Naive Bayes Classifier
Intution

Chennai (CSK)

	toss	Venue	outlook	Result
1	won	Mumbai	Overcast	won
2	lost	chennai	Sunny	won
3	won	Kolkata	Sunny	won
4	won	chennai	Sunny	won
5	lost	mumbai	Sunny	Lost
6	won	Chennai	overcast	Lost
7	won	Kolkata	overcast	Lost
8	won	mumbai	Sunny	won

Q. we have to fixed (given) this {lost, mumbai, Sunn will CSK win or lose.

$$P(w / lost \cap mumba \cap Sunny) \quad and$$
$$P(L / lost \cap mumbai \cap Sunny)$$

* Using Bayes Theorem,

$$\boxed{P(A/B) = \frac{P(B/A) \times P(A)}{P(B)}}$$

① = $\underbrace{P(w /}_{A} \underbrace{lost, mumbai, Sunny)}_{B}$ =

$$\frac{P(lost, mumbai, Sunny / w) \times P(w)}{P(lost, mumbai, Sunny)}$$

② $\underbrace{P(L /}_{A} \underbrace{Lost, mumbai, Sunny)}_{B}$ =

$$\frac{P(lost, mumbai, Sunny / L)(P(w))}{P(lost, mumbai, Sunny)}$$

* we will not calculate Denominator because Denominator is same for both equation and it will not provide any information.

So, $P(w \mid lost, mumbai, sunny) =$

$$\frac{P(lost, mumbai, sunny) \; P(w)}{P(lost \mid w) \times P(mumbai \mid w) \; P(sunny \mid w) \times P(w)}$$

we are adding Naive Bayes Assumption in above equation.
Naive Bayes add this Assumption because we are asking very specific question

Here, P(lost, mumbai sunny) and generally this type of specific question are not present in data set and if we do not add this Assumption the output of the specific question will be (0) and Naive Bayes will not perform well.

Now $P(w \mid lost, mumbai, sunny) =$

$$= P(lost \mid w) \times P(mumbai \mid w) \times P(sun \mid w) \times P(w)$$

In our dataset

$$= \frac{1}{5} \times \frac{2}{5} \times \frac{4}{5} \times \frac{5}{8} = \boxed{0.04}$$

$P(L \mid lost, mumbai, sunny) =$

$= P(lost, mumbai, sunny \mid L) \times P(L)$

$= P(lost \mid L) \times P(mum \mid L) \times P(sun \mid L) \times P(L)$

$$= \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{3}{8}$$

$= \boxed{0.013}$

so, $0.04 > 0.013$

meaning
If TOSS = Lost
    Venue = Mumbai
    Outlook = Sunny

$\boxed{CSK \text{ will win}}$