AStar BII Test
Question 7.2 Part a

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Given a d-dimensional grid of size (L_1, L_2, L_3, L_4, L_5, L_6), f maps $(x_1, x_2, x_3, x_4, x_5, x_6)$ coordinates to the index while $g_1, \ldots, g_d$ map an index I to $x_1, \ldots, x_d$ respectively.

$$
\begin{aligned}
f(x_1) &= x_1 \\
f(x_1, x_2) &= L_1 x_2 + x_1 \\
f(x_1, x_2, x_3) &= L_1 L_2 x_3 + L_1 x_2 + x_1 \\
&\ldots \\
f(x_1, ..., x_d) &= L^{(d-1)} x_d + L^{(d-2)} x_{d-1} + ... + L^{(1)} x_2 + x_1 \\
\text{where } \; L^{(n)} &= L_1 L_2 ... L_n \\
&= \prod_{i=1}^{n} L_i
\end{aligned}
$$

$$
\begin{aligned}
g_1(I) &= I \mod L_1 \\
g_2(I) &= \frac{(I \mod L_1 L_2) - g_1(I)}{L_1} \\
&\ldots \\
g_{d-1}(I) &= \frac{(I \mod L^{(d-1)}) - (g_1(I) + ... + g_{d-2}(I))}{L^{(d-2)}} \\
&= \frac{(I \mod L^{(d-1)}) - g^{(d-2)}(I)}{L^{(d-2)}} \\
g_d(I) &= \frac{I - g^{(d-1)}(I)}{L^{(d-1)}} \\
\text{where } \; g^{(n)} &= \sum_{i=1}^{n} g_i(I)
\end{aligned}
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