

Q1

Chosen Password: wD05@Ag9\$J

	possibilities
1. Lower case letter (a-z)	26
2. Upper case letter (A-Z)	26
3. Digit (0-9)	10
4. Digit (0-9)	10
5. @	1
6. Upper/Lower case letter (a-z, A-Z)	52
7. Upper/Lower case letter (a-z, A-Z)	52
8. Symbol {\$,9,5,v,w,J}	6
9. Symbol {\$,9,5,v,w,J}	6
10. Symbol {\$,9,5,v,w,J}	6

$$\text{Entropy} = L \log_2 N$$

$$N = 26 \times 26 \times 10 \times 10 \times 1 \times 52 \times 52 \times 6 \times 6 \times 6$$

$$= 39,482,726,400 \text{ or } 3.95 \times 10^{10}$$

$$\text{Entropy} = 1 \log_2 (39,482,726,400)$$

$$\approx 35.20 \text{ bits}$$

$$\text{Entropy of Tiger Hash} = 10 \log_2 \text{Tiger } 3.95 \times 10^{10}$$

$$\text{Tiger}(wD05@Ag9\$J) = 357c723ff871393085c9e40f401679187fad4f78f3959d52$$

Q2

	O1	O2	O3	O4	O5	O6
S1	R	R	R	R	R	RW
S2	R			W	W	W
S3	R	RW	RW		W	W
S4	R			R		W
S5	R					
S6	R	R	R		R	

O₁

Subjects from every level can read object O1 and is dominated by all subject, hence it is at the lowest level

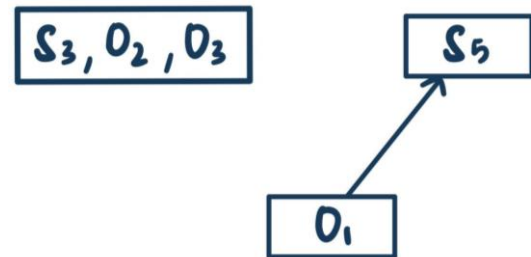
	O1	O2	O3	O4	O5	O6
S1	R	R	R	R	R	RW
S2	R			W	W	W
S3	R	RW	RW		W	W
S4	R			R		W
S5	R					
S6	R	R	R		R	

S₃, O₂, O₃O₁

Subject S3 can read and write objects O2 and O3, hence S3, O2, must be at the same level.

O3

	O1	O2	O3	O4	O5	O6
S1	R	R	R	R	R	RW
S2	R			W	W	W
S3	R	RW	RW		W	W
S4	R			R		W
S5	R					
S6	R	R	R		R	



Subject S5 can only read object O1, hence subject S5 can only dominate object O1.

	O1	O2	O3	O4	O5	O6
S1	R	R	R	R	R	RW
S2	R			W	W	W
S3	R	RW	RW		W	W
S4	R			R		W
S5	R					
S6	R	R	R		R	

Subjects S1 and S6 must dominate Object O2 and O3 to allow reading

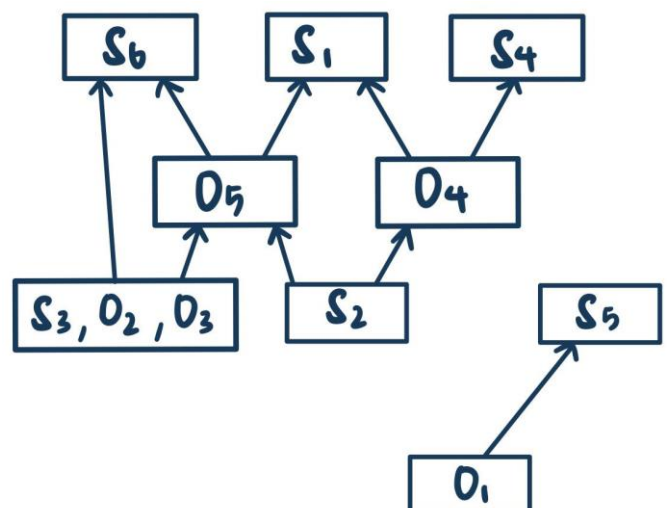
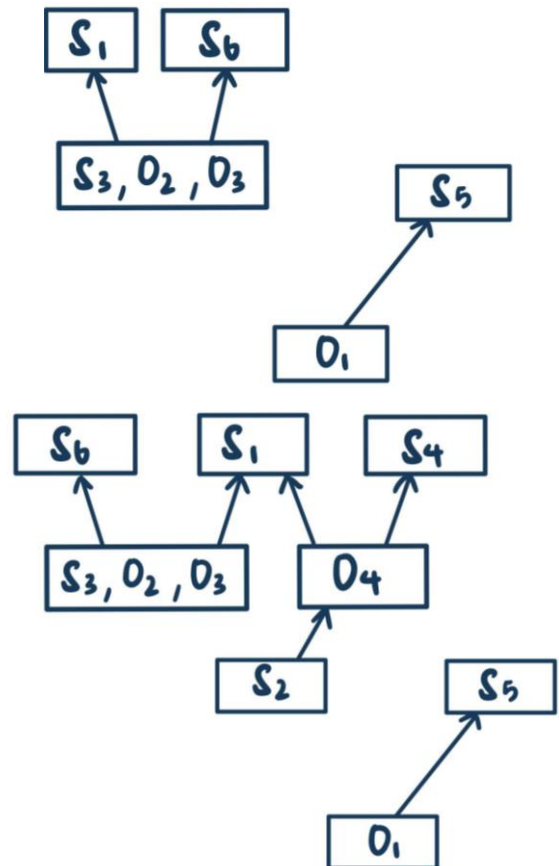
	O1	O2	O3	O4	O5	O6
S1	R	R	R	R	R	RW
S2	R			W	W	W
S3	R	RW	RW		W	W
S4	R			R		W
S5	R					
S6	R	R	R		R	

Subject S1 and S4 must dominate object O4 to allow reading.

	O1	O2	O3	O4	O5	O6
S1	R	R	R	R	R	RW
S2	R			W	W	W
S3	R	RW	RW		W	W
S4	R			R		W
S5	R					
S6	R	R	R		R	

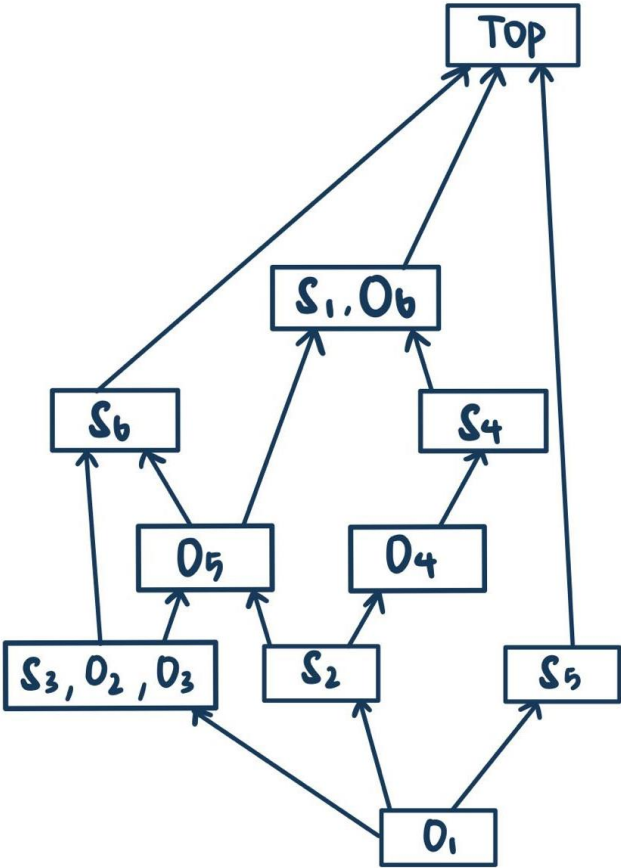
Subject S1 must dominate object O5 to allow reading.

O5 must dominate Subject S2 and S3 to allow writing.



	O1	O2	O3	O4	O5	O6
S1	R	R	R	R	R	RW
S2	R			W	W	W
S3	R	RW	RW		W	W
S4	R			R		W
S5	R					
S6	R	R	R		R	

O6 must dominate S4 to allow writing.
Top level introduced to complete the lattice.



Q3

Statement	Subject	Objects	Actions
Alice can climb trees and eat apples	Alice	Trees and Apples	Climb, Eat
Bob can climb fences, eat apples, and wave flags	Bob	Fences, Apples, Flags	Climb, Eat, Wave
Trees can hurt apples.	Trees	Apples	Hurt
Carol can jump waves and wave flags	Carol	Waves, Flags	Jump, Wave

Legends: Climb = C , Eat = E, Wave = W, Hurt = H, Jump = J

Subject/Objects	Apples	Fences	Flags	Trees	Waves
Alice	E			C	
Bob	E	C	W		
Trees	H				
Carol			W		J