Different Decoders

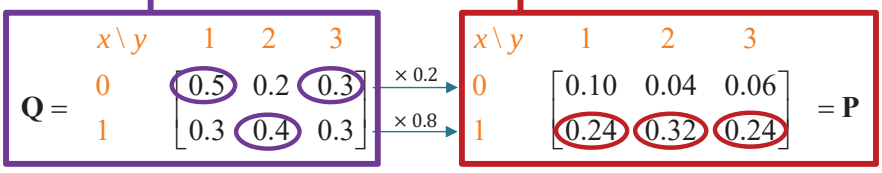
For naïve decoder, $\hat{x}_{\text{naïve}}(y) = y$. Therefore, we can simply copy the values in the y-column into its decoding table.

For DIY decoder, the decoding table is provided. (Alternatively, some equation may be given; in which case, we can simply plug-in each of the possible y values to get $\hat{x}_{\text{DIY}}(y)$.)

Deriving the MAP and ML decoder follows almost the same recipe: select the max value in each column and read the corresponding x-value. The difference is that the MAP decoder uses the **P** matrix but the ML decoder uses the **Q** matrix.

y	$\hat{x}_{\text{naïve}}(y)$	$\hat{x}_{\text{DIY}}(y)$	$\hat{x}_{\text{MAP}}(y)$	$\hat{x}_{\text{ML}}(y)$
1	1	1	1	0
2	2	1	1	1
3	3	0	1	0

[Ex. 3.25] [Ex. 3.27] [Ex. 3.35] [Ex. 3.46]



Finding $P(\mathcal{E})$

- Once a decoder $\hat{x}(y)$ is defined, we can find its corresponding $P(\mathcal{E})$ easily from the **P** matrix:
  - Write $\hat{x}(y)$ values on top of the y values for the **P** matrix.
  - For each column y in the **P** matrix, circle the element whose corresponding x value is the same as $\hat{x}(y)$.

y	$\hat{x}_{\text{naïve}}(y)$	$\hat{x}_{\text{DIY}}(y)$	$\hat{x}_{\text{MAP}}(y)$	$\hat{x}_{\text{ML}}(y)$
1	1	1	1	0
2	2	1	1	1
3	3	0	1	0
$P(\mathcal{E})$	0.76	0.38	0.20	0.52

[Ex. 3.25] [Ex. 3.27] [Ex. 3.35] [Ex. 3.46]

- $P(\mathcal{C})$ = the sum of the circled probabilities.
- $P(\mathcal{E}) = 1 - P(\mathcal{C})$.