Distributions

Theory  Examples  Easy Facts  For Dummies  Mathematicians
Theory for 100.

Formula for $F(x)$ the distribution function of the continuous r.v. $X$ with density $f(x)$

$$P[x \geq X]$$

$$\int_{0}^{\infty} t f(t) \, dt$$

$$\int_{-\infty}^{x} t \, dt$$

$$\int_{-\infty}^{\infty} f(t) \, dt$$

none of above

all of above including the previous answer
Theory for 200.

Density for an exponential random variable

\[ f(x) = \lambda e^{\lambda \cdot (-x)} \quad \text{if } x \geq 0 \text{ and otherwise} \]
\[ f(x) = -\lambda e^{-\lambda x} \quad \text{if } x < 0 \text{ and otherwise} \]
\[ f(x) = -\lambda e^{-\lambda \cdot (-x)} \quad \text{if } x \geq 0 \text{ and otherwise} \]
\[ f(x) = \lambda e^{-\lambda x} \quad \text{if } x < 0 \text{ and otherwise} \]
\[ f(x) = xe^{-\lambda x} \quad \text{if } x \geq 0 \text{ and otherwise} \]
\[ f(x) = xe^{\lambda x} \quad \text{if } x < 0 \text{ and otherwise} \]
Theory for 300.

What is true about $F$ the distribution and $f$ the density of a continuous r.v. $X$?

- $f' = F$
- $\int_{-\infty}^{x} F(x) \, dx = f(x)$
- $F(x) = f(x) - f(0)$
- $f(t) = \int F(t)$
- $f(t) = F'(t)$

none of the above
all of the above
Theory for 400.

If \( \alpha = \int_{-\infty}^{\infty} e^{-x^2} \, dx \), What is \( \alpha^2 \)?

1

\( \sqrt{2} \)

Perimeter of a equilateral triangle

The distance from here to the end of the universe

Area of a unit circle

All of the above answers

None of the above answers
Examples for 100.

An example of a discrete random variable

- normal
- exponential
- gamma
- uniform continuous
- geometric
- all of the above
- none of the above
Examples for 200.

If $\Omega = \{1, 2, 3, 4\}$ an example of two independent sets

$\{1, 2, 3, 4\}, \{\}\$

$\{1, 2\}, \{3, 4\}$

$\{1, 2, 3\}, \{2, 4\}$

$\{2, 3\}, \{3, 2\}$

$\{1, 3\}, \{2, 4\}$

none of them
Examples for 300.

An example of an decreasing sequence of sets is

\[
\begin{align*}
\{[1/n, \infty)\} \\
\{[-n, \infty)\} \\
\{[1/n, n)\} \\
\{[-n, n)\} \\
\{[1 - 1/n, 10)\} \\
\{[0, n)\} \\
\text{none of them}
\end{align*}
\]
Examples for 400.

An example of a sigma algebra $\mathcal{X}$ is

\[
\mathcal{X} = \{\emptyset, X, A\}
\]

\[
\mathcal{X} = \{\emptyset, X, A, B\}
\]

\[
\mathcal{X} = \{\emptyset, X, A^c, B^c\}
\]

\[
\mathcal{X} = \{(a, b) : a, b \in \mathbb{R}\}
\]

\[
\mathcal{X} = \{\emptyset, X, B, B^c\}
\]

none of them
Easy Facts for 100.

20 students take Spanish 402, 17 students take Math 352, 5 take both. How many students in total there are?

37
-4/3
103
27
32
Hannah Montana
none of them
Density for binomial random variable with 5 trials and probability of failure 1/2?

\[ f(k) = \binom{5}{k} k^2 \cdot 2^k \]

\[ f(k) = \binom{5}{k} \frac{1}{2^5} \cdot \frac{1}{2^k} \]

\[ f(k) = \binom{5}{k} 2^{-5} \cdot 2^{-k+5} \]

\[ f(k) = \binom{5}{k} \frac{64}{2} \]

\[ f(k) = \binom{28}{37} \]

none of them
Easy Facts for 300.

If \( x = r \cos \theta \), \( y = r \sin \theta \) then the Jacobian is

\[
\cos^2 \theta + \sin^2 \theta - \frac{51r^2}{(17)(3r)} - r \sin \theta + 192378 - r^2 \cos \theta^2 - 1
\]

none of them
Easy Facts for 400.

If $f, F$ are density and distribution function respectively, what does $\int_{2}^{\infty} f(x) \, dx$ represent?

- $P[X < 2]$
- $F(2)$
- $1 - F(2)$
- $F'(2)$
- $P[2 > x]$
- $f(2)$
- none of them
For Dummies for 100.

About the following statement \( P(A \cup B) = P(A) \cup P(B) \)

You need to subtract the probability of the intersection
True only if the sets are disjoint
\( A \) needs to be a subset of \( B \)
It is always true
Only dumb people will write those statements
all of the above
none of above
For Dummies for 200.

Mention four discrete distributions

Poisson, Binomial, Exponential and Normal
Normal, Bernoulli, Poisson and Geometric
Uniform Discrete, Bernoulli, Poisson and Normal
Exponential, Bernoulli, Geometric and Binomial
Uniform continuous, Exponential, Normal and Gamma
Binomial, Geometric, Poisson and Bernoulli
none of them
For Dummies for 300.

What is $P(A|B)$?

- $P(A)/P(B)$
- $P(B)/P(A)$
- $P(A) \cdot P(B)$
- $P(A \cap B)$
- I don’t give a dime
- $P(A \cup B)$
- none of them
For Dummies for 400.

What is \((A \cap B)^c\) equal to?

- \((A \cup B)^c\)
- \((A \cap B)\)
- \(A^c \cap B\)
- \(A \cup B^c\)
- \(A^c \cap B^c\)
- \(A^c \cup B^c\)
- none of them
Mathematicians for 100.

Flipping a coin is associated with …

Bernoulli
Poisson
Bonferoni
Buffon
Jacob
Bayes
DeMorgan
Venn
Mathematicians for 200.

He is related to the complement of a union.

Bernoulli
Poisson
Boole
Buffon
Jacob
Bayes
DeMorgan
Venn
Mathematicians for 300.

He is related to counting number of Pirates arriving to a certain area per unit of time. (famous Pirate?)

Bernoulli
Poisson
Bonferoni
Buffon
Jacob
Bayes
DeMorgan
Venn
Mathematicians for 400.

He is related to the probability of a union of sets (not necessarily disjoint).

Bernoulli
Poisson
Boole
Buffon
Jacob
Bayes
DeMorgan
Venn