① ORIGINAL PICTURE ──→ BLURED PICTURE ──→ + BLURED PICTURE
        ↑ 9x9 mean   ↑ ?
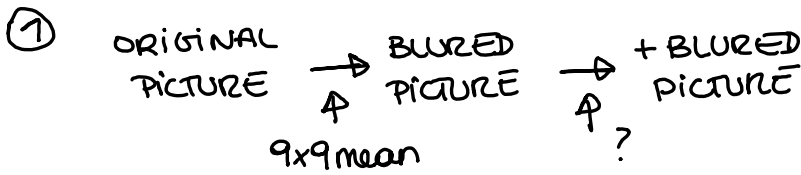
☐ 9x9 median ────→ median do not blur image, it's a salt&pepper filter

☐ 5x5 mean ────→ 5x5 won't make an image + blured than 9x9 (↑matrix, ↑blur)

☐ 5x5 median ↗

☐ 9x9 max ──┐

☒ 15x15 mean ──┘ ↳ ↑matrix, ↑blur

──→ max do not blur image

② Grayscale digital 300 rows and 140 columns
Each pixel values from 0 to 1023
How many bits are required to store it?

$$300 \times 140 \, (\times 10) = \boxed{420000}$$
        ↑ ?

③ How do we call the smallest change of a pixel's intensity that we are able to distinguish with a specific sensor?

☒ Resolution
☐ Accuracy
☐ None of the above
☐ Precision
☐ Saturation

④ Sharpening:

$$f_{sharp} = f + \alpha (f - f_{blur})$$

$$= (1 + \alpha) \cdot f - \alpha \cdot f_{blur}$$

$$= (1 + \alpha) \cdot (\underset{\uparrow}{w \cdot f}) - \alpha \cdot (\underset{\uparrow}{\sigma \cdot f})$$

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix} \qquad \frac{1}{9}\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

$$= \underline{((1+\alpha) \cdot w - \alpha \cdot \sigma) \cdot f}$$

$$((1 + 0'9) \cdot w - 0'9 \cdot \sigma) \quad 0'1$$

$$1'9 \cdot \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix} - \left(0'9 \cdot \frac{1}{9}\right)\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1'9 & 0 \\ 0 & 0 & 0 \end{bmatrix} - \begin{bmatrix} 0'1 & 0'1 & 0'1 \\ 0'1 & 0'1 & 0'1 \\ 0'1 & 0'1 & 0'1 \end{bmatrix} = \begin{bmatrix} -0'1 & -0'1 & -0'1 \\ -0'1 & 1'8 & -0'1 \\ -0'1 & -0'1 & -0'1 \end{bmatrix}$$

max value $= 1'8$
min value $= -0'1$