Ch 3.3 Addition and Multiplication Rule

Addition Rule:

Addition Rule are used to find “OR” in a procedure.

P(A or B) = P(A) + P(B) – P(A and B)

If A and B are mutually exclusive: P(A and B) = 0

P(A or B) = P(A)+ P (B) when A, B are mutually exclusive.

Ex1. Toss a 6-face die once, use addition rule method to find P(one or odd).

P(one or odd) = P(one) + P(odd) – P(one and odd)

= 1/6 + 3/6 – 1/6 = 3/6 =0.5

Ex2. Toss a 6-face die once, use addition rule method to find P(one or even)

Because one and even or mutully exclusive, so P (one or even) = P(one) + P(even) = 1/6 + 3/6 = 0.667

Ex3. Use the contingency table below:

	iPhone	Samsung	others
male	18	2	1
female	24	4	2

GT = 51

Use addition rule to find P(male or iPhone).

P(male or iPhone) = P(male) + P(iPhone) – P(male and iPhone) = 21/51 + 42/51 – 18/51 = (21+41-18)/51 =45/51 = 0.8823

Multiplication Rule:

Multiplication Rule is used to find probability of two events: A and B.

$\mathrm{P(A\ and\ B)} = P(A) * P(B|A)$

If A and B are independent, P(B|A) = P(B) so

$\mathrm{P(A\ and\ B)} = P(A) * P(B)$ when A, B are independent.

A result of the multiplication rule gives the formula for conditional probability as:

$textP(AgivenB) = \mathrm{P(A \mid B)} = \frac{\mathrm{A\ and\ B}}{P(B)}$

Ex1: Given the two-way table below:

	iPhone	Samsung	others
male	18	2	1
female	24	4	2

Find P(male |iPhone) = P(male and iPhone)/P(iPhone) = $\frac{18/51}{42/51} = \frac{18}{42} = 0.4286$