

Outer space N^3

a) →

		0	A	1	Marg of B
B	0	$P(A' \cap B')$	$P(A \cap B')$	$P(A' \cap B') + P(A \cap B')$	
	1	$P(A' \cap B)$	$P(A \cap B)$	$P(A' \cap B) + P(A \cap B)$	
Marg of A		$P(A' \cap B') + P(A' \cap B)$	$P(A \cap B') + P(A \cap B)$		

b) → $E(A \cdot B) = \sum_A \sum_B A \cdot B \cdot F(A, B)$

$$E(A \cdot B) = \sum_A A \left[0 \cdot F(A, 0) + 1 \cdot F(A, 1) \right] = \sum_A A \cdot F(A, 1) =$$

$$= 0 \cdot F(0, 1) + 1 \cdot F(1, 1) = F(1, 1) \Rightarrow P(A \cap B)$$

$$E(A) = P(A \cap B') + P(A \cap B) = P(A)$$

$$\Downarrow$$

$$E(B) = P(B)$$

c) $Cov(A, B) = P(A \cap B) - P(A) \cdot P(B)$

$$Var(A) = E(A^2) - E^2(A) = P(A) - P^2(A)$$

$$Var(B) = P(B) - P^2(B)$$

$$Corr_{AB} = \frac{Cov(A, B)}{\sqrt{Var(A)Var(B)}} = \frac{P(A \cap B) - P(A)P(B)}{\sqrt{[P(A) - P^2(A)][P(B) - P^2(B)]}}$$