Range of \( f(x) \):
\[ \mathbb{R} \subseteq \mathbb{R} \]

Domain of \( f(x) \):
\[ (a, b) \]

\( f(x) = g(x) \)

Mapping:
\[ X \xrightarrow{f} Y \]

Random Variable

Discrete

Continuous

Physical Model = Probabilistic Model

Experiment: Process and Observation

C14 \( \rightarrow \) TW0
\[ \forall x \in \{ x \in \mathbb{Z} \mid x \geq 3 \} \quad x = y = 4 \Rightarrow f(x) \]

\[ \text{Domain:} \quad \text{Range:} \]

\[ \{ x = x \} \quad \text{D} = (x) \]

\[ \{ x = x \} \]

\[ P(x = x) \equiv D[A] \quad \text{where} \]

\[ A = \{ y \mid y \leq 5 \} \]
Consider a random variable $X$ representing the number of heads in $n$ coin flips. Let $p$ be the probability of heads.

The expected number of successes is $np$. The probability of $k$ successes out of $n$ trials follows a binomial distribution, denoted as $\text{Bin}(n, p)$.

For $i$ flips, the expected number of successes is $ip$. The probability of exactly $i$ successes is given by the binomial probability mass function.

Recall: Consider $X$ representing the number of independent successes and $n$ independent Bernoulli trials.
The number of trials $n$, with $\frac{k}{n}$ successes (inclusive)
The expression for the average number of servers is:

\[ \lambda = \frac{1}{\sum \frac{1}{y_i}} \]

\( y_i \) are the service times.

\( \lambda \) is the arrival rate.

\( \sum \) denotes the sum over all service times.
not necessarily from the right, but

(a) $F(x)$ is continuous from the right, but

(b) $F(x)$ may be non-differentiable.

\[ F(x) = \begin{cases} 
  x & \text{if } x \leq 5b \\
  \infty & \text{if } x > 5b 
\end{cases} \]
\[ L = \text{inf} \text{ of } y \text{ as } \text{not large than } y. \]

The largest of the set that
\[ 1, 2, 3, 4, 5 \]

\[ y \]
$\lceil y \rceil$ is the smallest integer that is not smaller than $y$ (numerical).

The average value of a set of experiment outcomes is a statistic of the outcomes.

Three averages of interest:
- mean (or expected value, or expectation)
- median
- mode (unimodal, multimodal)
We can interpret $P[X = x] = \frac{\text{num}}{\text{den}}$ as
\[
\frac{\text{num}}{\text{den}} = \frac{x}{N}
\]

$m = \frac{\sum x}{N}$

\[
\text{sample value of } x = \frac{\sum x}{N}
\]

$\bar{x}$ is the arithmetic mean of the sample.

$\bar{x}$ is the sample average.

$x_i$ represents the $i$th experiment. Let $x_i$ denote the $i$th experiment.

Perform an independent trials of this experiment.

Consider an experiment that produces a real $x$.  

Relative frequency interpretation:
\[
\begin{align*}
\mathbb{E}[X] &= \sum_{x=1}^{\infty} x \cdot \frac{1}{2^x} \\
&= \sum_{x=1}^{\infty} \frac{x}{2^x} \\
&= \frac{1}{3} + \frac{2}{8} + \frac{3}{32} + \cdots \\
&= \frac{1}{3} \cdot \frac{1}{1 - \frac{1}{2}} \\
&= \frac{1}{3} \cdot 2 \\
&= \frac{2}{3}
\end{align*}
\]
\[
\frac{\sqrt{1 + \left( \frac{2-1}{2} \right)^2}}{\sqrt{2}} = \frac{r_0}{\sqrt{2}} = \frac{1}{\sqrt{2}} \cdot \frac{r_0}{2} = \frac{r_0}{2}
\]
\[
\frac{\partial}{\partial x} \left( \frac{1}{1-x} \right) = \frac{1}{x^2}
\]

\[
\lim_{y \to \infty} \ln (1-y) = \ln (1-x) = \frac{\partial}{\partial x} \left( \frac{1}{1-x} \right) = \frac{1}{x^2}
\]
\[ A = \{ x \mid x \in S \} = \{ x \mid x \in S \times F(x) \} \subseteq \text{domain} \times \text{range} \]

\[ \text{domain} \rightarrow \text{range} \]

\[ \forall x \in X \]
$Y$ is called the derived random variable.

Denote $Y = g(X)$. 

\[ Y = g(x) \]
\[ R(y) = \sum_{x} P(x) \]
\[ h = b(x) \]

\[ x \]

\[ \text{such that } x \in \mathbb{R}^n \]

\[ \{ h \mid b(x) = h \} \]

When \( i = 1 \), \( \phi(x) = h \)
Given \( f(x) \) and \( y = g(x) \), this section discusses the approach of finding \( By(x) \).
\[ \begin{align*}
&\text{If } y = 2 \Rightarrow y \in \{ 1 \times (1-2), 1 \times (2-1), 1 \} \Rightarrow y = \frac{2}{3} \Rightarrow x \in \{ -1 \times (1-2), 1 \} \\
&\text{If } y > 0 \Rightarrow x = 0 \Rightarrow x \in \emptyset \\
&\text{If } y < 0 \Rightarrow x \in \{ 1 \times (2-1), 1 \} \\
&\text{If } y = 0 \Rightarrow x \in \{ 1 \times (1-2), 1 \} \\
\end{align*} \]
Law of Unconscious Statistics
For any two linear operators $T\in L([x],[y])$ and

\[
\left[ \sum_{n=1}^{\infty} a_n \cdot \begin{bmatrix} y_n \mid x \end{bmatrix} \right] = \left[ \sum_{n=1}^{\infty} b_n \cdot \begin{bmatrix} y_n \mid x \end{bmatrix} \right]
\]

and any $x$ and $y$, if

\[
\text{there exists a sequence of}\quad \text{such that}
\]

An operator $T\in L([x],[y])$ is defined.
\[ \frac{M_x}{\text{E}(x)} = 6 \int_{\frac{Y}{2}}^{\infty} (x^2 + 1) \, dx + 6 \int_{\frac{2}{\sqrt{2}}}^{\infty} \frac{x}{\sqrt{2}} \, dx \]

\[ \int_{\frac{Y}{2}}^{\infty} (x^2 + 1) \, dx = 2 \left[ \frac{x^3}{3} \right]_{\frac{Y}{2}}^{\infty} = \frac{2}{3} \left( \frac{Y^3}{8} \right) \]

\[ \int_{\frac{2}{\sqrt{2}}}^{\infty} \frac{x}{\sqrt{2}} \, dx = \sqrt{2} \left[ \frac{x^2}{2} \right]_{\frac{2}{\sqrt{2}}}^{\infty} = \frac{2}{2} \left( \frac{2}{2} \right) = \frac{1}{2} \]

Theorem 2.10

Let \( f(x) = \frac{1}{x + b} \), then, from

\[ \frac{f(x)}{\text{E}(x)} = 2, \quad \text{for} \quad \text{the mean} \quad 2, \quad \text{and} \quad \mathbb{E}[X] = \mathbb{E}[Y] \]

Expectation is a linear operator.

\[ \mathbb{E}[5X] = 5 \mathbb{E}[X] \]
\([E = \emptyset(E \in \mathbb{R})]\)

\(E \subseteq \mathbb{R}\)

For \(M = \mathbb{R}\) when \(\emptyset \in \mathbb{R}\)

\([E \subseteq \mathbb{R}] = 9\)

\(\forall n \in \mathbb{R}\)

\(9\) non-dense

so

\(\emptyset = 9(\emptyset)\) so
\text{model } f(x) \text{, and so does } f(x^2) \text{.
}
\text{Similarly observe the probability}

\[ \forall x \left( x \in \mathbb{E} \right) \]

\[ x \in \mathbb{E} \]

\[ \forall x \left( x \in \mathbb{E} \right) \]

\[ \forall x \left( x \in \mathbb{E} \right) \]

\[ \forall x \left( x \in \mathbb{E} \right) \]

\[ \forall x \left( x \in \mathbb{E} \right) \]
of $x$ and $y$ to $m$. We describe the dispersion $\mathcal{D} \times \mathcal{E}(c) \rightarrow \mathbb{R}$ where $\mathcal{E}(c)$ is the set of all points $(x, y)$. For some $x$, $x > 0$. 

\begin{align*}
\text{For some } x,
\end{align*}
Mean square value of $x$ is commonly referred to as $\mathbb{E}[x^2]$.
Let $Y$ be a random variable. For any $x \in \mathbb{R}$, we have

$$E[X^2] \geq \frac{E[X]^2}{x^2} \geq 0$$

where $X \geq 0$. Then, for any $x \geq 0$,

$$E[X] = \mathbb{E}[x - \mathbb{E}[X]]^2 \geq 0$$

Thus, $X$ is a random variable. Some other details about probability theory. For all the moments, $\mathbb{E}[X^n]$ for $n \geq 1, 2, \ldots$
\[ P(A|B) = \frac{P(A \cap B)}{P(B)} \]

Random variable \( X \), if

\[ A = \{ x \in \mathbb{R} \mid 1 < x < 3 \} \]

Of course. \( A = \{ x \in \mathbb{R} \mid 1 < x < 3 \} \) for a disorder.

\[ P(B) \]

\[ P(A|B) = \frac{P(A \cap B)}{P(B)} \]

\[ \mathbb{E}[X] \geq 0 \] That is, for arbitrary \( A \) and \( B \),

The event \( B \) occurs, so the probability of event \( A \) given \( B \) occurs is denoted \( P(A|B) \) denotes the conditional probability.
\[
\begin{aligned}
\mathbb{P}(\Omega) &= |B| = |X = x|, \\
X &= \{y \in \mathbb{B} \mid y \in \mathbb{B} \}
\end{aligned}
\]
If \( x \neq B \),

\[
P(x \neq B) = \frac{P(B)}{P(x)}
\]

If \( x = B \),

\[
P(x = B) = \frac{P(x = B)}{P(x)}
\]
6, 6 \cdot \left[ 6 \frac{x + 6}{13} \right] = 6 \in \left[ 1 \frac{x}{13} \right] + 6.

To answer, \text{..} \text{.. for any }. \text{..}

\text{and}

\text{not necessarily straightforward cases, \text{..} and}

\text{not the case that would involve any of those}