.1% .what is the predictive value positive of the symptom?

Using P(D)=0.001

$$P(\bar{D}) = 1 - P(D) = 0.999$$

$$P(D\,|T) = \frac{P(T \mid D)\, P(D)}{P(T \mid D)\, P(D) + P(T|\bar{D}).P(\bar{D})} = \frac{\text{sensitivity } P(D)}{\text{sensitivity } P(D) + [1-\text{specificity}].P(\bar{D})}$$

$$= \frac{0.96 \text{ x } 0.001}{0.96 \text{ x } 0.001 + (1-0.9848)\text{x}(1-0.001)} = \frac{0.00096}{0.00096 + (0.0152)\text{x}(0.999)} = 0.0595$$

f) What is the predictive value negative of the symptom?

$$P(\bar{D} \mid \bar{T}) = \frac{P(\bar{T} \mid \bar{D})P(\bar{D})}{P(\bar{T} \mid \bar{D})P(\bar{D}) + P(\bar{T} \mid D)P(D)} = \frac{\text{specificity } P(\bar{D})}{\text{specificity}P(\bar{D}) + [1-\text{sensitivity}]P(D)}$$

$$= \frac{(0.9848)\text{x}(1-0.001)}{(0.9848)\text{x}(1-0.001) + (1-0.96)\text{x}(0.001)} = 0.9999$$