

Results:

a) Derive a mathematical equation converting coordinates to index and derive the inverse equations converting index into coordinates in d-dimensional grid.

Coordinate to index:

In the d-dimensional grid with size (L_1, L_2, \dots, L_d)

$$\text{index} = x_1 + L_1 x_2 + L_1 L_2 x_3 + \dots + L_1 L_2 \dots L_{d-1} x_d$$

Index to coordinate:

In the d-dimensional grid with size (L_1, L_2, \dots, L_d)

$$x_1 = \text{index} \% L_1$$
$$x_2 = (\text{index} - x_1) \% (L_1 L_2) / L_1$$
$$x_3 = (\text{index} - L_1 x_2 - x_1) \% (L_1 L_2 L_3) / (L_1 L_2)$$
$$\vdots$$
$$x_d = (\text{index} - L_1 L_2 \dots L_{d-2} x_{d-1} - \dots - L_1 x_2 - x_1) \% (L_1 L_2 \dots L_d) / (L_1 L_2 \dots L_{d-1})$$

b) All the results are in 'output_index_7_2' and 'output_coordinates_7_2'.