

## Task 1

Given the table below.

Some simplification is used here:

- no=0, yes=1, sometimes=0.5.
- mammals(**m**), reptiles(**r**), fishes(**f**), birds(**b**), amphibians(**a**)

Name	GiveBirth(B)	LayEggs(E)	CanFly(F)	LiveInWater(W)	HaveLegs(L)	Class(C)
human	1	0	0	0	1	<b>m</b>
python	0	1	0	0	0	<b>r</b>
salmon	0	1	0	1	0	<b>f</b>
whale	1	0	0	1	0	<b>m</b>
frog	0	1	0	0.5	1	<b>a</b>
komodo	0	1	0	0	1	<b>r</b>
bat	1	0	1	0	1	<b>m</b>
pigeon	0	1	1	0	1	<b>b</b>
cat	1	0	0	0	1	<b>m</b>
leopard shark	1	0	0	1	0	<b>f</b>
turtle	0	1	0	0.5	1	<b>r</b>
penguin	0	1	0	0.5	1	<b>b</b>
porcupine	1	0	0	0	1	<b>m</b>
eel	0	1	0	1	0	<b>f</b>
salamander	0	1	0	0.5	1	<b>a</b>
gila monster	0	1	0	0	1	<b>r</b>
platypus	0	1	0	0	1	<b>m</b>
owl	0	1	1	0	1	<b>b</b>
dolphin	1	0	0	1	0	<b>m</b>
eagle	0	1	1	0	1	<b>b</b>

What will be the predicted value for:  
<B=0, E=1, F=0, W=0.5, L=1> using Naïve Bayesian classification?

We need to compute for the probability of each class given x

$$x' = \langle B=0, E=1, F=0, W=0, L=1 \rangle$$

	$P(C=m x')$	$P(C=r x')$	$P(C=a x')$	$P(C=b x')$	$P(C=f x')$
$P(C)$	0.3500	0.2	0.1	0.2	0.15
$P(B=0 C)$	0.1429	1	1	1	0.6667
$P(E=1 C)$	0.1429	1	1	1	0.6667
$P(F=0 C)$	0.8571	1	1	0.75	1
$P(W=0.5, C)$	$\begin{aligned} &0.0000 \\ &\text{Laplace} = \frac{0+1}{7+4} = \\ &0.0909 \end{aligned}$	0.25	1	0.25	$\begin{aligned} &0 \\ &\text{Laplace} = \frac{0+1}{3+4} = \\ &0.1429 \end{aligned}$
$P(L=1 C)$	0.7143	0.75	1	2	$\begin{aligned} &0 \\ &\text{Laplace} = \frac{0+1}{3+14} = \\ &0.5882 \end{aligned}$
<b>Product</b>	$3.97748482 \times 10^{-4}$	0.0375	0.1	0.075	0.0056

The predicted value is amphibian.