$$X \sim U(0,1),$$

Y, :

$$Y = \begin{cases} 1, & X \le \dfrac{1}{3}, \\ 2, & X > \dfrac{1}{3}. \end{cases}$$

1. $p_Y(y)$

$X \sim U(0,1)$, :

$$P(X \le a) = a, \quad 0 \le a \le 1.$$

:

$$p_Y(1) = P\left(X \le \frac{1}{3}\right) = \frac{1}{3},$$

$$p_Y(2) = P\left(X > \frac{1}{3}\right) = 1 - \frac{1}{3} = \frac{2}{3}.$$

,

$$p_Y(y) = \begin{cases} \dfrac{1}{3}, & y = 1, \\ \dfrac{2}{3}, & y = 2, \\ 0, & . \end{cases}$$

2. $E(Y)$

1: $p_Y(y)$

$$E(Y) = \sum_y y\, p_Y(y) = 1 \cdot \frac{1}{3} + 2 \cdot \frac{2}{3} = \frac{5}{3}.$$

2: $f_X(x)$

X:

$$f_X(x) = \begin{cases} 1, & 0 < x < 1, \\ 0, & . \end{cases}$$

:

$$E(Y) = \int_0^{1/3} 1\, dx + \int_{1/3}^1 2\, dx = \frac{1}{3} + 2 \cdot \frac{2}{3} = \frac{5}{3}.$$

$$p_Y(1) = \frac{1}{3}, \quad p_Y(2) = \frac{2}{3}, \quad E(Y) = \frac{5}{3}.$$