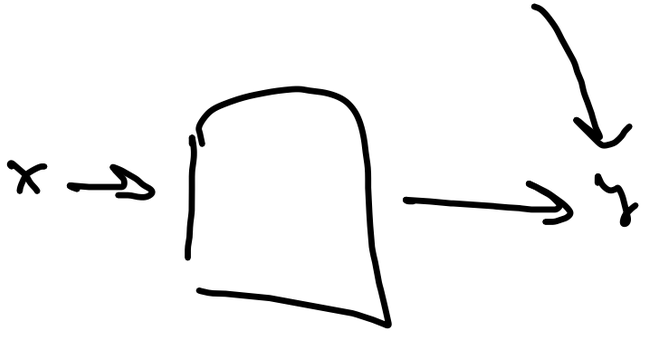
y

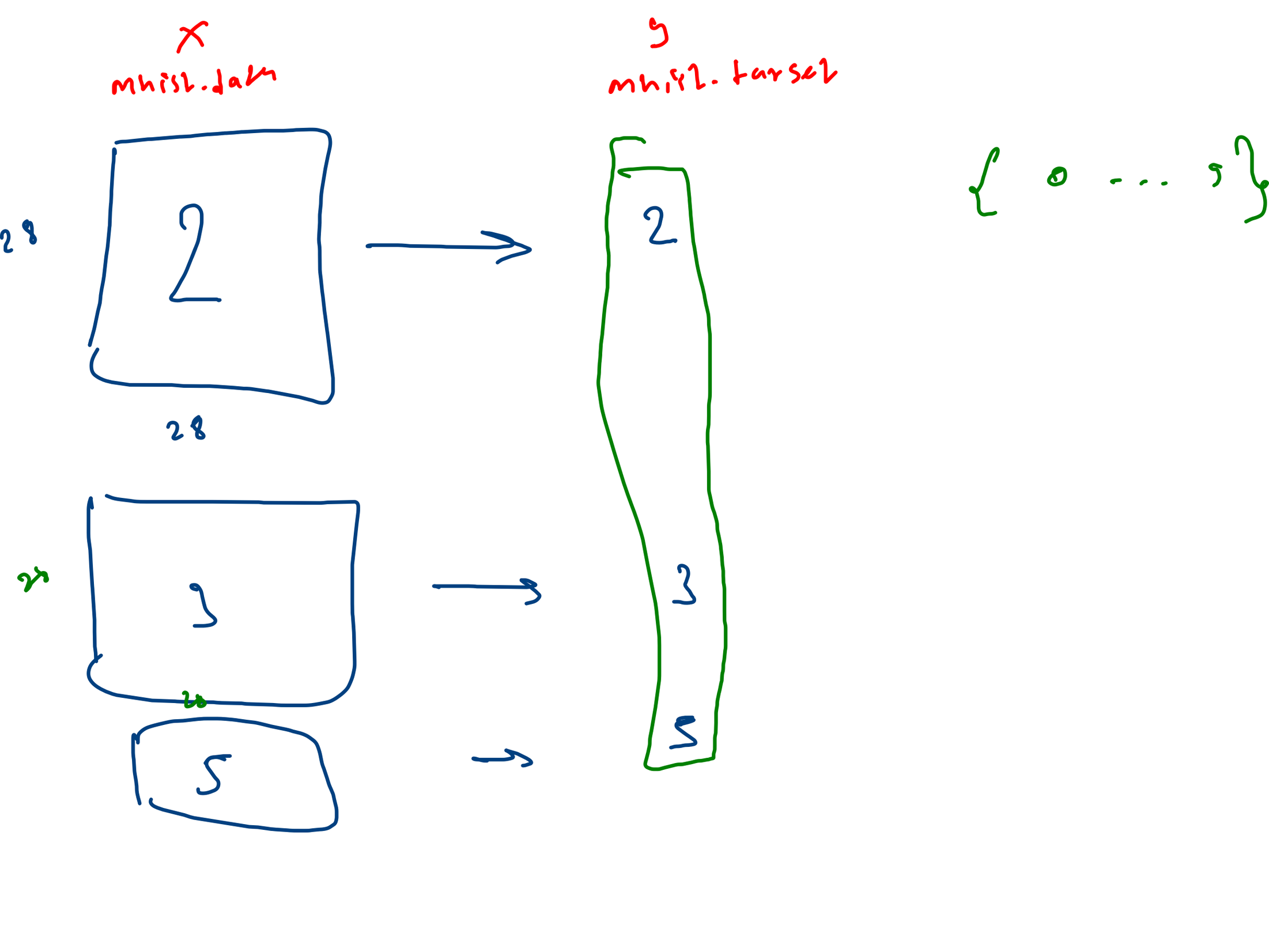
Regression ← infinite set $\{0.1, 0.2, \ldots, 0.01\}$ - y

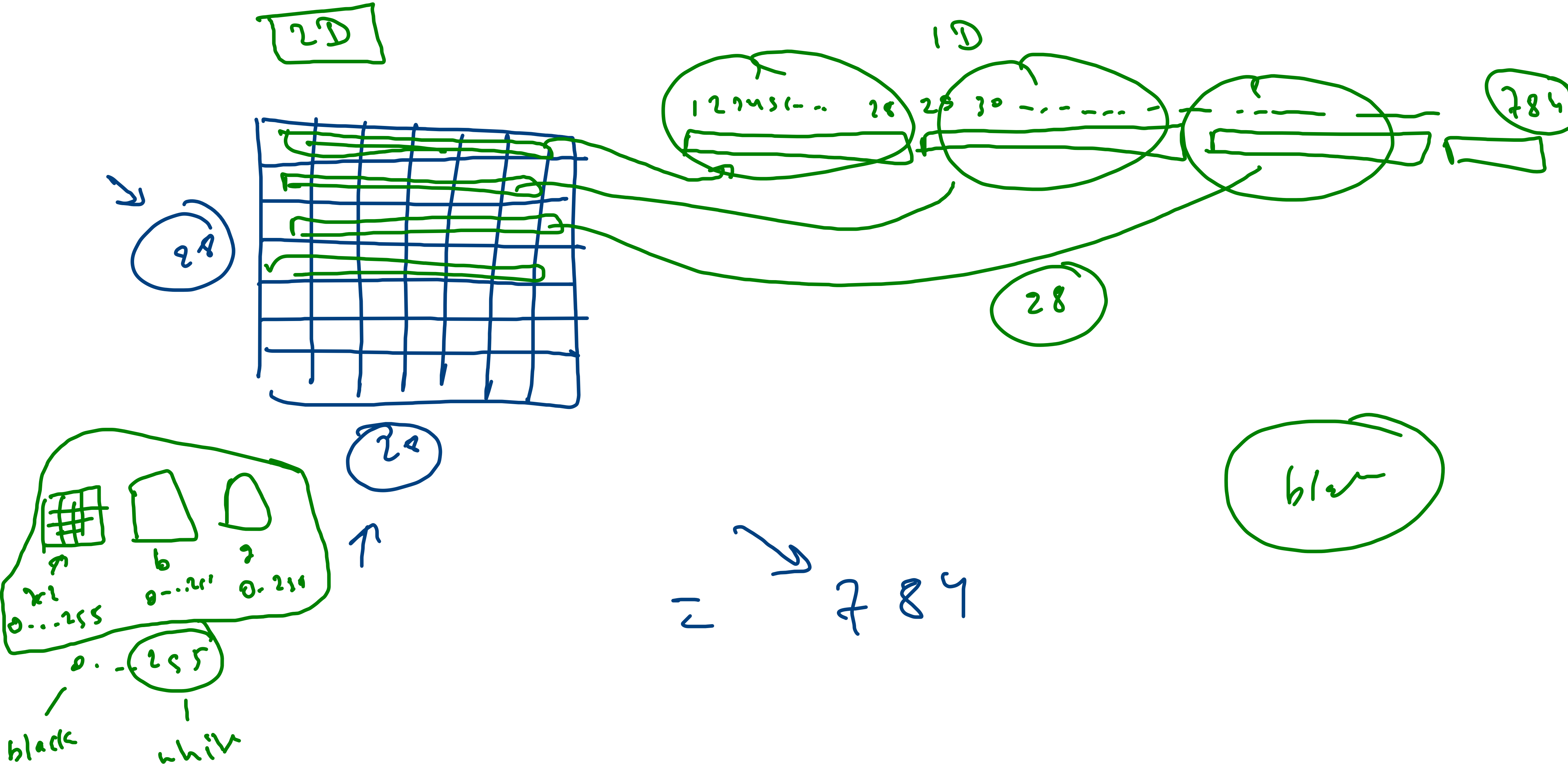
Classification

finite set

$\{0, 1, ?\}$

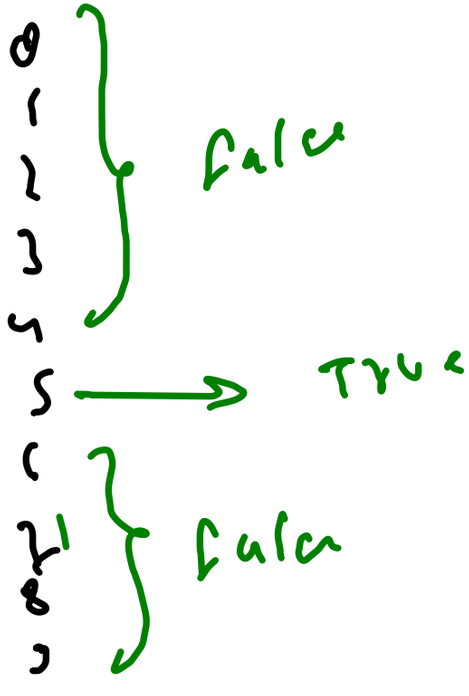



X
mnist.data
y
mnist.target
{ 0 ... 9 }
28
2
28
n
1
2
3
5


2D
1D
28
28
784
28
0...255
black
white
784

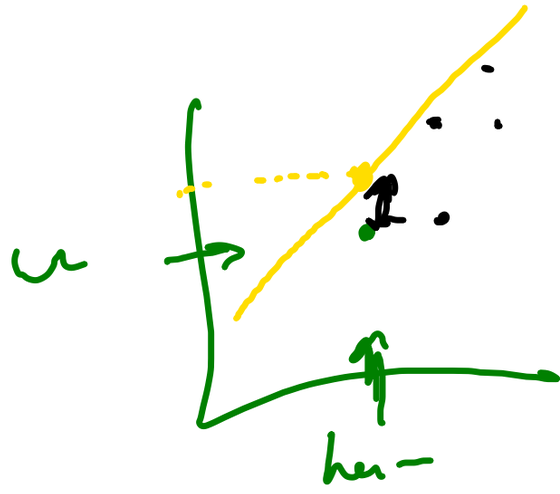
multi class classification → >2 classes {0, 1, ...}

binary class classification → 2 classes {0, 1}



{0, 1}

Squared error $\rightarrow \sum (y_{act} - y_{pred})^2$



Mean error $\rightarrow \dfrac{\sum (y_{act} - y_{pred})^2}{N}$

True

False

image

$$\text{accuracy} = \frac{\text{correct predictions}}{\text{total predictions}}$$

Correct + wrong

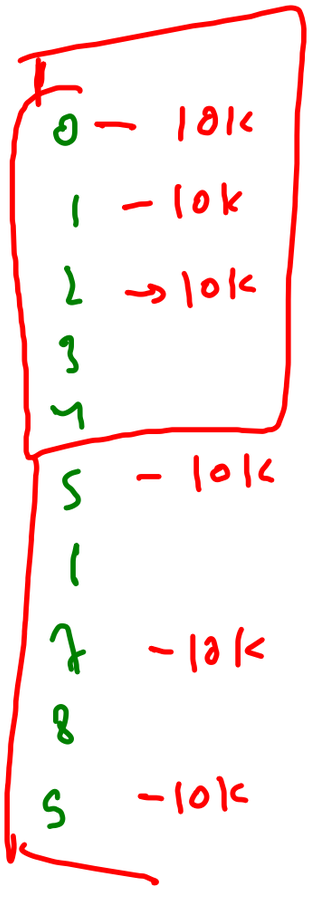
Cor

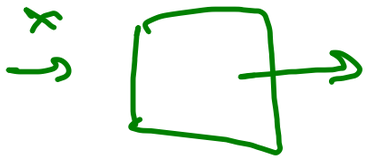
Cor + Inc

metric system

$n < 5$

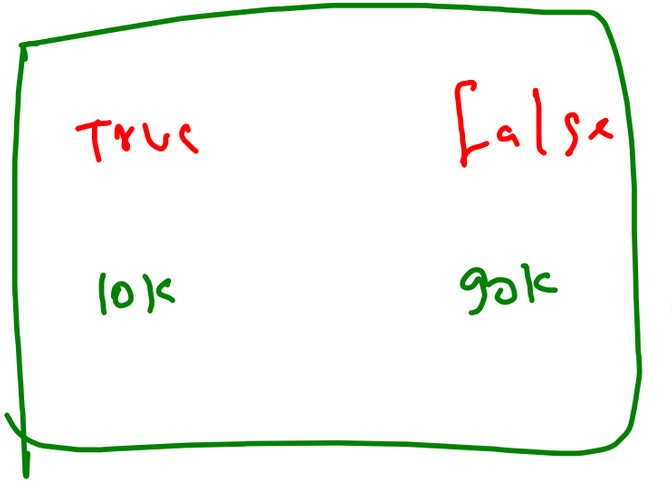
$n \geq 5$





accuracy → α

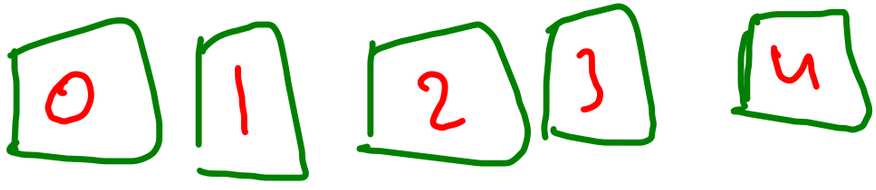
$$\frac{\text{Total correct}}{\text{Total}} \rightarrow \frac{90}{100}$$



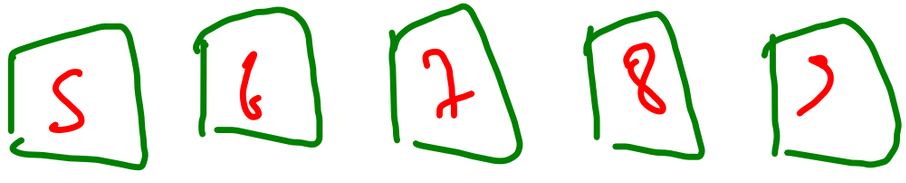
← not a balanced dataset

$$\frac{9}{10} = 0.9$$

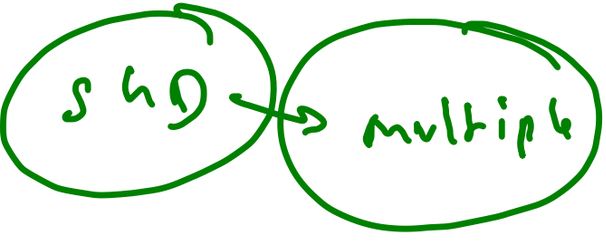
< 5

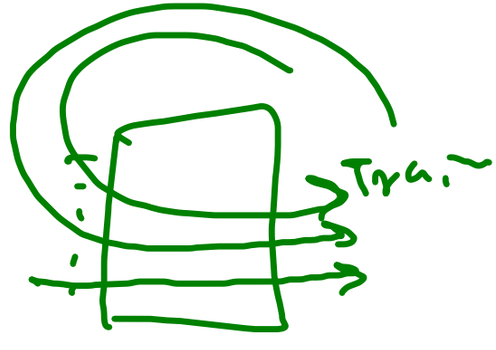


→ True

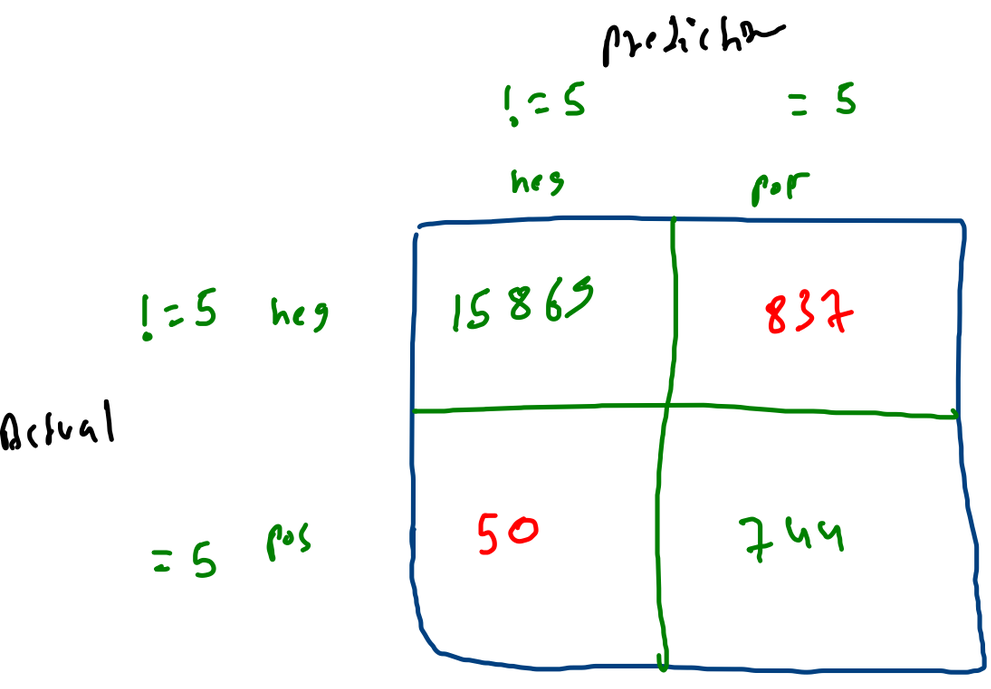


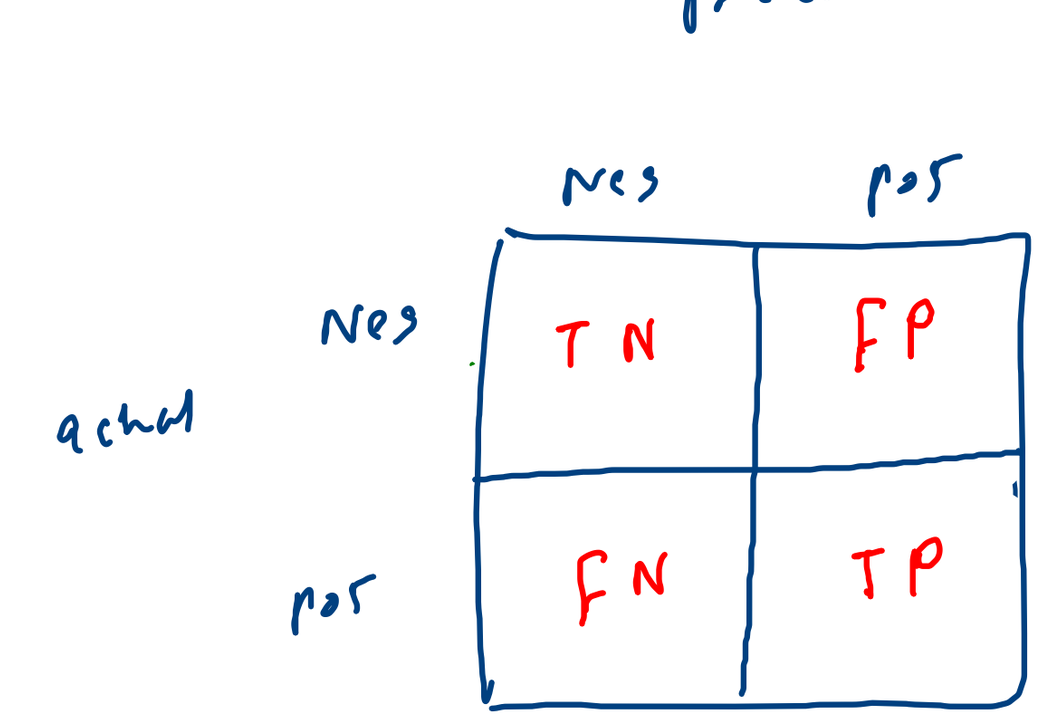
→ False

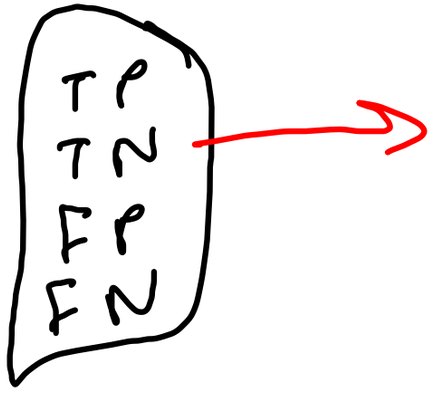




Confusion Matrix





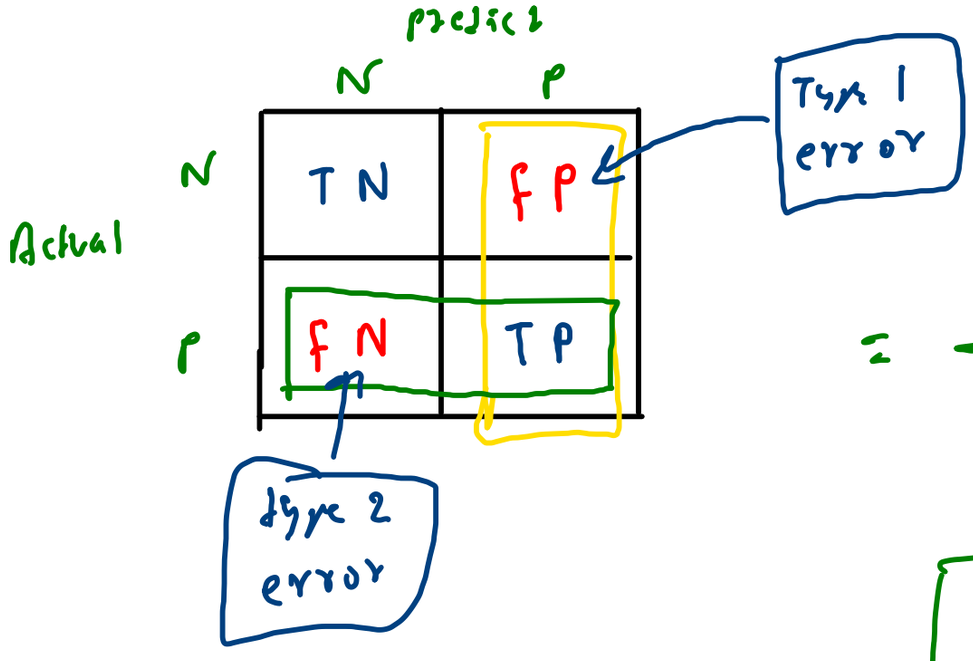


Precision

$$= \frac{TP}{TP + FP}$$

FP → Type 1 error

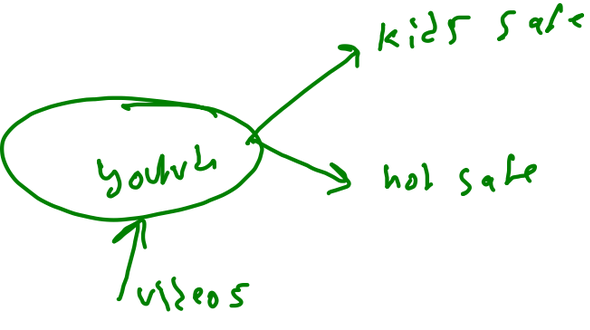
youtube kids video safe ↑

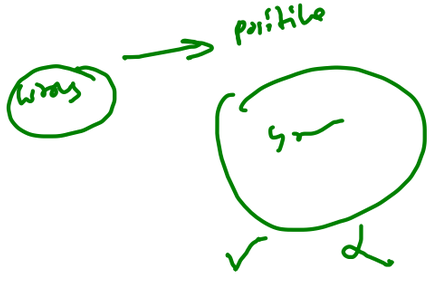


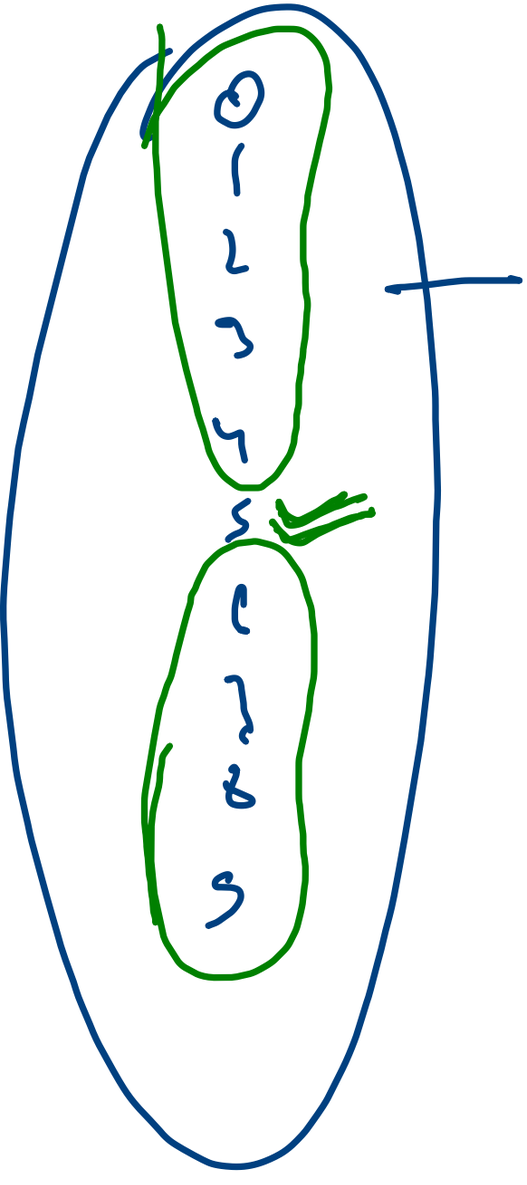
Recall

$$= \frac{TP}{FN + TP}$$

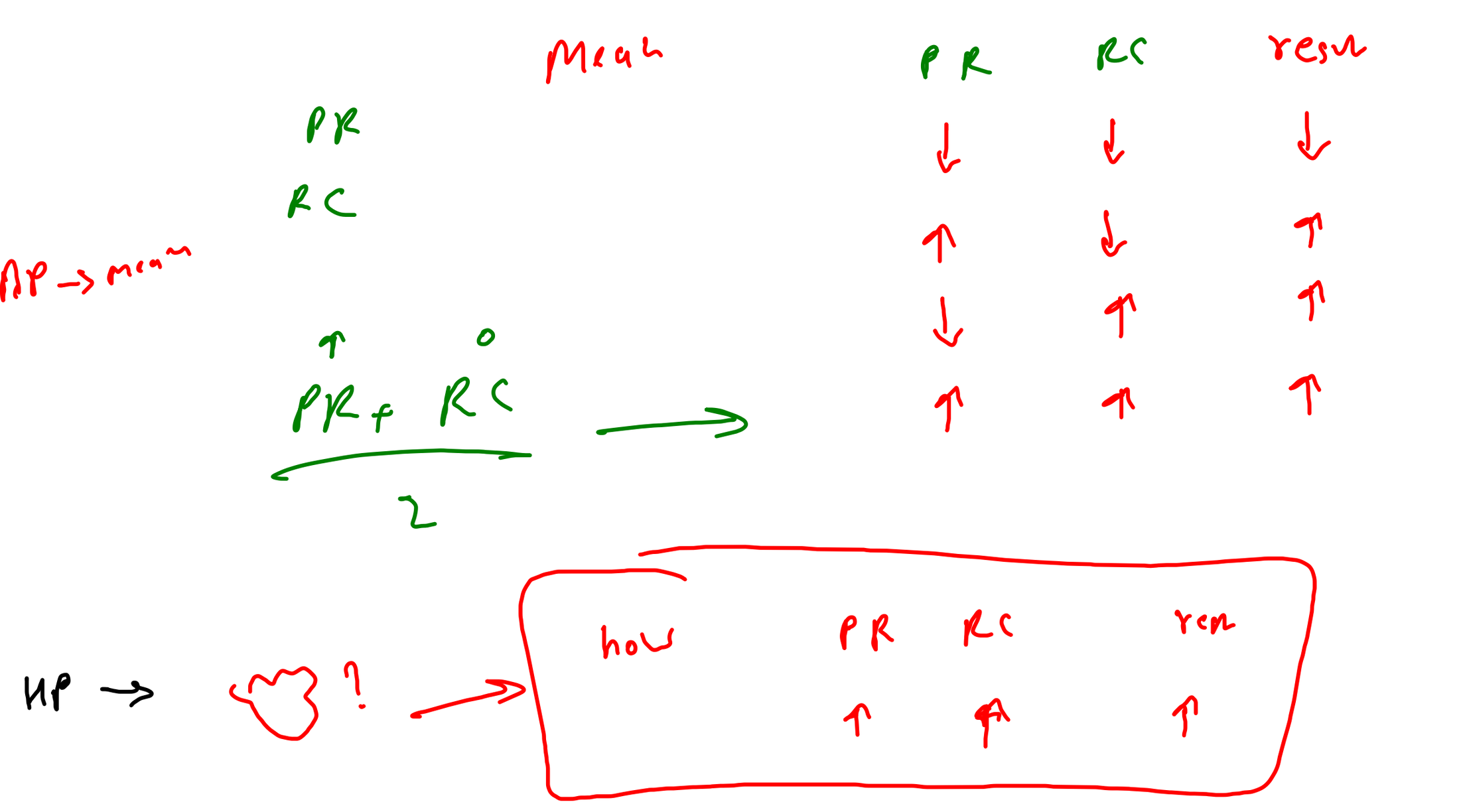
Report post shop lifter ↑

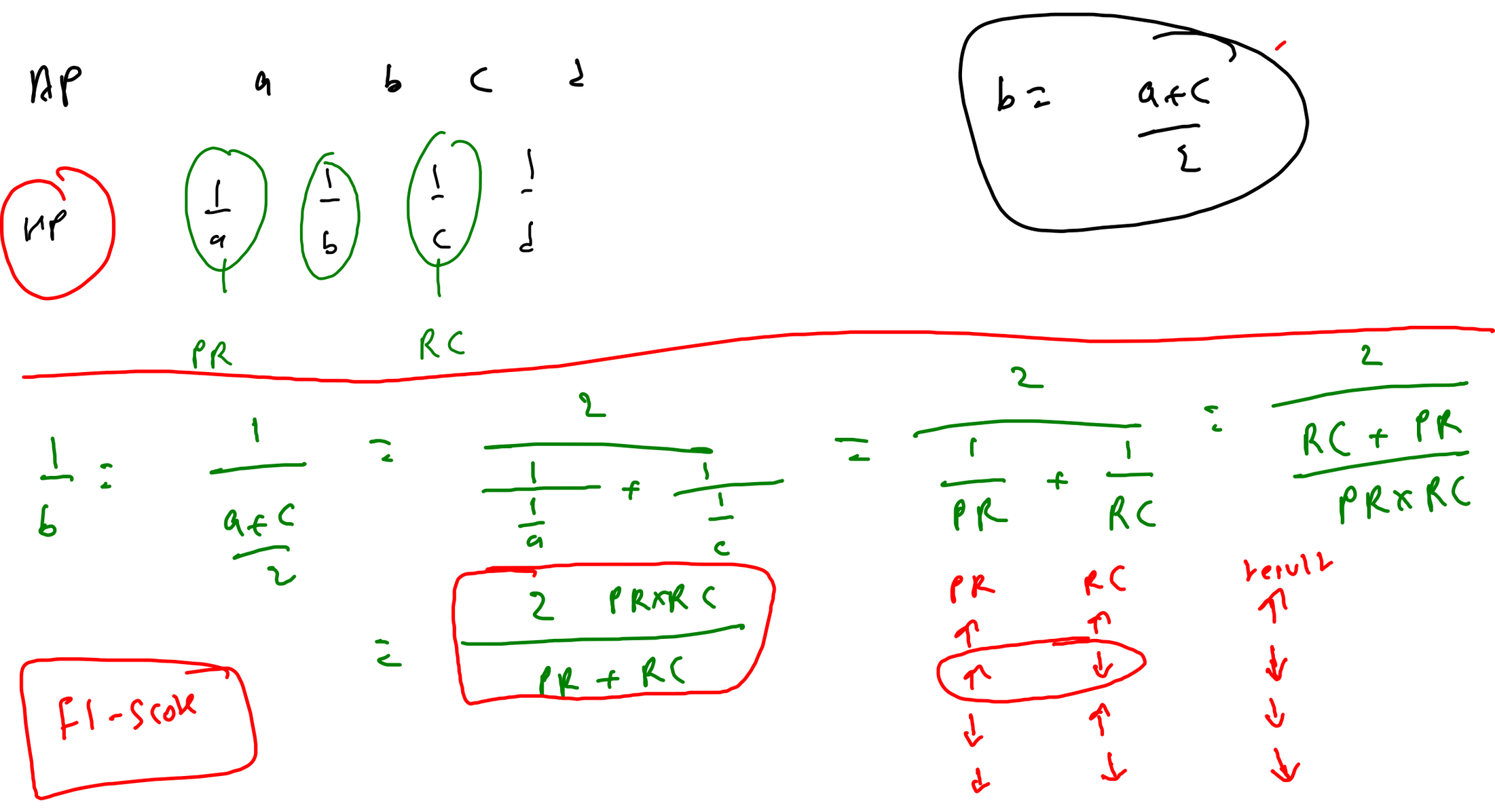


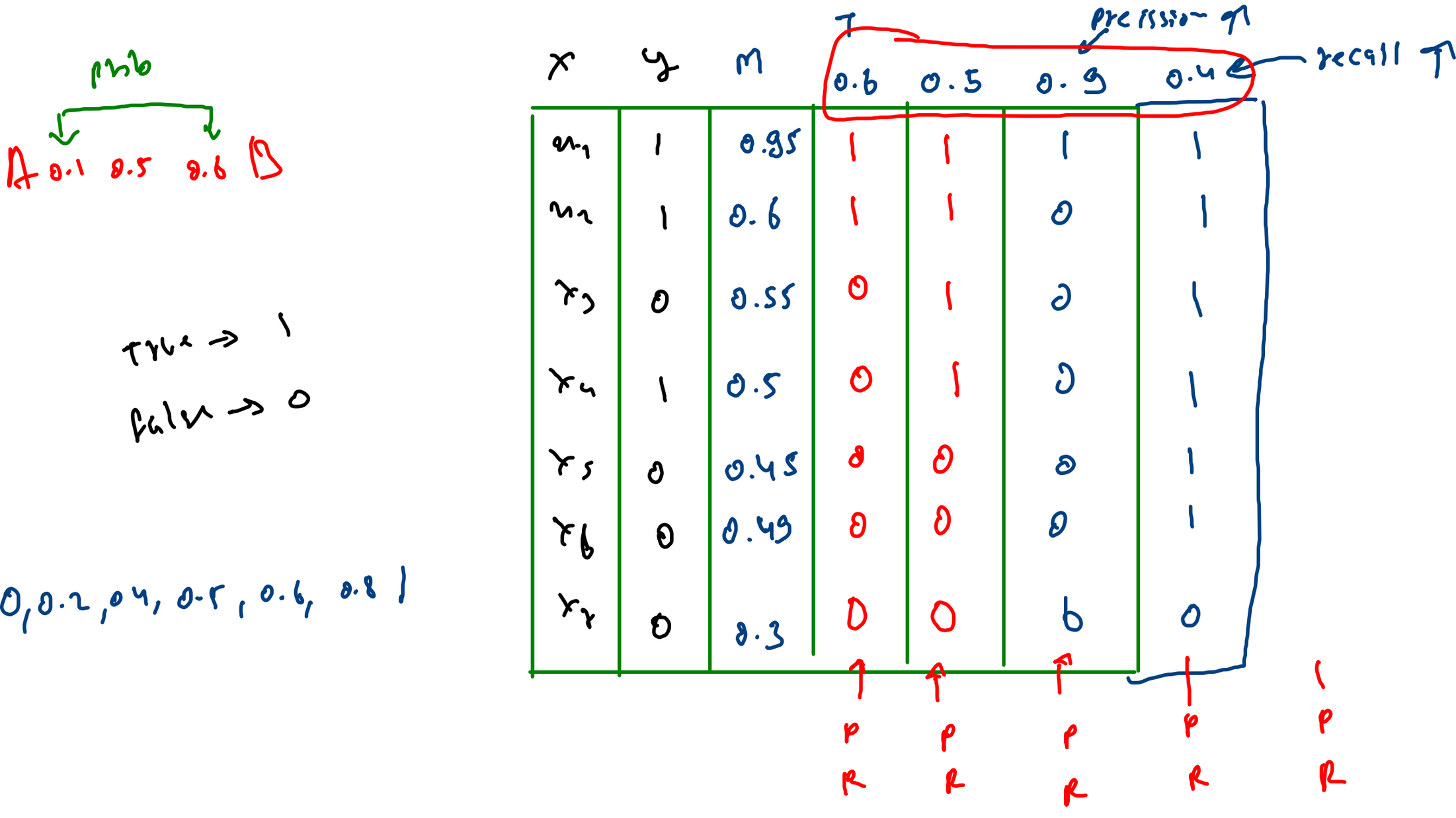


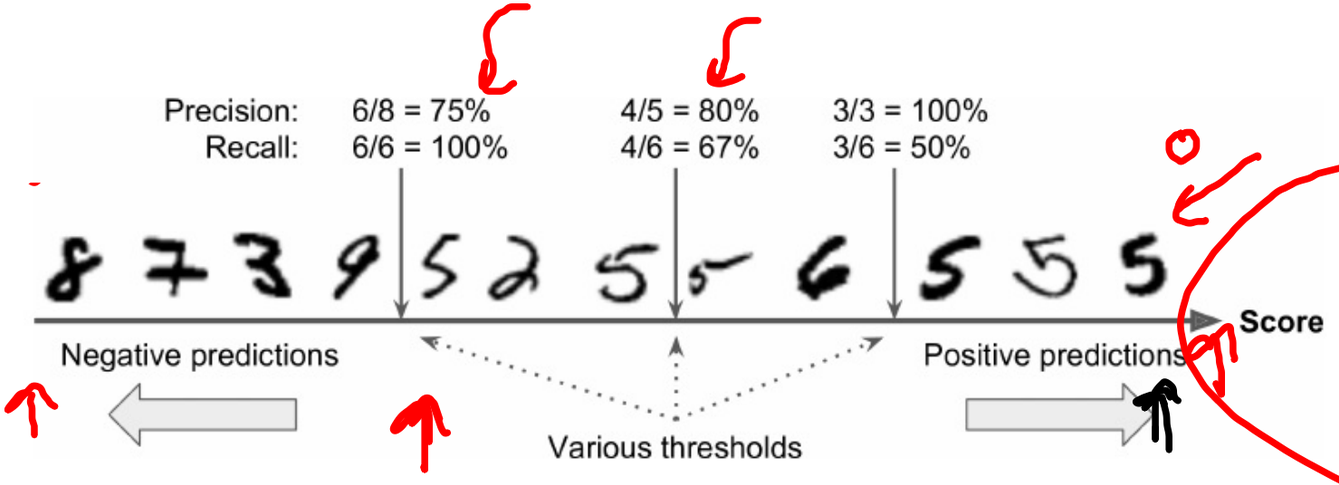


True


Mean
PR
RC
resn
PR
RC
MP → mean
↑
0
PR_f
RC
2
↓
↓
↓
↑
↓
↑
↑
↑
↑
MP →
?
how
PR
RC
rem
↑
↑
↑


MP
a
b
c
d
MP
1/a
1/b
1/c
1/d
PR
RC
b = (a+c)/2
1/b = 1/((a+c)/2) = 2/(1/a + 1/c) = 2/(1/PR + 1/RC) = 2/((RC+PR)/(PR×RC))
= 2 PR×RC / (PR+RC)
F1-Score
PR
RC
result


prob
A 0.1 0.5 0.6 B
true → 1
false → 0
0, 0.2, 0.4, 0.5, 0.6, 0.8 1
T
precision ↑
recall ↑
x y m 0.6 0.5 0.9 0.4
x1 1 0.95 1 1 1 1
x2 1 0.6 1 1 0 1
x3 0 0.55 0 1 0 1
x4 1 0.5 0 1 0 1
x5 0 0.45 0 0 0 1
x6 0 0.49 0 0 0 1
x7 0 0.3 0 0 0 0
P R
P R
P R
P R
P R


Precision: 6/8 = 75%
Recall: 6/6 = 100%
4/5 = 80%
4/6 = 67%
3/3 = 100%
3/6 = 50%
Score
Negative predictions
Positive predictions
Various thresholds

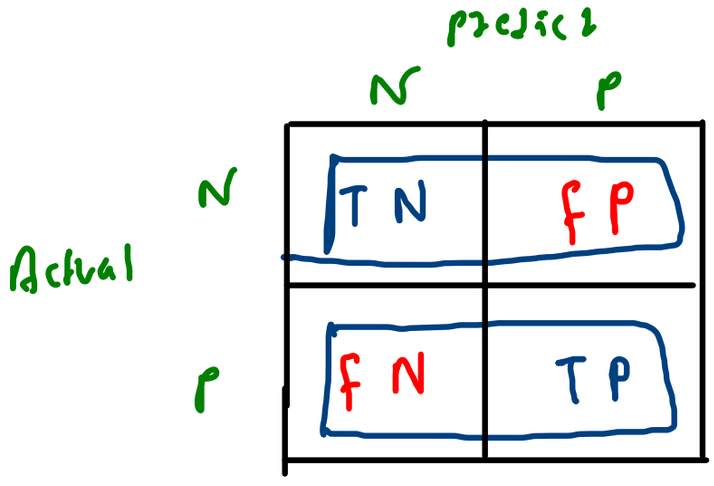
ROC

TPR

actual positive

model positive

$$\frac{TP}{TP + FN}$$



FPR

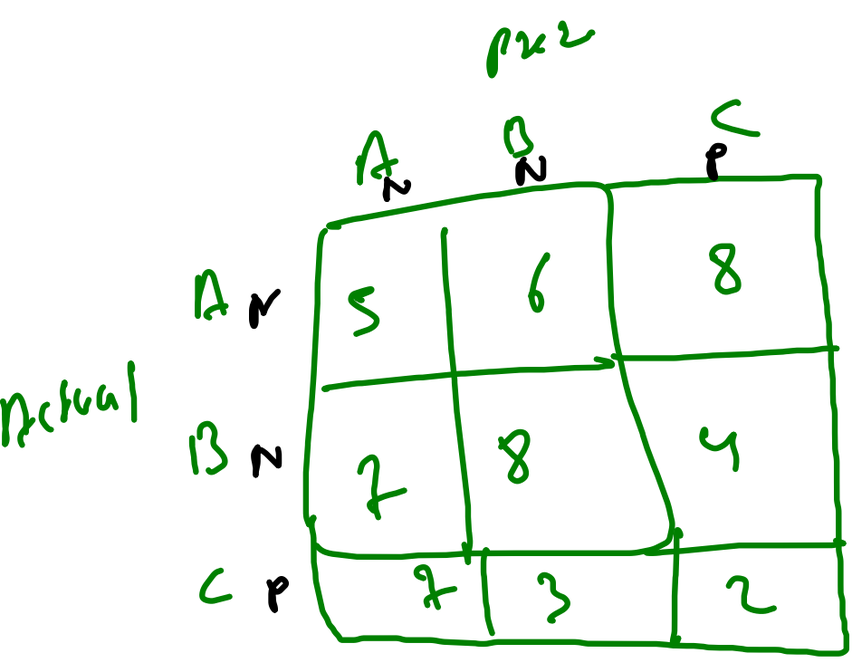
actual negative

model positive

$$\frac{FP}{TN + FP}$$

TPR

FPR



C 1

AB 0

TP →

TN →

FP →

FN →

A 1

BC 0

TP →

TN →

FP →

FN →

B 1

AC 0

TP →

TN →

FP →

FN →