# Week 2 Exercises
Uninformed and Informed Search

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50.021 Artificial Intelligence

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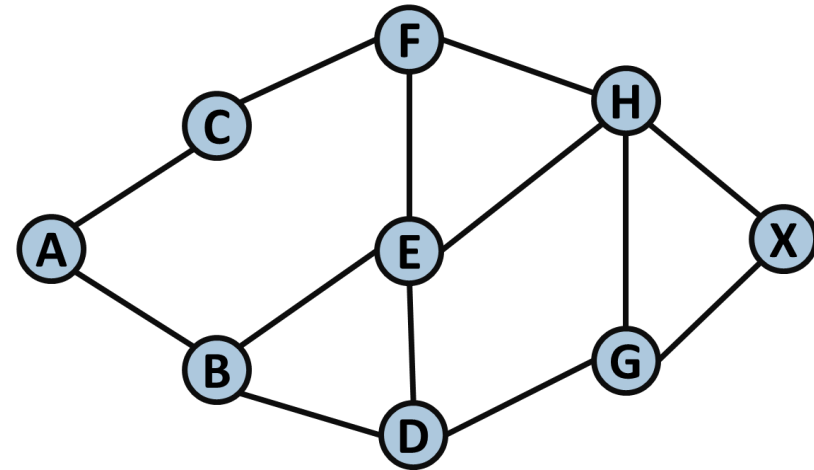
Exercise: Applying Search
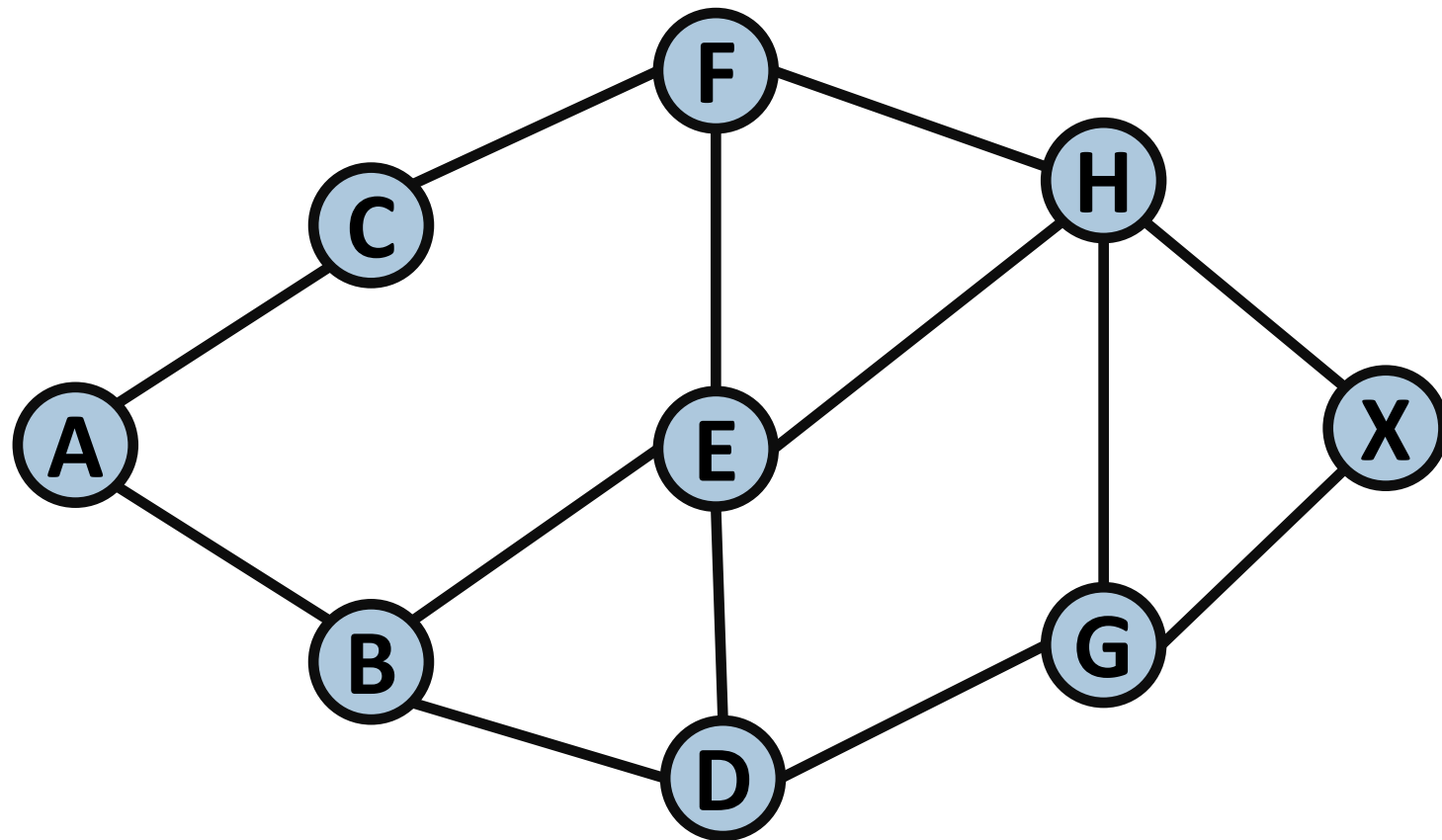
Exercise: Applying Search

o Using the graph shown, run **Breadth-First Search** as a graph search, with A as the initial state and X as the goal state. Assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

```
FIFO queue
Pop out one at the front and add node to be explored
A
AB, AC
AC, ABD, ABE
ABD, ABE, ACF
ABE, ACF, ABDG (ABDE not added – explored alr)
ACF, ABDG, ABEH
ABDG, ABEH (ACF removed, not expanded)
ABEH, ABDGX

ABDGX
```

Exercise: Applying Search

o Using the graph shown, run **Depth-First Search** as a graph search, with A as the initial state and X as the goal state. Assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

```
LIFO queue
Pop out one at the back and add node to be explored
A
AB, AC
AB, ACF
AB, ACFH
AB, ACFHG, ACFHX

ACFHX
```
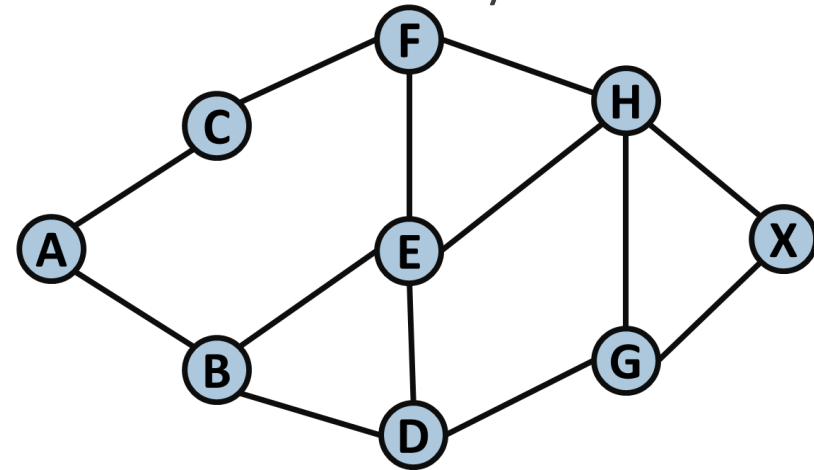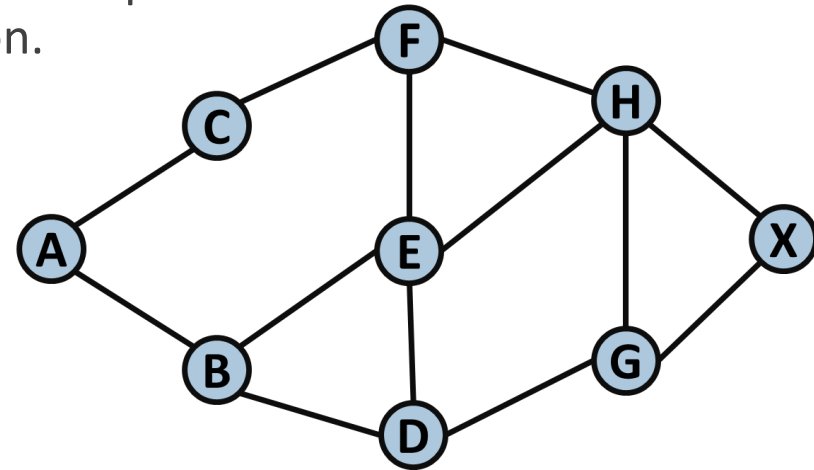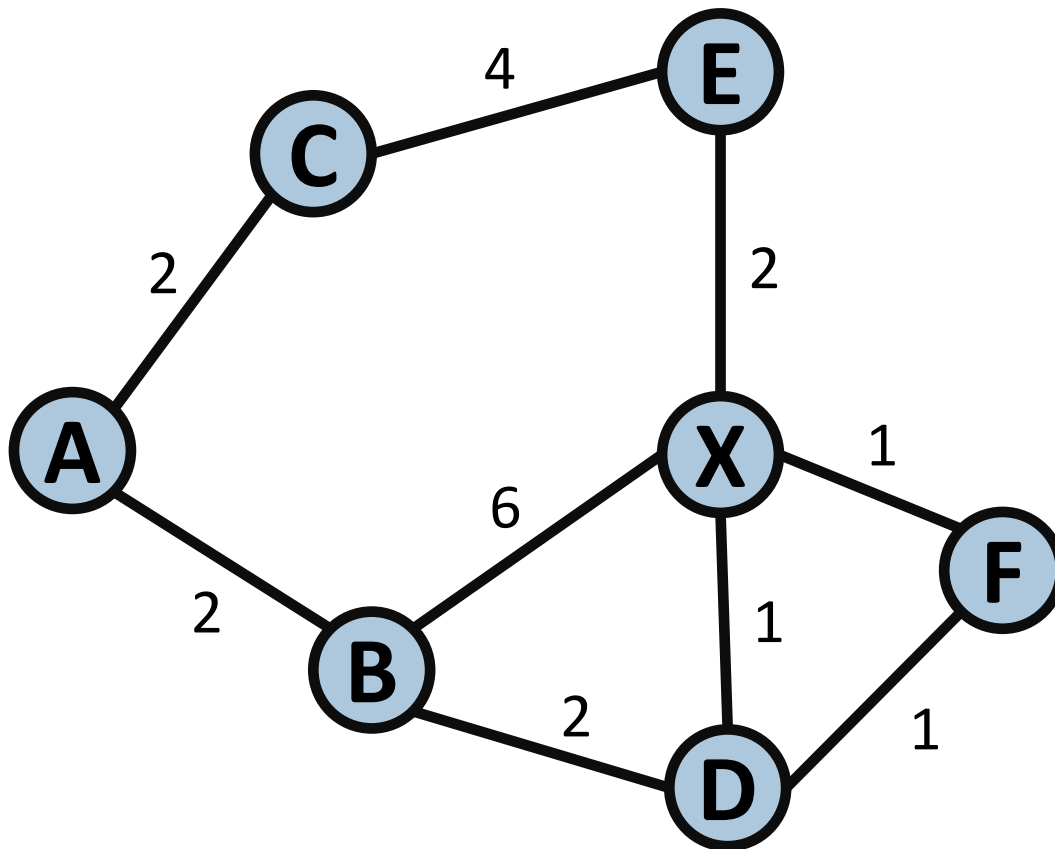
Exercise: Applying Search

o Using the graph shown, run **Depth-Limited Search** as a graph search, with A as the initial state, X as the goal state and depth l = 2. Assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

```
A
AB, AC
AB, ACF
AB,
ABD, ABE
ABD
[empty]

Solution: NIL
```

Exercise: Applying Search

Heuristic
_h(n)_ to X

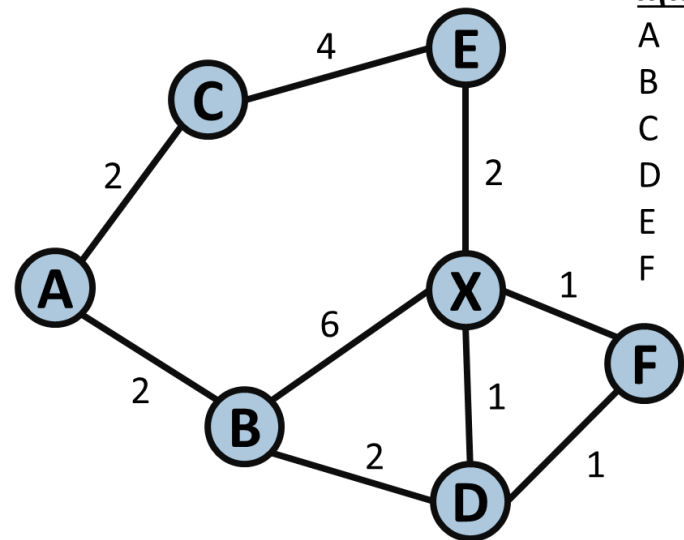|	
A	7
B	4
C	5
D	3
E	4
F	2

Exercise: Applying Search

o Using the graph shown, run **Greedy Best-first Search** as graph search, with A as the initial state, X as the goal state. In the event of a tie-break, assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

```
Priority queue, pop and expand lowest h(n)

A (7)
AB (4), AC (5)
ABX (0), ABD (3), AC(5)

Solution: ABX
```

Heuristic
_h(n)_ **to X**

A	7
B	4
C	5
D	3
E	4
F	2

Exercise: Applying Search

o Using the graph shown, run **A* Search**, with A as the initial state, X as the goal state. In the event of a tie-break, assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

Heuristic
_h(n)_ to X

```
Add step cost to h(n), expand node that incurred least cost

A (7)
AB (2+4=6), AC (2+5=7)
ABD (2+2+3=7),  AC (7), ABX (2+6=8)
ABDX (2+2+1=5), ABDF (2+2+1+2=7), AC (7), ABX (2+6=8)

Solution: ABDX
```

A	7
B	4
C	5
D	3
E	4
F	2