

1. Define the joint PMF of X, Y as

$$f(x, y) = \frac{x + y}{32}, \quad x = 1, 2, \quad y = 1, 2, 3, 4.$$

- (a) Find the marginal of X .
 - (b) Find the marginal of Y .
 - (c) Find $P(X > Y)$.
 - (d) Find $P(Y = 2X)$.
 - (e) Find $P(X + Y = 3)$.
 - (f) Find $P(X \leq 3 - Y)$.
 - (g) Are X and Y independent?
2. The probability that a person will die from a certain respiratory infection is 0.002. Of the next 2000 infected, find the
- (a) probability that fewer than 5 will die,
 - (b) probability that greater than 7 will die,
 - (c) probability that exactly 10 will die,
 - (d) expected number of infected people that might die.
3. Assume the random variables X and Y are independent with marginals $f(x) = 2x$ on $0 \leq x \leq 1$, and $f(y) = 3y^2$ on $0 \leq y \leq 1$. Find $P(Y < X)$.
4. Let $X \sim \text{Exponential}(\lambda)$. Show that

$$P(X > s + t | X > t) = P(X > s), \quad \forall s, t \geq 0.$$

This is called the memoryless property of random variables.