

#### Breadth\_first\_search:

Problem	Expansions	Goal Tests	Time Elapsed	Optimality
1	43	56	0.0328	Yes
2	3343	4609	11.30	Yes
3	14663	18098	87.84	Yes

#### Depth\_first\_graph\_search:

Problem	Expansions	Goal Tests	Time Elapsed	Optimality
1	21	22	0.0097	No
2	624	625	2.938	No
3	408	409	1.400	No

#### Uniform\_cost\_search:

Problem	Expansions	Goal Tests	Time Elapsed	Optimality
1	55	57	0.0239	Yes
2	4853	4855	8.497	Yes
3	18151	18153	38.23	Yes

#### A\*\_ignore\_precond:

Problem	Expansions	Goal Tests	Time Elapsed	Optimality
1	41	43	0.02751	Yes
2	1450	1452	3.209	Yes
3	5038	5040	13.47	Yes

#### A\*\_planning\_graph:

Problem	Expansions	Goal Tests	Time Elapsed	Optimality
1	11	13	0.6073	Yes
2	86	88	54.85	Yes
3	313	315	259.2	Yes

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#### Optimal Plans

##### Problem 1:

```
Load(C1, P1, SFO)
Fly(P1, SFO, JFK)
Unload(C1, P1, JFK)
Load(C2, P2, JFK)
Fly(P2, JFK, SFO)
Unload(C2, P2, SFO)
```

##### Problem 2:

```
Load(C1, P1, SFO)
Fly(P1, SFO, JFK)
Unload(C1, P1, JFK)
Load(C2, P2, JFK)
Fly(P2, JFK, SFO)
Unload(C2, P2, SFO)
Load(C3, P3, ATL)
Fly(P3, ATL, SFO)
Unload(C3, P3, SFO)
```

##### Problem 3:

```
Load(C1, P1, SFO)
Fly(P1, SFO, ATL)
Load(C3, P1, ATL)
Fly(P1, ATL, JFK)
Unload(C1, P1, JFK)
Load(C2, P2, JFK)
```

```
Fly(P2, JFK, ORD)
Load(C4, P2, ORD)
Fly(P2, ORD, SFO)
Unload(C2, P2, SFO)
Unload(C3, P1, JFK)
Unload(C4, P2, SFO)
```

**Analysis:**

The best heuristic is A\* search ignoring preconditions based on optimality and time elapsed. However, for simple problems like problem 1, other methods like uniform cost search may perform better, which is a simpler algorithm but still effective for simple problems.