

L3

Probability & Statistics

Office Hours - ~~5-7~~ 6 pm on Tuesdays
N303, Dept. of Maths.

Random Variable: (S, A, P)

$$X: S \rightarrow \mathbb{R}$$

which associates numbers
to outcomes.

Exp. Toss a coin $S = \{H, T\}$

$$\begin{array}{l|l} X(H) = 0 & Y(H) = a \\ X(T) = 1 & Y(T) = b \end{array} \quad \begin{array}{l} \cancel{a \neq b} \end{array}$$

many ways to define such
a fr.

$$f(x) = P(X=x) = P\{\omega \in S \mid \underbrace{X(\omega) = x}_{x \in \mathbb{R}}\}$$
$$P(a \leq X \leq b)$$

$$f: \mathbb{R} \rightarrow [0, 1]$$

Assume S is countable. i.e.

$$|S| \text{ finite or } |S| = |\mathbb{N}|$$

Then $f(x) = \frac{P(X=x)}$ is called a pmf or probability 'mass' function associated with X .

Q. ^{Does} ~~Can~~ any function $f: \mathbb{R} \rightarrow [0, 1]$ represent a pmf of some random variable?

Def. (pmf) A function f is a pmf corresponding to X

$$(1) f(x) \geq 0, x \in S_X$$

$$(2) \sum_{x \in S_X} f(x) = 1 \quad \begin{array}{l} \parallel \\ \text{the range set} \\ \uparrow \\ X \end{array}$$

$$(3) A \subset S_X \text{ then } P(X \in A) = \sum_{x \in A} f(x)$$

