Conditional Probability

A and B are said to be independent if and only if $P(A \cap B) = P(A) \times P(B)$

$P(A|B)$ The probability of A given that B has happened is given by

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

This provides an alternative test for independence

Events A and B are independent

if $\quad P(A|B) = P(A)$

or $\quad P(B|A) = P(B)$

ie. the probability of A is unchanged by the fact B has happened.

Suppose $\quad P(A|B) = P(A)$

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

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

which is the original condition for independence

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1)

	Pizza	Curry	Total
Male	11	18	29
Female	14	17	31
Total	25	35	60

a) $P(\text{Male}) = \frac{29}{60}$

b) $P(\text{Curry} | \text{Male}) = \frac{18}{29}$

c) $P(\text{Male} | \text{Curry}) = \frac{18}{39}$

d) $P(\text{Pizza} | \text{Female}) = \frac{14}{31}$
