

TWO DISCRETE RANDOM VARIABLES

For discrete rvs X and Y :

JOINT MASS FUNCTION: $p(x, y) = P(X=x, Y=y)$ gives the probability that X and Y have certain values simultaneously

MARGINAL MASS FUNCTIONS: $p_X(x) = \sum_y p(x, y)$ } give probabilities of X and Y individually
 $p_Y(y) = \sum_x p(x, y)$

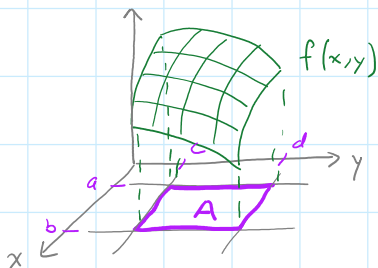
X and Y are **INDEPENDENT** if $p(x, y) = p_X(x) p_Y(y)$.

TWO CONTINUOUS RANDOM VARIABLES

For continuous rvs X and Y :

JOINT DENSITY FUNCTION: $f(x, y)$ such that for any

set A in \mathbb{R}^2 , $P((X, Y) \in A) = \iint_A f(x, y) dA$



$$P(a \leq X \leq b, c \leq Y \leq d) = P((X, Y) \in A)$$

$$= \int_a^b \int_c^d f(x, y) dy dx = \iint_A f(x, y) dA$$

MARGINAL DENSITY FUNCTIONS: $f_X(x) = \int_{-\infty}^{\infty} f(x, y) dy$
 $f_Y(y) = \int_{-\infty}^{\infty} f(x, y) dx$

X and Y are **INDEPENDENT** if $f(x, y) = f_X(x) f_Y(y)$.