

In this question, you will be practicing filtering by hand on the following image. You will enter your final result for each question in the provided empty tables.

| | | | | |
|---|---|---|---|---|
| 2 | 0 | 0 | 1 | 3 |
| 1 | 2 | 0 | 7 | 0 |
| 1 | 0 | 1 | 0 | 2 |
| 1 | 0 | 2 | 0 | 0 |

Note that you do not have to fill all the cells. If a cell contains a number that is not an integer, enter it as a fraction.

Question (1a)

Apply the correlation filter to the image with **no padding**.

| | | |
|----|---|---|
| 0 | 0 | 1 |
| 0 | 0 | 0 |
| -1 | 0 | 0 |

Enter your final result here in integer or fraction:

| | | | | |
|--|----|---|----|--|
| | | | | |
| | -1 | 1 | 2 | |
| | -1 | 7 | -2 | |
| | | | | |

Question (1b)

Apply the convolution filter to the image with **no padding**.

| | | |
|----|---|---|
| 0 | 0 | 1 |
| 0 | 0 | 0 |
| -1 | 0 | 0 |

Enter your final result here in integer or fraction:

| | | | | |
|--|---|----|----|--|
| | | | | |
| | 1 | -1 | -2 | |
| | 1 | -7 | 2 | |
| | | | | |

Question (1c)

Apply the filter to the image with **zero padding** to make the input image and the output have the same shape. **Note:** zero padding means to pad your image with zeros; it is not the same as “no padding”.

| | | |
|---------------|---------------|---------------|
| $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ |
| $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ |
| $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ |

Enter your final result here in integer or fraction:

| | | | | |
|---------------|---------------|----------------|----------------|----------------|
| $\frac{5}{9}$ | $\frac{5}{9}$ | $\frac{10}{9}$ | $\frac{11}{9}$ | $\frac{11}{9}$ |
| $\frac{2}{3}$ | $\frac{7}{9}$ | $\frac{11}{9}$ | $\frac{14}{9}$ | $\frac{13}{9}$ |
| $\frac{3}{9}$ | $\frac{8}{9}$ | $\frac{4}{3}$ | $\frac{4}{3}$ | 1 |
| $\frac{5}{9}$ | $\frac{8}{9}$ | $\frac{4}{3}$ | $\frac{4}{3}$ | 1 |
| $\frac{2}{9}$ | $\frac{5}{9}$ | $\frac{1}{3}$ | $\frac{5}{9}$ | $\frac{2}{9}$ |