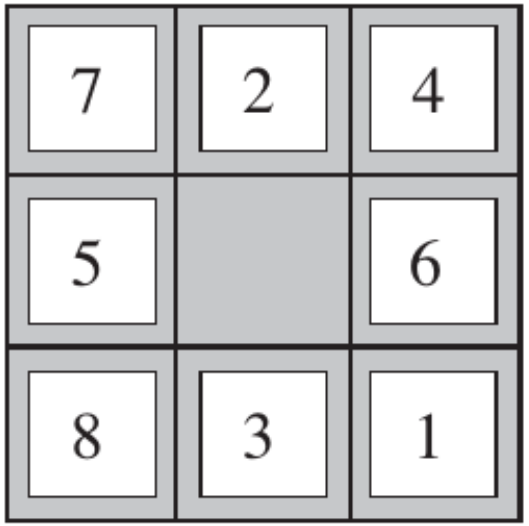
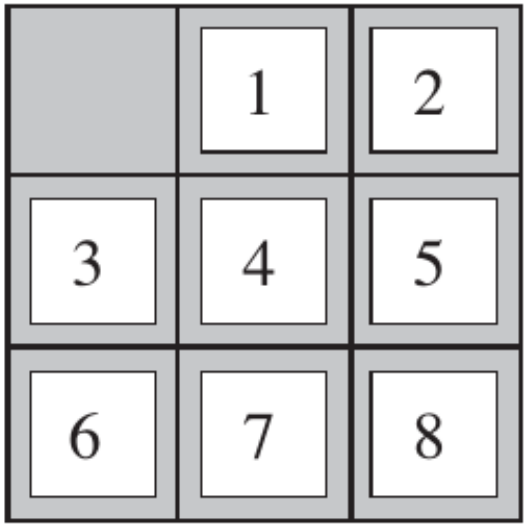
Heuristic Functions for 8-puzzle problem



Start State



Goal State

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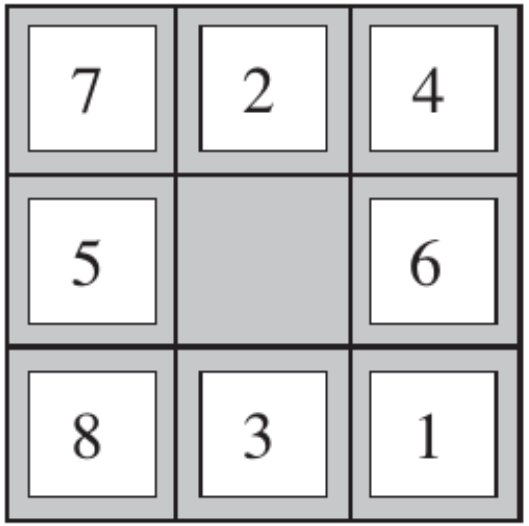

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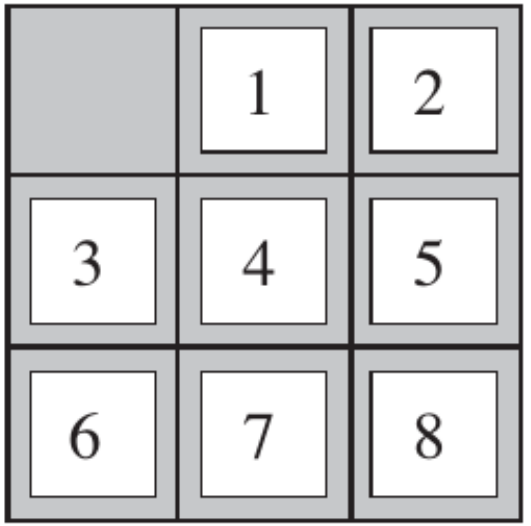

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1. Number of misplaced tiles (h_1) 8

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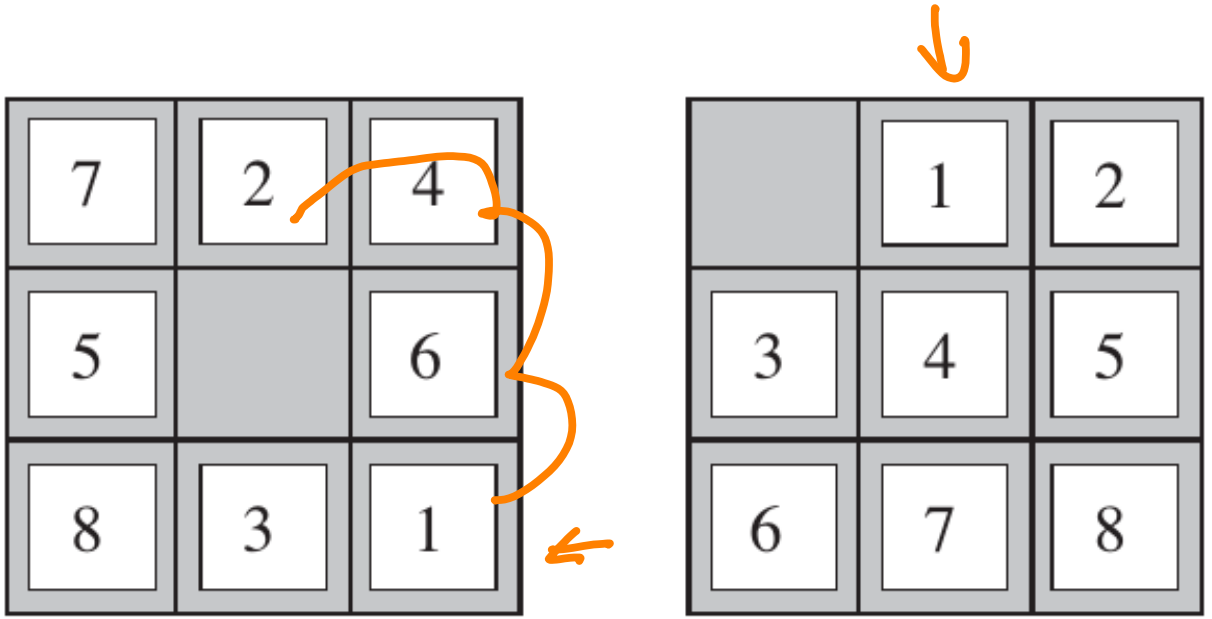

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2. Manhattan distance (h_2)

3 + . . . + = 18

Effect of Heuristic on performance

- For now, let us assume that h_1 and h_2 are consistent.

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	Search Cost (nodes generated)			Effective Branching Factor		
d	IDS	A*(h_1)	A*(h_2)	IDS	A*(h_1)	A*(h_2)
2	10	6	6	2.45	1.79	1.79
4	112	13	12	2.87	1.48	1.45
6	680	20	18	2.73	1.34	1.30
8	6384	39	25	2.80	1.33	1.24
10	47127	93	39	2.79	1.38	1.22
12	3644035	227	73	2.78	1.42	1.24
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Figure 3.29 Comparison of the search costs and effective branching factors for the ITERATIVE-DEEPENING-SEARCH and A* algorithms with h_1, h_2. Data are averaged over 100 instances of the 8-puzzle for each of various solution lengths d.

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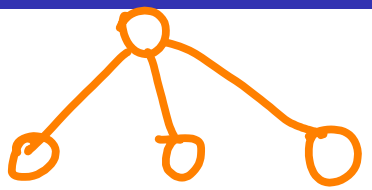

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Heuristic domination

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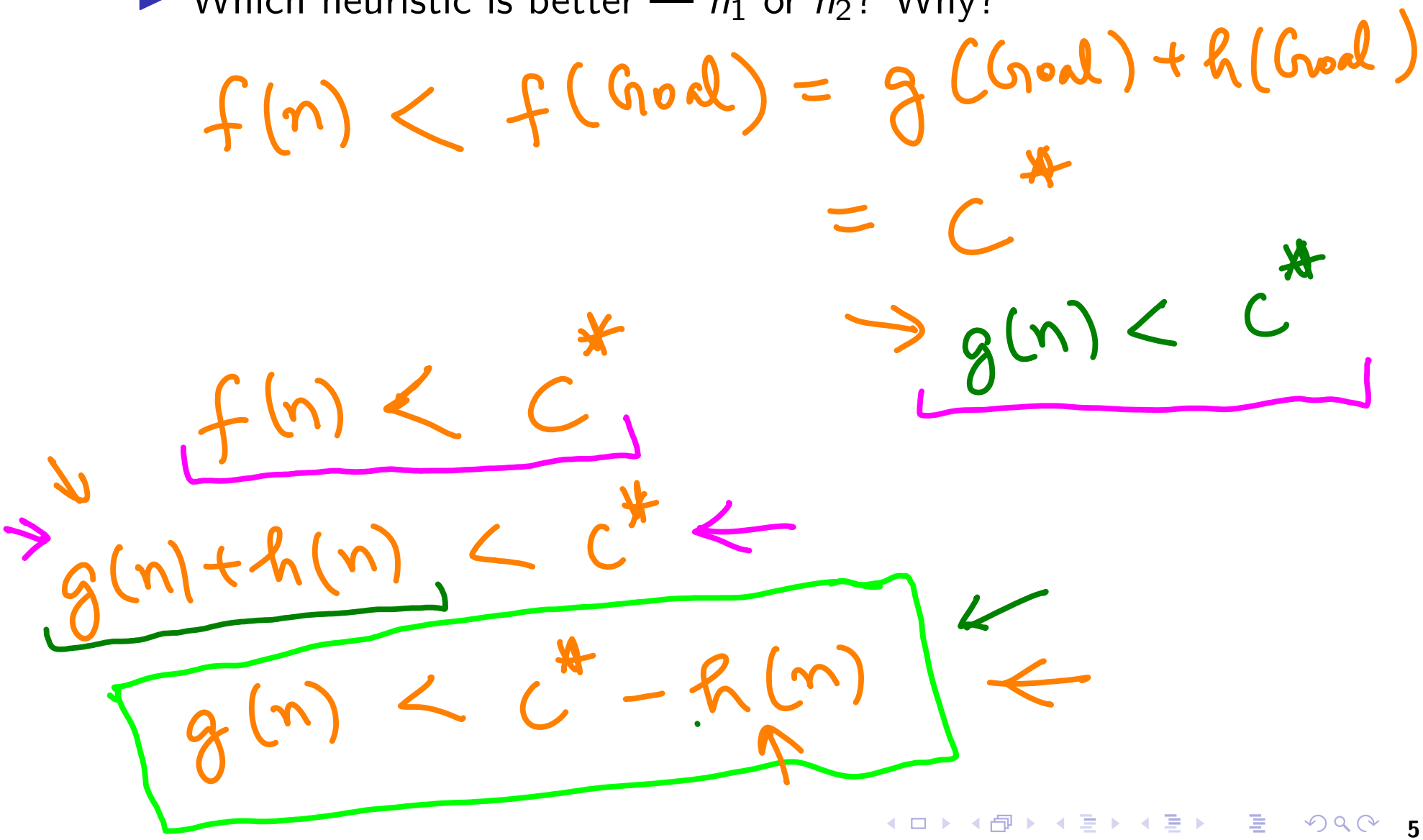

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- How to find a consistent heuristic?

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- Each action can move one tile one position closer to its goal position.
- What will be the cost of the shortest path in this relaxed state space? Manhattan distance (h_2)

h_2 is consistent in the relaxed state space for 8-puzzle

To prove : $h_2(n) \leq c(n, a, n') + h_2(n')$

Proof:

$h_2(n) > c(n, a, n') + h_2(n')$