Probability and Random Processes

ECS 315

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8 Discrete Random Variable

Office Hours:

BKD, 6th floor of Sirindhralai building

Wednesday	14:00-15:30
Friday	14:00-15:30

Example 8.15: pdf and probabilities

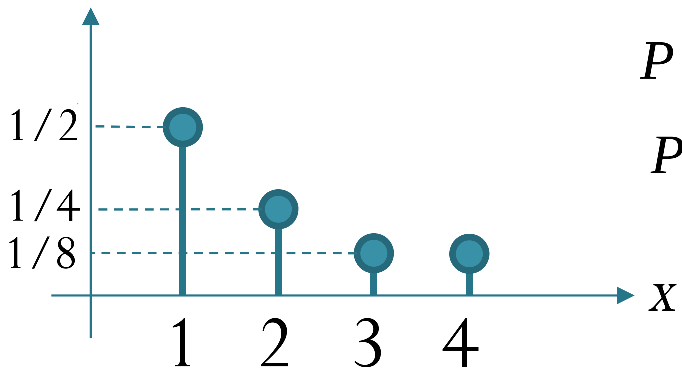
Consider a random variable (RV) X.

probability mass function (pmf)

$p_X(x) = \text{P}[X = x]$

$$p_X(x) = \begin{cases} 1/2, & x = 1, \\ 1/4, & x = 2, \\ 1/8, & x \in \{3,4\} \\ 0, & \text{otherwise} \end{cases}$$

stem plot:



$P[X = 2] = ?$

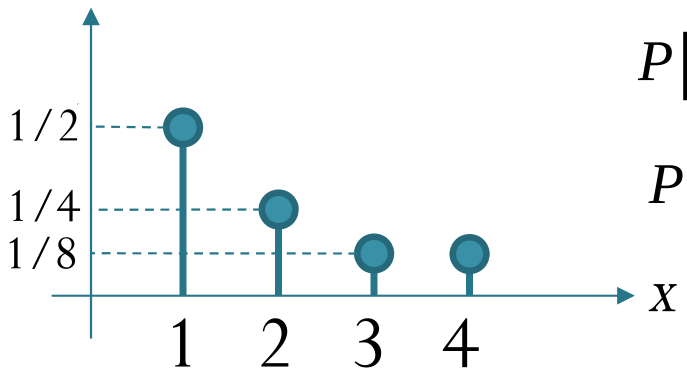
$P[X > 1] = ?$

Example 8.15: pdf and probabilities

Consider a random variable (RV) X.

probability mass function (pmf) $$p_X(x) = \begin{cases} \frac{1}{2}, & x = 1, \\ \frac{1}{4}, & x = 2, \\ \frac{1}{8}, & x \in \{3,4\} \\ 0, & \text{otherwise} \end{cases}$$

stem plot:



$$P[X = 2] = p_X(2) = \frac{1}{4}$$

$$P[X > 1] = p_X(2) + p_X(3) + p_X(4)$$

$$= \frac{1}{4} + \frac{1}{8} + \frac{1}{8} = \frac{1}{2}$$

Example: pdf and its interpretation

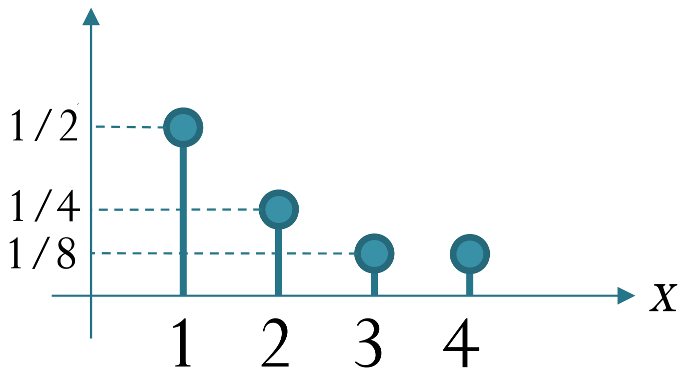
Consider a random variable (RV) X.

probability mass function (pmf)

?

$$p_X(x) = \begin{cases} 1/2, & x = 1, \\ 1/4, & x = 2, \\ 1/8, & x \in \{3,4\} \\ 0, & \text{otherwise} \end{cases}$$

stem plot:



Example: pdf and its interpretation

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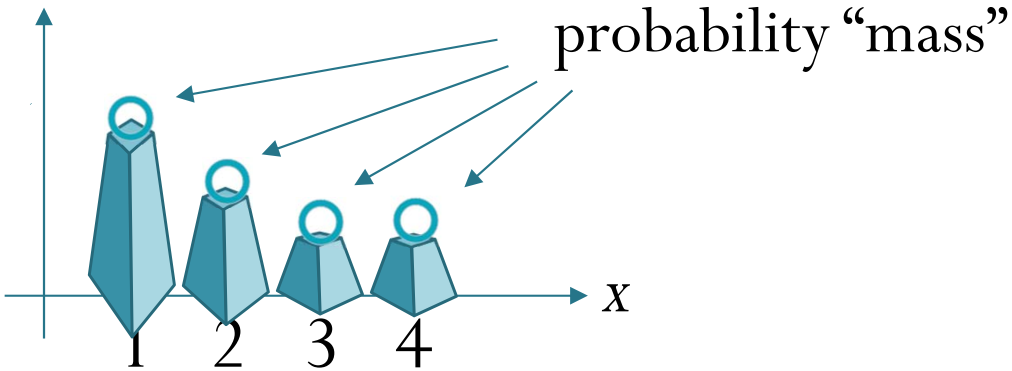

Example: pdf and its interpretation

Consider a random variable (RV) X.

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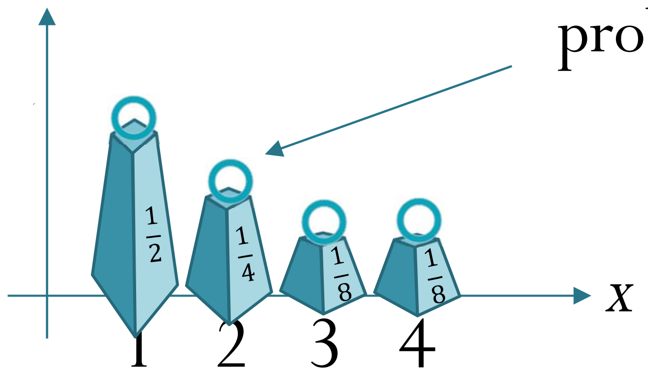
probability "mass" of size $1/4$



Example: Support of a RV

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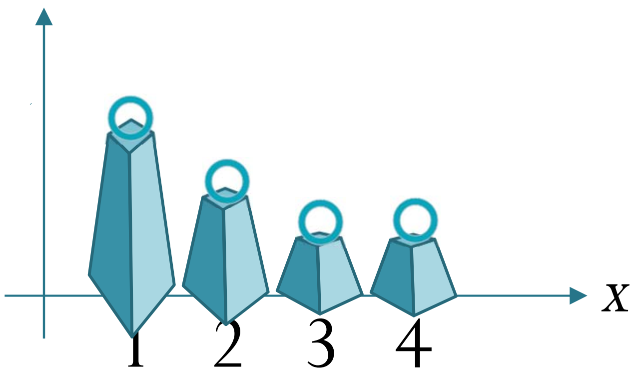

What about the **support** of this RV X?

Example: Support of a RV

Consider a random variable (RV) X.

probability mass function (pmf) $$p_X(x) = \begin{cases} \frac{1}{2}, & x = 1, \\ \frac{1}{4}, & x = 2, \\ \frac{1}{8}, & x \in \{3,4\} \\ 0, & \text{otherwise} \end{cases}$$

The set $\{1,2,3,4\}$ is a support of X.

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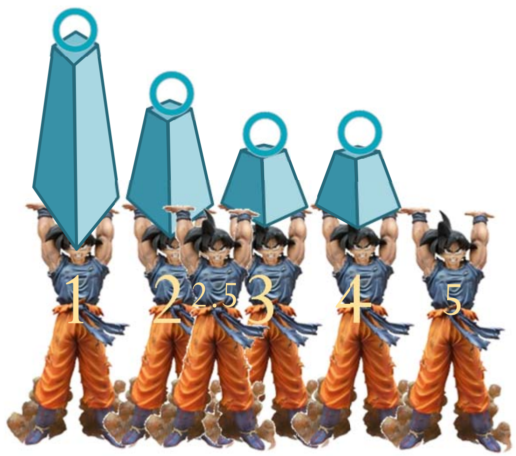

The set $\{1,2,2.5,3,4,5\}$ is also a support of this RV X.

Example: Support of a RV

Consider a random variable (RV) X.

probability mass function (pmf) $$p_X(x) = \begin{cases} 1/2, & x = 1, \\ 1/4, & x = 2, \\ 1/8, & x \in \{3,4\} \\ 0, & \text{otherwise} \end{cases}$$

The set $\{1,2,4\}$ is *not* a support of this RV X.

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The set $\{1,2,3,4\}$ is the "minimal" support of X.

For discrete RV, we take the collection of x values at which $p_X(x) > 0$ to be our **"default" support**.

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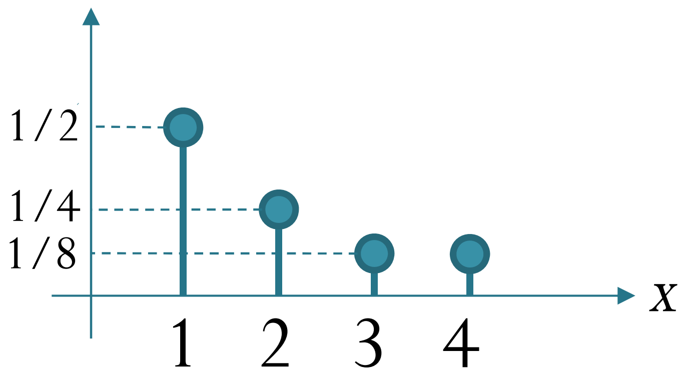
stem plot:



The "default" support for this RV is the set $S_X = \{1,2,3,4\}$.