Assignment 2

SMAI Assignemnt 2
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Problem 1

False.

There is still an unavoidable error as Y is probabilistic, thus predicting Y is often impossible even if the models's estimate P(Y) is perfect, The perfect predition of P(Y) in itself isn't neccesarily true as Naive Bayes is linear.

Problem 3

Part 1

Given :

```
P(Pos/Cov) = 0.9
P(Neg/Cov') = 0.97
P(Cov) = 0.08
```

Pos -> Positive on Test
Neg -> Negative on Test
Cov -> Corona Positive
Cov' -> Complement of Corona (Corona Negative)

To Find :

```
P(Cov/Pos)
```

Solution :

```
P(Cov/Pos) = (P(Pos/Cov)P(Cov))/P(Pos)
           = (0.9 * 0.08)/P(Pos)

P(Pos)     = P(Pos/Cov)P(Cov) + P(Pos/Cov')P(Cov')
           = 0.9 * 0.08 + 0.03 * 0.92
           = 0.0996

P(Cov/Pos) = 0.027/0.0996
           = 720/996
           = 0.7228
```

Conclusion

P(Cov/Pos) > 0.5 => Probably detect as Corona Positive

Part 2

Given :

```
P(Cov) = 0.6, other values as given above
```

To Find :

```
P(Cov/Pos)
```

Solution :

```
P(Cov/Pos) = (P(Pos/Cov)P(Cov))/P(Pos)
           = 0.9 * (0.6/P(Pos))

P(Pos)     = P(Pos/Cov)P(Cov) + P(Pos/Cov')P(Cov')
           = 0.9*0.6 + 0.03*0.4
           = 0.552

P(Cov/Pos) = 0.54/0.552
           = 540/552
           = 0.9781
```

Conclusion

P(Cov/Pos) very close to 1, thus highly certain.