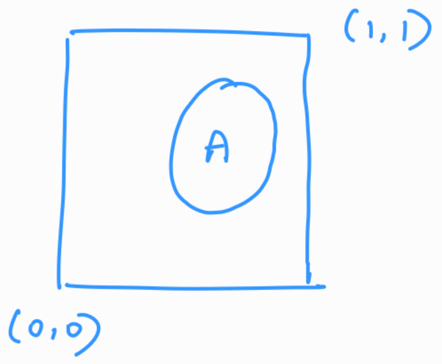
CONTINUOUS RV

→ Ω has to be uncountable for a continuous RV to be defined on it.

Let Ω : $\{(x,y) : 0 \le x \le 1,\ 0 \le y \le 1\}$.



$\mathcal{F}$: all subsets of Ω.

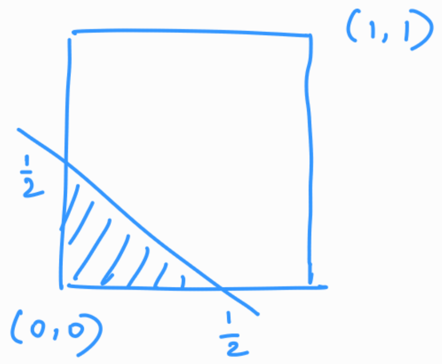
Uniform distribution (discrete)

Random experiment : Throw a dart of 1×1 square area.

$P(A) = \text{Area}(A)$ (One of the probability laws).

$0 < (\ ) < 1$ and additive. } so valid prob. law

$P((x,y) : x+y \le \frac{1}{2}) = \frac{1}{8}$



$P(\{0.4, 0.6\}) = 0$ ($\because$ Area of a point is zero).

→ $\Omega = \bigcup_{w \in \Omega} \{w\}$ and $P(\{w\}) = 0$

But we know that $P(\Omega) = 1$.

But $\sum_{w \in \Omega} P(w) = 0$.

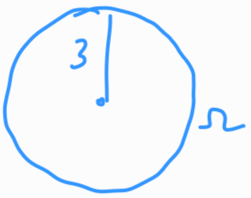
Something wrong here

Can't be written like this.

∵ Additivity holds only for a sequence.

But here we have uncountable ω.

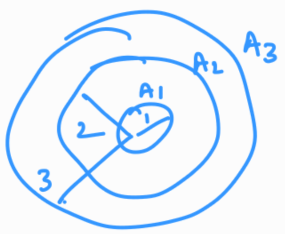
Eg:



$$\Omega = \{(x,y) : x^2+y^2 < 9\}.$$

$$P(A) = \frac{\text{area}(A)}{9\pi}$$

Suppose the dart falls within radius 1, then we get some score ||ly within radius 2 — some score.



$$A_k = \{(x,y) : k-1 \le \sqrt{x^2+y^2} \le k\}.$$

$$k = 1, 2, 3.$$

$$U(\omega) = k \iff \omega \in A_k.$$

Discrete RV.

Score

$$V(\omega) = V((x,y)) = \sqrt{x^2+y^2}$$

Continuous RV.

Compute F_U, F_V.

$$F_X(x) = P(X \le x)$$

$$P(X \le 1) = \frac{1}{9}$$

$$P(X \le 2) = \frac{4}{9}$$

$$P(X \le 3) =$$