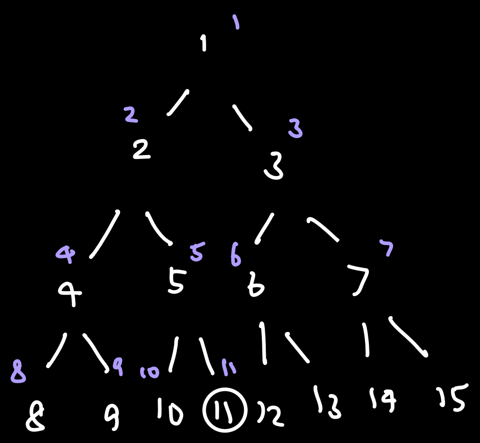
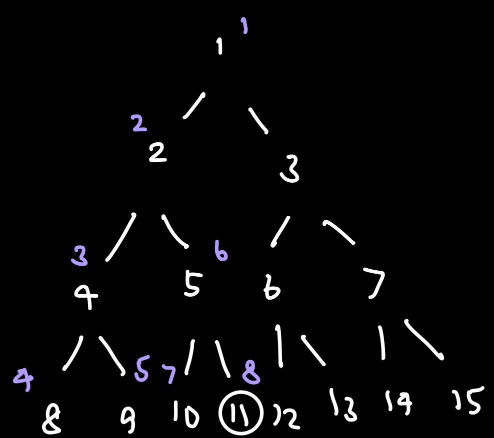
1.

BFS

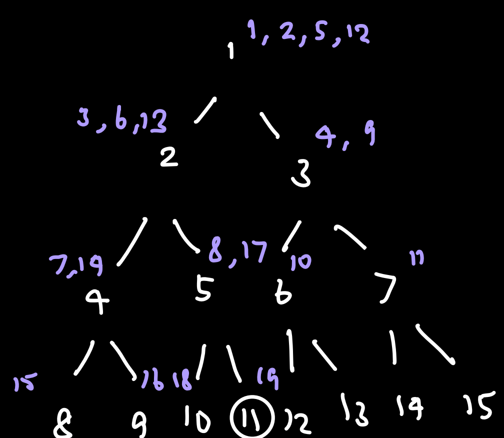


DFS, 3



1 2 4 8 9 5 10 11

ID



1, 1 2 3, 1 2 4 5 3 6 7, 1 2 4 8 9 5 10 11

Heuristic Admissible

$My \Rightarrow Im$

$\neg My \Rightarrow \neg Im \wedge Mam$

$Im \vee Mam \Rightarrow H$

$H \Rightarrow Mag$

$My = \text{True}$?

$\alpha : My$

Let

My - A		$A \Rightarrow B$
Im - B		$\neg A \Rightarrow \neg B \wedge C$
Mam - C		$B \vee C \Rightarrow D$
H - D		$D \Rightarrow E$
Mag - E		

KB: $(\neg A \vee B)$

$(A \vee (\neg B \wedge C))$

$(\neg B \wedge \neg C) \vee D$

$(\neg D \vee E)$

$$(A \vee (\neg B \wedge C)) = (A \vee \neg B) \wedge (A \vee C)$$

$$(\neg B \vee D) \wedge (\neg C \vee D)$$

$$KB: (\neg A \vee B) \wedge (A \vee \neg B) \wedge (A \vee C) \wedge (\neg B \vee D) \wedge (\neg C \vee D) \wedge (\neg D \vee E)$$

α : A

$$\Delta \models \alpha$$

$$\neg \Delta \vee \alpha$$

$$\neg(\neg \Delta \vee \alpha)$$

$$\boxed{\Delta \wedge \neg \alpha}$$

$$\neg \alpha \rightarrow \neg A$$

1. $\neg A \vee B$
2. $A \vee \neg B$
3. $A \vee C$
4. $\neg B \vee D$

5. $\neg C \vee D$

6. $\neg D \vee E$

---

7. $\neg A$

---

8. $\neg B$

9. C

10. D

11. E

12. $\neg A$

Can't prove

So $\Delta \not\models \alpha$

Mythical ✗

7. $\neg E$

8. $\neg D$

9. $\neg C$

10. A

11. B

12. A

13. D

Magical ✓

$\Delta \models \alpha$

7. $\neg D$

8. $\neg C$

9. A

10. B

11. D

Horned ✓

$\Delta \models \alpha$

$\Delta \Rightarrow \alpha$

1. T

2. F

3. $A \wedge B \models (A \Leftrightarrow B)$

A	B	Δ	α
T	T	T	T
T	F	F	F
F	T	F	F
F	F	F	T

$(A \Rightarrow B) \wedge (B \Rightarrow A)$

$(\neg A \vee B) \wedge (\neg B \vee A)$

$M(\Delta) \subseteq M(\alpha)$

$\{1\} \quad \{1, 4\}$

T

4. F

(5) $(\neg A \vee B) \wedge (\neg B \vee A)$

$\alpha \quad \neg A \vee B$

$\underline{(\neg A \vee B)} \wedge (\neg B \vee A) \wedge \underline{\neg(\neg A \vee B)}$

T//

(6) c is true

or

A = F and B = F

$(\neg A \vee c) \wedge (\neg B \vee c)$

$(A \vee B) \wedge \neg(\neg A \vee B)$

$(A \vee B) \wedge (A \wedge \neg B)$

$$\begin{matrix} A & \neg B \\ \downarrow & \downarrow \\ T & F \end{matrix}$$

$\underline{(\neg A \vee B) \wedge (\neg B \vee A)} \wedge \underbrace{(\neg A \vee B)}$

$R \Rightarrow (E \Leftrightarrow C)$

$(R \cap E) \Leftrightarrow C$

$\big((R \wedge E) \Rightarrow C\big) \wedge \big(C \Rightarrow (R \cap E)\big)$

$\big(\neg(R \wedge E) \vee C\big) \wedge \big(\neg C \vee (R \cap E)\big)$

$(\neg R \vee \neg E \vee C)$ $\qquad \downarrow$

$(\neg C \vee R) \wedge (\neg C \vee E)$

$\Delta \models \alpha$

$\Delta \wedge \neg \alpha$

$$\begin{array}{ccc} \neg F & \vee & P \\ | & & | \\ T & & F \end{array}$$

$\neg G$

$\neg D$

$\neg B$

A

C

G

1a. $P \Rightarrow \neg Q$ $\quad$ $Q \Rightarrow \neg P$

P	Q	$\neg P$	$\neg Q$	$Q \Rightarrow \neg P$
T	T	F	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

YES

b.

P	Q	$\neg P$	$\neg Q$	$P \wedge \neg Q$	$\neg P \wedge Q$	
T	T	F	F	F	F	F
T	F	F	T	T	F	T
F	T	T	F	F	T	T
F	F	T	T	F	F	F

NO

$P \Rightarrow \neg Q$	$\neg Q \Rightarrow P$
F	
T	
T	
T	

2. a. $(A \Rightarrow B) \Rightarrow (\neg A \Rightarrow \neg B)$

A	B	$\neg A$	$\neg B$	$\overset{C}{A \Rightarrow B}$	$\overset{D}{\neg A \Rightarrow \neg B}$	$C \Rightarrow D$
T	T	F	F	T	T	T
T	F	F	T	F	T	T
F	T	T	F	T	F	F
F	F	T	T	T	T	T

b. $(A \Rightarrow B) \Rightarrow ((A \vee C) \Rightarrow B)$

A	B	C	$A \Rightarrow B$	$\overset{D}{A \vee C}$	B	$D \Rightarrow B$
T	T	T	T	T	T	T
T	T	F	T	F	T	T
T	F	T	F	T	F	F
T	F	F	F	F	F	T
F	T	T	T	F	T	T
F	T	F	T	F	T	T
F	F	T	T	F	F	T
F	F	F	T	F	F	T

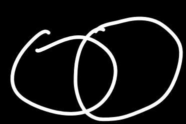
c) $((A \wedge B) \Rightarrow C) \Leftrightarrow ((A \Rightarrow C) \vee (B \Rightarrow C))$

$(\neg(A \wedge B) \vee C) \Leftrightarrow ((\neg A \vee C) \vee (\neg B \vee C))$

$(\neg A \vee \neg B \vee C)$ $(\neg A \vee \neg B \vee C)$

4. a) Dec → AND diffhrent ✓

Dot → OR mutvally exclusive



$\alpha \wedge \beta$ unsat

$\alpha = (\neg A \wedge B)$ α : $\neg A \wedge \neg B$ α :

β : $(\neg B \wedge A)$ β : A

α : C α : $C \wedge \neg D$

β : $\neg C \wedge \neg D$ β : $\neg C \wedge D$

$\alpha = ((\overset{F}{\neg A} \wedge B) \vee (\overset{T}{\neg B} \wedge A)) \wedge ((C) \vee (\neg C \wedge \neg D))$

$(C \vee \neg D)$

$\beta = ((\neg A \wedge \neg B) \vee A) \wedge ((C \wedge \neg D) \vee (\neg C \wedge D))$

$(\neg \cancel{A \vee A}) \wedge (\neg B \vee A)$

$$\alpha \wedge \beta$$

A	B	α	β
T	T	F	
T	F		
F	T	F	
F	F		

$\alpha : (\neg A \wedge B)$

$\beta : (\neg A \wedge B)$

A	B	$\neg A$	$\neg B$	$\overset{C}{\neg A \wedge B}$	$\overset{D}{\neg B \wedge A}$	$C \vee D$
T	T	F	F	F	F	F
T	F	F	T	F	T	T
F	T	T	F	T	F	T
F	F	T	T	F	F	F

$$(A \wedge \neg B) + (\neg A \wedge B)$$

$$0.1 \times 0.7 + 0.9 \times 0.3$$

$$0.07 + 0.27$$

$$0.34$$

1.
```
(defun REVERSE (L)
    (cond ((null L) L)
          (t (append (REVERSE (cdr L)) (car L)))
    )
)

          (append (REVERSE (cdr L)) (list (car L)))
```

2.
```
(defun DELETE (L k)
    (cond ((null L) L)
          ((= k 0) (cdr L))
          (t (cons (car L) (DELETE (cdr L) (- k 1))))
    )
)
```

3.
```
(defun DL (L)
    (cond ((null L) 0)
          ((atom L) 1)
          (t (+ (DL (car L)) (DL (cdr L))))
    )
)
```

SEARCH

1. BFS

A B C D E F I J G H K

2. DFS

A B D E G H F C I K

3. DL $l = 2$

A B D E F C I J

4. DFID

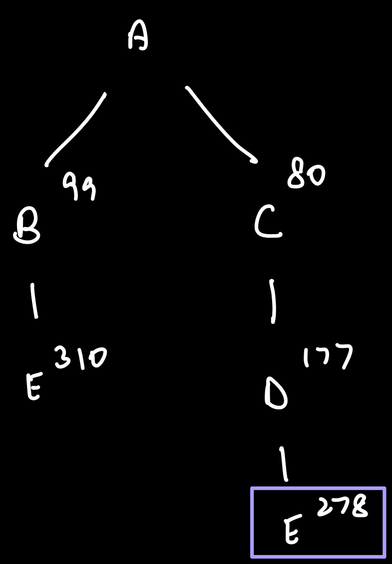
(A) (A B C) (A B D E F C I J)

(A B C D E G H F C I K)

2.

	BFS	DFS	DL	DFID	UCS
	✓	×	if $d \le l$	✓	✓
	✓	×	×	✓	✓
	b^d	b^m	b^l	b^d	$b^{\lceil c^*/\varepsilon \rceil}$
	b^d	bm	bl	bd	$b^{\lceil c^*/\varepsilon \rceil}$

3.



A - C - D - E

278

$97 + 80$

177

211
99

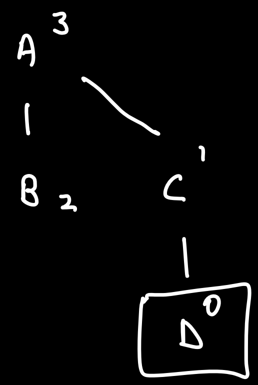
310

177
101

278

INFORMED

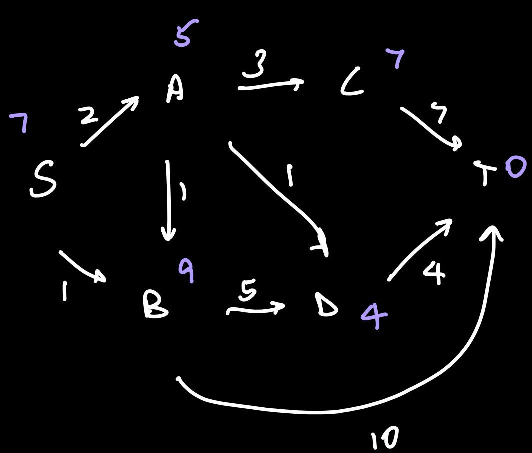
1.



A - C - D   1000

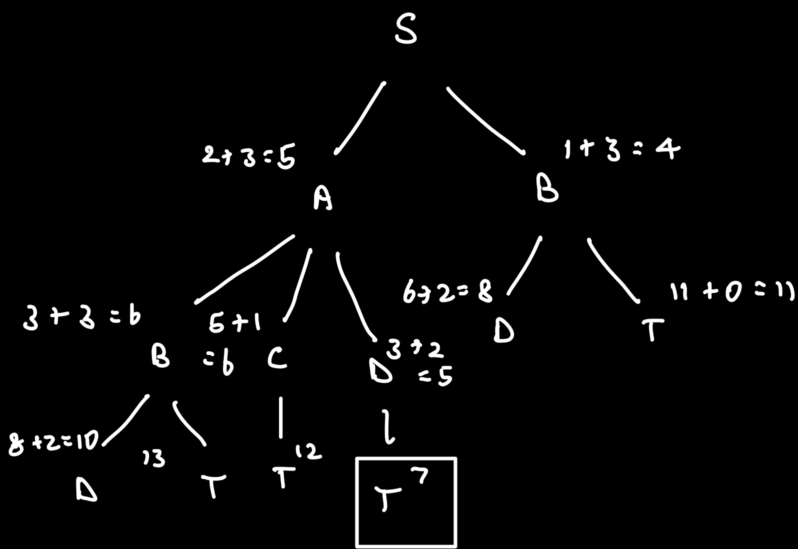
Not optimal

2.



Admissible

$h < h^*$



S - A - D - T

7//

CSP:

1. CSP Problem

Variables: $\{A, B, C, D, E, F\}$
x_i

Domain: $\{Red, Green, Blue\}$

for

all variables
D_i

Constrains: $A \neq B$

$A \neq C$

$B \neq D$

$B \neq C$

$C \neq D$

$C \neq E$

$C \neq F$

$D \neq E$

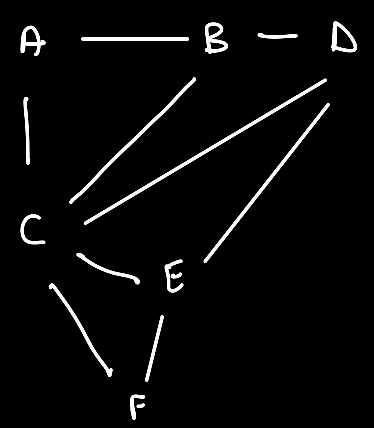
$E \neq F$

State Space: All partially or fully colored or empty state.

IS: No colors

Goal: All colored with no adjacent same color.

Actions: Color a region that is not yet colored.

2. 

3.

{ }

{A = R} {A = G} {A = B}

{A = R, B = G} {A = R, B = B}

{A = R
B = G
C = B}

{A = R
B = G
C = B
D = R}

{A = R
B = G
C = B
D = R
E = G} $\longrightarrow$ {A = R, B = G, C = B, D = R, E = G, F = R}

4.

{ }

R G B

{C = R} {C = G} {C = B}

{C = R, B = G}

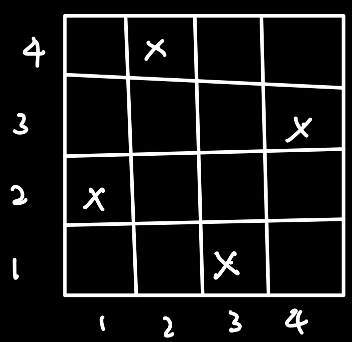
{C = R, B = B}

{C = R
B = G
D = B}

{C = R
B = G
D = B
A = B}

{C = R
B = G
D = B
A = B
E = G} → {C = R, B = G, D = B, A = B, E = G, F = B}

5)



Variables: Q_1, Q_2, Q_3, Q_4

Domain: $(x, y) \ \forall \ x \in [1, 4]$

$y \in [1, 4]$

Constraints:

In words

$\{\}$

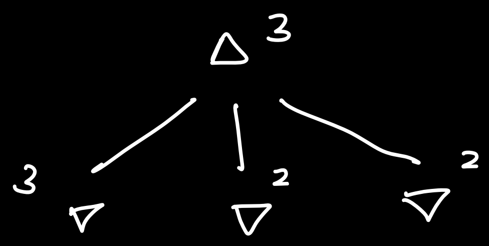
$\{Q_1 = 1,1\}$ $\{Q_1 = 1,2\}$ . . .

$\{Q_2 = 2, 3\}$ $\{Q_2 = 4,2\}$ $\{Q_2 = 2, 4\}$ $\{Q_2 = 3,2\}$ $\{Q_2 = 4,3\}$

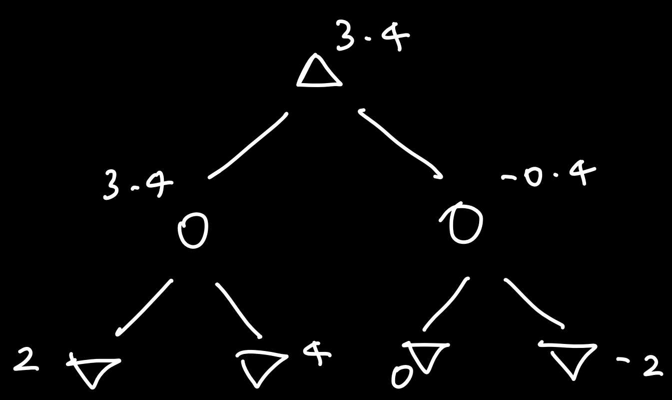
$Q_2 : \{3,4\}$

2- PLAYERS GAME:

1.



2.



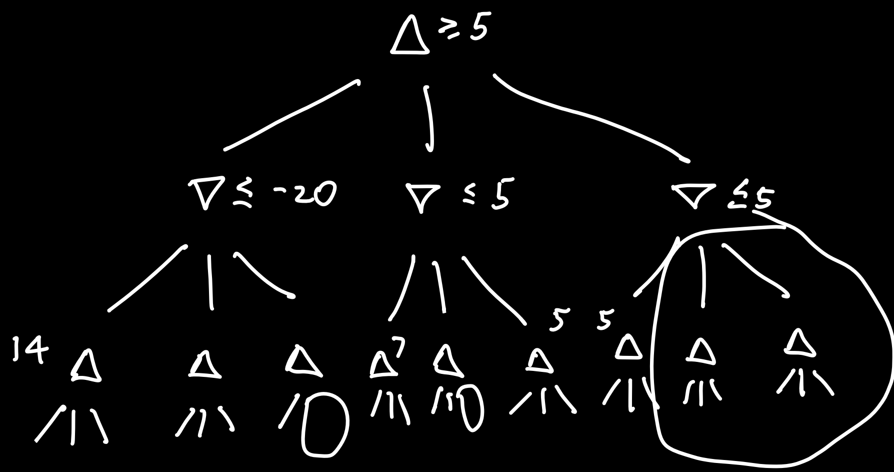
$0.3 \times 2 + 0.7 \times 4$

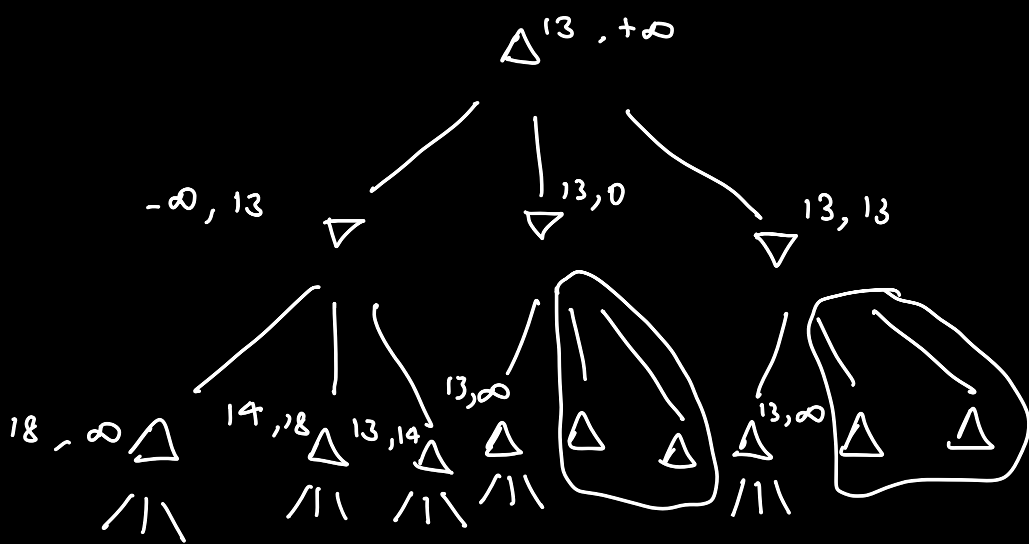
$0.6 + 2.8$

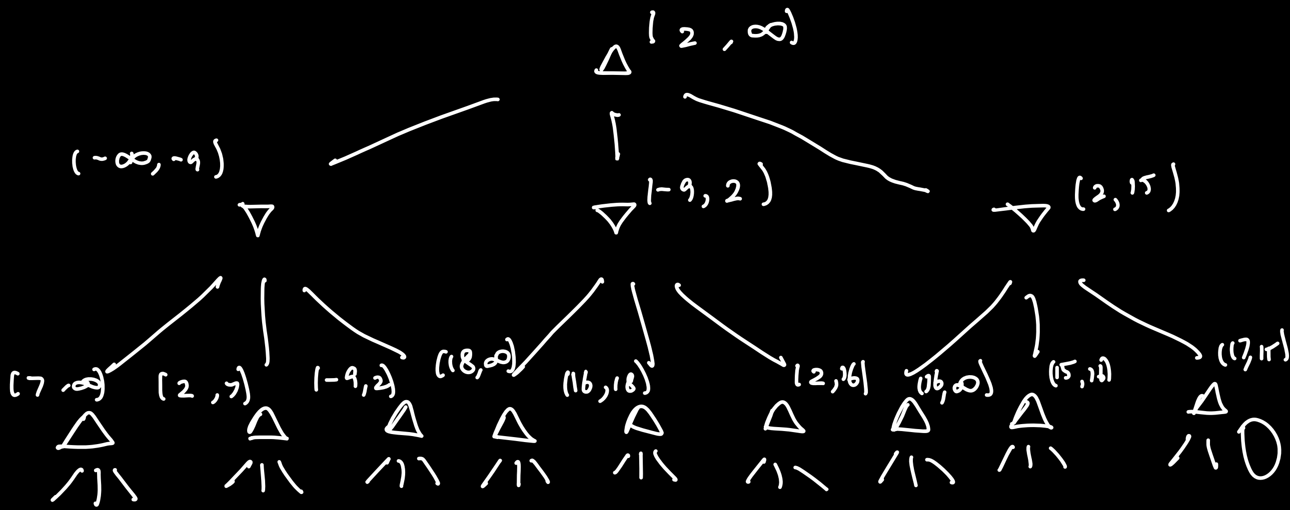
3.4

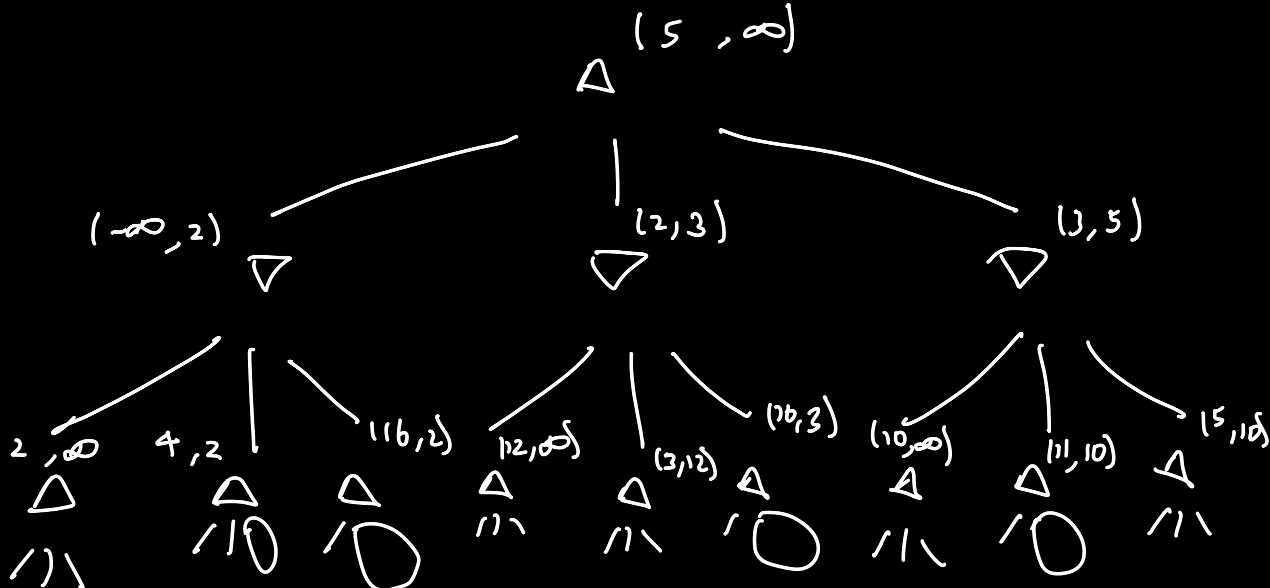
$0.2 \times (-2)$

-0.4


≥ 5
≤ -20
≤ 5
≤5
14
7
5
5


13 , +∞
-∞, 13
13, 0
13, 13
18 , ∞
14, 18
13, 14
13, ∞
13, ∞


(2, ∞)
(-∞, -9)
(-9, 2)
(2, 15)
(7, ∞)
(2, 7)
(-9, 2)
(18, ∞)
(16, 18)
(2, 16)
(16, ∞)
(15, 18)
(17, 15)


(5, ∞)
(-∞, 2)
(2, 3)
(3, 5)
2, ∞
4, 2
(16, 2)
(12, ∞)
(3, 12)
(16, 3)
(10, ∞)
(11, 10)
(5, 10)

NORMAL FORMS:

	$\vee$	$\top$
CNF	✓	×
DNF	✓	✓
NNF	✓	×
DNNF	✓	✓
Horn	×	✓

LOGIC:

1. $(A \vee \neg B) \Rightarrow C$

$C \Rightarrow (D \vee \neg E)$

$E \vee D$

STEP 1:

$\neg(A \vee \neg B) \vee C$

$\neg C \vee (D \vee \neg E)$

$E \vee D$

STEP 2:

$(\neg A \wedge B) \vee C$

$(\neg C \vee D \vee \neg E)$

$E \vee D$

STEP 3:

$(\neg A \vee C) \wedge (B \vee C)$

$(\neg C \vee D \vee \neg E)$

$E \vee D$

2. $KB \models \alpha$

$M(KB) \subseteq M(\alpha)$

$\neg(A \vee B) \vee C$

$\Delta \models \alpha$

$\Delta \wedge \neg \alpha$

$(\neg A \wedge \neg B) \vee C \wedge \neg C$

$\underbrace{(\neg A \vee C)}_{1} \wedge \underbrace{(\neg B \vee C)}_{2} \wedge \underbrace{(\neg C)}_{3}$

4. $\neg B$

$(\neg A \wedge \neg B) \vee C$

5. $\neg A$

A	B	C	D $A \vee B$	$D \Rightarrow C$		$\neg A$	$\neg B$	$(\neg A \wedge \neg B)$	Δ
T	T	T	T	T	T	F	F	F	T
T	T	F	T	F	F	F	F	F	F
T	F	T	T	T	T	F	T	F	T
T	F	F	T	F	F	F	T	F	F
F	T	T	T	T	F	T	F	F	T
F	T	F	T	F	F	T	F	F	F
F	F	T	F	T	F	T	T	T	T
F	F	F	F	T	F	T	T	T	T

$M(KB) = \{1, 3\}$

$M(\alpha) : \{1, 3, 5, 7\}$

3. KB

$\neg(A \vee \neg B) \vee C$

$\neg C \vee (D \vee \neg E)$

$E \vee D$

1. $(\neg A \vee C)$

2. $(\neg C \vee D \vee \neg E)$

3. $(E \vee D)$

$KB \wedge \neg \alpha$

$\neg(\neg A \vee D)$

$A \wedge \neg D$

4. $(B \vee C)$

5. A

6. $\neg D$

7. E

8. C

9. D

$\alpha = (\neg A \wedge \neg B)$

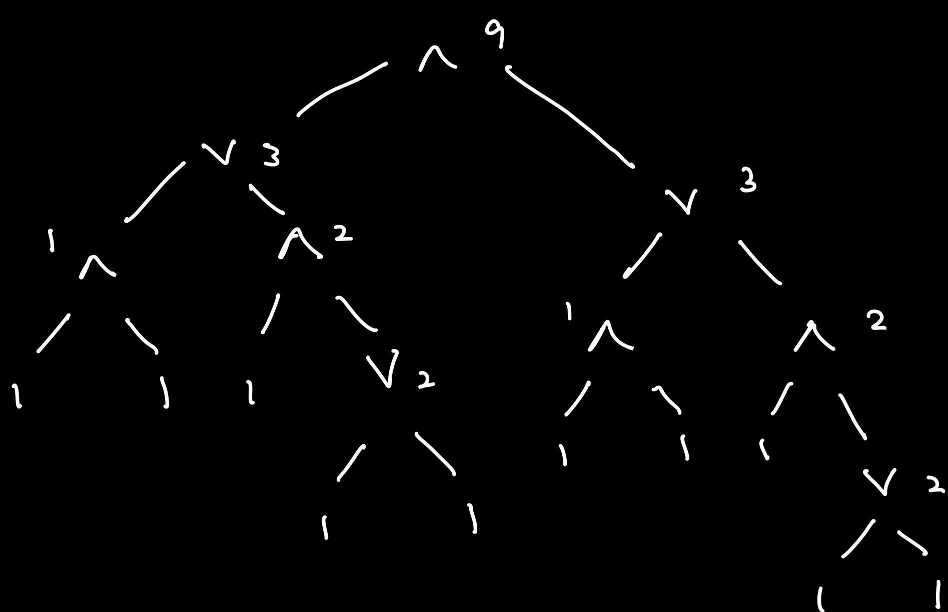
$\beta = (B \wedge (A \vee \neg A)) = B$

$\alpha \wedge \beta = \phi$

$\alpha = D \wedge \neg E$

$\beta = \neg D \wedge (T) = \neg D$

ϕ



2) i)

$$\exists x \ \exists y \ \ Brother(Richard, x) \wedge Brother(Richard, y) \wedge \neg(x = y)$$

ii) $\forall x \ \exists y \ (Mother(x, y) \wedge \neg(\exists z \ Mother(x, z) \wedge \neg(y = z)))$

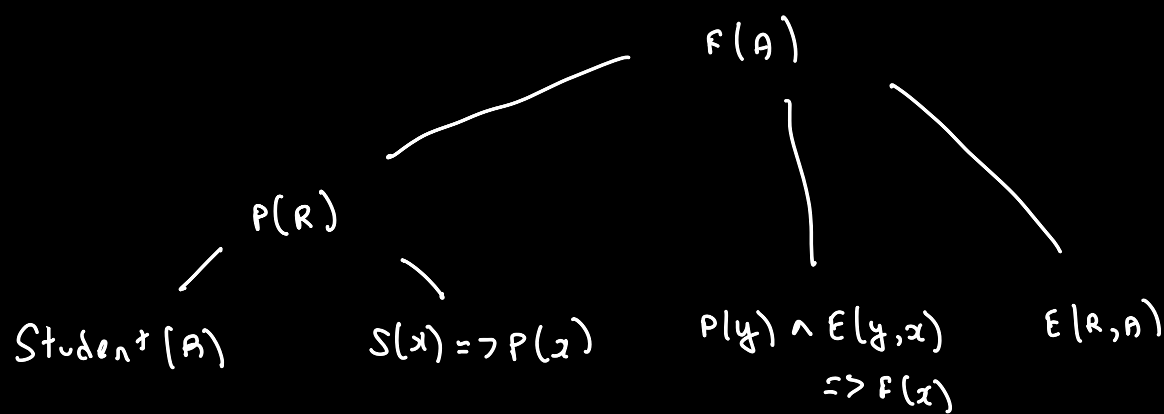
iii) $\exists p \ \forall t \ YouFool(p, t)$

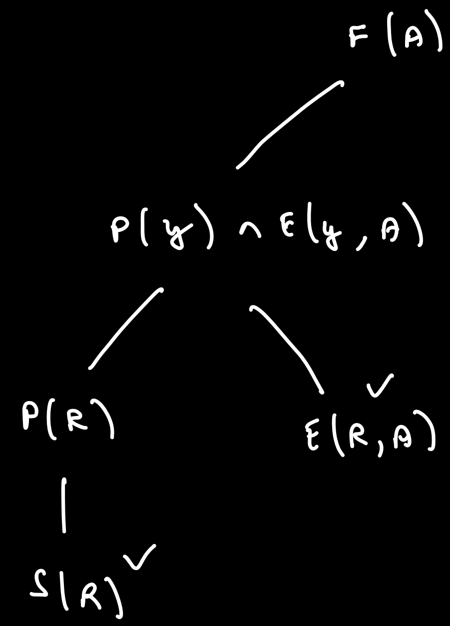
iv) $\forall p \ \exists t \ YouFool(p, t)$

v) $\exists x \ \exists y \ \ Brother(Richard, x) \wedge Brother(Richard, y) \wedge \neg(x = y)$

$$\wedge \neg(\exists z \ Brother(Richard, z) \wedge \neg(x = z) \wedge \neg(y = z))$$

2)





(1.2).2

$x = A \quad y = A \quad z = B$

NO

$x = B \quad y = A$

$x = y = \text{John}$

NO

$P(D) = 1/100$

$P(T \mid D) = 90/100$

$P(T \mid \neg D) = 8/100$

$$P(T) = \frac{90/100 \times 1/100}{90/100 \times 1/100 + 8/100 \times 99/100}$$

$\forall x \; Food(x) \Rightarrow Likes(John, x)$ ✓

$Food(Apples)$ ✓

$Food(Chicken)$ ✓

$\forall x \; (\exists y \; Eats(y, x) \wedge \neg Kill(x, y)) \Rightarrow Food(x)$ ✓

$\forall x \; (\exists y \; kills(y, x)) \Rightarrow \neg Alive(x)$ ✓

$\forall x (\neg \exists y \; Eats(x, y)) \Rightarrow Die(x)$

$\forall x \; Die(x) \Rightarrow \neg Alive(x)$ $\quad$ $Alive(Bill)$ ✓

$\forall x \; Eats(Bill, x) \Rightarrow Eats(Sue, x)$ ✓

$\forall x \quad \neg Food(x) \vee Likes(John, x)$

$Food(Apples)$ $\quad$ $\neg Die(x) \vee \neg Alive(x)$

$Food(Chicken)$ $\quad$ $Eats(x, f(x)) \vee Die(x)$

$\forall x \neg(\exists y \; Eats(y, x) \wedge \neg Kill(x, y)) \vee Food(x)$

$\forall x \; \neg(\exists y \; Kills(y, x)) \vee \neg Alive(x)$

$Eats(Bill, Peanuts) \wedge Alive(Bill)$

$\forall x \neg Eats(Bill, x) \vee Eats(Sue, x)$

1. $\neg Eat(y,x) \vee Kills(x,y) \vee Food(x)$

2. $\neg Kills(y,x) \vee \neg Alive(x)$

3. $\neg Eats(Bill, x) \vee Eats(Sue, x)$

4. $Eats(Bill, Peanuts)$

5. $\neg Food(x) \vee Likes(John, x)$

6. $Food(Apples)$

7. $Food(Chicken)$

8. $Alive(Bill)$

9. $\neg Kills(y, Bill)$ $\quad x/Bill$

10. $\neg Eat(Bill, x) \vee Food(x)$ $\quad y/Bill$

11. $Food(Peanuts)$ $\quad x/Peanuts$

12. $Likes(John, Peanuts)$ $\quad x/Peanuts$

2. $P(D) = 1/100$

$P(T|D) = 90/100$

$P(T|\neg D) = 8/100$

$$P(D|T) = \frac{P(T|D) \cdot P(D)}{P(T)}$$

$\downarrow$

$P(T|D) \cdot P(D) + P(T|\neg D) \cdot P(\neg D)$

$$\frac{90}{100} \times \frac{1}{100} + \frac{8}{100} \times \frac{99}{100}$$

$$\frac{90}{107}$$

2.2.1.

$I(S, \phi, GM)$

$I(G, \phi, SM)$

$I(A, SG, M)$

$I(Y, AM, SG)$

$I(M, \phi, SGA)$

$I(A, \phi, BE)$

$I(B, \phi, AC)$

$I(C, A, BDE)$

$I(D, AB, CE)$

$I(E, B, ACDFG)$

$I(F, CD, ABE)$

$I(G, F, ACDBEH)$

$I(H, EF, ACDBG)$

3. dsep (S, Y, M) no

yes

2.3.

$$\begin{tikzcd} & A \arrow[dl] \arrow[dr] & \\ B & & C \end{tikzcd}$$

Step 1 :

Variables

A, B, C, $\neg A$, $\neg B$, $\neg C$

θ_A - P_1

$\theta_{\bar{A}}$ - P_2

$\theta_{B|A}$ - P_3 $\quad\quad$ $\theta_{C|A}$ - P_7

$\theta_{\neg B|A}$ - P_4 $\quad\quad$ $\theta_{\neg C|A}$ - P_8

$\theta_{B|\neg A}$ - P_5 $\quad\quad$ $\theta_{C|\neg A}$ - P_9

$\theta_{\neg B|\neg A}$ - P_6 $\quad\quad$ $\theta_{\neg C|\neg A}$ - P_{10}

KB :

$A \Leftrightarrow P_1$ $\quad\quad$ $B \wedge \neg A \Leftrightarrow P_5$ $\quad\quad$ $C \wedge \neg A \Leftrightarrow P_9$

$\neg A \Leftrightarrow P_2$ $\quad\quad$ $\neg B \wedge \neg A \Leftrightarrow P_6$ $\quad\quad$ $\neg C \wedge \neg A \Leftrightarrow P_{10}$

$A \wedge B \Leftrightarrow P_3$ $\quad\quad$ $C \wedge A \Leftrightarrow P_7$

$\neg B \wedge A \Leftrightarrow P_4$ $\quad\quad$ $\neg C \wedge A \Leftrightarrow P_8$

$$w_A = w_{\neg A} = w_B = w_{\neg B} = w_C = w_{\neg C} = 1$$

$$w_{P1} = \theta_A \quad \theta_{P2} = \theta_{\bar{A}} \quad \dots$$

$$w_{\neg P1} \dots = 1$$

$A = T \quad B = F \quad C = T$

A	$\neg B$	C	$P1$	$P4$	$P7$	$\neg P2$	$\neg P3$ ...
1	1	1	$\downarrow$	$\downarrow$	$\downarrow$	1	1
			θ_A	$\theta_{\neg B \mid A}$	$P_{C \mid A}$		

2.4. 2. $O(n \cdot d^{w})$

2.5.

H	S	E	
T	F	T	3
F	T	F	1
F	F	T	1
T	F	F	1
F	F	F	1

H	Pr(H)
T	4/7
F	3/7

H	S	Pr(S|H)
T	T	0
T	F	1
F	T	1/3
F	F	2/3

H	E	Pr(E|H)
T	T	3/4
T	F	1/4
F	T	1/3
F	F	2/3

3.

H	Pr(H)
T	1/2
F	1/2

H	S	Pr(S|H)
T	T	1/2
T	F	1/2
F	T	1/2
F	F	1/2

H	E	Pr(E|H)
T	T	1/2
T	F	1/2
F	T	1/2
F	F	1/2

H	S	E	
F	T	F	1
F	F	T	1
T	F	F	1
F	F	F	1
T	F	T	1
T	T	T	1/8
T	F	T	1/8
T	T	T	1/8
T	T	F	1/8
T	F	T	1/8
T	F	F	1/8

$$Pr(H=T) \cdot Pr(S=T \mid H=T) \cdot Pr(E=T \mid H=T)$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$

H	Pr(H)
T	11/23
F	12/23

H	S	Pr(S|H)
T	T	3/22
T	F	19/22
F	T	1/3
F	F	2/3

H	E	Pr(E|H)
T	T	
T	F	
F	T	
F	F	

$$\Pr(\bar{b} \mid e_1) = \frac{\Pr(\bar{b}, e_1)}{\Pr(e_1)}$$

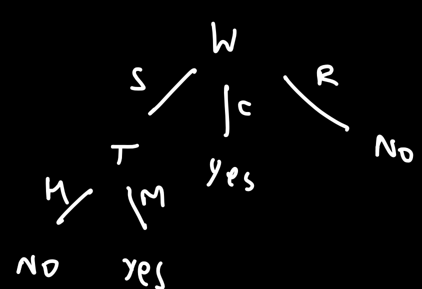
$$= \frac{\Pr(\bar{b}, \bar{a}, c)}{\Pr(\bar{a}, c)} = \frac{\Pr(\bar{a}) \cdot \Pr(\bar{b} \mid \bar{a}) \cdot \Pr(c \mid \bar{a})}{\Pr(\bar{a}) \cdot \Pr(c \mid \bar{a})}$$

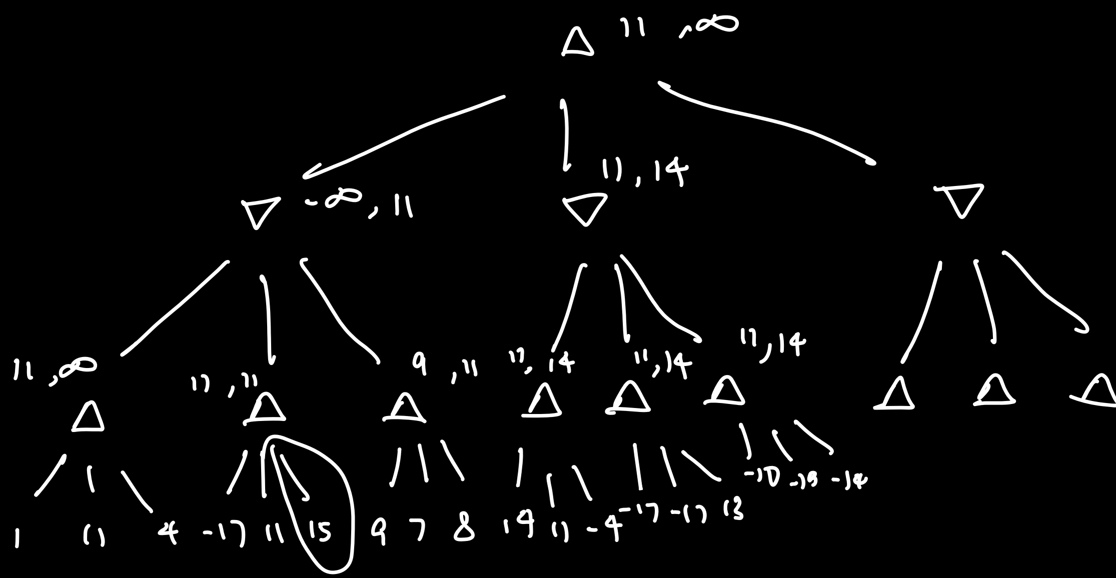
$$= 0.5$$

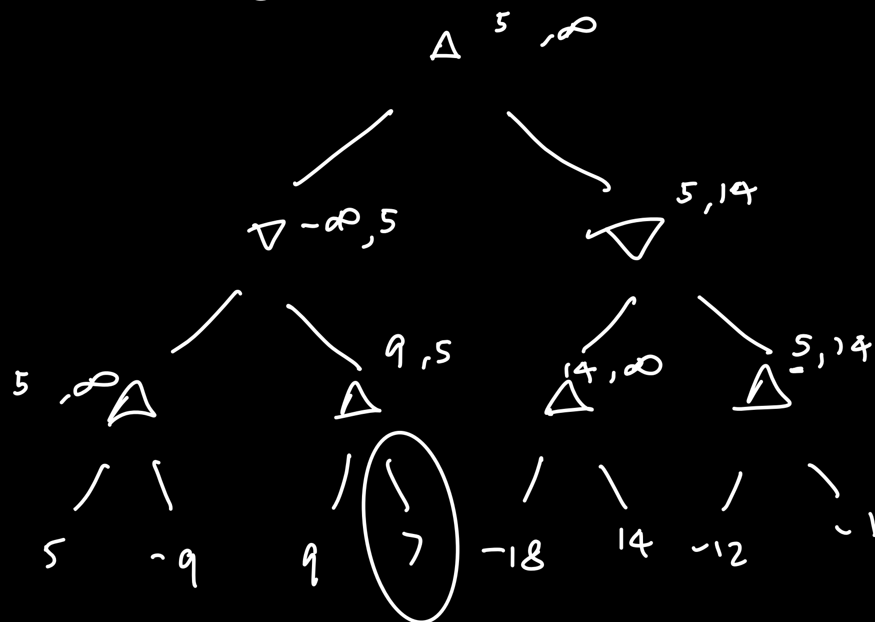
3.1. 2.

T	S	1/2	1/2
	C	yes	
	R	No	

T	H	1/2	1/2
	M	2/3	1/3




11, ∞
-∞, 11
11, 14
11, ∞
11, 11
9, 11
11, 14
11, 14
11, 14
1 11 4 -17 11 15 9 7 8 14 11 -4 -17 -17 13
-10 -18 -14


5, ∞
-∞, 5
5, 14
5, ∞
9, 5
14, ∞
5, 14
5 -9 9 7 -18 14 -12 -1

2.4 - 2, 2.5 - 3

```
(defun REVERSE (L)
    (cond ((null L) (NIL))
          (t (append (REVERSE (cdr L)) (car L)))))

                                   (list (car L)) ✓

(defun DELETE-K (L k)
    (cond ((null L) L)
                              (cdr L)
          ((= k 1) (DELETE-K (cond L) (- K 1)))
          (t (cons (car L) (DELETE-K (cond L)
                                     (- k 1)))))))

(defun DEEPLENGTH (L)
    (cond ((null L) 0)
          ((atom L) 1)
          (t (+ (DEEPLENGTH (car L))
                (DEEPLENGTH (cdr L)))))))
```

BFS: A B C D E F I J G H K

DFS: A B D E G H F C I K

l = 2 A B D E F C I J

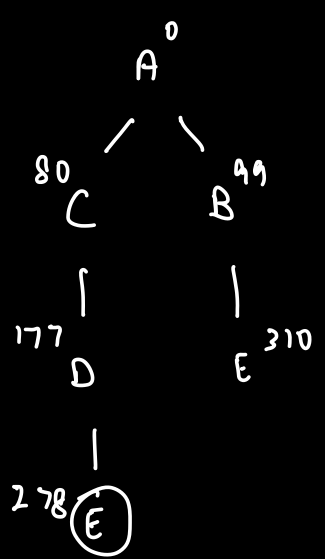
DFID A ABC ABDEFCIJ ABDEGHFCIK

✓ ✗ ✗ (dcl) ✓ ✓

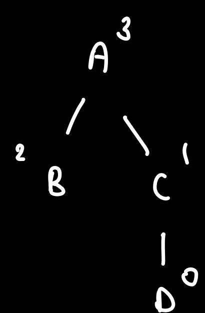
✓ ✗ ✗ ✓ ✓

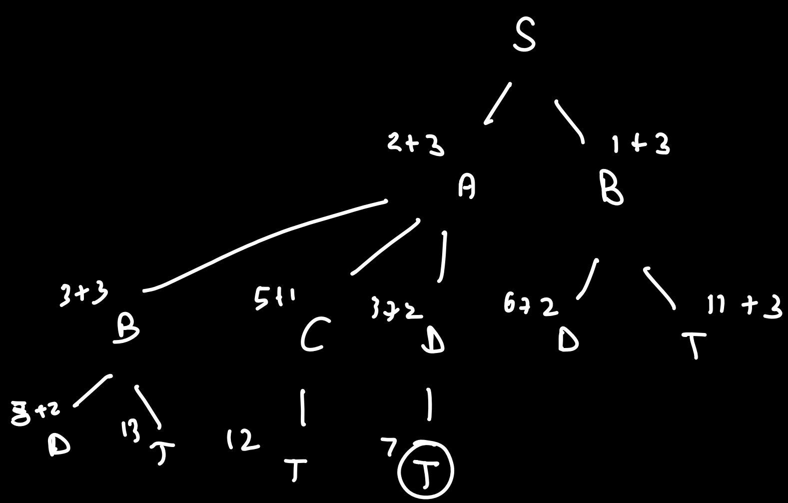
b^d b^m b^l b^d $b^{\lceil c^*/e \rceil}$

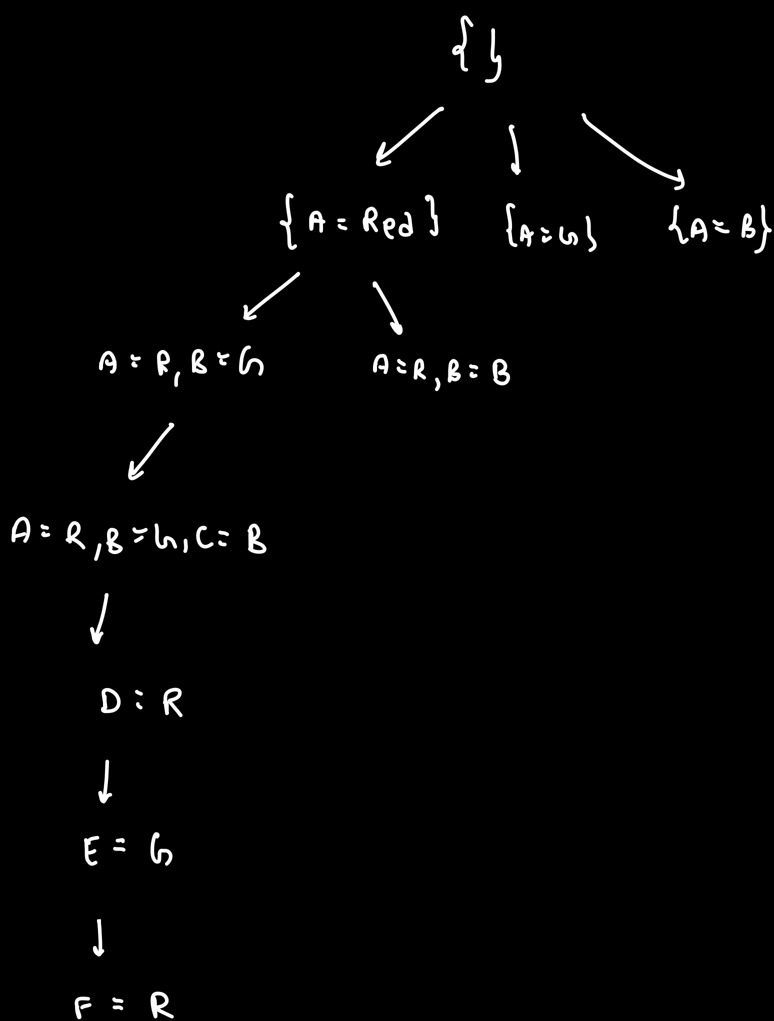
b^d bm bl bd $b^{\lceil c^*/e \rceil}$

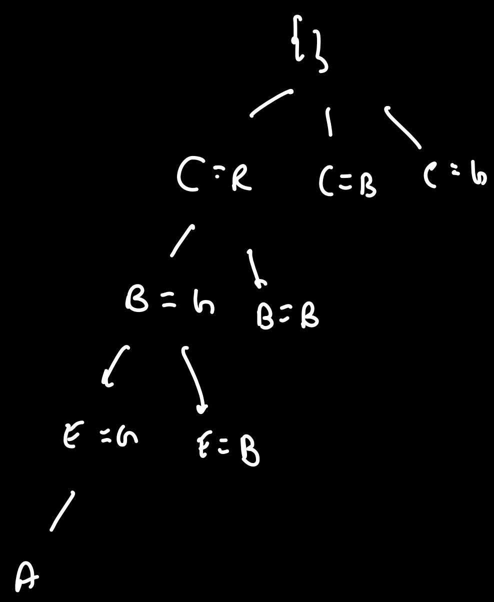


1 1
211
99
310




S
2+3
A
1+3
B
3+3
B
5+1
C
3+2
D
6+2
D
11+3
T
3+2
D
13
T
12
T
7
T


{ }
{A = Red}
{A = G}
{A = B}
A = R, B = G
A = R, B = B
A = R, B = G, C = B
D = R
E = G
F = R



A - ~~2~~ ~~1~~ 0

B - ~~3~~ 2

C - 5

D - ~~3~~ ~~2~~ ~~1~~ 0

E - ~~3~~ ~~2~~ 1

F - ~~2~~ ~~1~~ 0

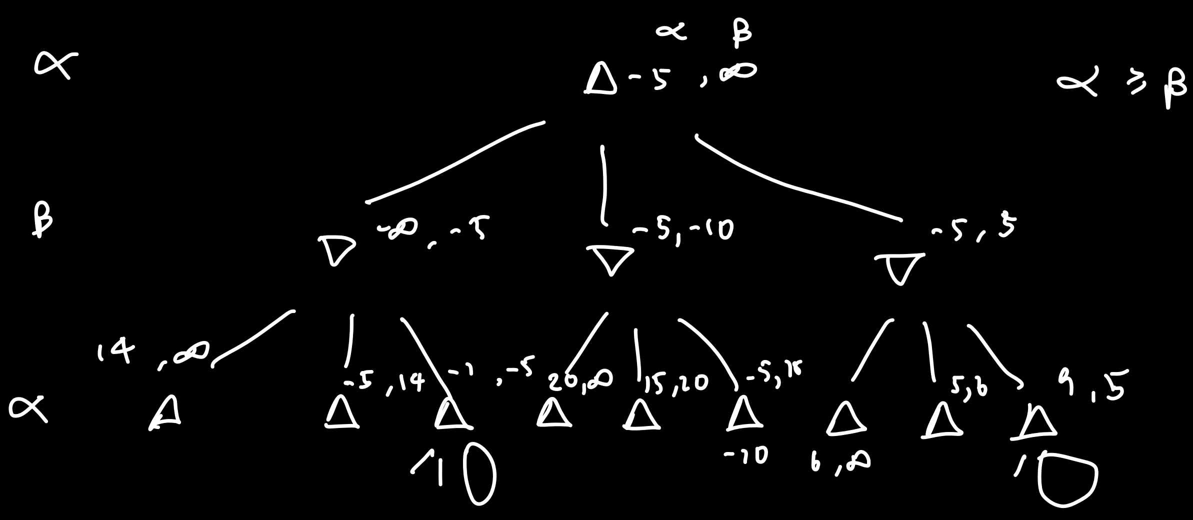
$0.3 \times 2 + 0.7 \times 4$

$0.6 + 2.8$

3.4

$0.8 \times 0 + 0.2 \times -2$

-0.4



✓	X
✓	✓
✓	X
✓	✓
X	✓

$\neg(A \vee \neg B) \vee C$

$\neg C \vee (D \vee \neg E)$

$E \vee D$

$(\neg A \wedge B) \vee C$

$\boxed{(\neg A \vee C) \wedge (B \vee C)}$

$\neg(A \vee B) \vee C$

$(\neg A \wedge \neg B) \vee C$

$(\neg A \vee C) \wedge (\neg B \vee C) \wedge A$

A is True

C is true

$\neg(A \vee \neg B) \vee C$

$$\frac{(\neg A \wedge B) \vee C}{}$$

- $(\neg A \vee C)$
- $(\neg C \vee D \vee \neg E)$
- $E \vee D$
- $B \vee C$

$$\frac{\begin{array}{c} A \\ \neg D \end{array}}{\begin{array}{c} E \\ \neg C \\ B \\ \neg A \end{array}}$$

$(\neg A \wedge \neg B)$ (B)

$(D \wedge \neg E)$ $(\neg D)$

$\neg P \vee \neg Q$ $\neg Q \vee \neg P$

$\neg P \vee \neg Q$

$(\neg S \vee F) \Rightarrow (\neg S \vee F)$

$(S \wedge \neg F) \vee (\neg S \vee F)$

$My \Rightarrow Imm$

$\neg My \Rightarrow \neg Imm \wedge M$

$Imm \vee M \Rightarrow H$

$M \Rightarrow Mag$

$\neg A \vee B$ ✓

$A \vee (\neg B \wedge C)$ | $A \vee \neg B$ ✓, $A \vee C$ ✓

$\neg(B \vee C) \vee D$ $(\neg B \wedge \neg C) \vee D$

$\neg B \vee D$ ✓

$\neg C \vee D$ ✓

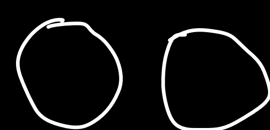
$\neg D \vee E$ ✓

	$\neg A$	$\neg D$	$\neg E$
$\neg A \vee B$	$\neg B$	$\neg B$	$\neg D$
$A \vee \neg B$	$\neg A$	$\neg C$	$\neg C$
$A \vee C$	C	$\neg A$	$\neg B$
$\neg B \vee D$	D	A	$\neg A$
$\neg C \vee D$	E		A
$\neg D \vee E$			

$P(O) = 0.5$

$P(N) = 0.2$

$P(\neg O \wedge \neg N) = 0.3$



$P(O \wedge N) = 0$

$P(T \mid O) = 0.9$

$P(T \mid N) - 0.3$

$P(T \mid \neg O \wedge \neg N) = 0.1$

$$P(O \mid T) = \frac{0.9 \times 0.5}{0.9 \times 0.5 + 0.3 \times 0.2 + 0.1 \times 0.3}$$

$P(H \mid a) = 20/100$

$P(H \mid b) = 40/100$

$P(H \mid c) = 80/100$

	x_1
H	$1/5$
T	$4/5$

$$
\begin{tikzcd}
 & \text{Coin} \arrow[dl] \arrow[d] \arrow[dr] & \\
X_1 \arrow[dr] & X_2 \arrow[d] & X_3 \arrow[dl] \\
 & B &
\end{tikzcd}
$$

X_1	X_2	X_3	B
H	H	H	1
T	T	T	1
			0
			$\vdots$
			0

$I(A, \emptyset, BE)$ $\quad$ $I(C, A, DBE)$

$I(B, \emptyset, AC)$ $\quad$ $I(D, AB, CE)$ ...

Open

Closed

$$\text{ENT}(D \mid A = \text{true}) \cdot \Pr(A = \text{true}) + \text{ENT}(D \mid A = \text{false}) \cdot \Pr(A = \text{false})$$

$$\downarrow$$

$$\frac{7}{11}, \frac{4}{11}$$

$$-\frac{7}{11}\log_2\left(\frac{7}{11}\right) - \frac{4}{11}\log_2\frac{4}{11}$$