[Dataset]

Example	shape	Contour		Filling		class
		Size	Shade	Size	Shade	
ex1	Circle	Thick	Gray	Thick	Dark	positive
ex2	Circle	Thick	white	Thick	Dark	"
ex3	Tri-angle	Thick	Dark	Thick	Gray	"
ex4	Circle	Thin	white	Thin	Dark	"
ex5	square	Thick	Dark	"	white	"
ex6	Circle	Thick	white	"	Dark	"
ex7	Circle	Thin	Gray	Thick	white	"
ex8	square	Thin	Gray	Thin	Gray	"
ex9	Triangle	Thin	Dark	Thick	white	negative
ex10	square	Thin	Dark	"	white	"
ex11	Circle	Thick	Gray	"	white	"
ex12	square	Thick	white	"	Gray	"
ex13	Tri-angle	Thin	Gray	Thin	Dark	"
ex14	Circle	Thick	Dark	Thick	white	"
ex15	square	Thick	white	"	Dark	"
ex16	Tri-angle	Thick	white	"	Gray	"

A classifier is defined with the following conjunction to classify "positive class"

[(shape = Circle) AND (contour-shade = White)]

Q) Calculate True Positive, False Positive, True Negative, False Negative,

~ defination:-

TP → Correctly classified as Positive

FP → Incorrectly " " "

TN → Correctly " " Negative

FN → Incorrectly " " "

given classifier,

$$\left[(\text{Shape} = \text{Circle}) \text{ AND } (\text{Circle-Shade} = \text{White})\right]$$

applying this classifier to each example we get:

TP: classifier predicts Positive if shape is "Circle" & Circle shade is "White"

ex:- ex2, ex6, ex4

count:- 3

FP: predicts Positive, but true class is negative

ex:- None (as all cases with shape, Circle with Circle-shade white are Positive)

count:- 0

TN: predicts negative when shape is not "Circle" or Circle-shade is not "White"

ex:- ex9, ex10, ex11, ex12, ex13, ex14, ex15, ex16

count: 8

- FN: Classifier predicts negative but true class is Positive.

ex:- ex1, ex3, ex5, ex7, ex8

count:- 5

=> Calculations:-

TP: $\frac{3}{16} \times 100 = 18.75\%$, FP: 0%

TN: $\frac{8}{16} \times 100 = 50\%$, FN: 31.25%

b) Calculate Accuracy & Error:

Accuracy, $\frac{TP + TN}{Total} = \frac{3+8}{16} \times 100 = 68.75\%$

Error, $100\% - 68.75\% = 31.25\%$

c) Redefine classifier with expression that will increase accuracy predicting "Positive" class accurately:

=> (shape = circle) AND (crust-shade = white)

(shape = circle AND filling-shade = Dark)

OR

(crust-shade = white AND filling-shade = Dark)

OR

(shape ≠ circle AND crust-shade ≠ white)

This classifier will correctly classify all "Positive" examples.

d) Redefine classifier to make Error = 100%

to make Error = 100%, classifier must incorrectly classify every example,

so, [(shape ≠ circle) OR (crust-shade ≠ white)]

this will 100%, result in every prediction as incorrect, which will led to 100% error,

e) classifier expression for predict "ex 9, 10, 11, 13, 14" is :-

⇒ [(crust-shade ≠ white) AND (filling-shade = white OR shape ≠ circle)]

This classifier captures ex 9, ex 10, ex 11, ex 13 & ex 14.