



**Definition**

Let  $X, Y : \Omega \rightarrow \mathbf{R}$  be random variables on probability space  $(\Omega, \mathcal{F}, \mathbf{P})$ . The *joint cumulative distribution function* denoted  $F_{X,Y} : \mathbf{R}^2 \rightarrow [0, 1]$  is defined by  $F_{X,Y}(s, t) = \mathbf{P}[X \leq s, Y \leq t]$ .

In general the *joint cdf* for a random vector  $X : \Omega \rightarrow \mathbf{R}^n$  is  $F_X : \mathbf{R}^d \rightarrow [0, 1]$  defined by  $F_X(t) = \mathbf{P}[X \leq t]$  where  $x \leq t$  means  $x_i \leq t_i$  for all  $i$ .



