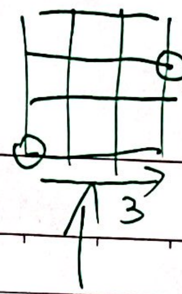
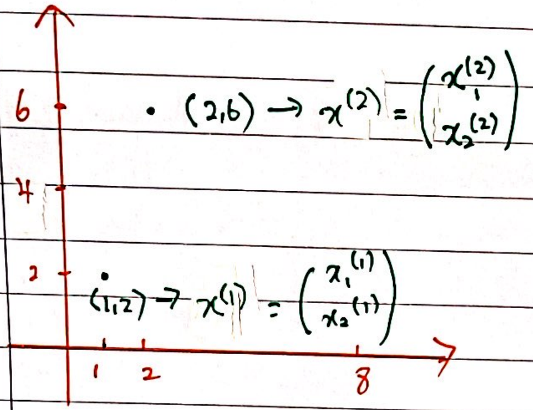


Intuition of taxi travelling.
Taxi cannot travel diagonally.
$\rightarrow L_1 = 3+2 = 5$ units

DATE: NO:

2-d space



$$L_1 \text{ Norm} = \|x^{(1)} - x^{(2)}\|_1 = \sum_{i=1}^{2} (x_i^{(1)} - x_i^{(2)})$$
$$= (1) + (4) = 5$$

$$L_2 \text{ Norm} = \|x^{(1)} - x^{(2)}\|_2 = \left(\sum_{i=1}^{2} (x_i^{(1)} - x_i^{(2)})^2\right)^{1/2}$$
$$= \sqrt[2]{1^2 + 4^2}$$
$$= \sqrt{17}$$

- We first look at distances in 2-dimensional space, we can then generalize to n-dimensional space.

L_1 - Norm Manhattan

Let $\vec{p}, \vec{q}$ be two vectors in the n-dimension space $\mathbb{R}^n$. Then the L_1-Norm

$$d_1(\vec{p}, \vec{q}) = \|\vec{p} - \vec{q}\| = \sum_{i=1}^{n} |p_i - q_i|$$

where $\vec{p}, \vec{q}$ are vectors of the form $\vec{p} = (p_1, p_2 \dots, p_n)$
$\vec{q} = (q_1, q_2 \dots q_n)$

L_2 - Norm Euclidean

Let $\vec{p}, \vec{q}$ be defined similarly as L_1 - Norm. Then the L_2-Norm is

$$d(\vec{p}, \vec{q}) = \|\vec{p} - \vec{q}\|_2 = \left[\sum_{i=1}^{n} (p_i - q_i)^2\right]^{1/2}$$

L_p - Norm Minkowski

Let $\vec{p}, \vec{q}$ be defined similarly as L_1-Norm, then the L_p Norm is

$$d(\vec{p}, \vec{q}) = \|\vec{p} - \vec{q}\|_p = \left[\sum_{i=1}^{n} (p_i - q_i)^p\right]^{1/p}.$$