

Key Sample-5 (Page 1 of 2)

A* SEARCH: S -> G

Expanded	Search Fringe (g+h=f)
S	C(4+3=7), B(6+4=10), J(2+8=10), K(7+5=12), I(10+7=17)
C	B(6+4=10), G(10+0=10), J(2+8=10), H(5+6=11), K(7+5=12) I(10+7=17)
B	B(6+4=10), J(2+8=10), G(10+0=10), H(5+6=11), K(7+5=12) I(10+7=17), F(11+7=18)
G	[]
	Solution path: S -> C -> G

Question 2: Alpha-Beta Minimax

A=9

B=9

C=9

D=9

E=9

F=9

H=4

I=9

J=9

K=12

L=7

M=9

N=6

O=5

Pruned Nodes: G, K, N, O

Question 3: Decision Tree

Information Gain Computations:

Node: Outlook

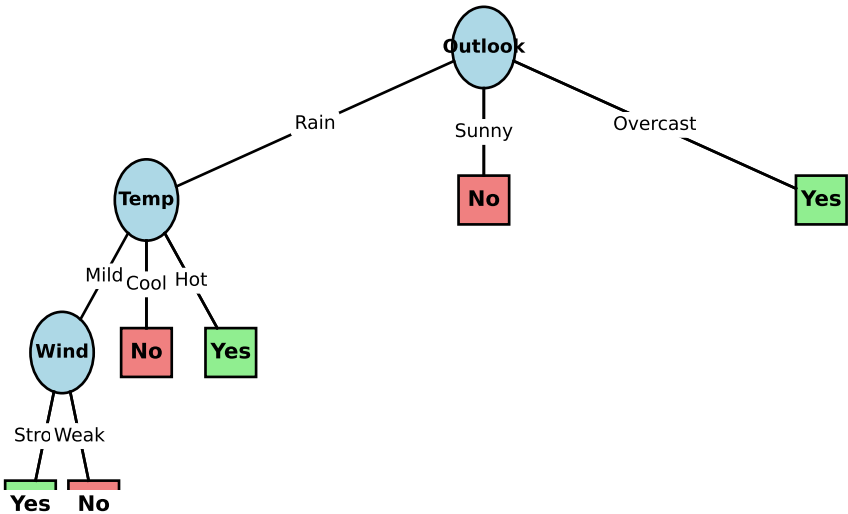
- ✓ Outlook: 0.5000
- Temp: 0.3444
- Wind: 0.1887

Node: Temp

- ✓ Temp: 0.5000
- Wind: 0.3113

Node: Wind

- ✓ Wind: 1.0000



Question 4: First-Order Logic Translation

Predicates: Company(x), Employee(x), WorksFor(x, x), Manager(x)

a. English to First-Order Logic:

1. Every company has at least one employee.

Solution: $\forall x (Company(x) \Rightarrow \exists y (Employee(y) \wedge WorksFor(y, x)))$

2. Managers work for companies that have other managers.

Solution: $\forall x (Employee(x) \wedge Manager(x) \Rightarrow \exists y (Company(y) \wedge WorksFor(x, y) \wedge \exists z (Employee(z) \wedge Manager(z) \wedge WorksFor(z, y) \wedge \neg(x=z))))$

3. There is a company where all employees are managers.

Solution: $\exists x (Company(x) \wedge \forall y (Employee(y) \wedge WorksFor(y, x) \Rightarrow Manager(y)))$

b. First-Order Logic to English:

1. $\forall x (Company(x) \Rightarrow \exists y (Employee(y) \wedge WorksFor(y, x) \wedge Manager(y)))$

Solution: Every company has at least one employee who is a manager.

2. $\exists x (Employee(x) \wedge Manager(x) \wedge \forall y (Company(y) \wedge WorksFor(x, y) \Rightarrow Manager(x)))$

Solution: There exists a manager such that if they work for any company, then they are a manager.

3. $\forall x \forall y (Employee(x) \wedge Company(y) \wedge WorksFor(x, y) \Rightarrow \exists z (Employee(z) \wedge WorksFor(z, y) \wedge \neg(x=z)))$

Solution: For every employee working for a company, there exists another employee working for the same company.