Methods for Distance Calculation

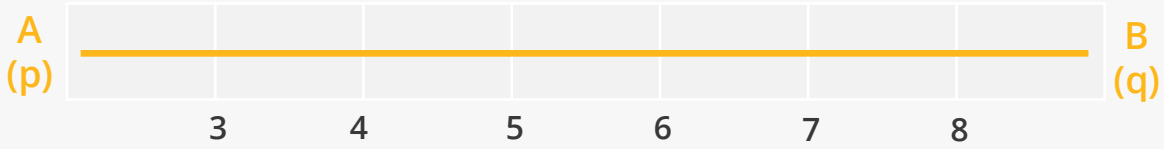
1. Manhattan Distance
2. Euclidean Distance
3. Hamming Distance

Manhattan Distance

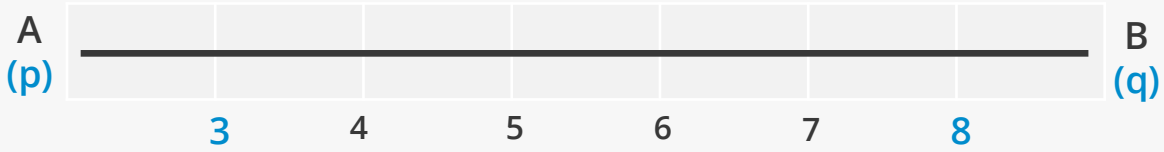
$$d = |p1 - q1| + |p2 - q2| \ldots\ldots\ldots\ldots + |p_n - q_n|$$

Manhattan Distance

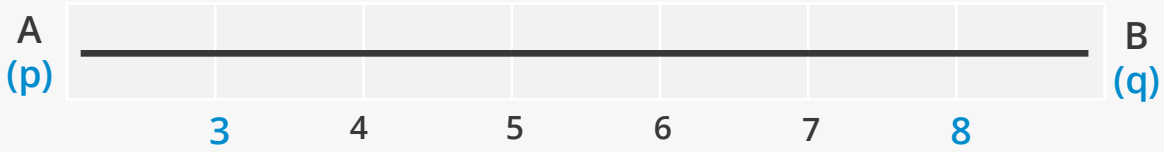
Manhattan Distance



Manhattan Distance



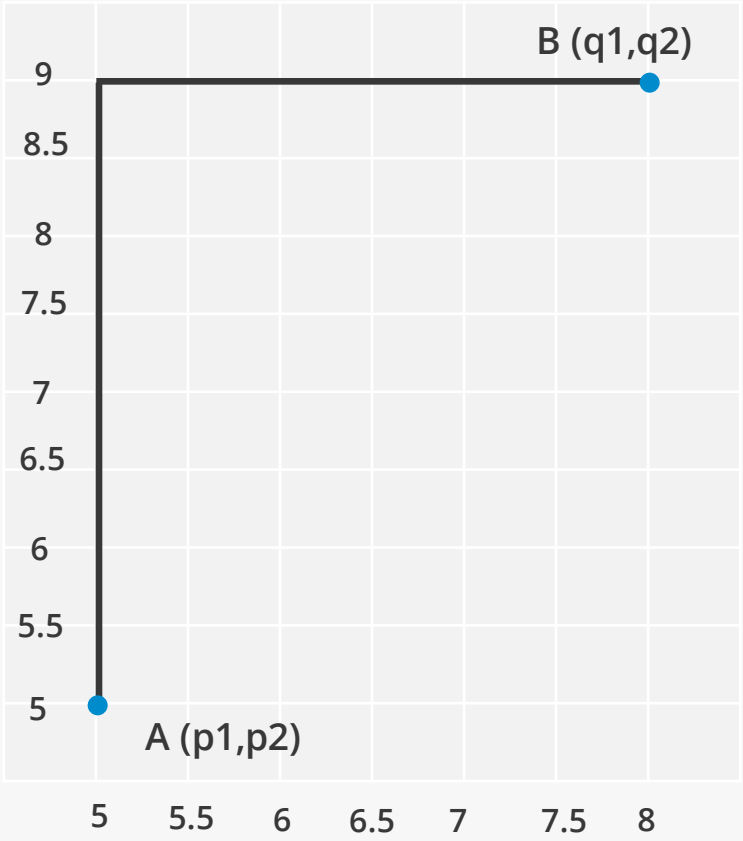
Manhattan Distance



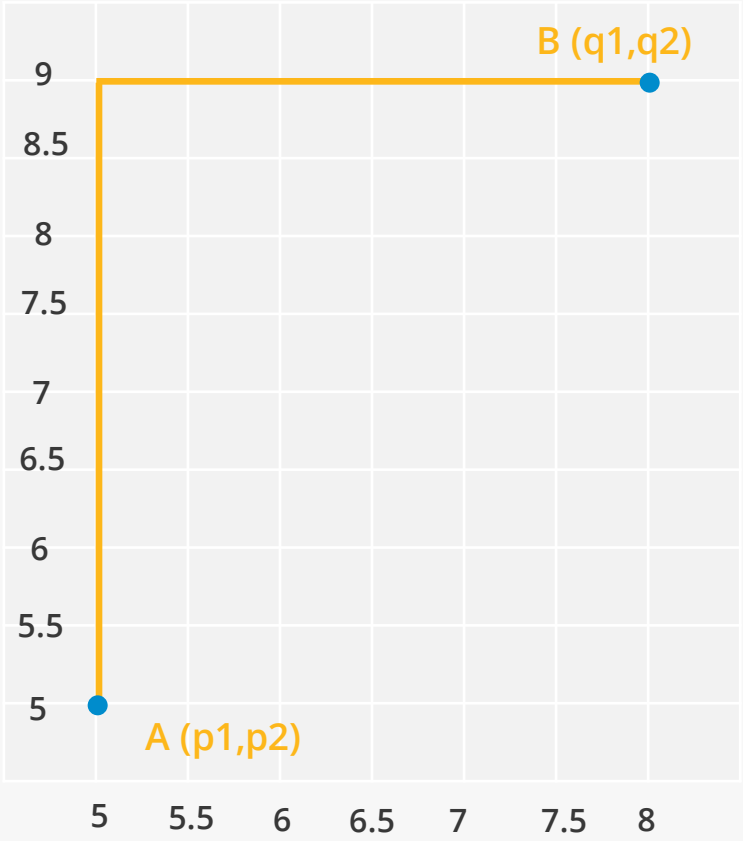
Distance = |p – q|

= |3 - 8| = 5 units

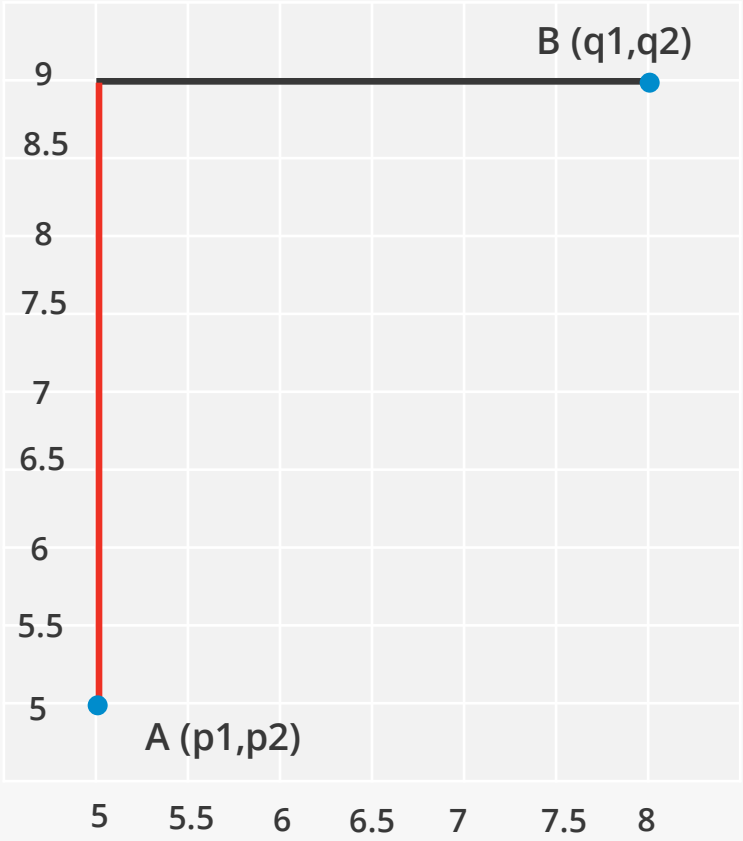
Manhattan Distance



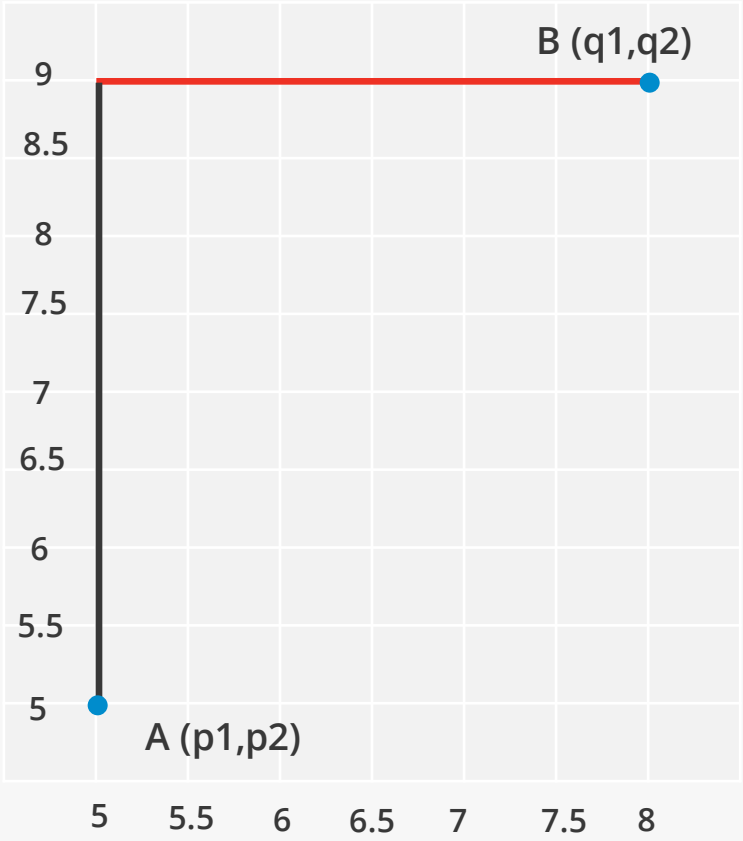
Manhattan Distance



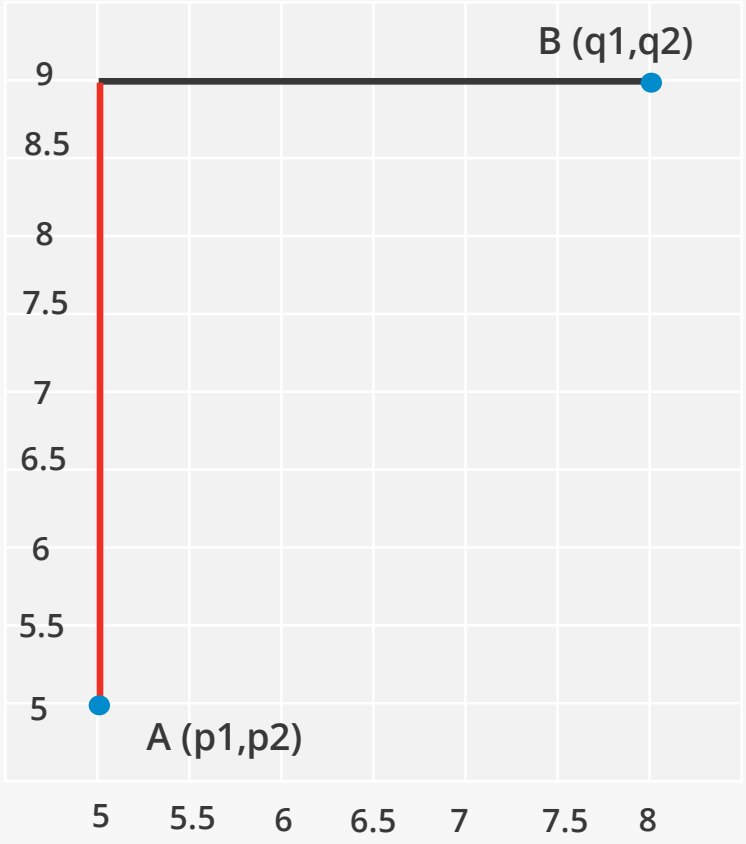
Manhattan Distance



Manhattan Distance

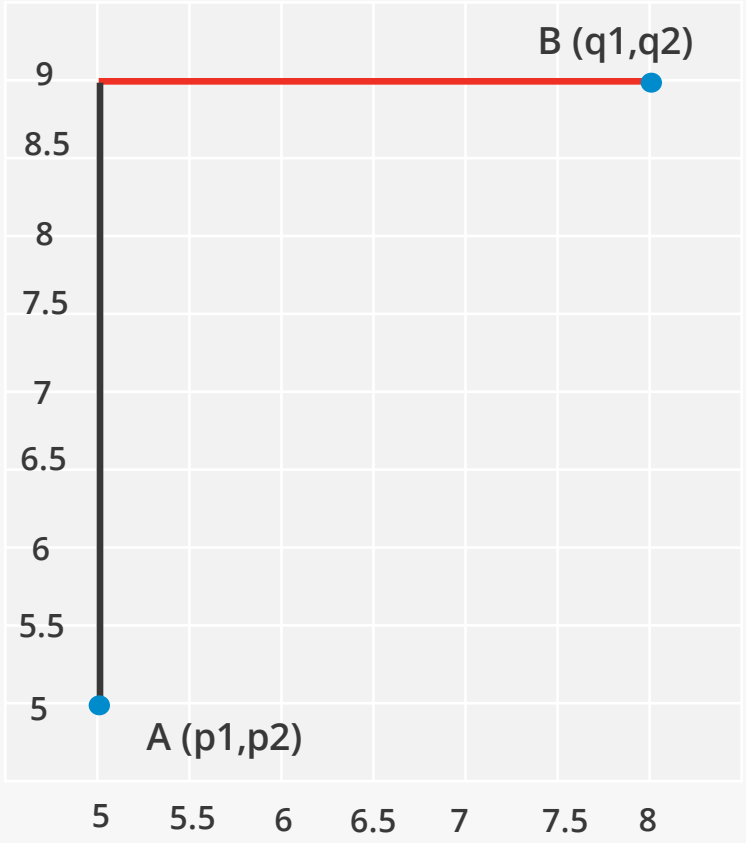


Manhattan Distance



Distance = |p1 – q1| +

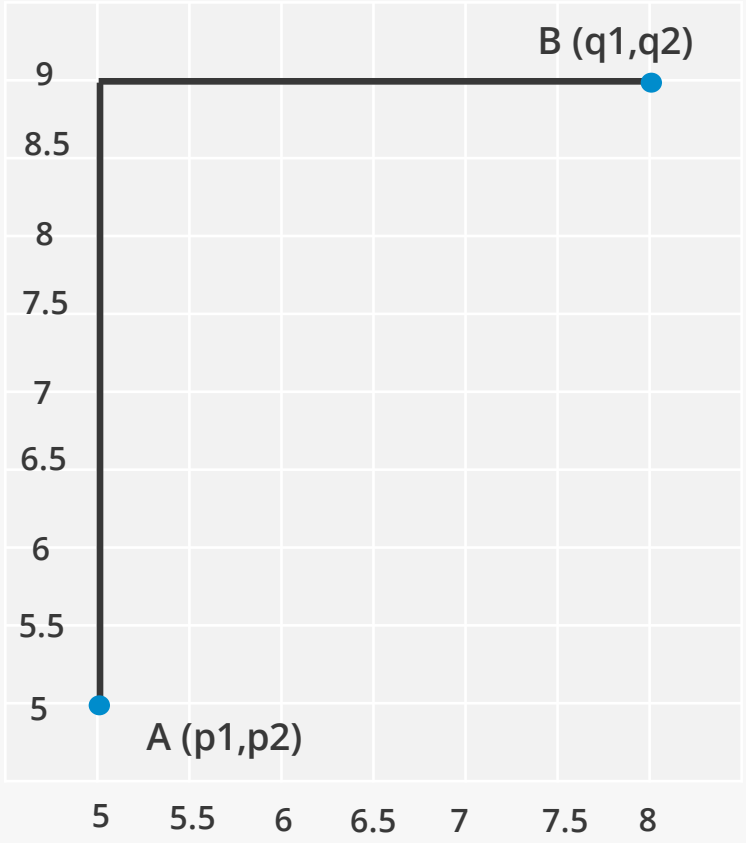
Manhattan Distance



$$\text{Distance} = |p1 - q1| + |p2 - q2|$$

$$= $$

Manhattan Distance



Distance = $|p1 - q1| + |p2 - q2|$

$= |5 - 8| + |5 - 9|$

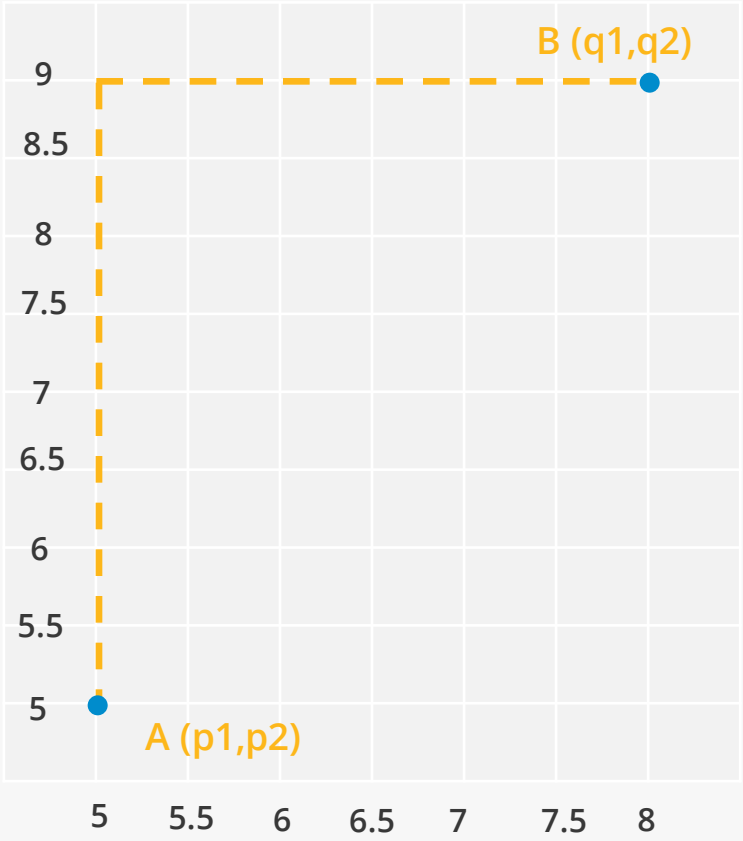
$= 3 + 4 =$ **7 Units**

Manhattan Distance

Distance for n dimensions:

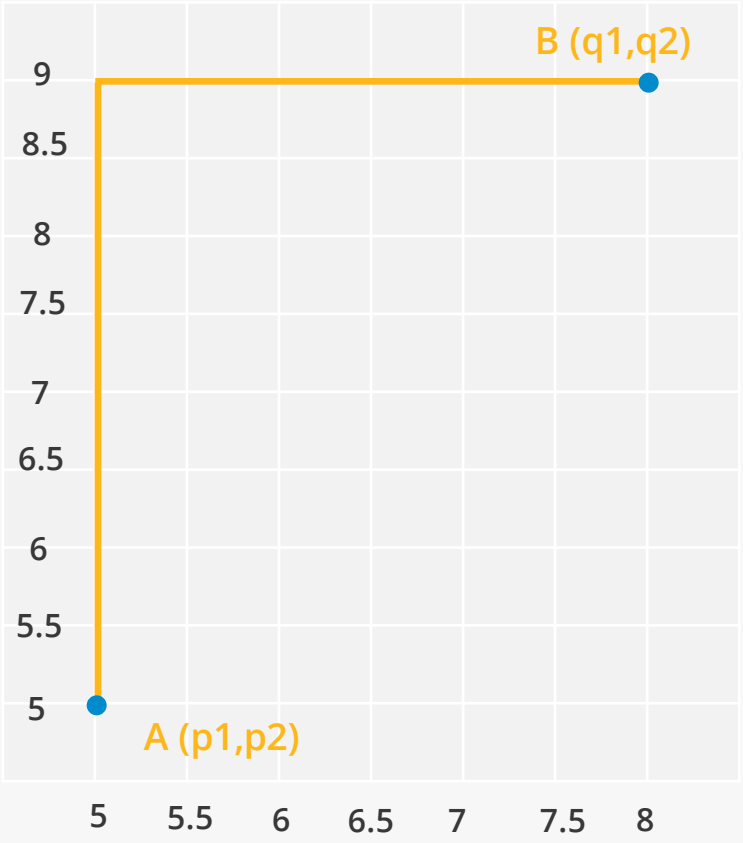
$$d = |p1 - q1| + |p2 - q2| ..... + |p_n - q_n|$$

Manhattan Distance



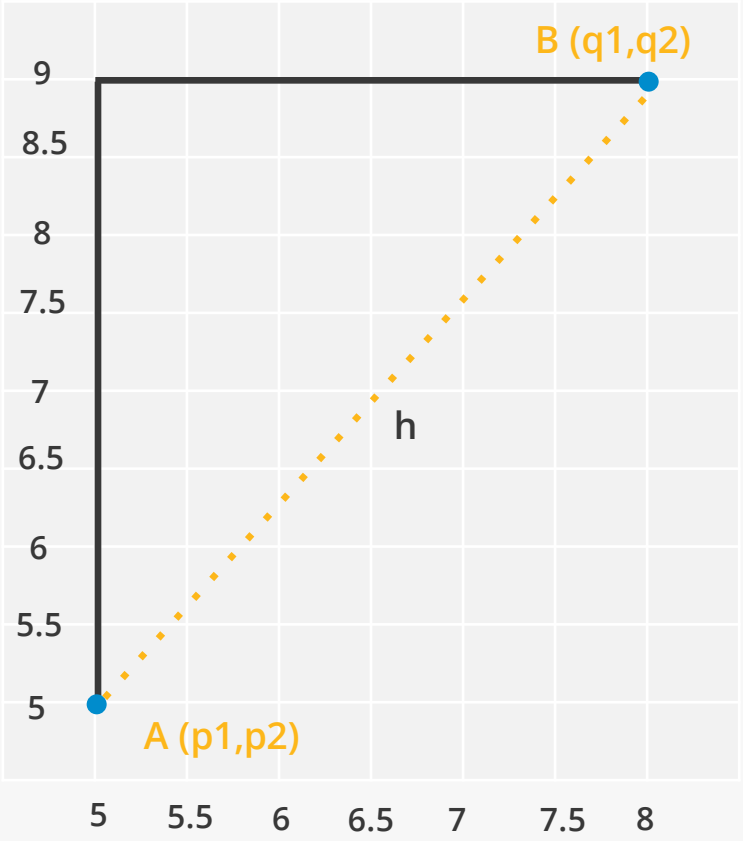
Euclidean Distance

Euclidean Distance



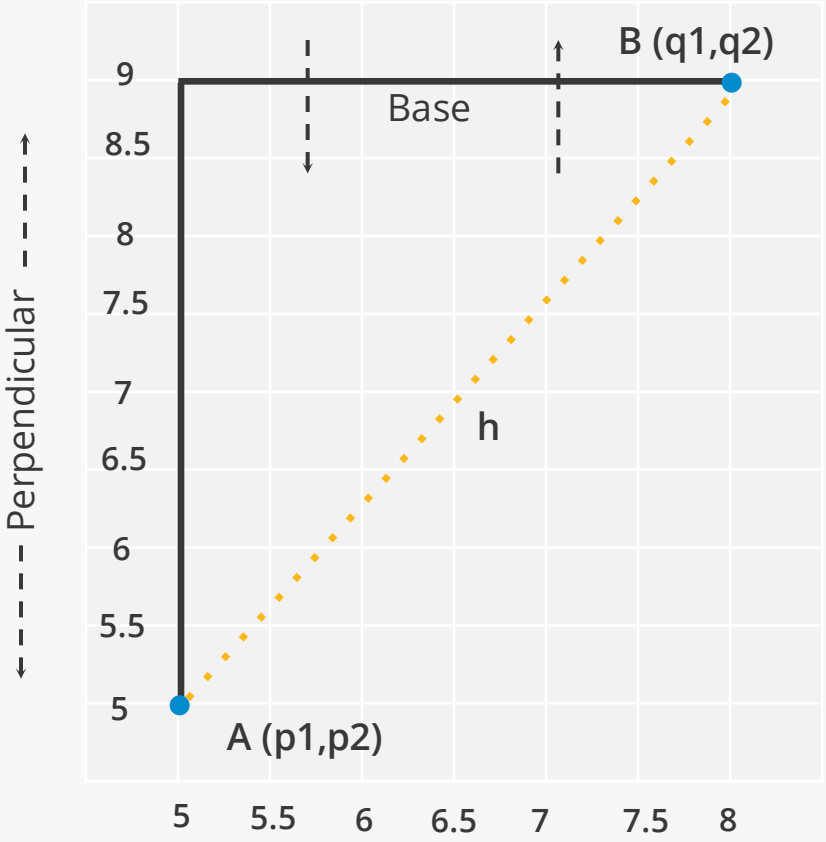
Distance between A and B
= **7 Units**

Euclidean Distance



Distance between A and B
= **7 Units**

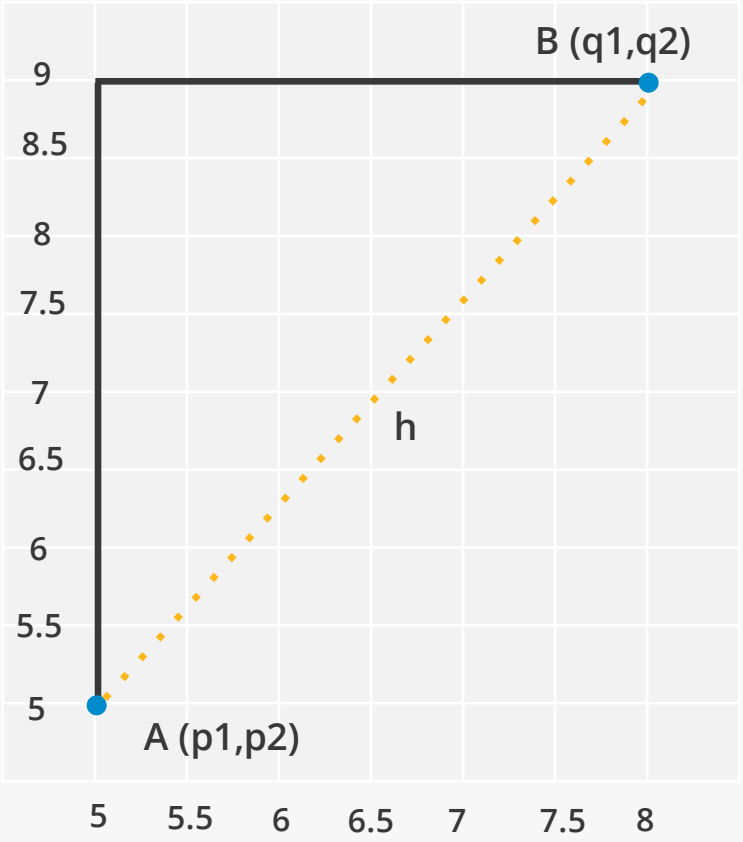
Euclidean Distance



Pythagoras Theorem

$$\sqrt{base^2 + perpendicular^2} = c$$

Euclidean Distance



$$\sqrt{(p1 - q1)^2 + (p2 - q2)^2}$$

$$= \sqrt{(5 - 9)^2 + (5 - 8)^2}$$

$$= \sqrt{4^2 + 3^2}$$

$$= \mathbf{5\ Units}$$

Euclidean Distance

Shortest distance between 2 points for n dimensions:

$$d = \left((p1 - q1)^2 + (p2 - q2)^2 \ldots\ldots\ldots\ldots + (p_n - q_n)^2 \right)^{1/2}$$

Euclidean Distance

Shortest distance between 2 points for n dimensions:

$$\left[\sum_{i=1}^{n} (p_i - q_i)^2\right]^{1/2}$$

Distance between 2 categorical variables

Hamming Distance

Hamming Distance

The Hamming Distance is the total number of differences between two strings of identical length. **Identical length** implies that the number of characters in both strings should be the same.

Hamming Distance: Example

ID	Gender	Strings
A	Male	‘0’
B	Female	‘1’
C	Male	‘0’

Hamming Distance: Example

ID	Gender	Strings
A	Male	**‘0’**
B	Female	**‘1’**
C	Male	‘0’

Hamming Distance: Example

ID	Gender	Strings
A	Male	‘0’
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Hamming Distance: Example

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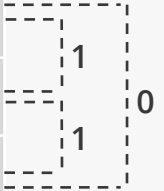

Hamming Distance: Example

ID	Gender	Marital Status	Employment Status
A	Male	Married	Self Employed
B	Female	Married	Salaried
C	Male	Unmarried	Unemployed

Hamming Distance: Example

ID	Gender	Marital Status	Employment Status
A	‘0’	‘0’	‘1’
B	‘1’	‘0’	‘2’
C	‘0’	‘1’	‘3’

Hamming Distance: Example

ID	Gender	Marital Status	Employment Status	Strings
A	‘0’	‘0’	‘1’	**‘001’**
B	‘1’	‘0’	‘2’	**‘102’**
C	‘0’	‘1’	‘3’	**‘013’**

Hamming Distance: Example

ID	Gender	Marital Status	Employment Status	Strings
A	‘0’	‘0’	‘1’	‘001
B	‘1’	‘0’	‘2’	‘102’
C	‘0’	‘1’	‘3’	‘013’

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2

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2

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