In [2]:
```
import numpy as np
```

Problem 4

In [2]:
```
p=0.94 # true positive
q=0.94 # true negative
r=0.006 # prior desiese probability
```

By Bayes theorem,

$$
\begin{aligned}
& P(disease|positive) \\
= & \frac{P(positive|disease)P(disease)}{P(positive|disease)P(disease)+P(positive|notdisease)P(notdiease)} \\
= & \frac{p*r}{p*r+(1-q)*(1-r)}
\end{aligned}
$$

In [3]:
```
print(p*r/(p*r+(1-q)*(1-r)))
```

```
0.08639705882352933
```

Ans.1

0.086

$$
\begin{aligned}
P(disease|positive) &= \frac{p*r}{p*r+(1-q)*(1-r)} \\
&\geq 0.9
\end{aligned}
$$

i.e.

$$
r >= \frac{0.9*(1-q)}{p-0.9*p+0.9*(1-q)}
$$

In [4]:
```
print(0.90*(1-q)/(p-0.90*p+0.90*(1-q)))
```

```
0.36486486486486513
```

Ans.2

0.365