Suppose P is scaled to P'. What are the values of the transformation matrix M?

P

2
3
1

M

S_x	0	0
0	S_y	0
0	0	1

P'

8
-6
1

$2S_x = 8$

$S_x = 4$

$3S_y = -6$

$S_y = -2$

Scale, Translate, Rotate

P = (3, -2)

Scale by [3, -4]

Translate by [1, 2]

Rotate CCW by 37°

P’ = ?

$\cos(37°) = \frac{4}{5}$

$\sin(37°) = \frac{3}{5}$

3
-2
1

P

a

3	0	1
0	-4	2
0	0	1

b

9+1 = 10
8+2 = 10
1

c

4/5	-3/5	0
+3/5	4/5	0
0	0	1

2
14
1

P’

8 - 6 = 2

-6 + 8 = 2

6 + 8 = 14

$-\frac{3}{5} \times 10 + \frac{4}{5} \times 10$

$= \frac{1}{5} \times 10$

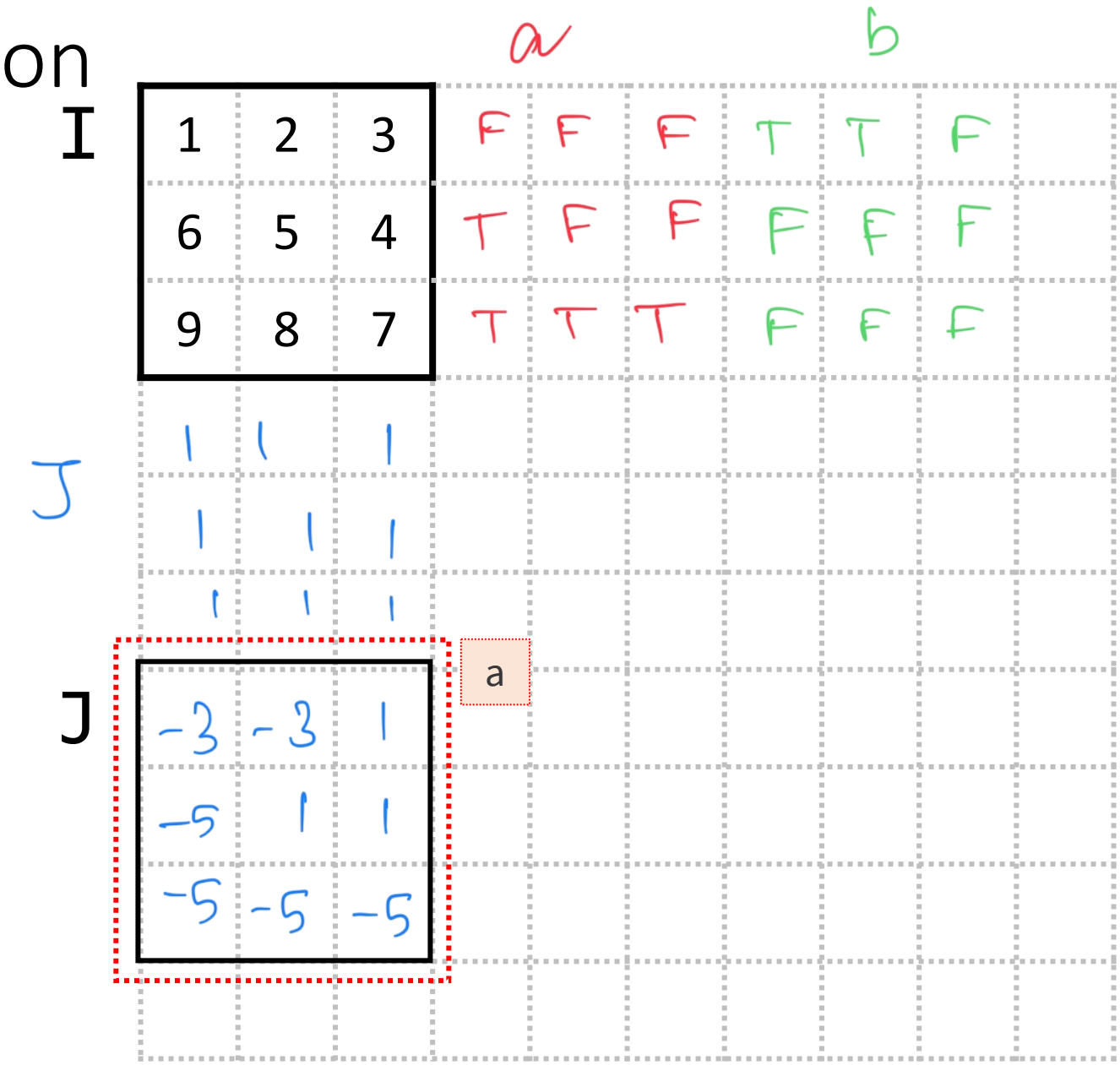
$= 2$

$\frac{4}{5} \times 10 - \frac{3}{5} \times 10$

$= \frac{1}{5} \times 10$ 2

Logic Operation

```
1. a = I > 5
2. b = I < 3
3. J = np.ones((3,3))
4. J[a] = -5
5. J[b] = -3
```



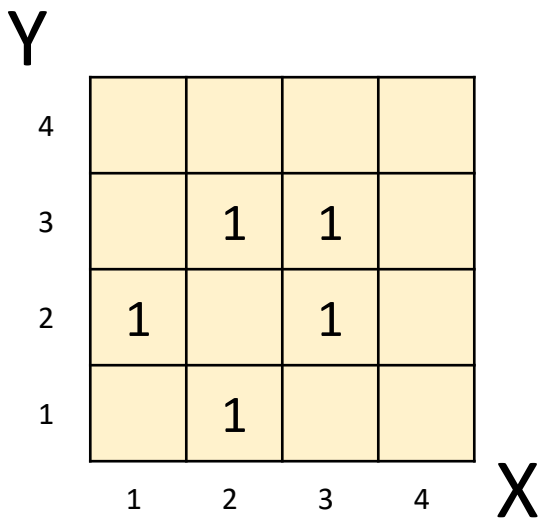
M_{2x2}

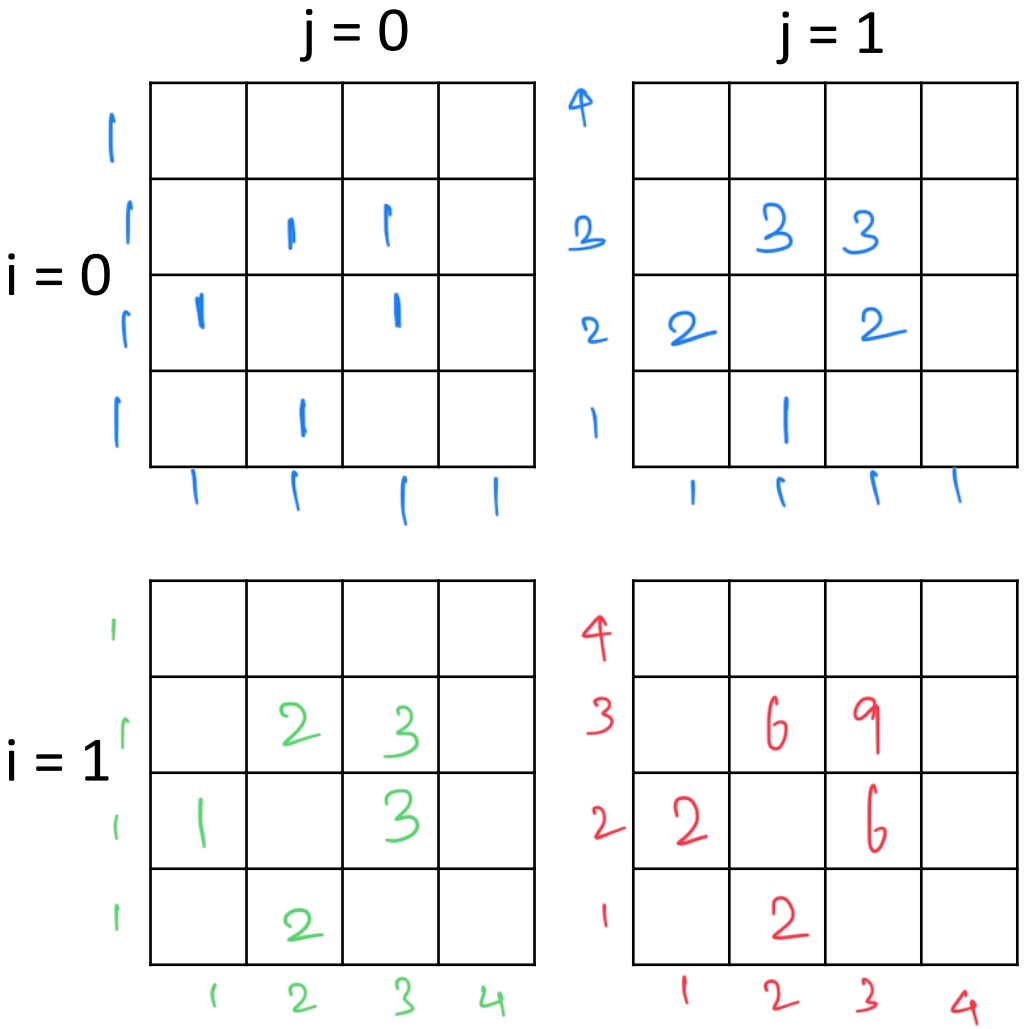
$x^i y^j I(x,y)$

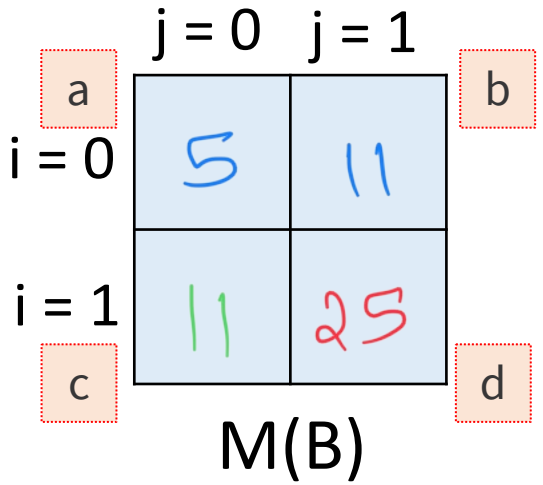
$\sum_x \sum_y$

B

$I(x, y)$

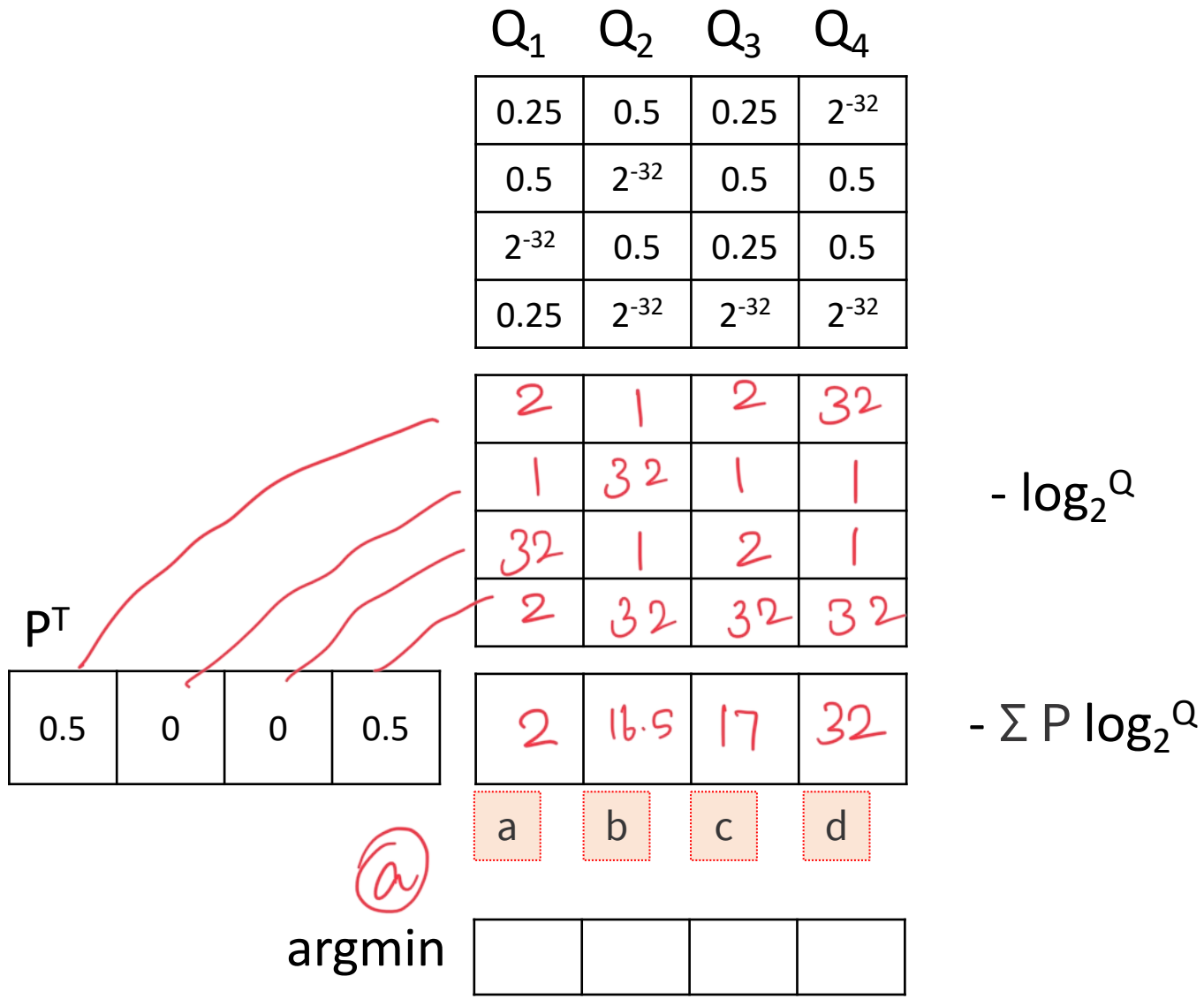






Find Q most similar to P by Cross Entropy

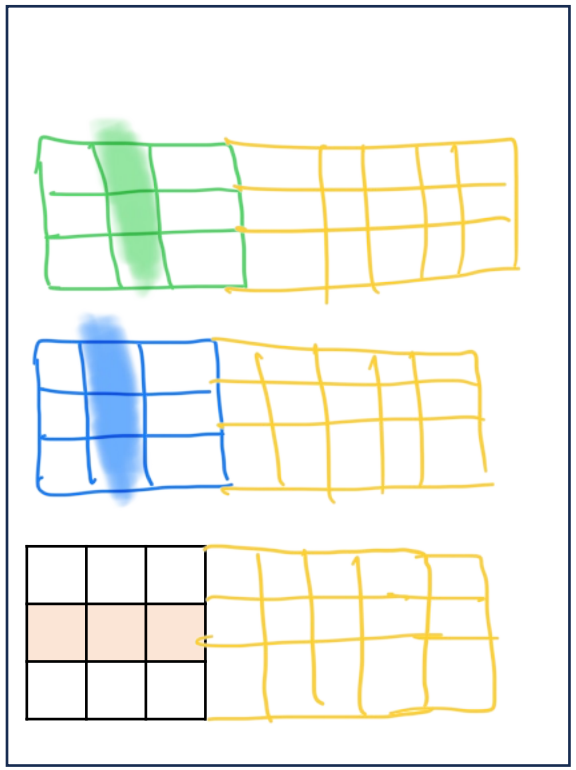
X	$\log_2{}^X$
1	0
0.5	-1
0.25	-2
0.125	-3
2^{-32}	-32
0	NaN



Scale to 3 channels, 5 filters, 8 inputs

Copy, add rows and columns
Show your work

X

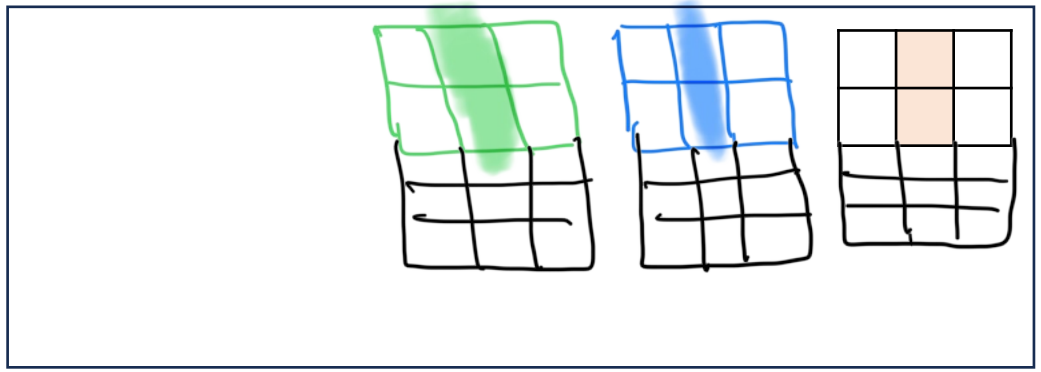


shape(K) = (5, 9)

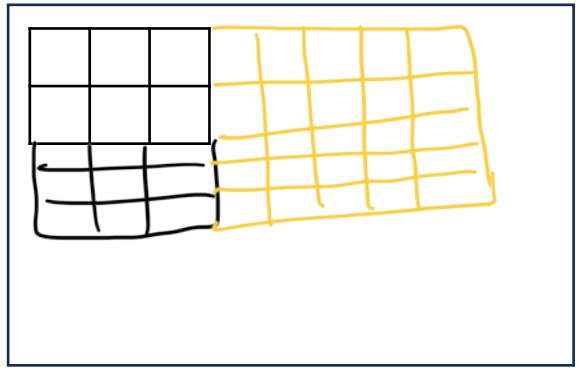
shape(X) = (9, 8)

shape(Z) = (5, 8)

K



Z



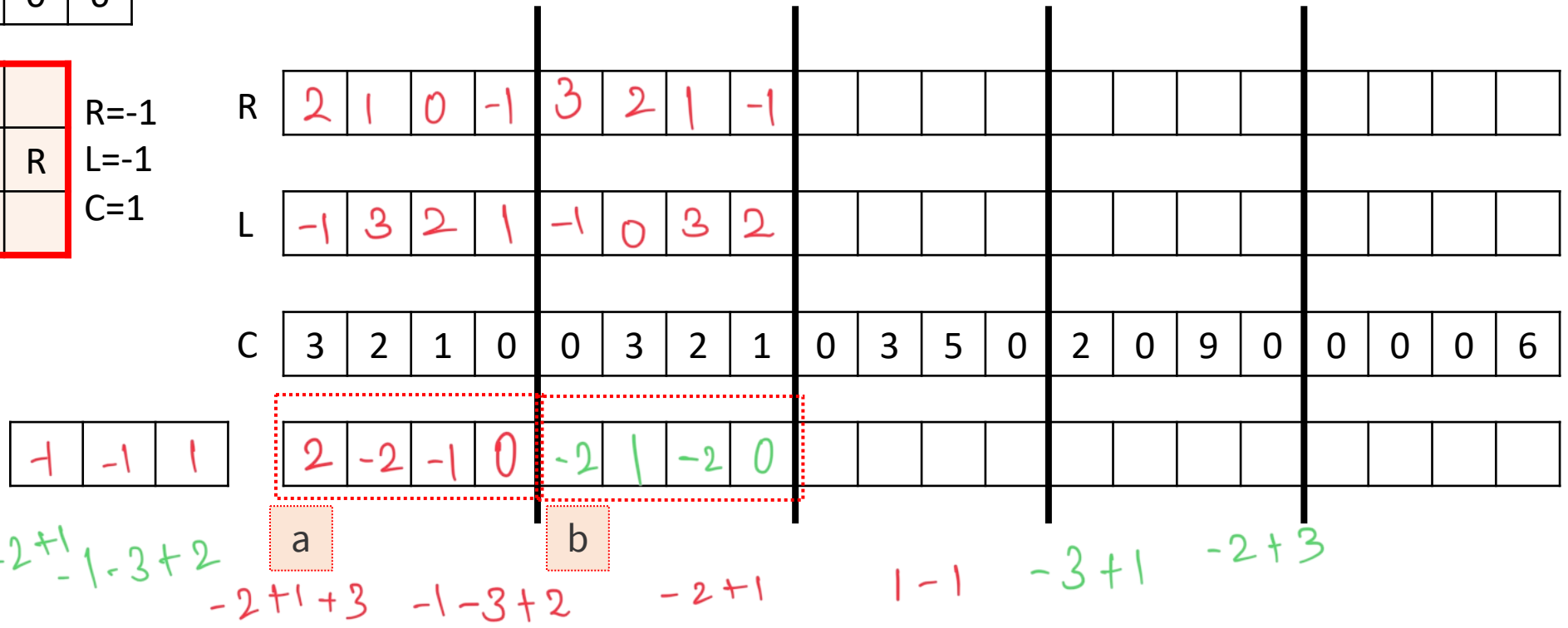
Left/Right Neighbors

3	2	1	0
0	3	2	1
0	3	5	0
2	0	9	0
0	0	0	6

L	C	R

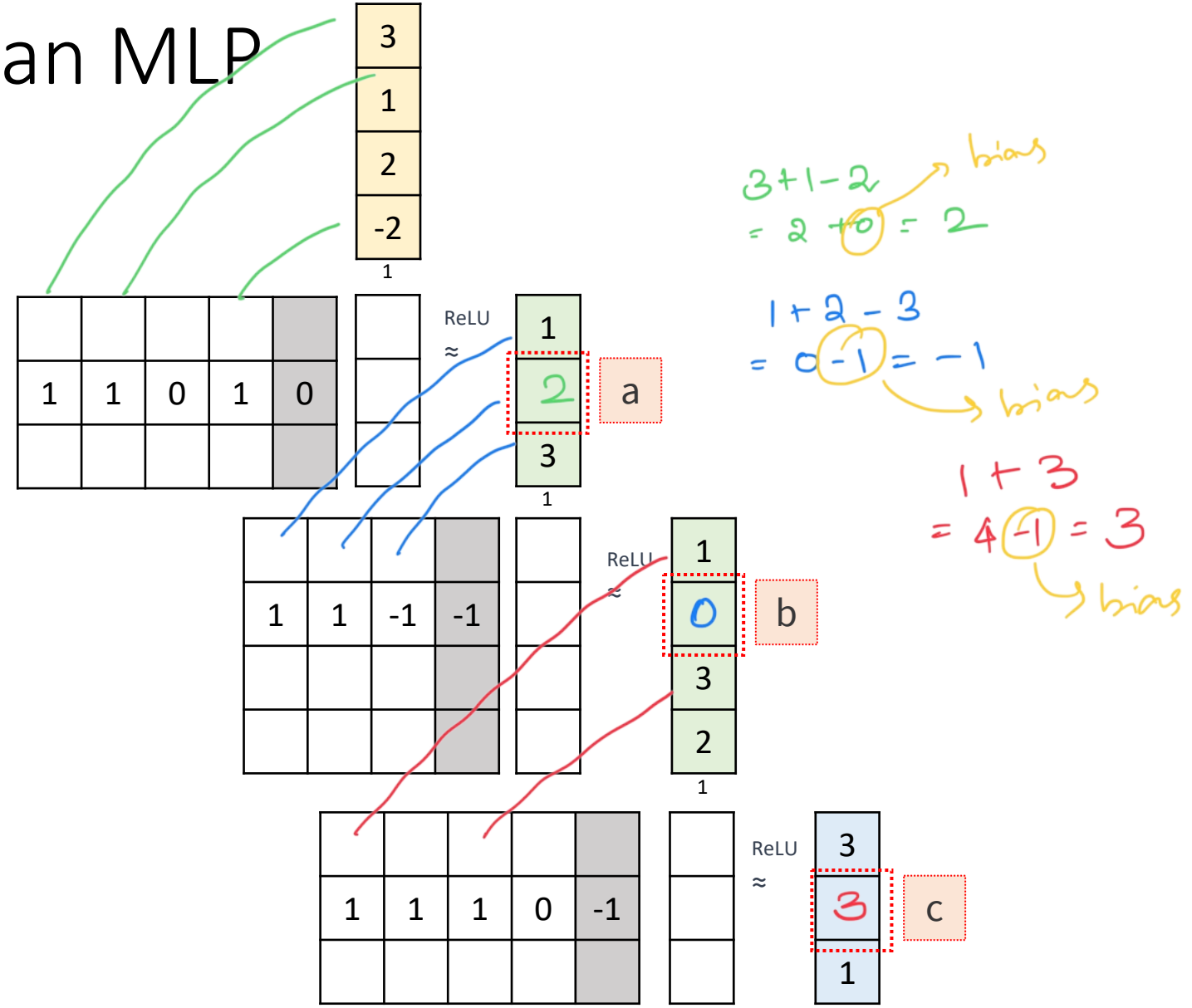
R=-1
L=-1
C=1

Calculate a, b. Pad with -1 instead of X.



Calculate an MLP

Calculate the second feature / node / row only.



2 Layers

ReLU: ✗

1	-2	1	-2	0	-2	1	2	-1	0	2	-1
2	6	-1	4	1	0	4	1	-2	2	0	3
0	1	5	0	4	0	-1	0	3	0	-1	0

1 1 1 1 1 1 1 1 1 1 1 1

1	0	1	-2
1	1	0	-2
0	1	0	0
1	-1	0	0

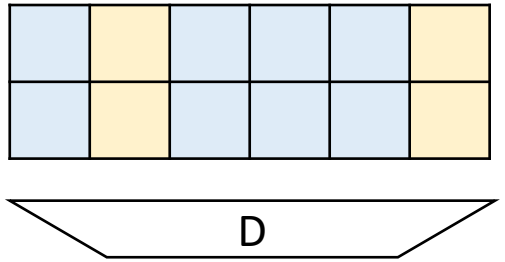
			0	2							
			0	0							
			4	1							
			0	0							

1 1 1 1 1 1 1 1 1 1 1 1

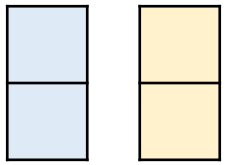
1	1	1	1	0
1	0	-1	0	5

		a	4	3	c						
			1	6							
		b			d						

Discriminator Loss



Fake Real



-log(0) ≈32
-log(0.1) ≈ 3
-log(0.3) ≈ 2
-log(0.5) ≈ 1
-log(0.7) ≈ 0.5
-log(0.9) ≈ 0.2
-log(1) = 0

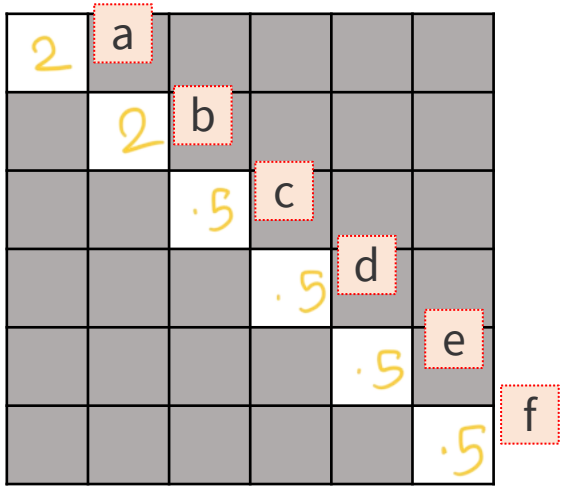
F R F F F R

	P_1	P_2	P_3	P_4	P_5	P_6
real	0	1	0	0	0	1
!real	1	0	1	1	1	0

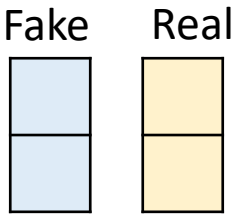
	.7	.3	.3	.3	.3	.7	Y
	.3	.7	.7	.7	.7	.3	1-Y

	.5	2	2	2	2	.5	-log
	2	.5	.5	.5	.5	2	

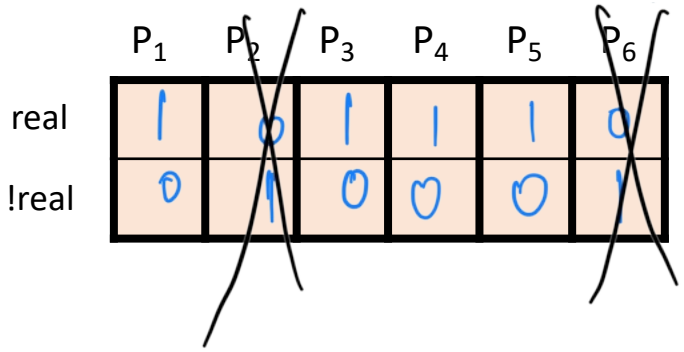
	real	!real
P_1	0	1
P_2	1	0
P_3	0	1
P_4	0	1
P_5	0	1
P_6	1	0

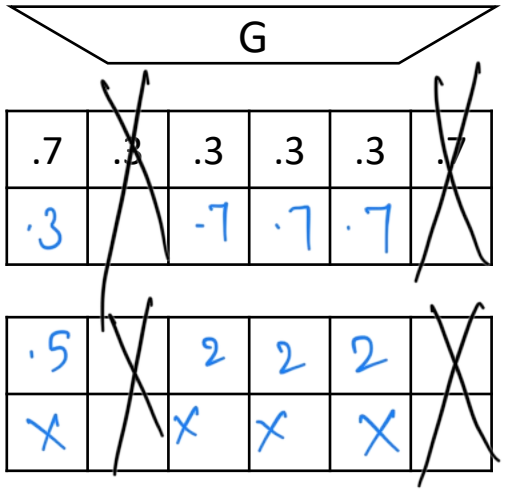


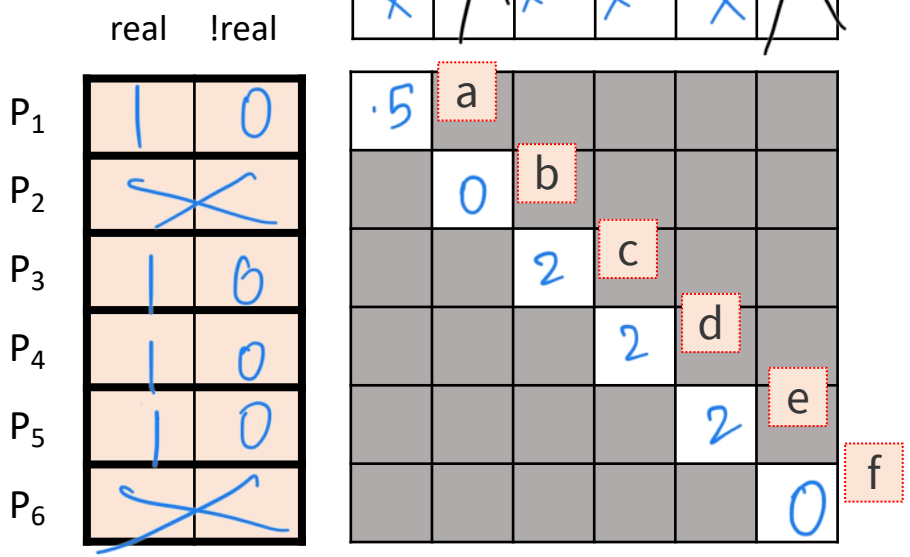
Generator Loss



-log(0) ≈32
-log(0.1) ≈ 3
-log(0.3) ≈ 2
-log(0.5) ≈ 1
-log(0.7) ≈ 0.5
-log(0.9) ≈ 0.2
-log(1) = 0







Calculate p(sound?, angry?, home?)

(Simplify the fractions)

!Home 20	!Angry 10	A. woof	4
		B. growl	4
		C. bark	2
	Angry 10	A. woof	6
		B. growl	2
		C. bark	2

Home 30	!Angry 20	A. woof	6
		B. growl	12
		C. bark	2
	Angry 10	A. woof	2
		B. growl	3
		C. bark	5

a

p(growl, angry, !home) = $\frac{2}{50} = \frac{1}{25}$

b

p(woof, angry, !home) = $\frac{6}{50} = \frac{3}{25}$

c

p(woof, angry, home) = $\frac{2}{50} = \frac{1}{25}$

d

p(bark, !angry, home) = $\frac{2}{50} = \frac{1}{25}$

Calculate p(sound? | angry?, home?)

(Simplify the fractions)

!Home 20	!Angry 10	A. woof	4
		B. growl	4
		C. bark	2
	Angry 10	A. woof	6
		B. growl	2
		C. bark	2

Home 30	!Angry 20	A. woof	6
		B. growl	12
		C. bark	2
	Angry 10	A. woof	2
		B. growl	3
		C. bark	5

a

p(growl| angry, !home) = $\frac{2}{10}$ $\frac{1}{5}$

b

p(woof| angry, !home) = $\frac{6}{10}$ $\frac{3}{5}$

c

p(woof| angry, home) = $\frac{2}{10}$ $\frac{1}{5}$

d

p(bark| !angry, home) = $\frac{2}{20}$ $\frac{1}{10}$

Conditional Probability Values

Wh → 5
Bl → 4
Gr → 2
Br → 0

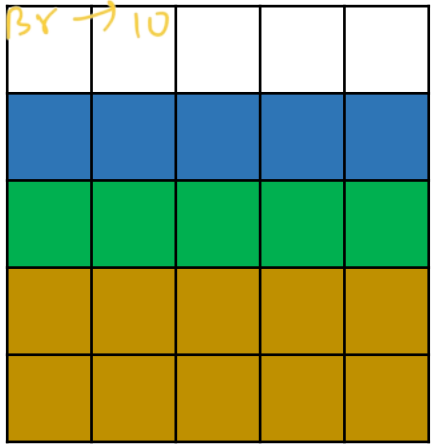
Sky = 11

land = 14

Wh → 0
Bl → 1
Gr → 3
Br → 10

1 = sky, 2 = land

1	1	1	1	1
1	1	2	1	1
1	2	2	2	1
2	2	2	2	2
2	2	2	2	2



a $p(\text{color} = \text{blue} \mid \text{part} = \text{sky}) = \frac{4}{11}$

b $p(\text{color} = \text{blue} \mid \text{part} = \text{land}) = \frac{1}{14}$

c $p(\text{color} = \text{white} \mid \text{part} = \text{sky}) = \frac{5}{11}$

d $p(\text{color} = \text{green} \mid \text{part} = \text{land}) = \frac{3}{14}$

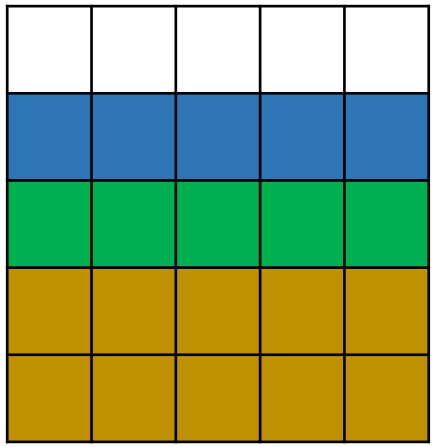
Joint Probability Values

(Simplify the fractions)

$\frac{5}{11} \cdot \frac{11}{25}$

1 = sky, 2 = land

1	1	1	1	1
1	1	2	1	1
1	2	2	2	1
2	2	2	2	2
2	2	2	2	2



a p(color = blue, part = sky) = $\frac{4}{25}$

b p(color = blue, part = land) = $\frac{1}{25}$

c p(color = white, part = sky) = $\frac{5}{25} = \frac{1}{5}$

d p(color = green, part = land) = $\frac{3}{25}$