

더블클릭 또는 Enter 키를 눌러 수정

✓ (1,0) path

```

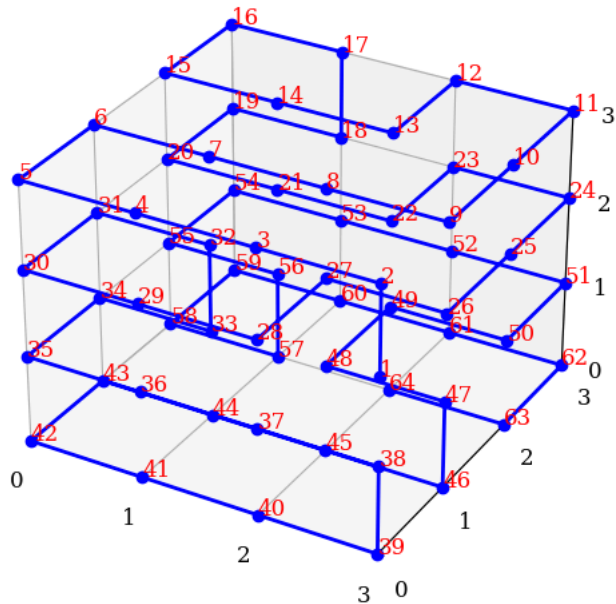
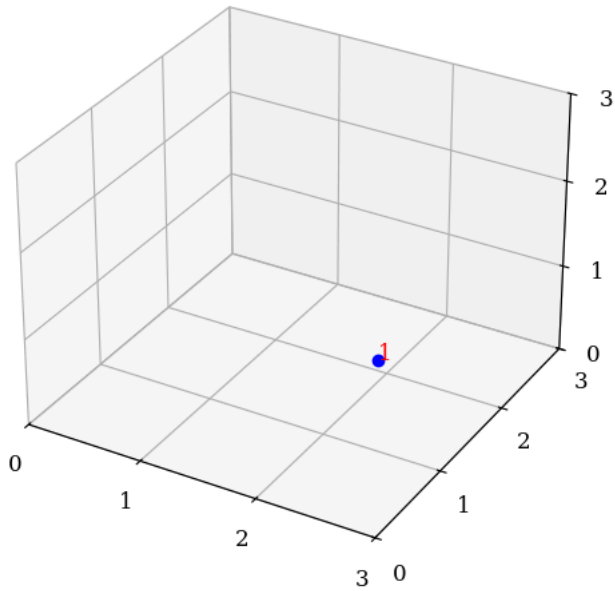
1 #(1,0) 3D
2 import matplotlib.pyplot as plt
3 from mpl_toolkits.mplot3d import Axes3D
4 from matplotlib.animation import FuncAnimation, PillowWriter
5 from IPython.display import Image, display
6 import matplotlib.pyplot as plt
7 import numpy as np
8
9
10 # 예시 3D 경로
11 path = [
12 (3,0,2),
13 (3,0,3),
14 (2,0,3),
15 (1,0,3),
16 (0,0,3),
17 (0,1,3),
18 (1,1,3),
19 (2,1,3),
20 (3,1,3),
21 (3,2,3),
22 (3,3,3),
23 (2,3,3),
24 (2,2,3),
25 (1,2,3),
26 (0,2,3),
27 (0,3,3),
28 (1,3,3),
29 (1,3,2),
30 (0,3,2),
31 (0,2,2),
32 (1,2,2),
33 (2,2,2),
34 (2,3,2),
35 (3,3,2),
36 (3,2,2),
37 (3,1,2),
38 (2,1,2),
39 (2,0,2),
40 (1,0,2),
41 (0,0,2),
42 (0,1,2),
43 (1,1,2),
44 (1,1,1),
45 (0,1,1),
46 (0,0,1),
47 (1,0,1),
48 (2,0,1),
49 (3,0,1),
50 (3,0,0),
51 (2,0,0),
52 (1,0,0),
53 (0,0,0),
54 (0,1,0),
55 (1,1,0),
56 (2,1,0),
57 (3,1,0),
58 (3,1,1),
59 (2,1,1),
60 (2,2,1),
61 (3,2,1),
62 (3,3,1),
63 (2,3,1),
64 (1,3,1),
65 (0,3,1),
66 (0,2,1),
67 (1,2,1),
68 (1,2,0),
69 (0,2,0),
70 (0,3,0),
71 (1,3,0),
72 (2,3,0),
73 (3,3,0),
74 (3,2,0),

```

```

75 (2,2,0),
76
77 ]
78
79 fig = plt.figure(figsize=(6,6))
80 ax = fig.add_subplot(111, projection='3d')
81
82
83 # 3D 경로 표시를 위한 초기화
84 line, = ax.plot([], [], [], marker='o', color='b', linewidth=2)
85 number_texts = []
86
87 def init():
88     line.set_data([], [])
89     line.set_3d_properties([])
90     for t in number_texts:
91         t.remove()
92     number_texts.clear()
93     return line,
94
95 def update(frame):
96     x, y, z = zip(*path[:frame+1])
97     line.set_data(x, y)
98     line.set_3d_properties(z)
99
100     for t in number_texts:
101         t.remove()
102     number_texts.clear()
103
104     for idx, (xi, yi, zi) in enumerate(path[:frame+1]):
105         t = ax.text(xi, yi, zi, str(idx+1), color='red')
106         number_texts.append(t)
107
108     return line, *number_texts
109
110 xs, ys, zs = zip(*path)
111
112 # 예시: 0,1,2 정수 눈금만 표시
113 ax.set_xticks(np.arange(0, max(xs)+1, 1))
114 ax.set_yticks(np.arange(0, max(ys)+1, 1))
115 ax.set_zticks(np.arange(0, max(zs)+1, 1))
116
117 ax.set_xlim(min(xs), max(xs))
118 ax.set_ylim(min(ys), max(ys))
119 ax.set_zlim(min(zs), max(zs))
120
121
122 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
123
124 # GIF로 저장
125 ani.save("animation3d.gif", writer=PillowWriter(fps=20))
126 display(Image(filename="animation3d.gif"))
127

```



```

1 #(1,0) 3D
2 import matplotlib.pyplot as plt
3 from mpl_toolkits.mplot3d import Axes3D
4 from matplotlib.animation import FuncAnimation, PillowWriter
5 from IPython.display import Image, display
6 import matplotlib.pyplot as plt
7 import numpy as np
8
9
10 # 예시 3D 경로
11 path = [
12 (3,1,4),
13 (4,1,4),
14 (4,0,4),
15 (3,0,4),
16 (2,0,4),
17 (1,0,4),
18 (0,0,4),
19 (0,1,4),
20 (1,1,4),
21 (2,1,4),
22 (2,2,4),
23 (3,2,4),

```

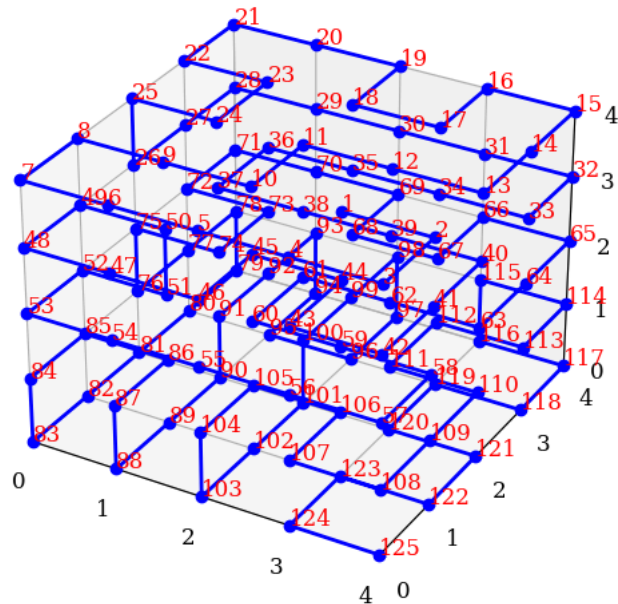
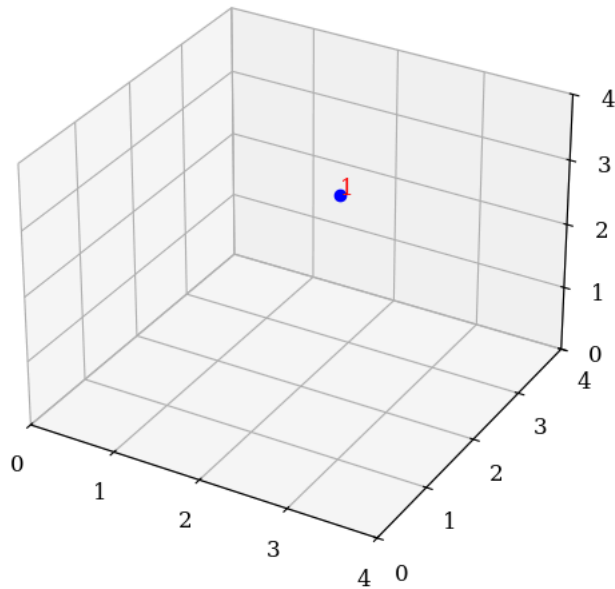
24 (4,2,4),
25 (4,3,4),
26 (4,4,4),
27 (3,4,4),
28 (3,3,4),
29 (2,3,4),
30 (2,4,4),
31 (1,4,4),
32 (0,4,4),
33 (0,3,4),
34 (1,3,4),
35 (1,2,4),
36 (0,2,4),
37 (0,2,3),
38 (0,3,3),
39 (0,4,3),
40 (1,4,3),
41 (2,4,3),
42 (3,4,3),
43 (4,4,3),
44 (4,3,3),
45 (3,3,3),
46 (2,3,3),
47 (1,3,3),
48 (1,2,3),
49 (2,2,3),
50 (3,2,3),
51 (4,2,3),
52 (4,1,3),
53 (4,0,3),
54 (3,0,3),
55 (3,1,3),
56 (2,1,3),
57 (2,0,3),
58 (1,0,3),
59 (0,0,3),
60 (0,1,3),
61 (1,1,3),
62 (1,1,2),
63 (0,1,2),
64 (0,0,2),
65 (1,0,2),
66 (2,0,2),
67 (3,0,2),
68 (4,0,2),
69 (4,1,2),
70 (3,1,2),
71 (2,1,2),
72 (2,2,2),
73 (3,2,2),
74 (4,2,2),
75 (4,3,2),
76 (4,4,2),
77 (3,4,2),
78 (3,3,2),
79 (2,3,2),
80 (2,4,2),
81 (1,4,2),
82 (0,4,2),
83 (0,3,2),
84 (1,3,2),
85 (1,2,2),
86 (0,2,2),
87 (0,2,1),
88 (0,3,1),
89 (0,4,1),
90 (0,4,0),
91 (0,3,0),
92 (0,2,0),
93 (0,1,0),
94 (0,0,0),
95 (0,0,1),
96 (0,1,1),
97 (1,1,1),
98 (1,0,1),
99 (1,0,0),
100 (1,1,0),
101 (1,2,0),
102 (1,2,1),
103 (1,3,1),
104 (1,4,1),
105 (1,4,0),

```

106 (1,3,0),
107 (2,3,0),
108 (2,4,0),
109 (2,4,1),
110 (2,3,1),
111 (2,2,1),
112 (2,2,0),
113 (2,1,0),
114 (2,0,0),
115 (2,0,1),
116 (2,1,1),
117 (3,1,1),
118 (3,0,1),
119 (4,0,1),
120 (4,1,1),
121 (4,2,1),
122 (3,2,1),
123 (3,3,1),
124 (4,3,1),
125 (4,4,1),
126 (3,4,1),
127 (3,4,0),
128 (4,4,0),
129 (4,3,0),
130 (3,3,0),
131 (3,2,0),
132 (4,2,0),
133 (4,1,0),
134 (3,1,0),
135 (3,0,0),
136 (4,0,0),
137
138 ]
139
140 fig = plt.figure(figsize=(6,6))
141 ax = fig.add_subplot(111, projection='3d')
142
143
144 # 3D 경로 표시를 위한 초기화
145 line, = ax.plot([], [], [], marker='o', color='b', linewidth=2)
146 number_texts = []
147
148 def init():
149     line.set_data([], [])
150     line.set_3d_properties([])
151     for t in number_texts:
152         t.remove()
153     number_texts.clear()
154     return line,
155
156 def update(frame):
157     x, y, z = zip(*path[:frame+1])
158     line.set_data(x, y)
159     line.set_3d_properties(z)
160
161     for t in number_texts:
162         t.remove()
163     number_texts.clear()
164
165     for idx, (xi, yi, zi) in enumerate(path[:frame+1]):
166         t = ax.text(xi, yi, zi, str(idx+1), color='red')
167         number_texts.append(t)
168
169     return line, *number_texts
170
171 xs, ys, zs = zip(*path)
172
173 # 예시: 0,1,2 정수 눈금만 표시
174 ax.set_xticks(np.arange(0, max(xs)+1, 1))
175 ax.set_yticks(np.arange(0, max(ys)+1, 1))
176 ax.set_zticks(np.arange(0, max(zs)+1, 1))
177
178 ax.set_xlim(min(xs), max(xs))
179 ax.set_ylim(min(ys), max(ys))
180 ax.set_zlim(min(zs), max(zs))
181
182
183 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
184
185 # GIF로 저장
186 ani.save("animation3d.gif", writer=PillowWriter(fps=20))

```

```
187 display(Image(filename="animation3d.gif"))
188
```



▽ (2,1) path

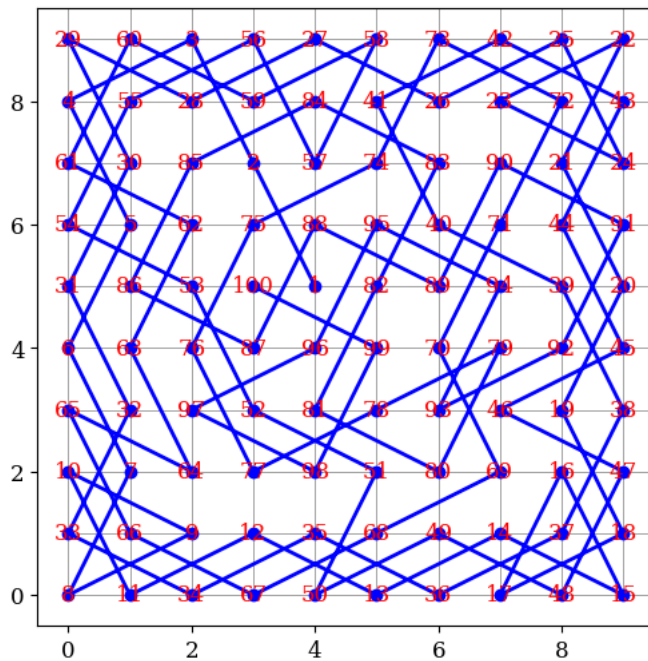
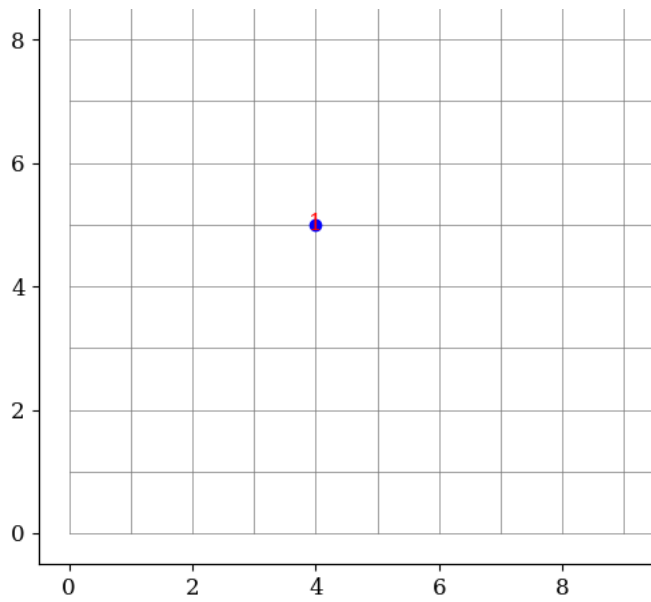
```
1 #2d W+
2 import matplotlib.pyplot as plt
3 from matplotlib.animation import FuncAnimation, PillowWriter
4 from IPython.display import Image, display
5
6 # 격자 크기
7 N = 10
8 path = [
9     (4,5),
10    (3,7),
11    (2,9),
12    (0,8),
13    (1,6),
14    (0,4),
15    (1,2),
16    (0,0),
```

17 (2,1).
18 (0,2).
19 (1,0).
20 (3,1).
21 (5,0).
22 (7,1).
23 (9,0).
24 (8,2).
25 (7,0).
26 (9,1).
27 (8,3).
28 (9,5).
29 (8,7).
30 (9,9).
31 (7,8).
32 (9,7).
33 (8,9).
34 (6,8).
35 (4,9).
36 (2,8).
37 (0,9).
38 (1,7).
39 (0,5).
40 (1,3).
41 (0,1).
42 (2,0).
43 (4,1).
44 (6,0).
45 (8,1).
46 (9,3).
47 (8,5).
48 (6,6).
49 (5,8).
50 (7,9).
51 (9,8).
52 (8,6).
53 (9,4).
54 (7,3).
55 (9,2).
56 (8,0).
57 (6,1).
58 (4,0).
59 (5,2).
60 (3,3).
61 (2,5).
62 (0,6).
63 (1,8).
64 (3,9).
65 (4,7).
66 (5,9).
67 (3,8).
68 (1,9).
69 (0,7).
70 (2,6).
71 (1,4).
72 (2,2).
73 (0,3).
74 (1,1).
75 (3,0).
76 (5,1).
77 (7,2).
78 (6,4).
79 (7,6).
80 (8,8).
81 (6,9).
82 (5,7).
83 (3,6).
84 (2,4).
85 (3,2).
86 (5,3).
87 (7,4).
88 (6,2).
89 (4,3).
90 (5,5).
91 (6,7).
92 (4,8).
93 (2,7).
94 (1,5).
95 (3,4).
96 (4,6).
97 (6,5).
98 (7,7).

```

99 (9,6).
100 (8,4).
101 (6,3).
102 (7,5).
103 (5,6).
104 (4,4).
105 (2,3).
106 (4,2).
107 (5,4).
108 (3,5).
109
110 ]
111
112 fig, ax = plt.subplots(figsize=(6,6))
113 for i in range(N+1):
114     ax.plot([0, N], [i, i], color='gray', linewidth=0.5)
115     ax.plot([i, i], [0, N], color='gray', linewidth=0.5)
116 ax.set_xlim(-0.5, N-0.5)
117 ax.set_ylim(-0.5, N-0.5)
118 ax.set_aspect('equal')
119
120 line, = ax.plot([], [], marker='o', color='b', linewidth=2)
121 number_texts = []
122
123 def init():
124     line.set_data([], [])
125     for t in number_texts:
126         t.remove()
127     number_texts.clear()
128     return line,
129
130 def update(frame):
131     x, y = zip(*path[:frame+1])
132     line.set_data(x, y)
133     for t in number_texts:
134         t.remove()
135     number_texts.clear()
136     for idx, (xi, yi) in enumerate(path[:frame+1]):
137         t = ax.text(xi, yi, str(idx+1), color='red', fontsize=12, ha='center', va='center')
138         number_texts.append(t)
139     return line, *number_texts
140
141 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
142
143 # GIF로 저장
144 ani.save("animation.gif", writer=PillowWriter(fps=20))
145
146 # Colab에서 표시
147 display(Image(filename="animation.gif"))
148

```

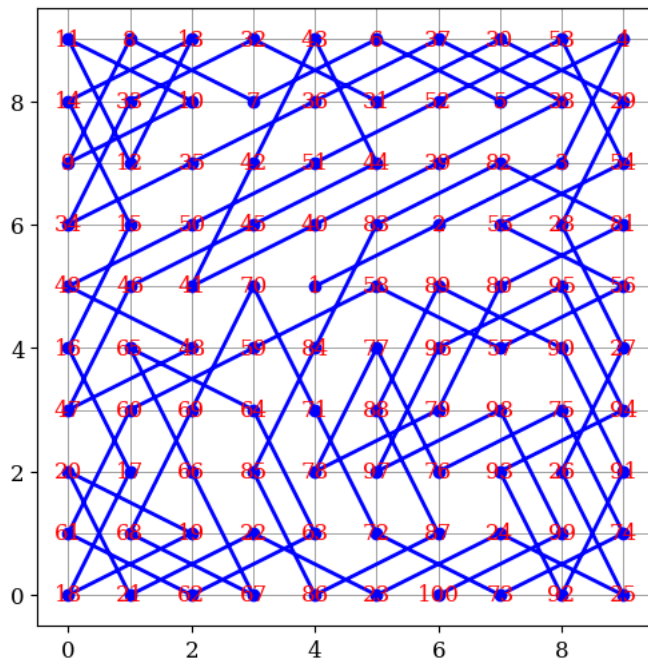
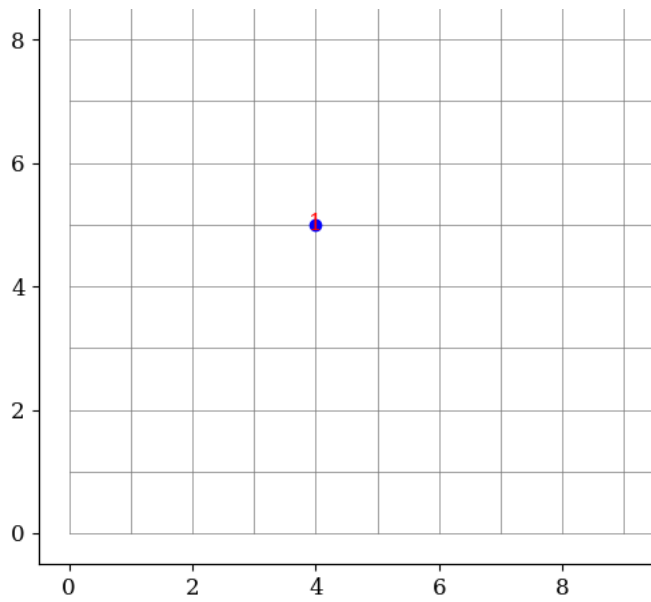
```

1 #2d W
2 import matplotlib.pyplot as plt
3 from matplotlib.animation import FuncAnimation, PillowWriter
4 from IPython.display import Image, display
5
6 # 격자 크기
7 N = 10
8 path = [
9 (4,5),
10 (6,6),
11 (8,7),
12 (9,9),
13 (7,8),
14 (5,9),
15 (3,8),
16 (1,9),
17 (0,7),
18 (2,8),
19 (0,9),
20 (1,7),
21 (2,9),
22 (0,8),

```

23 (1.6).
24 (0.4).
25 (1.2).
26 (0.0).
27 (2.1).
28 (0.2).
29 (1.0).
30 (3.1).
31 (5.0).
32 (7.1).
33 (9.0).
34 (8.2).
35 (9.4).
36 (8.6).
37 (9.8).
38 (7.9).
39 (5.8).
40 (3.9).
41 (1.8).
42 (0.6).
43 (2.7).
44 (4.8).
45 (6.9).
46 (8.8).
47 (6.7).
48 (4.6).
49 (2.5).
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51 (4.9).
52 (5.7).
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54 (1.5).
55 (0.3).
56 (2.4).
57 (0.5).
58 (2.6).
59 (4.7).
60 (6.8).
61 (8.9).
62 (9.7).
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64 (9.5).
65 (7.4).
66 (5.5).
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68 (1.3).
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70 (2.0).
71 (4.1).
72 (3.3).
73 (1.4).
74 (2.2).
75 (3.0).
76 (1.1).
77 (2.3).
78 (3.5).
79 (4.3).
80 (5.1).
81 (7.0).
82 (9.1).
83 (8.3).
84 (6.2).
85 (5.4).
86 (4.2).
87 (6.3).
88 (7.5).
89 (9.6).
90 (7.7).
91 (5.6).
92 (4.4).
93 (3.2).
94 (4.0).
95 (6.1).
96 (5.3).
97 (6.5).
98 (8.4).
99 (9.2).
100 (8.0).
101 (7.2).
102 (9.3).
103 (8.5).
104 (6.4).

```
105 (5.2),
106 (7.3),
107 (8.1),
108 (6.0),
109
110 ]
111
112 fig, ax = plt.subplots(figsize=(6,6))
113 for i in range(N+1):
114     ax.plot([0, N], [i, i], color='gray', linewidth=0.5)
115     ax.plot([i, i], [0, N], color='gray', linewidth=0.5)
116 ax.set_xlim(-0.5, N-0.5)
117 ax.set_ylim(-0.5, N-0.5)
118 ax.set_aspect('equal')
119
120 line, = ax.plot([], [], marker='o', color='b', linewidth=2)
121 number_texts = []
122
123 def init():
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125     for t in number_texts:
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129
130 def update(frame):
131     x, y = zip(*path[:frame+1])
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141 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
142
143 # GIF로 저장
144 ani.save("animation.gif", writer=PillowWriter(fps=20))
145
146 # Colab에서 표시
147 display(Image(filename="animation.gif"))
148
```



```

1 #(2,1) 3D
2 import matplotlib.pyplot as plt
3 from mpl_toolkits.mplot3d import Axes3D
4 from matplotlib.animation import FuncAnimation, PillowWriter
5 from IPython.display import Image, display
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16 (3,1,0),
17 (1,0,0),
18 (0,2,0),
19 (2,3,0),
20 (0,3,1),
21 (0,1,0),
22 (2,0,0),

```

```

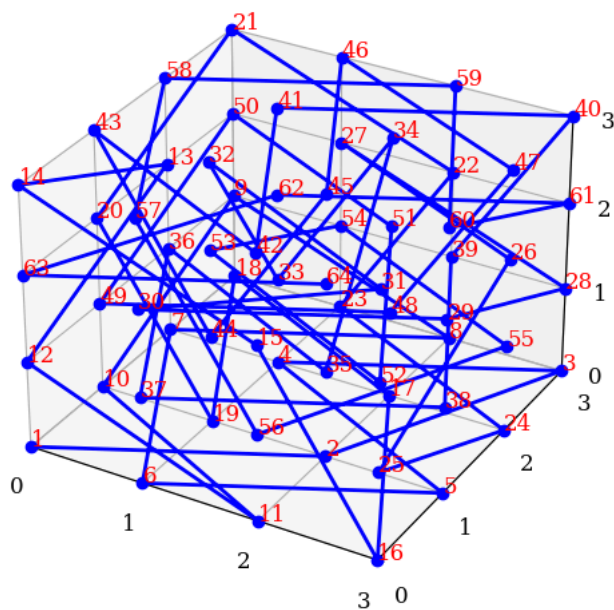
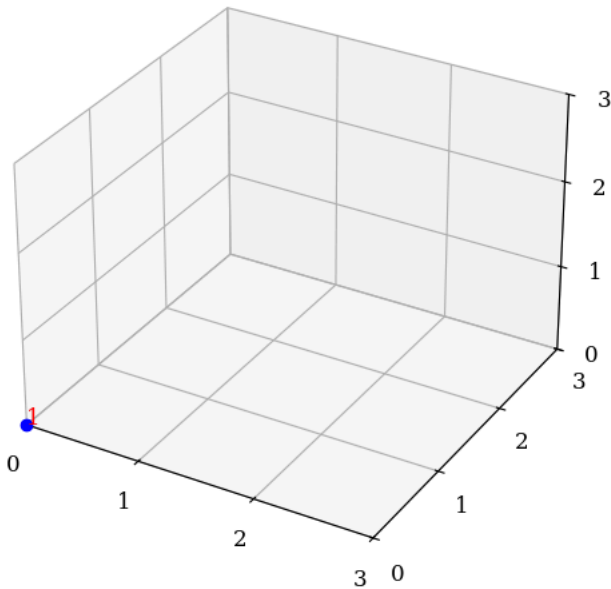
23 (0,0,1),
24 (0,2,2),
25 (0,0,3),
26 (2,0,2),
27 (3,0,0),
28 (2,2,0),
29 (0,3,0),
30 (1,1,0),
31 (0,1,2),
32 (0,3,3),
33 (2,3,2),
34 (1,3,0),
35 (3,2,0),
36 (3,0,1),
37 (3,2,2),
38 (1,3,2),
39 (3,3,1),
40 (3,1,2),
41 (1,0,2),
42 (3,0,3),
43 (1,1,3),
44 (1,2,1),
45 (2,2,3),
46 (2,1,1),
47 (0,2,1),
48 (1,0,1),
49 (3,1,1),
50 (2,3,1),
51 (3,3,3),
52 (1,2,3),
53 (2,0,3),
54 (0,1,3),
55 (1,1,1),
56 (2,1,3),
57 (1,3,3),
58 (3,2,3),
59 (2,2,1),
60 (0,1,1),
61 (0,3,2),
62 (2,2,2),
63 (3,0,2),
64 (1,1,2),
65 (1,3,1),
66 (3,2,1),
67 (2,0,1),
68 (1,0,3),
69 (0,2,3),
70 (2,3,3),
71 (3,1,3),
72 (3,3,2),
73 (1,2,2),
74 (0,0,2),
75 (2,1,2),
76
77 ]
78
79 fig = plt.figure(figsize=(6,6))
80 ax = fig.add_subplot(111, projection='3d')
81
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83 # 3D 경로 표시를 위한 초기화
84 line, = ax.plot([], [], [], marker='o', color='b', linewidth=2)
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96     x, y, z = zip(*path[:frame+1])
97     line.set_data(x, y)
98     line.set_3d_properties(z)
99
100     for t in number_texts:
101         t.remove()
102     number_texts.clear()
103
104     for idx, (xi, yi, zi) in enumerate(path[:frame+1]):

```

```

105     t = ax.text(xi, yi, zi, str(idx+1), color='red')
106     number_texts.append(t)
107
108     return line, *number_texts
109
110 xs, ys, zs = zip(*path)
111
112 # 예시: 0,1,2 정수 눈금만 표시
113 ax.set_xticks(np.arange(0, max(xs)+1, 1))
114 ax.set_yticks(np.arange(0, max(ys)+1, 1))
115 ax.set_zticks(np.arange(0, max(zs)+1, 1))
116
117 ax.set_xlim(min(xs), max(xs))
118 ax.set_ylim(min(ys), max(ys))
119 ax.set_zlim(min(zs), max(zs))
120
121
122 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
123
124 # GIF로 저장
125 ani.save("animation3d.gif", writer=PillowWriter(fps=20))
126 display(Image(filename="animation3d.gif"))
127

```



```
1 #(2,1) 3D
2 import matplotlib.pyplot as plt
3 from mpl_toolkits.mplot3d import Axes3D
4 from matplotlib.animation import FuncAnimation, PillowWriter
5 from IPython.display import Image, display
6 import matplotlib.pyplot as plt
7 import numpy as np
8
9
10 # 예시 3D 경로
11 path = [
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13 (2,1,0),
14 (4,0,0),
15 (2,0,1),
16 (0,1,1),
17 (0,0,3),
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69 (1,4,0),
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76 (2,4,4),
77 (4,4,3),
78 (4,2,4),
79 (3,0,4),
80 (1,1,4),
81 (1,3,3),
82 (3,4,3),
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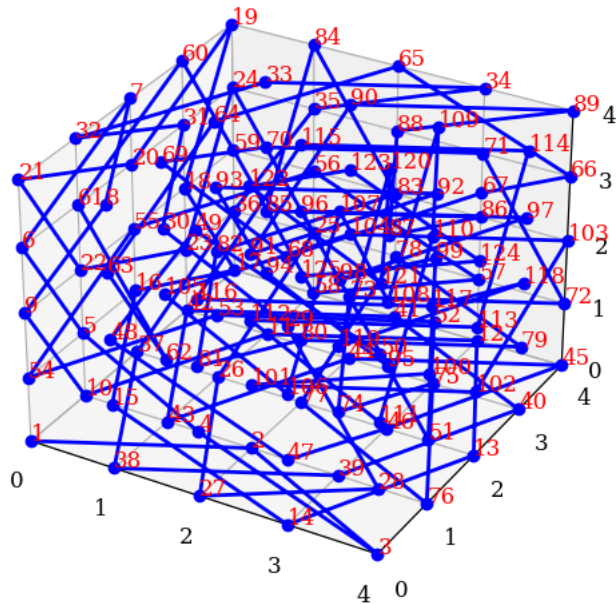
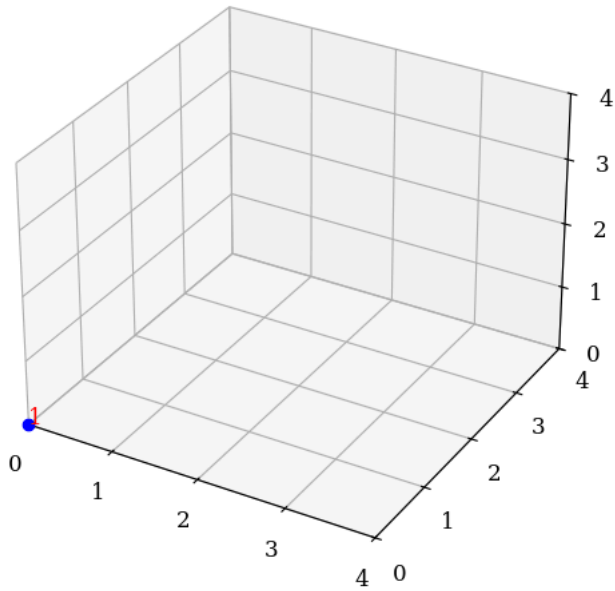
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134 (2,3,3),
135 (4,2,3),
136 (2,2,2),
137
138 ]
139
140 fig = plt.figure(figsize=(6,6))
141 ax = fig.add_subplot(111, projection='3d')
142
143
144 # 3D 경로 표시를 위한 초기화
145 line, = ax.plot([], [], [], marker='o', color='b', linewidth=2)
146 number_texts = []
147
148 def init():
149     line.set_data([], [])
150     line.set_3d_properties([])
151     for t in number_texts:
152         t.remove()
153     number_texts.clear()
154     return line,
155
156 def update(frame):
157     x, y, z = zip(*path[:frame+1])
158     line.set_data(x, y)
159     line.set_3d_properties(z)
160
161     for t in number_texts:
162         t.remove()
163     number_texts.clear()
164

```



```
165     for idx, (xi, yi, zi) in enumerate(path[:frame+1]):
166         t = ax.text(xi, yi, zi, str(idx+1), color='red')
167         number_texts.append(t)
168
169     return line, *number_texts
170
171 xs, ys, zs = zip(*path)
172
173 # 예시: 0,1,2 정수 눈금만 표시
174 ax.set_xticks(np.arange(0, max(xs)+1, 1))
175 ax.set_yticks(np.arange(0, max(ys)+1, 1))
176 ax.set_zticks(np.arange(0, max(zs)+1, 1))
177
178 ax.set_xlim(min(xs), max(xs))
179 ax.set_ylim(min(ys), max(ys))
180 ax.set_zlim(min(zs), max(zs))
181
182
183 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
184
185 # GIF로 저장
186 ani.save("animation3d.gif", writer=PillowWriter(fps=20))
187 display(Image(filename="animation3d.gif"))
188
```



✓ (2,2,1) path

```

1 #(2,1) 3D
2 import matplotlib.pyplot as plt
3 from mpl_toolkits.mplot3d import Axes3D
4 from matplotlib.animation import FuncAnimation, PillowWriter
5 from IPython.display import Image, display
6 import matplotlib.pyplot as plt
7 import numpy as np
8
9
10 # 예시 3D 경로
11 path = [
12 (2,3,1),
13 (0,1,0),
14 (2,0,2),
15 (4,1,0),
16 (6,0,2),
17 (7,2,0),
18 (5,0,1),

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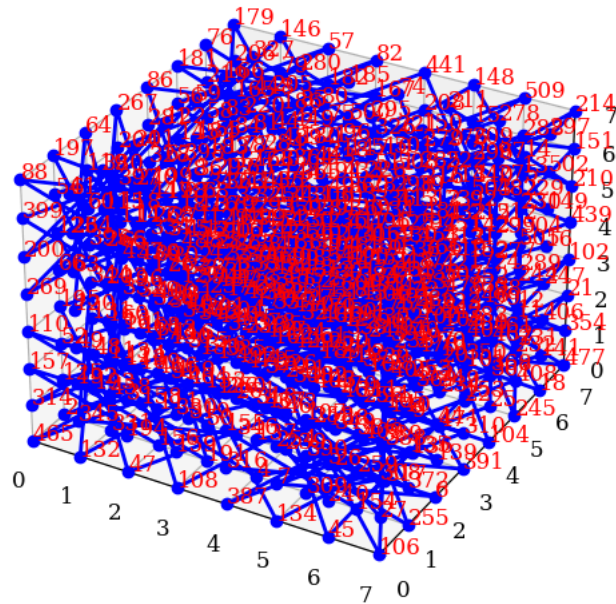
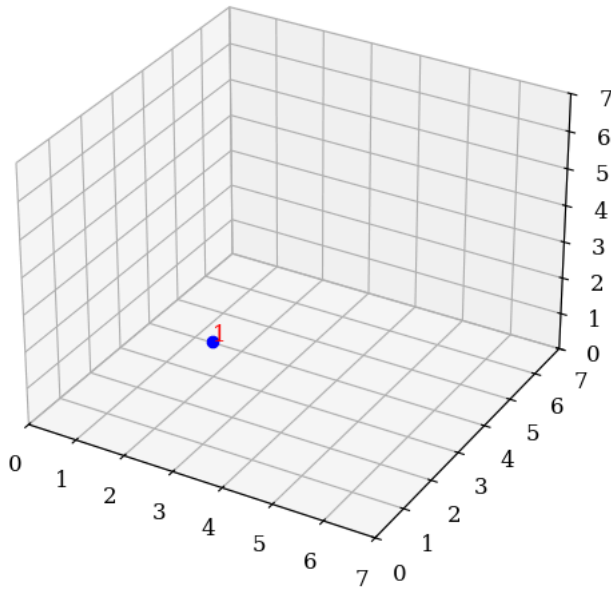
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521 (4,5,6),
522 (3,7,4),
523 (5,5,5),
524
525 ]
526
527 fig = plt.figure(figsize=(6,6))
528 ax = fig.add_subplot(111, projection='3d')
529
530
531 # 3D 경로 표시를 위한 초기화
532 line, = ax.plot([], [], [], marker='o', color='b', linewidth=2)
533 number_texts = []
534
535 def init():
536     line.set_data([], [])
537     line.set_3d_properties([])
538     for t in number_texts:
539         t.remove()
540     number_texts.clear()
541     return line,
542
543 def update(frame):
544     x, y, z = zip(*path[:frame+1])
545     line.set_data(x, y)
546     line.set_3d_properties(z)
547
548     for t in number_texts:
549         t.remove()
550     number_texts.clear()
551
552     for idx, (xi, yi, zi) in enumerate(path[:frame+1]):
553         t = ax.text(xi, yi, zi, str(idx+1), color='red')
554         number_texts.append(t)
555
556     return line, *number_texts
557
558 xs, ys, zs = zip(*path)
559
560 # 예시: 0,1,2 정수 눈금만 표시
561 ax.set_xticks(np.arange(0, max(xs)+1, 1))
562 ax.set_yticks(np.arange(0, max(ys)+1, 1))
563 ax.set_zticks(np.arange(0, max(zs)+1, 1))
564
565 ax.set_xlim(min(xs), max(xs))
566 ax.set_ylim(min(ys), max(ys))
567 ax.set_zlim(min(zs), max(zs))
568
569
570 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
571
572 # GIF로 저장
573 ani.save("animation3d.gif", writer=PillowWriter(fps=20))
574 display(Image(filename="animation3d.gif"))
575

```



```

1 #(2,1) 3D
2 import matplotlib.pyplot as plt
3 from mpl_toolkits.mplot3d import Axes3D
4 from matplotlib.animation import FuncAnimation, PillowWriter
5 from IPython.display import Image, display
6 import matplotlib.pyplot as plt
7 import numpy as np
8
9
10 # 예시 3D 경로
11 path = [
12 (2,3,1),
13 (0,1,0),
14 (2,0,2),
15 (4,1,0),
16 (6,0,2),
17 (7,2,0),
18 (5,0,1),
19 (7,1,3),
20 (6,3,1),
21 (4,5,0),
22 (6,7,1),
23 (7,5,3),

```

24 (6,7,5),
25 (7,5,7),
26 (5,7,6),
27 (7,6,4),
28 (5,7,2),
29 (7,6,0),
30 (6,4,2),
31 (5,6,0),
32 (7,7,2),
33 (6,5,0),
34 (4,7,1),
35 (6,6,3),
36 (7,4,1),
37 (5,2,0),
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39 (6,2,3),
40 (7,0,5),
41 (5,1,7),
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75 (0,2,7),
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92 (1,6,5),
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94 (1,5,6),
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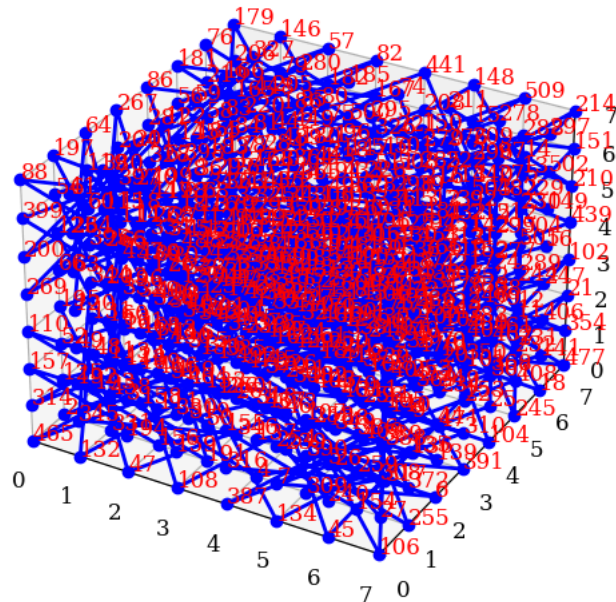
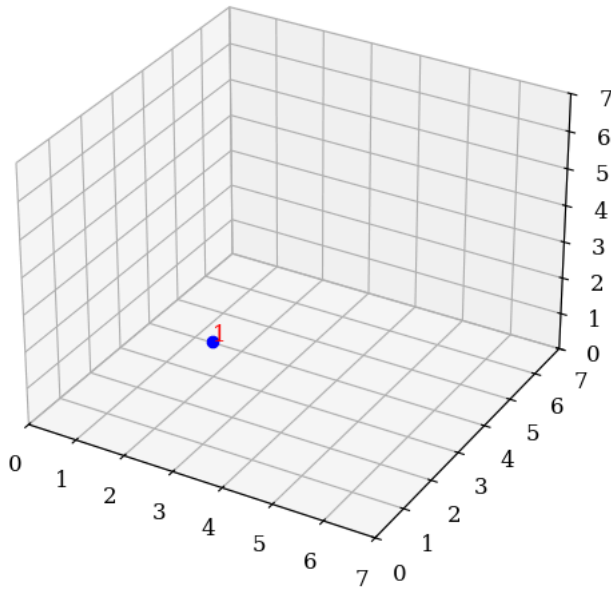
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507 (4,5,4),
508 (6,3,3),
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510 (2,4,4),
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512 (5,4,7),
513 (7,6,6),
514 (5,7,4),
515 (7,5,5),


```

516 (6,7,3),
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519 (4,6,5),
520 (6,7,7),
521 (4,5,6),
522 (3,7,4),
523 (5,5,5),
524
525 ]
526
527 fig = plt.figure(figsize=(6,6))
528 ax = fig.add_subplot(111, projection='3d')
529
530
531 # 3D 경로 표시를 위한 초기화
532 line, = ax.plot([], [], [], marker='o', color='b', linewidth=2)
533 number_texts = []
534
535 def init():
536     line.set_data([], [])
537     line.set_3d_properties([])
538     for t in number_texts:
539         t.remove()
540     number_texts.clear()
541     return line,
542
543 def update(frame):
544     x, y, z = zip(*path[:frame+1])
545     line.set_data(x, y)
546     line.set_3d_properties(z)
547
548     for t in number_texts:
549         t.remove()
550     number_texts.clear()
551
552     for idx, (xi, yi, zi) in enumerate(path[:frame+1]):
553         t = ax.text(xi, yi, zi, str(idx+1), color='red')
554         number_texts.append(t)
555
556     return line, *number_texts
557
558 xs, ys, zs = zip(*path)
559
560 # 예시: 0,1,2 정수 눈금만 표시
561 ax.set_xticks(np.arange(0, max(xs)+1, 1))
562 ax.set_yticks(np.arange(0, max(ys)+1, 1))
563 ax.set_zticks(np.arange(0, max(zs)+1, 1))
564
565 ax.set_xlim(min(xs), max(xs))
566 ax.set_ylim(min(ys), max(ys))
567 ax.set_zlim(min(zs), max(zs))
568
569
570 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
571
572 # GIF로 저장
573 ani.save("animation3d.gif", writer=PillowWriter(fps=50))
574 display(Image(filename="animation3d.gif"))
575

```



✓ 경로

```

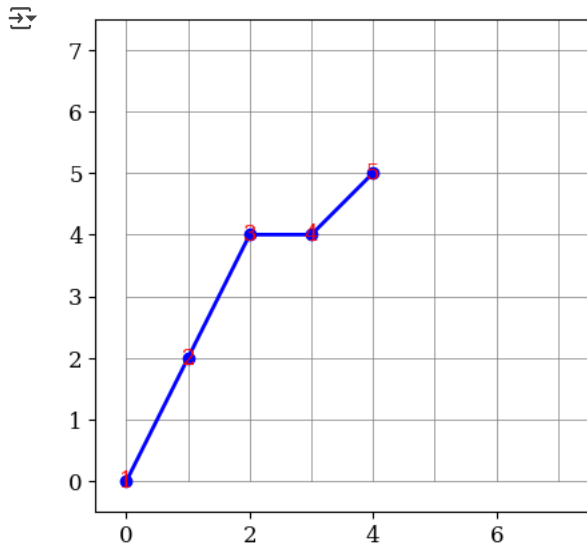
1 import matplotlib.pyplot as plt
2
3 N = 8 # 격자 크기
4 path = [(0,0), (1,2), (2,4), (3,4), (4,5)] # 예시 경로
5
6 # 격자 그리기
7 for i in range(N+1):
8     plt.plot([0, N], [i, i], color='gray', linewidth=0.5) # 가로선
9     plt.plot([i, i], [0, N], color='gray', linewidth=0.5) # 세로선
10
11 # 경로 그리기
12 x, y = zip(*path)
13 plt.plot(x, y, marker='o', color='b', linewidth=2)
14 for idx, (xi, yi) in enumerate(path):
15     plt.text(xi, yi, str(idx+1), color='red', fontsize=12, ha='center', va='center')
16
17 plt.xlim(-0.5, N-0.5)
18 plt.ylim(-0.5, N-0.5)

```

```

19 plt.gca().set_aspect('equal')
20 plt.show()
21

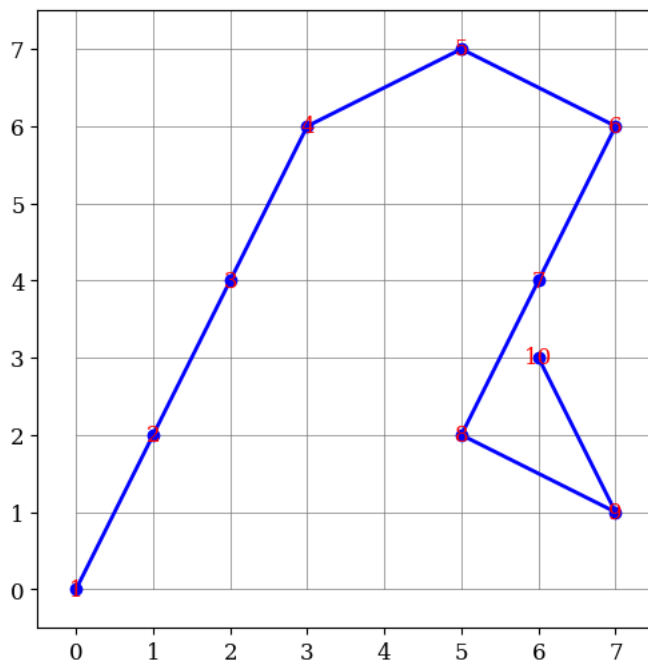
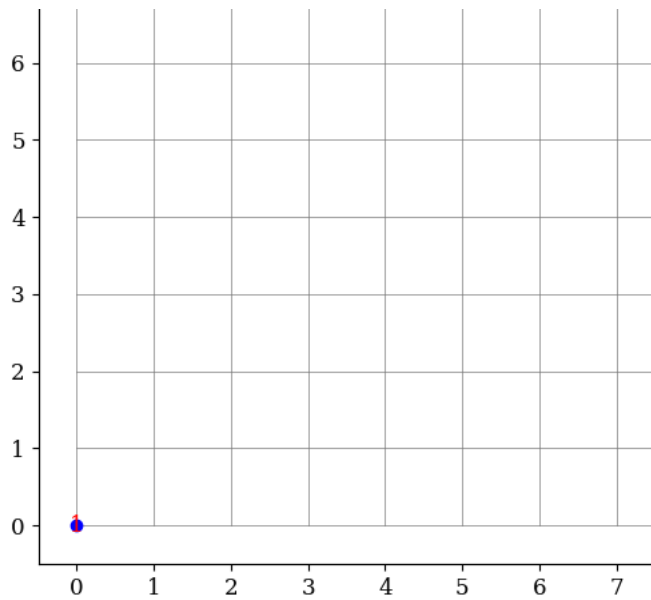
```



```

1 import matplotlib.pyplot as plt
2 from matplotlib.animation import FuncAnimation, PillowWriter
3 from IPython.display import Image, display
4
5 # 격자 크기
6 N = 8
7 path = [(0,0), (1,2), (2,4), (3,6), (5,7), (7,6), (6,4), (5,2), (7,1), (6,3)]
8
9 fig, ax = plt.subplots(figsize=(6,6))
10 for i in range(N+1):
11     ax.plot([0, N], [i, i], color='gray', linewidth=0.5)
12     ax.plot([i, i], [0, N], color='gray', linewidth=0.5)
13 ax.set_xlim(-0.5, N-0.5)
14 ax.set_ylim(-0.5, N-0.5)
15 ax.set_aspect('equal')
16
17 line, = ax.plot([], [], marker='o', color='b', linewidth=2)
18 number_texts = []
19
20 def init():
21     line.set_data([], [])
22     for t in number_texts:
23         t.remove()
24     number_texts.clear()
25     return line,
26
27 def update(frame):
28     x, y = zip(*path[:frame+1])
29     line.set_data(x, y)
30     for t in number_texts:
31         t.remove()
32     number_texts.clear()
33     for idx, (xi, yi) in enumerate(path[:frame+1]):
34         t = ax.text(xi, yi, str(idx+1), color='red', fontsize=12, ha='center', va='center')
35         number_texts.append(t)
36     return line, *number_texts
37
38 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
39
40 # GIF로 저장
41 ani.save("animation.gif", writer=PillowWriter(fps=2))
42
43 # Colab에서 표시
44 display(Image(filename="animation.gif"))
45

```



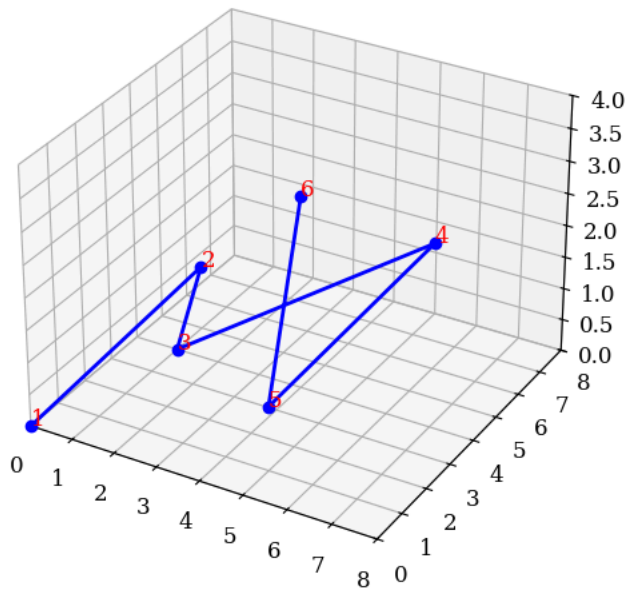
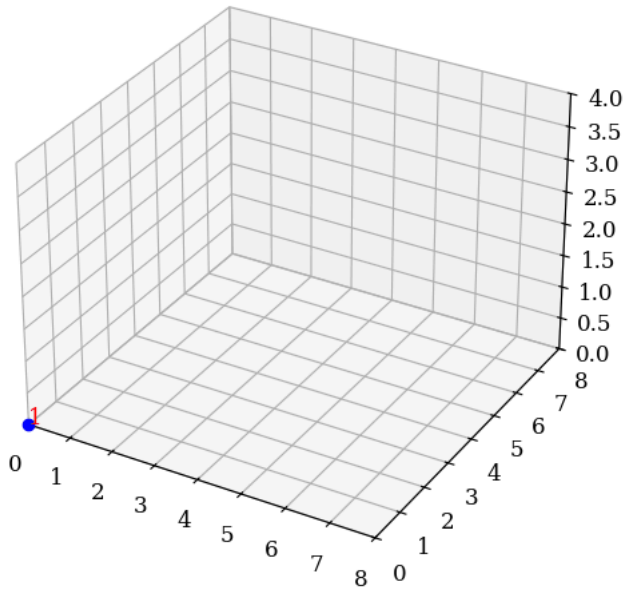
▽ 새 섹션

```

1 import matplotlib.pyplot as plt
2 from mpl_toolkits.mplot3d import Axes3D
3 from matplotlib.animation import FuncAnimation, PillowWriter
4 from IPython.display import Image, display
5
6 # 예시 3D 경로
7 path = [(0,0,0), (1,5,1), (1,4,0), (6,6,2), (5,1,1), (4,4,3)]
8
9 fig = plt.figure(figsize=(6,6))
10 ax = fig.add_subplot(111, projection='3d')
11
12 # 3D 경로 표시를 위한 초기화
13 line, = ax.plot([], [], [], marker='o', color='b', linewidth=2)
14 number_texts = []
15
16 def init():
17     line.set_data([], [])
18     line.set_3d_properties([])

```

```
19     for t in number_texts:
20         t.remove()
21     number_texts.clear()
22     return line,
23
24 def update(frame):
25     x, y, z = zip(*path[:frame+1])
26     line.set_data(x, y)
27     line.set_3d_properties(z)
28
29     for t in number_texts:
30         t.remove()
31     number_texts.clear()
32
33     for idx, (xi, yi, zi) in enumerate(path[:frame+1]):
34         t = ax.text(xi, yi, zi, str(idx+1), color='red')
35         number_texts.append(t)
36
37     return line, *number_texts
38
39 ax.set_xlim(0, 8)
40 ax.set_ylim(0, 8)
41 ax.set_zlim(0, 4)
42
43 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
44
45 # GIF로 저장
46 ani.save("animation3d.gif", writer=PillowWriter(fps=2))
47 display(Image(filename="animation3d.gif"))
48
```



1

✓ 메모장

```

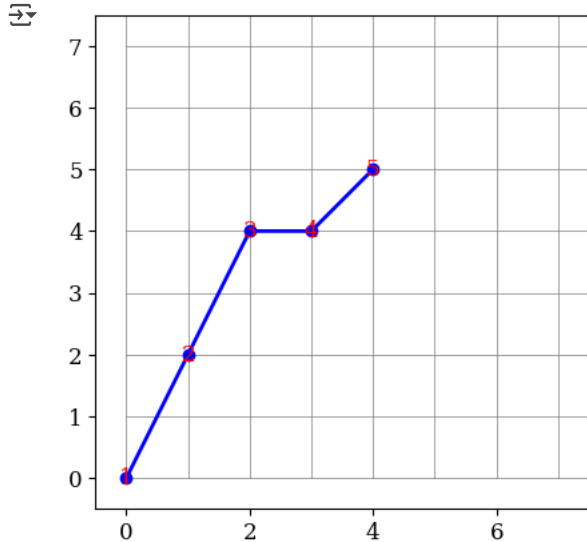
1 import matplotlib.pyplot as plt
2
3 N = 8 # 격자 크기
4 path = [(0,0), (1,2), (2,4), (3,4), (4,5)] # 예시 경로
5
6 # 격자 그리기
7 for i in range(N+1):
8     plt.plot([0, N], [i, i], color='gray', linewidth=0.5) # 가로선
9     plt.plot([i, i], [0, N], color='gray', linewidth=0.5) # 세로선
10
11 # 경로 그리기
12 x, y = zip(*path)
13 plt.plot(x, y, marker='o', color='b', linewidth=2)
14 for idx, (xi, yi) in enumerate(path):
15     plt.text(xi, yi, str(idx+1), color='red', fontsize=12, ha='center', va='center')
16

```

```

17 plt.xlim(-0.5, N-0.5)
18 plt.ylim(-0.5, N-0.5)
19 plt.gca().set_aspect('equal')
20 plt.show()
21

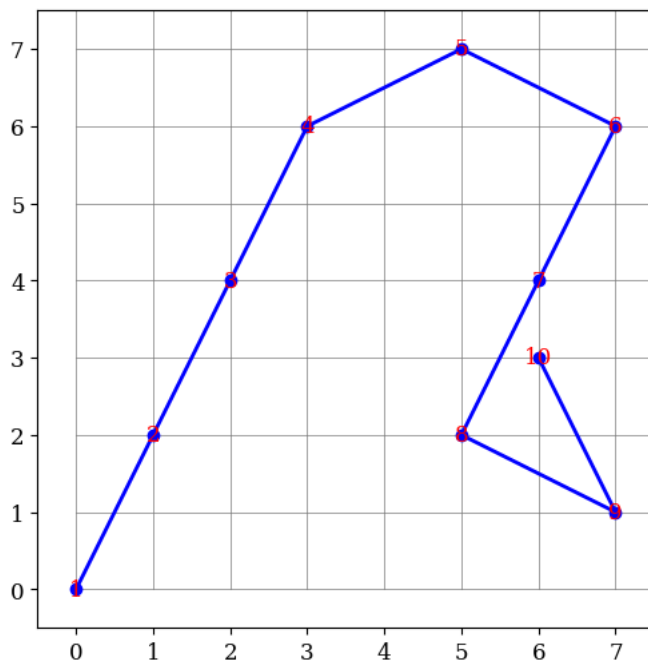
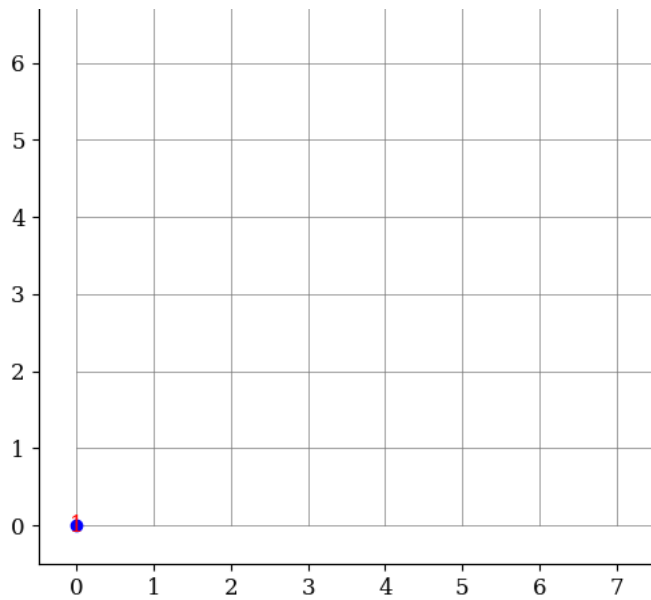
```



```

1 import matplotlib.pyplot as plt
2 from matplotlib.animation import FuncAnimation, PillowWriter
3 from IPython.display import Image, display
4
5 # 격자 크기
6 N = 8
7 path = [(0,0), (1,2), (2,4), (3,6), (5,7), (7,6), (6,4), (5,2), (7,1), (6,3)]
8
9 fig, ax = plt.subplots(figsize=(6,6))
10 for i in range(N+1):
11     ax.plot([0, N], [i, i], color='gray', linewidth=0.5)
12     ax.plot([i, i], [0, N], color='gray', linewidth=0.5)
13 ax.set_xlim(-0.5, N-0.5)
14 ax.set_ylim(-0.5, N-0.5)
15 ax.set_aspect('equal')
16
17 line, = ax.plot([], [], marker='o', color='b', linewidth=2)
18 number_texts = []
19
20 def init():
21     line.set_data([], [])
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28     x, y = zip(*path[:frame+1])
29     line.set_data(x, y)
30     for t in number_texts:
31         t.remove()
32     number_texts.clear()
33     for idx, (xi, yi) in enumerate(path[:frame+1]):
34         t = ax.text(xi, yi, str(idx+1), color='red', fontsize=12, ha='center', va='center')
35         number_texts.append(t)
36     return line, *number_texts
37
38 ani = FuncAnimation(fig, update, frames=len(path), init_func=init, blit=True, interval=500, repeat=False)
39
40 # GIF로 저장
41 ani.save("animation.gif", writer=PillowWriter(fps=2))
42
43 # Colab에서 표시
44 display(Image(filename="animation.gif"))
45

```



```

1 import matplotlib.pyplot as plt
2 from mpl_toolkits.mplot3d import Axes3D
3 from matplotlib.animation import FuncAnimation, PillowWriter
4 from IPython.display import Image, display
5
6 # 예시 3D 경로
7 path = [(0,0,0), (1,5,1), (1,4,0), (6,6,2), (5,1,1), (4,4,3)]
8
9 fig = plt.figure(figsize=(6,6))
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12 # 3D 경로 표시를 위한 초기화
13 line, = ax.plot([], [], [], marker='o', color='b', linewidth=2)
14 number_texts = []
15
16 def init():
17     line.set_data([], [])
18     line.set_3d_properties([])
19     for t in number_texts:
20         t.remove()
21     number_texts.clear()
22     return line,

```