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1) $\rightarrow (0,0,0)$ & $(1,1,1)$.

Distance formula $\rightarrow$ $d(x,y) = \sum((x_i - y_i)^3)$.

$d((0,0,0),(1,1,1)) = (0-1)^3 + (0-1)^3 + (0-1)^3$

$= -1 + -1 + -1$

$= -3$

There fore the function is not a proper distance function as the distance we got is negative. A proper distance function will give a non-negative distance.

Further $d(x,y)$ must be equal to $d(y,x)$ but here $\rightarrow$ $d((0,0,0),(1,1,1)) = -3$

$d((1,1,1),(0,0,0)) = (1-0)^3 + (1-0)^3 + (1-0)^3$

$= 3$.

$$d(x,y) \neq d(y,x)$$

7. 1,000,000 individuals $\Rightarrow \div 10,000 = 100$ [for ease]

20% of population is Ovlp +ve $\Rightarrow 0.2 \times 100$

$= 20\%$.

$P(+ve/sick) = \dfrac{P(+ve \cap sick)}{P(sick)} = \dfrac{0.95}{0.2} =$

$P(sick/+ve) = 0.95$ $\boxed{\begin{array}{l} P(+ve|sick) = 0.95. \\ P(sick) = 0.2. \end{array}}$

$P(sick|+ve) = \dfrac{P(+ve \cap sick)}{P(+ve)}$.

$P(+ve \cap sick) = P(+ve|sick) P(sick)$ $\qquad \therefore P(+|sick) = \dfrac{P(+ve \cap s)}{P(sick)}$

$\therefore P(sick|+ve) = \dfrac{P(+ve|sick) P(sick)}{P(+ve)}$

$$P(+ve) = P(+ve \cap sick) + P(+ve \cap healthy)$$
$$= P(+ve | sick) P(sick) + P(+ve | healthy) P(healthy)$$

$$P(healthy) = 1 - P(sick) = 1 - 0.2 = 0.8.$$

$$\therefore P(+ve) = 0.95 \times 0.2 + 0.1 \times 0.8.$$
$$= 0.19 + 0.08$$
$$= 0.27.$$

$$\therefore P(sick | +ve) = \frac{0.95 \times 0.2}{0.27}$$
$$= \frac{0.19}{0.27} = 0.7037.$$

$$P(sick | -ve) = \frac{P(-ve | sick) P(sick)}{P(-ve)}.$$
$$= \frac{[1 - P(+ve | sick)] P(sick)}{1 - P(+ve)}$$
$$= \frac{0.05 \times 0.2}{0.73}$$
$$= 0.0136\%$$

$\therefore$ Probability that an individual who tested positive is actually sick is 70.37%.

Probability that an individual who tested negative is actually sick is 1.36%.