Conditional probability

- It is possibility of an event happening, based on the existence of a previous event

Independent events: are those events whose occurrence **is not dependent** on any other event. For example, if we flip a coin in the air and get the outcome as Head, then again flip the coin but this time we get the outcome as Tail. In both cases, the occurrence of both events is independent of each other

Dependent events are usually real-life events and **rely on another event to occur**. For example, Sam scored well in his math test **because** he studied for it; the gym class had a football session because Adam got a football from home. If you look at these examples, then you will notice that one event is dependent on the other from happening.

Conditional probability formula

when two events, A and B, are dependent,Then:

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

Probability of A given B = Probability of A and B / Probability of B

Probability rules

Addition rule : $P(A\cup B)=P(A)+P(B)-P(A\cap B)$

If A and B are mutually exclusive: $P(A\cup B)=P(A)+P(B)$

Multiplication rule : $P(A\cap B)=P(A)*P(B\mid A)$ or $P(B)*P(A\mid B)$

If A and B are independent: $P(A\cap B)=P(A)*P(B)$

Complement rule : $P(A^{c})=1-P(A)$

A and B are mutually exclusive if $P(A\cap B)=0$

A and B are independent if $P(A\mid B)=P(A)$ or $P(B\mid A)=P(B)$

Question 1:

The probability that it is Friday and that a student is absent is 0.03. Since there are 5 school days in a week, the probability that it is Friday is 0.2. What is the probability that a student is absent given that today is Friday?

Solution:

The formula of Conditional probability Formula is:

P (B|A) = P(A ∩ B)∕P(A)

P(Absent | Friday)= P (Absent and Friday)∕P(Friday)

= 0.03/0.2

= 0.15

= 15 %

Question 2: A teacher gave her students of the class two tests namely maths and science. 25% of the students passed both the tests and 40% of the students passed the maths test. What percent of those who passed the maths test also passed the science test?

Solution:
Given,
Percentage of students who passed the maths test = 40%
Percentage of students who passed both the tests = 25%
Let A and B be the events of the number of students who passed maths and science tests.
According to the given,
P(A) = 40% = 0.40
P(A ∩ B) = 25% = 0.25
Percent of students who passed the maths test also passed the science test
= Condition probability of B given A
= P(B|A)
= P(A ∩ B)/P(A)
= 0.25/0.40
= 0.625
= 62.5%

Question 3: A bag contains green and yellow balls. Two balls are drawn without replacement. The probability of selecting a green ball and then a yellow ball is 0.28. The probability of selecting a green ball on the first draw is 0.5. Find the probability of selecting a yellow ball on the second draw, given that the first ball drawn was green.

Solution:
Let A and B be the events of drawing a green in the first draw and yellow ball in the second draw respectively.
From the given,
P(A) = 0.5
P(A ∩ B) = 0.28
Probability of selecting a yellow ball on the second draw, given that the first ball drawn was green =
Conditional of B given A
= P(B|A)
= P(A ∩ B)/P(A)
= 0.28/0.5
= 0.56