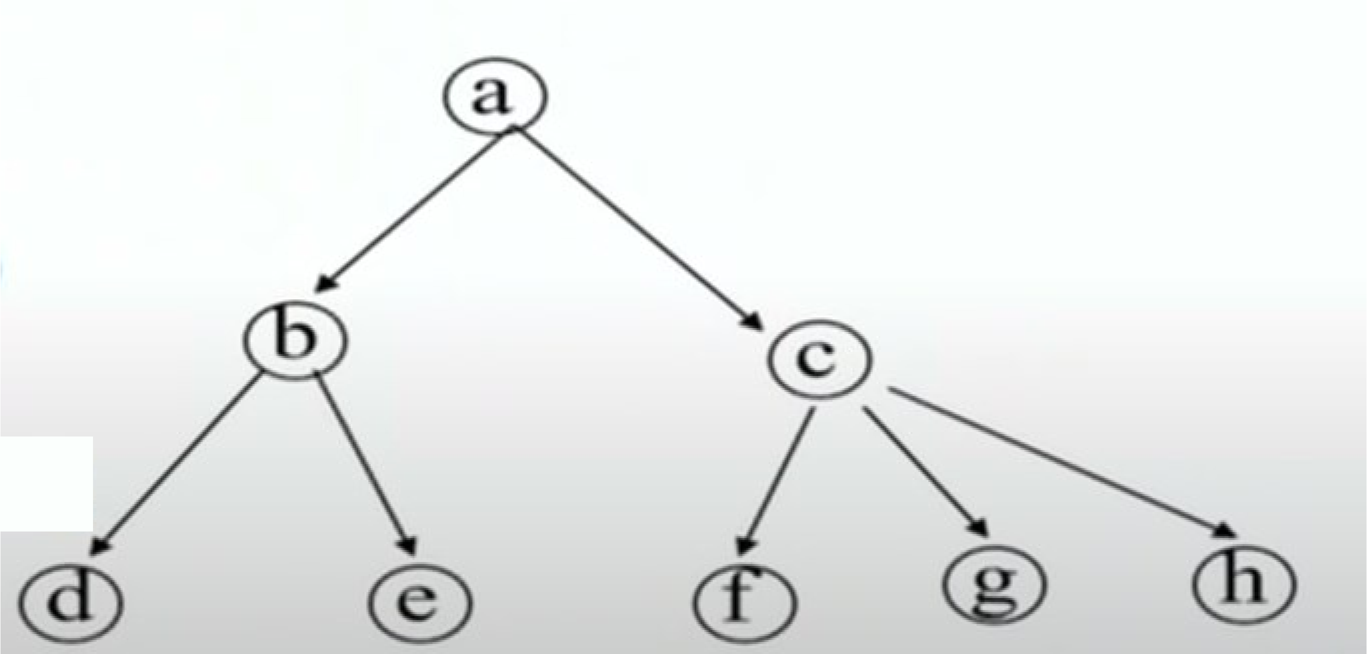
- ✓ **Breadth-First Search (BFS)**
- ✓ **Depth-First Search (DFS):**
- ✓ **Uniform-Cost Search (UCS):**
- ✓ **Bidirectional Search**
- ✓ **Iterative Deepening Search (IDS)**
- ✓ **Depth-Limited Search (DLS)**


a
b
c
d
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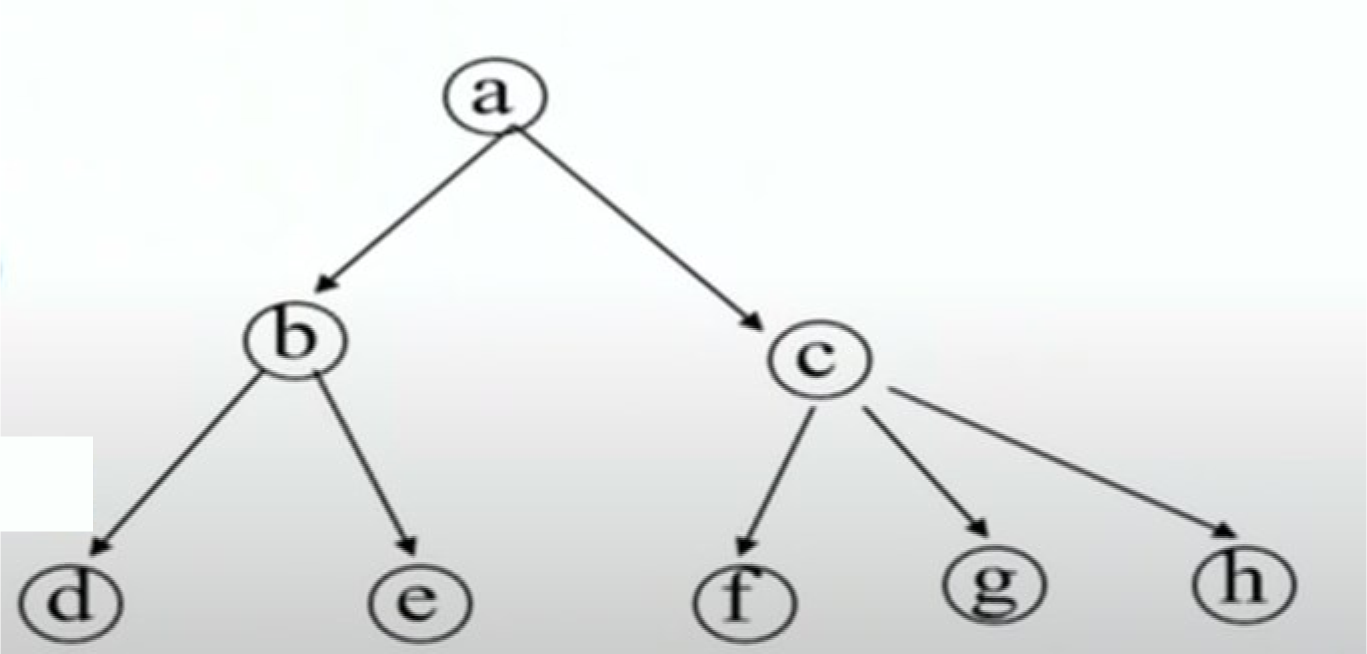
f
g
h


a
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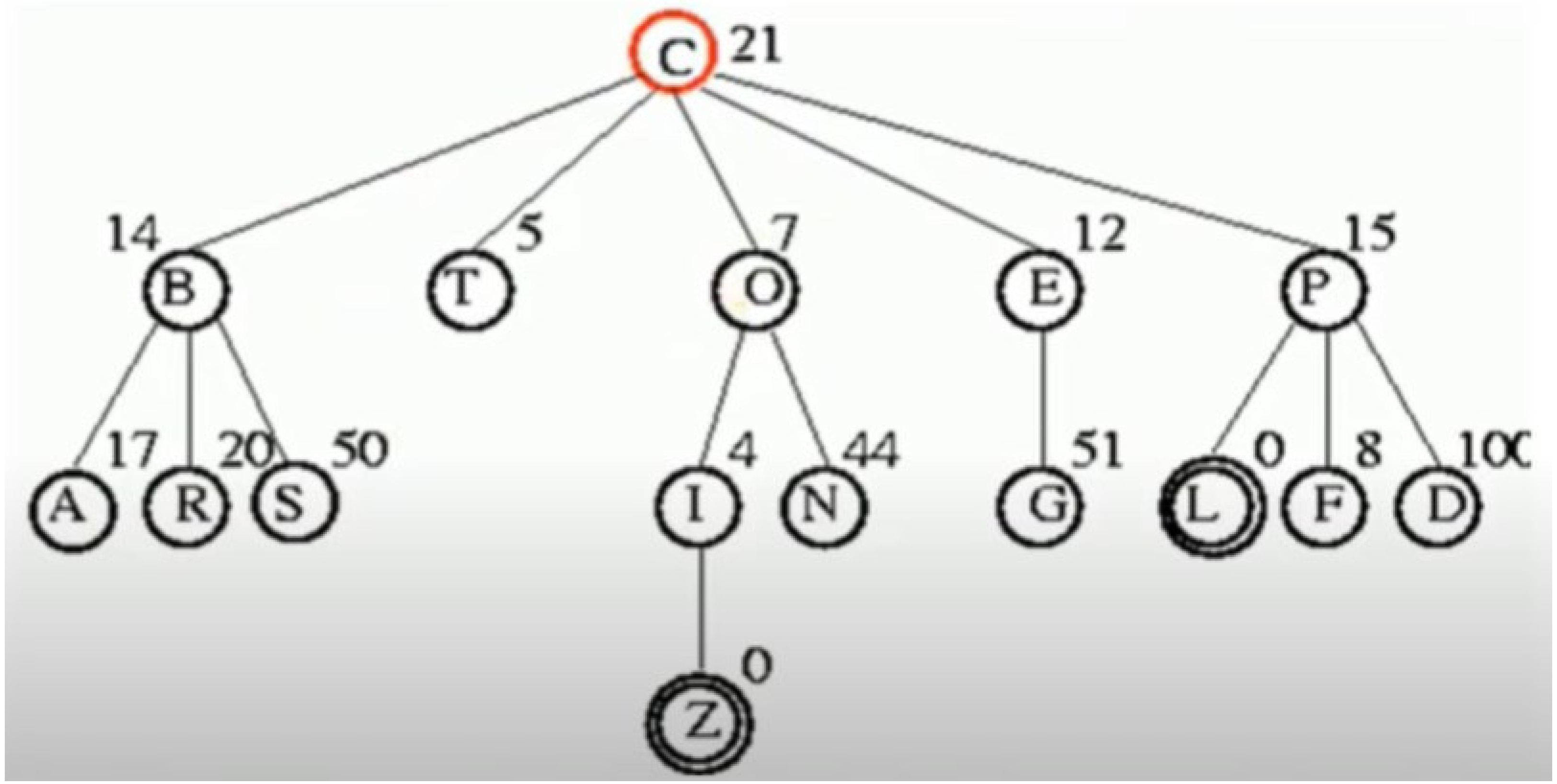
Uniform-Cost Search (UCS):

- UCS expands nodes based on their path cost from the initial state.
- It is used for weighted graphs or problems where the cost of the path is a crucial factor.


C
21
14
B
T
5
O
7
E
12
P
15
A
17
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20
S
50
I
4
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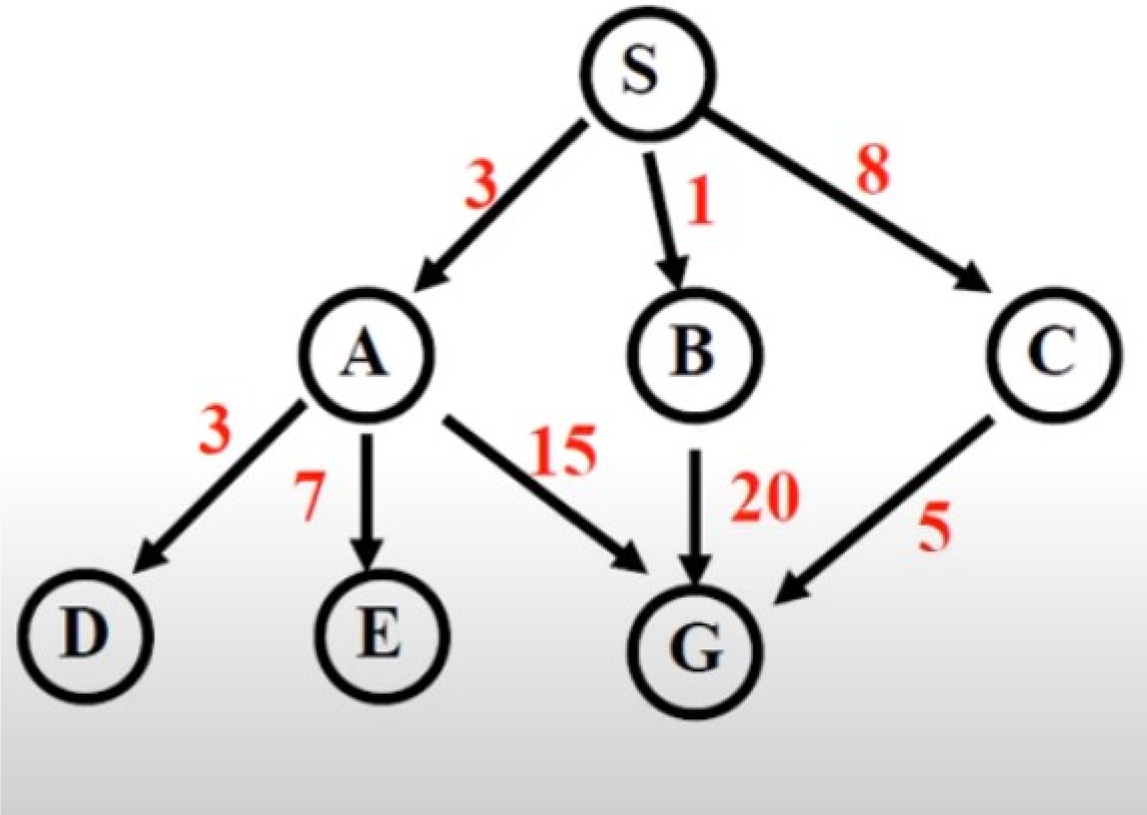
44
G
51
L
0
F
8
D
100
Z
0


S
3
1
8
A
B
C
3
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15
20
5
D
E
G

Bidirectional Search:

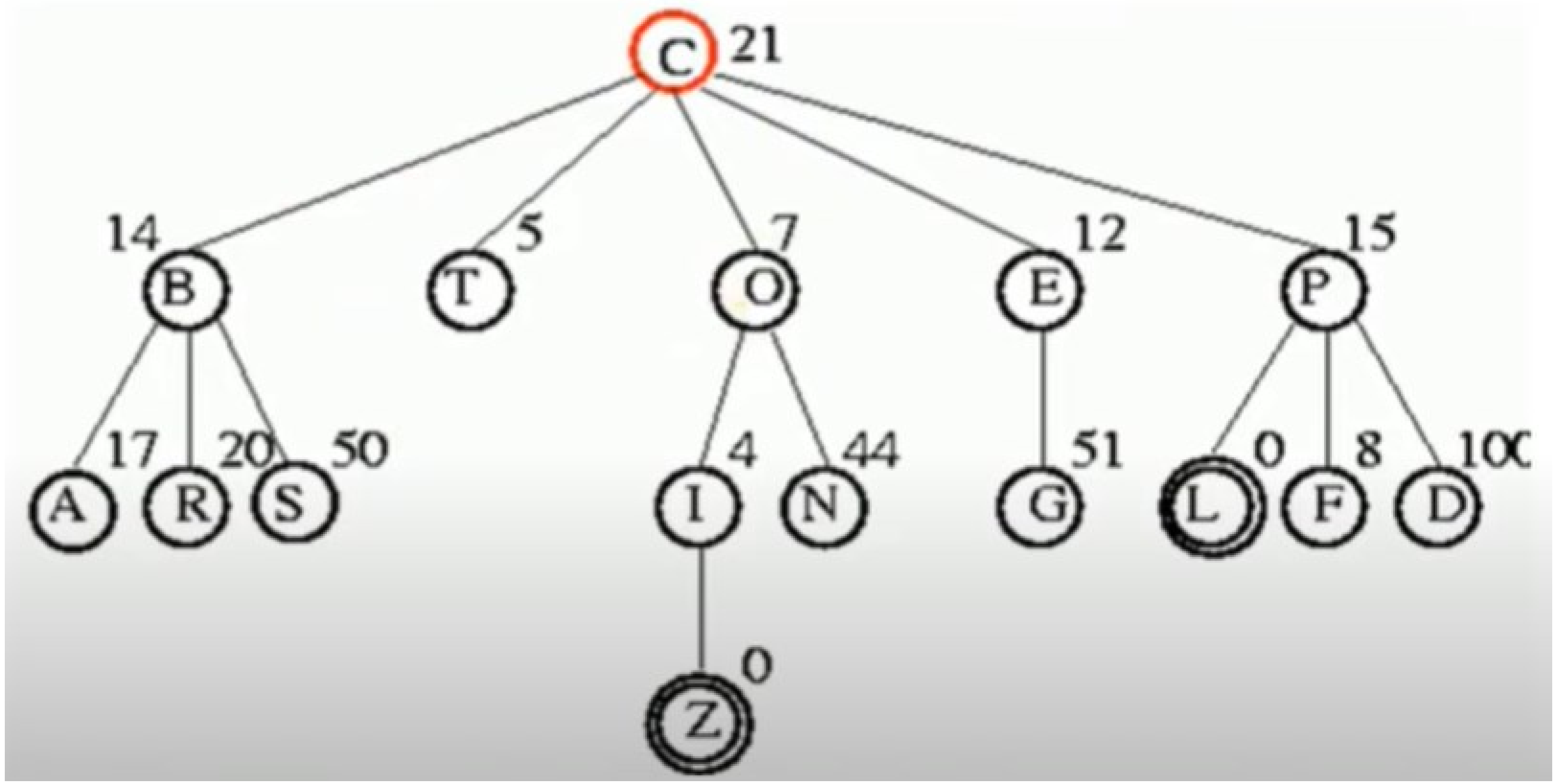
- Bidirectional search explores the search space from both the initial state and the goal state simultaneously.
- It can be more efficient than uninformed search in some cases.

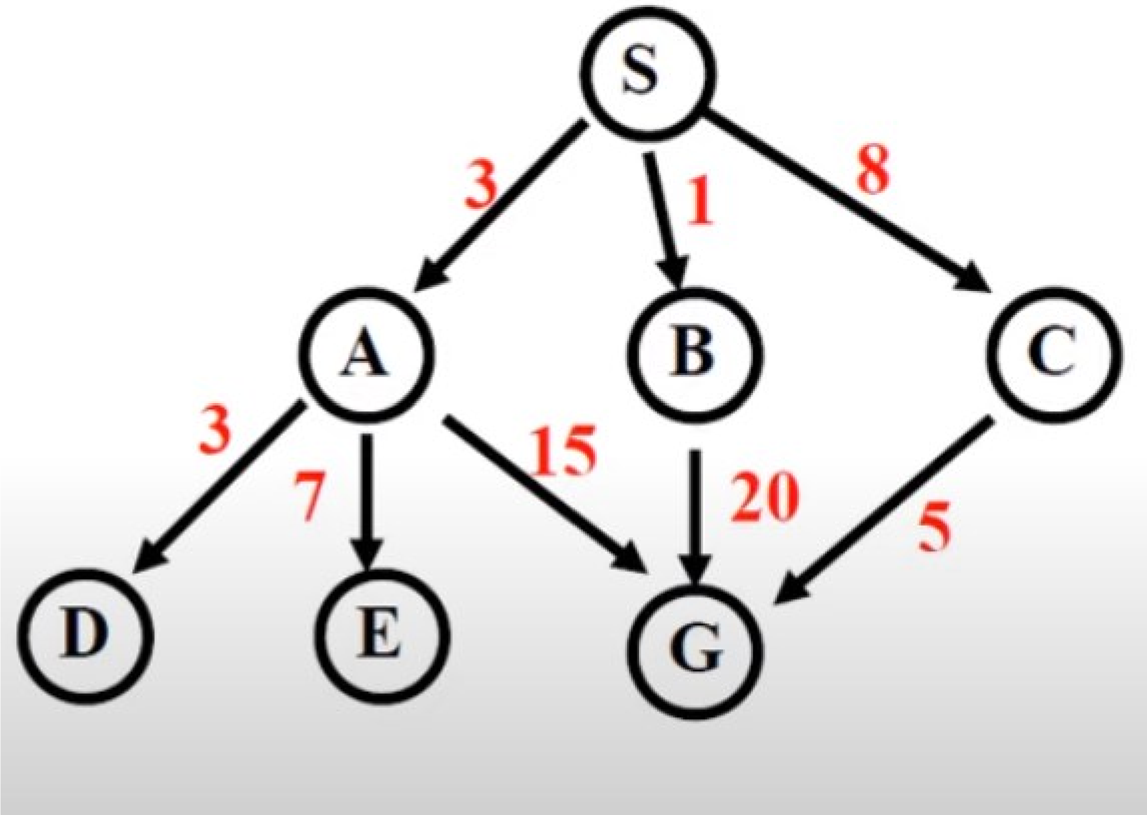
Depth-Limited Search (DLS):

- DLS is similar to DFS but with a depth limit. It limits the depth of exploration to avoid infinite loops in case of infinite or very deep search spaces.

Iterative Deepening Depth-First Search (IDDFS):

- IDDFS is a combination of BFS and DFS. It performs a series of DFS with increasing depth limits until the goal is found.
- It maintains the memory efficiency of DFS while ensuring optimality like BFS.


C 21
B 14
T 5
O 7
E 12
P 15
A 17
R 20
S 50
I 4
N 44
G 51
L 0
F 8
D 100
Z 0


S
3
1
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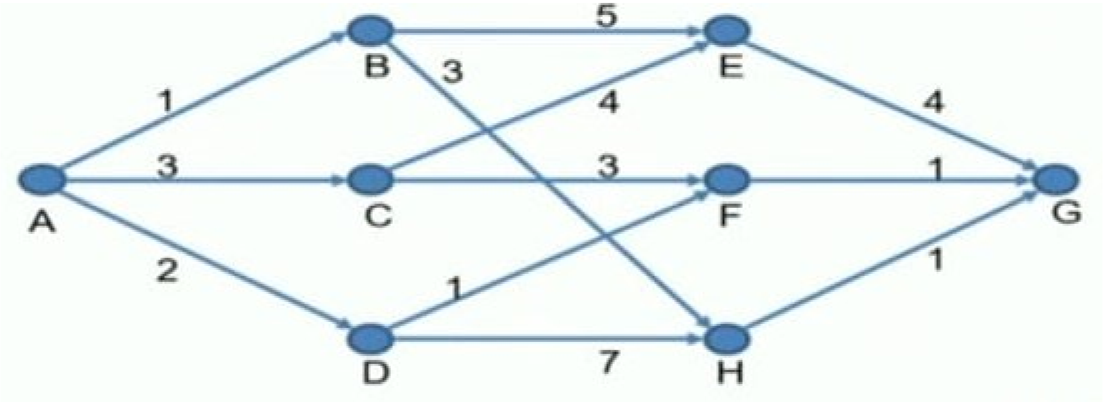
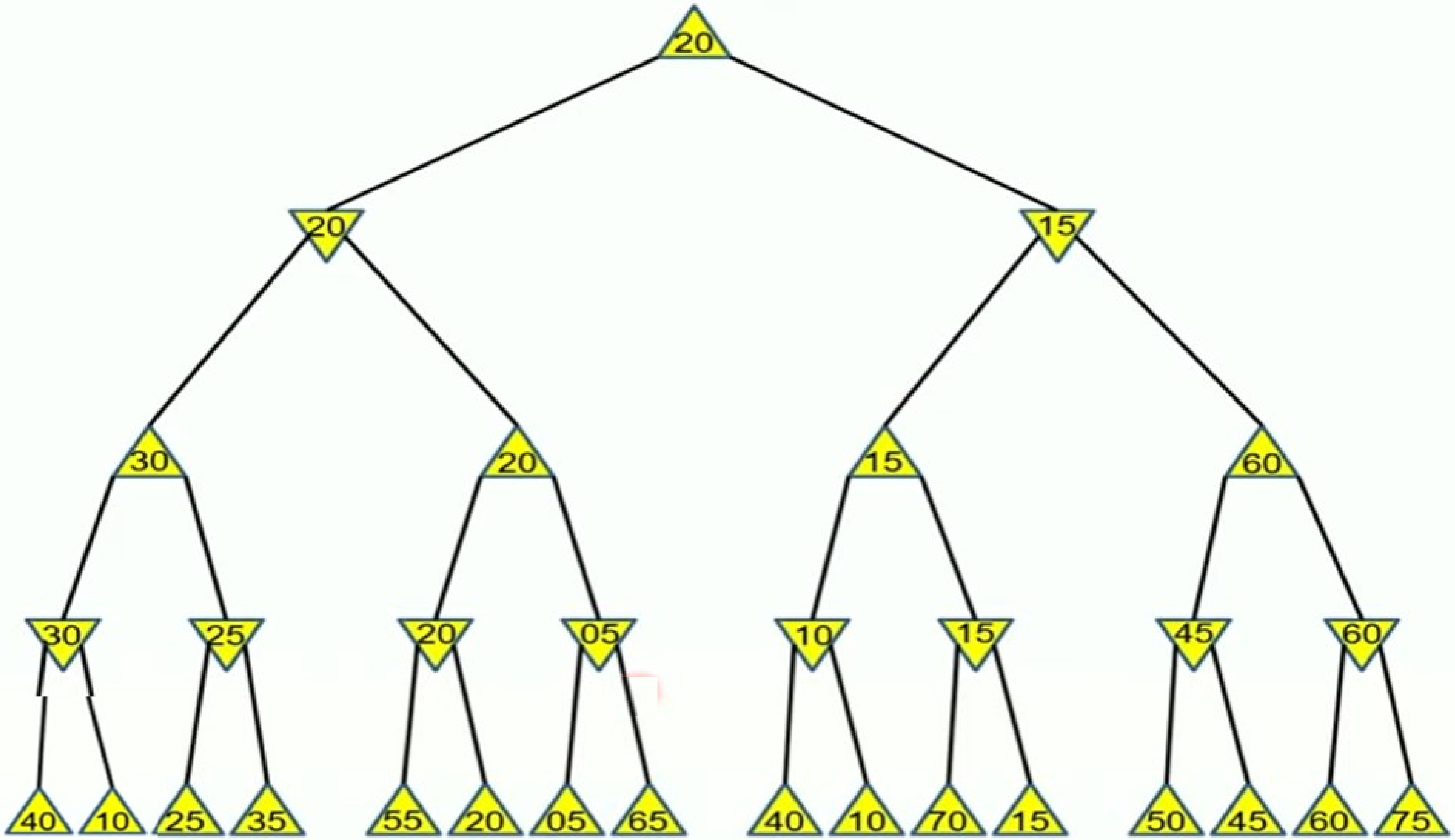
A
B
C
3
7
15
20
5
D
E
G


A
B
C
D
E
F
H
G
1
3
2
5
3
4
3
1
7
4
1
1



20
20
15
30
20
15
60
30
25
20
05
10
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45
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40
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25
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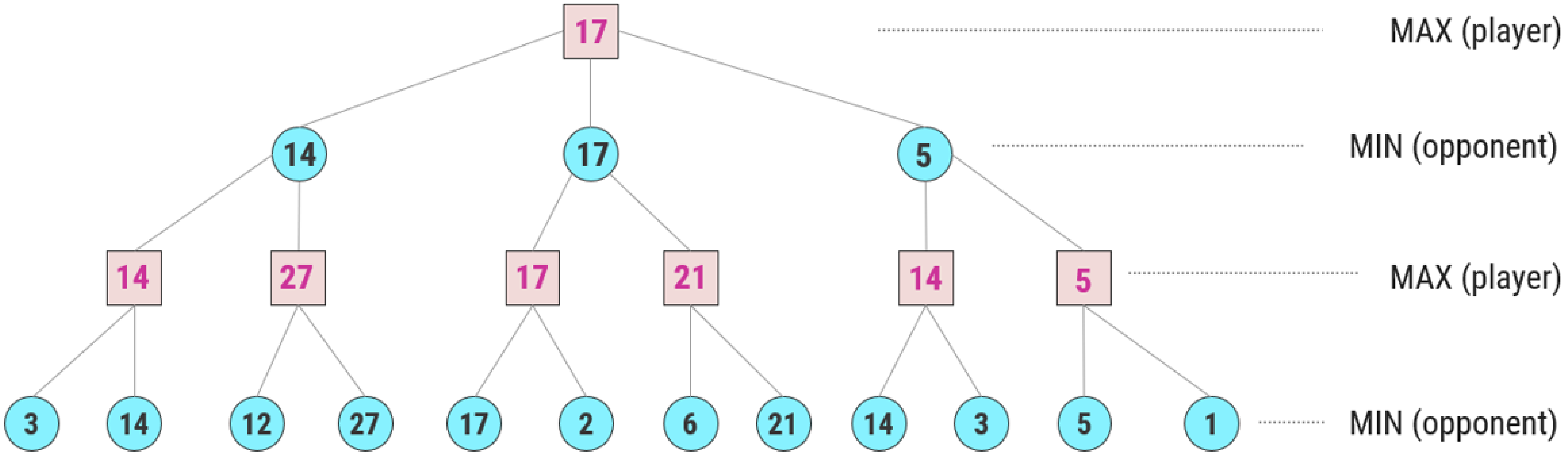
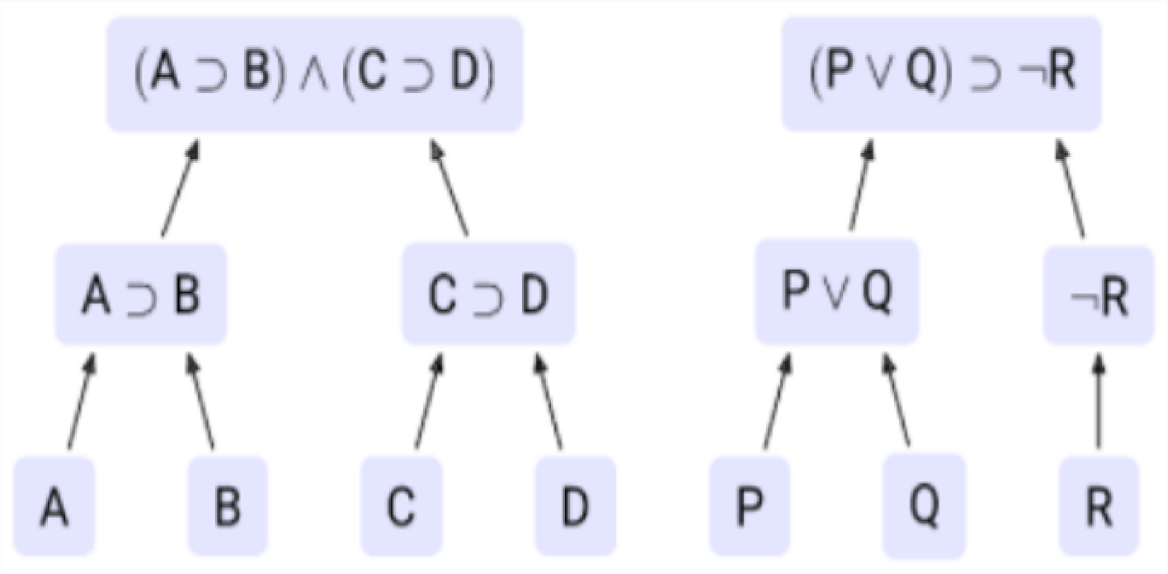
15
50
45
60
75


17
14
17
5
14
27
17
21
14
5
3
14
12
27
17
2
6
21
14
3
5
1
MAX (player)
MIN (opponent)
MAX (player)
MIN (opponent)

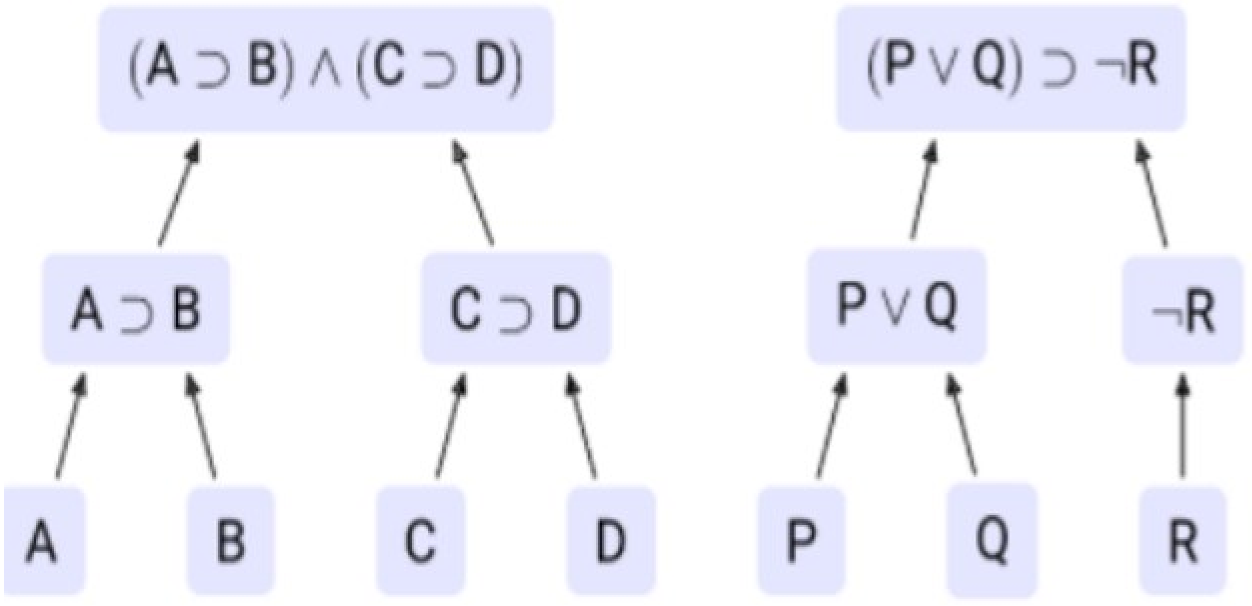
The figure shows a set of expressions, each shaded box is an element of this set, arrows indicate how these expressions are composed from smaller expressions.



Pick the correct answers.

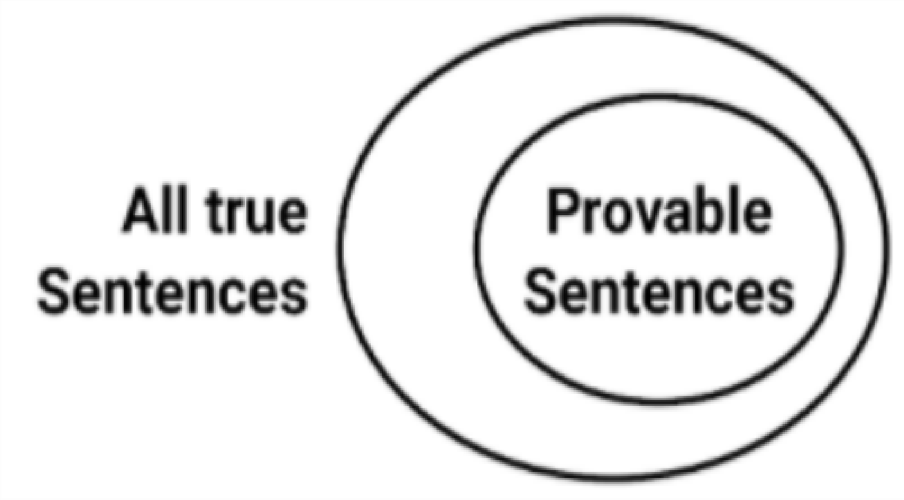
- [ ] There are 6 formulas
- [ ] There are 13 formulas
- [ ] There are 7 atomic formulas
- [ ] There are no atomic formulas
- [ ] There are 7 propositional variables
- [ ] There are no propositional variables
- [ ] The connectives used are: ¬, ∧, ∨, ⊃

given the truth assignment { A: false, B: true, C: true, D: false, P: true, Q: false, R: false } determine the truth value for all the formulas.



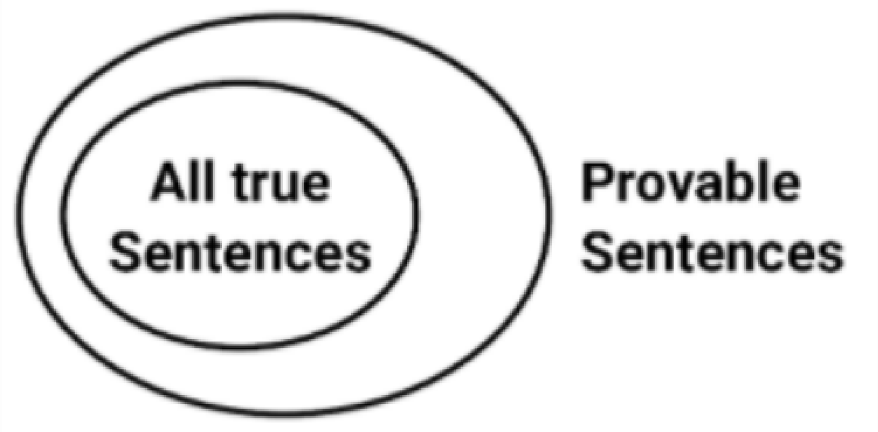
- [ ] $(P \vee Q) \supset \neg R$ is true
- [ ] $(P \vee Q) \supset \neg R$ is false
- [ ] $(A \supset B) \wedge (C \supset D)$ is true
- [ ] $(A \supset B) \wedge (C \supset D)$ is false
- [ ] $(C \supset D)$ is true
- [ ] $(C \supset D)$ is false

Based on the containment relation between the two sets of sentences depicted below, what can you conclude about the reasoning algorithm that produces the provable set?



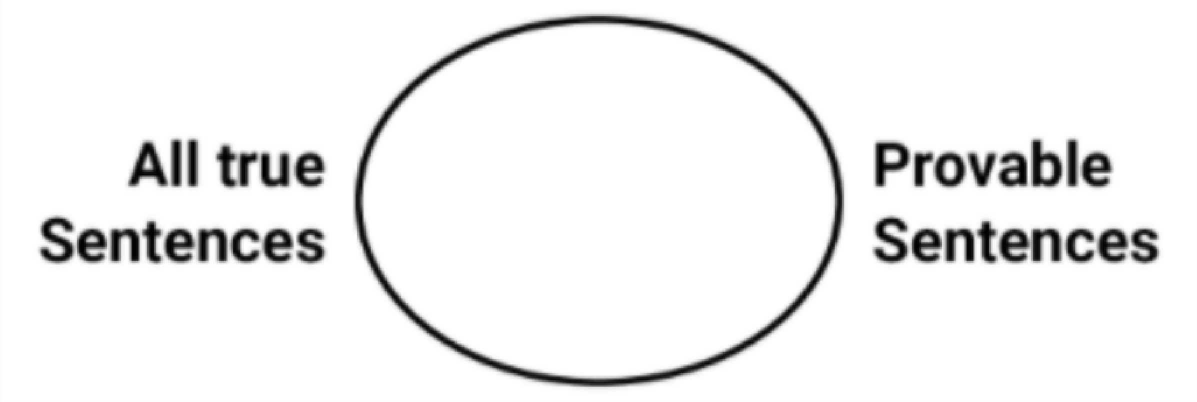
- [x] Sound
- [ ] Unsound
- [ ] Complete
- [x] Incomplete
- [ ] None of the above

Based on the containment relation between the two sets of sentences depicted below, what can you conclude about the reasoning algorithm that produces the provable set?



- [ ] Sound
- [ ] Unsound
- [ ] Complete
- [ ] Incomplete
- [ ] None of the above

Based on the containment relation between the two sets of sentences depicted below, what can you conclude about the reasoning algorithm that produces the provable set?



- [x] Sound
- [ ] Unsound
- [x] Complete
- [ ] Incomplete
- [ ] None of the above

For the binary operation “op” shown in the truth table, identify the expression(s) that are equivalent to “op”

A	B	op
T	T	F
T	F	T
F	T	F
F	F	F

- [ ] $A \wedge \neg B$
- [ ] $B \wedge \neg A$
- [ ] $\neg(A \supset B)$
- [ ] $\neg(B \supset A)$
- [ ] $\neg(B \vee \neg A)$

Given the rule of inference { P1 , P2 , P3 } ⊢ C, which of the following formulas correctly express the rule in logic?

- [ ] $(P1 \wedge P2 \wedge P3) \supset C$
- [ ] $(P1 \vee P2 \vee P3) \supset C$
- [ ] $P1 \wedge P2 \wedge P3 \wedge C$
- [ ] $P1 \vee P2 \vee P3 \vee C$
- [ ] $\neg P1 \vee \neg P2 \vee \neg P3 \vee \neg C$
- [ ] $\neg P1 \vee \neg P2 \vee \neg P3 \vee C$

For each formula listed below prepare a truth table, then identify the type of the formula. Fill in the blanks with one of the types: **tautology**, **unsatisfiable**, **contingency**, **none**. Note: to avoid spelling mistakes, copy-paste from the list.

$(P \wedge Q) \supset (P \vee Q)$

$(P \vee Q) \supset (P \wedge Q)$

$[P \wedge (P \supset Q)] \supset Q$

$[(P \vee Q) \supset (P \wedge Q)] \supset (P \equiv Q)$

$[P \wedge (P \supset Q)] \supset Q$

Match the following FOL formulas to the statements given in the options.

A. $\forall x$ [Man(x) $\supset$ Mortal(x)]

B. $\exists x$ [Apple(x) $\wedge$ Red(x)]

Fill in the blanks with the item label of the FOL formula or else enter NONE.

1) All men are mortal

2) If an element is a man then that element is mortal

3) Men are mortal

4) There is no man who is not mortal

5) Immortal beings are not men

6) There is an apple that is red

7) Some apples are red

There is at least one apple that is red

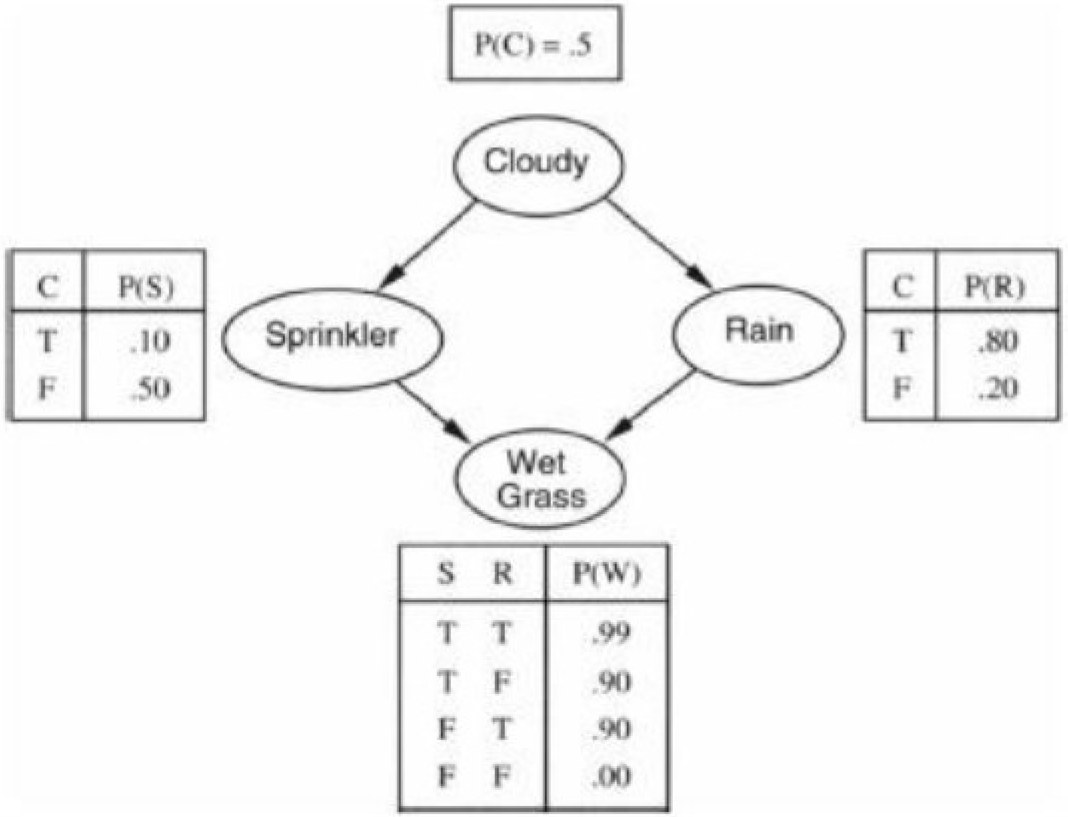
A

B

Which of the following propositions is logically equivalent to A ∨ (A ∧ B) ∨ (A ∧ B ∧ C) ∨ (A ∧ B ∧ C ∧ D) ∨ (A ∧ B ∧ C ∧ D ∧ E)?

- A
- A ∧ B ∧ C ∧ D ∧ E
- E
- A ∨ B ∨ C ∨ D ∨ E

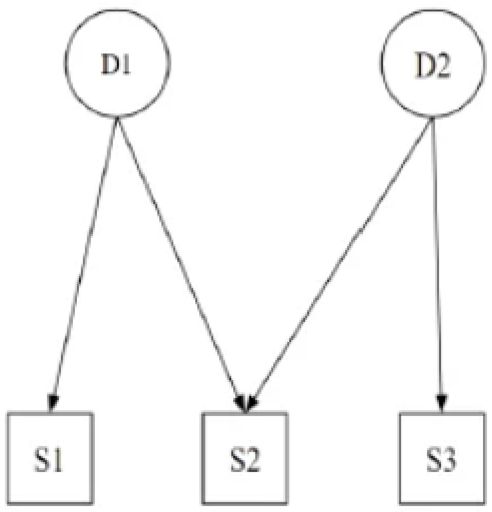
Consider the following Bayesian Network. Suppose you are doing likelihood sampling to determine P(S| ¬ C,W).



Let the weight for the sample (¬ C,S, ¬R, W) be w. What is 100w? (Round off your answer to the closest integer)

45

A patient goes to a doctor with symptoms S1, S2 and S3. The doctor suspects disease D1and D2 and constructs a Bayesian network for the relation among the disease and symptoms as the following:



What is the joint probability distribution in terms of conditional probabilities?

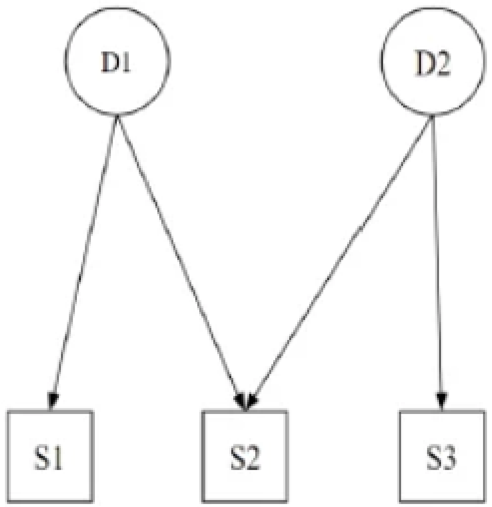
a. P(D1) * P(D2\D1) * P(S1|D1) * P(S2]D1) * P(S3|D2)

b. P(D1) * P(D2) * P(S1\D1) * P(S2]D1) * P(S3|D1, D2)

c. P(D1) * P(D2) * P(S1 D2) * P(S2]D2) * P(S3|D2)

d. P(D1) * P(D2) * P(S1|D1) * P(S2|D1, D2) * P(S3|D2)

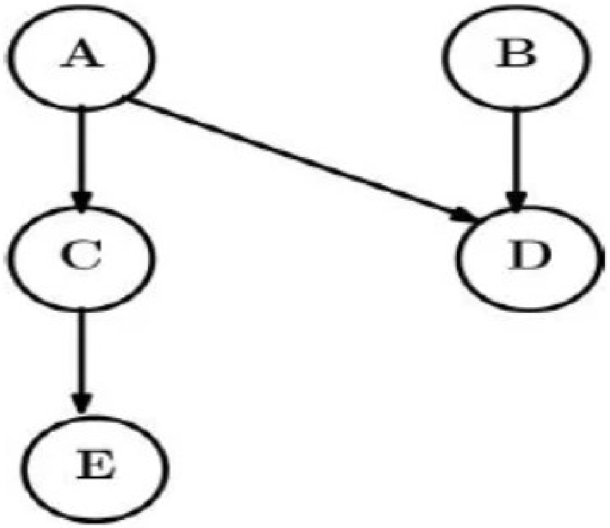
A patient goes to a doctor with symptoms S1, S2 and S3. The doctor suspects disease D1and D2 and constructs a Bayesian network for the relation among the disease and symptoms as the following:



Suppose P(D1) = 0.4, P(D2) = 0.7 , P(SID1)=0.3 and P(S1| D1′)= 0.6. Find P(S1)

a. 0.12
b. 0.48
c. 0.36
d. 0.60

Consider the following Bayesian network.



The values of the conditional probabilities are given below. Find $P(D)$.

Assume,

The values of the conditional probabilities are given below. Find $P(D)$.

Assume,

$$P(A) = 0.3$$

$$P(B) = 0.6$$

$$P(C|A) = 0.8$$

$$P(C|\underline{A}) = 0.4$$

$$P(D|A, B) = 0.7$$

$$P(D|A, \underline{B}) = 0.8$$

$$P(D|\underline{A}, B) = 0.1$$

$$P(D|\underline{A}, \underline{B}) = 0.2$$

$$P(E|C) = 0.7$$

$$P(E|\underline{C}) = 0.2$$

a. 0.68
b. 0.32
c. 0.50
d. 0.70