

* Two events, A, B

Bayes theorem:

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

Posterior \swarrow Likelihood \swarrow Prior \swarrow evidence \swarrow

We know,

by definition of conditional probability,

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \dots \dots \textcircled{i}$$

and,

$$A \cap B = B \cap A$$

so, we can write,

$$P(B|A) = \frac{P(B \cap A)}{P(A)}$$
$$= \frac{P(A \cap B)}{P(A)}$$

$$\Rightarrow P(A \cap B) = P(B|A) \times P(A)$$

..... (ii)

From (i) and (ii):

$$P(A|B) = \frac{P(B|A) P(A)}{P(B)}$$