Bayes' Theorem

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

$P(B)$ ⟹ Prior probability of B.
$P(B|A)$ ⟹ Conditional probability / posterior probability of B.

Derivation of Bayes' theorem → Refer textbook.

Numericals

Ex (1) :- Medical Diagnosis

When one has a cold, one usually has a high temperature (80% of the time). At any one time around 1 in every 10,000 people has a cold, & that 1 in every 1000 people has a high temperature. Now suppose that you have a high temperature, what is the likelihood that you have a cold?

Sol :-

Let's assume
A → I have a temperature
B → I have a cold
$P(A|B) = 0.8$ (80% of the time)
↳ Probability of A given B.
$P(A) = 0.001$ (1 in 1000 ppl)
$P(B) = 0.0001$ (1 in 10,000 ppl)

$$P(B|A) = \frac{P(A|B) \cdot P(B)}{P(A)} = \frac{0.8 \times 0.0001}{0.001} = \boxed{0.008}$$

(Probability of B given A)

8 in 1000 people.
Not very likely to have a cold.