

Computing for

Data Science

-Assignment 5

2022-24670

이종현

# array

1.

9								
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17	9							
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17	9	4						
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17	13	4	9					
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17	16	4	9	13				
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23	16	17	9	13	4			
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34	16	23	9	13	4	17		
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40	34	23	16	13	4	17	9	
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40	34	23	16	13	4	17	9	5
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# Binary Tree

(9)

(17)

(9)

(17)

(9)

(4)

(17)

(13)

(4)

(9)

(17)

(16)

(4)

(9)

(13)

(23)

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(9)

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(34)

(16)

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(9)

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(4)

(17)

(40)

(34)

(23)

(9)

(16)

(13)

(4)

(17)

(40)

(34)

(23)

(9)

(16)

(13)

(4)

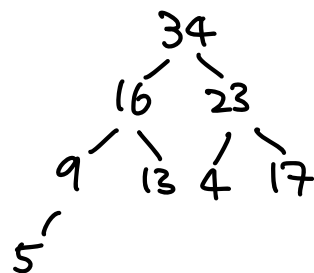
(17)

(9)

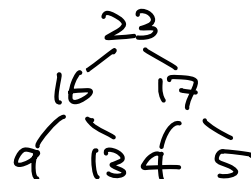
(5)

2.

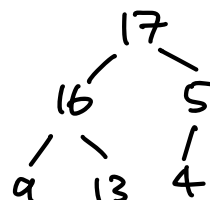
34	16	23	9	13	4	17	5	
----	----	----	---	----	---	----	---	--



23	16	17	9	13	4	5		
----	----	----	---	----	---	---	--	--



17	16	5	9	13	4			
----	----	---	---	----	---	--	--	--



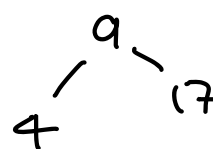
3.

(9)

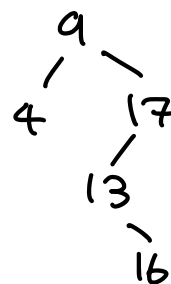
⇒

(9) (17)

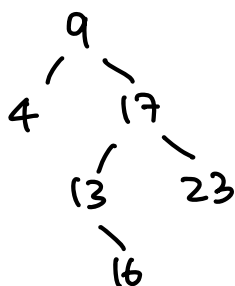
⇒



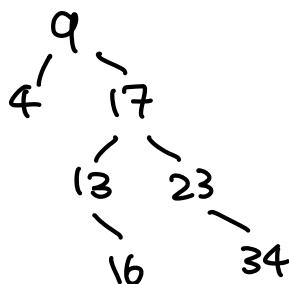
⇒



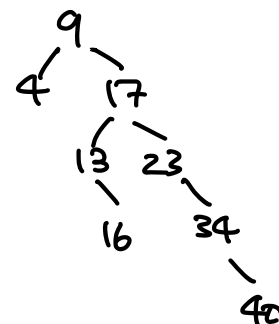
⇒



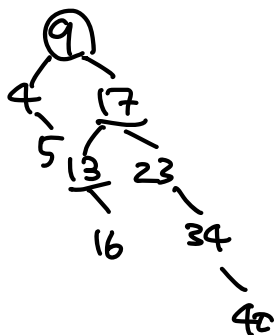
⇒



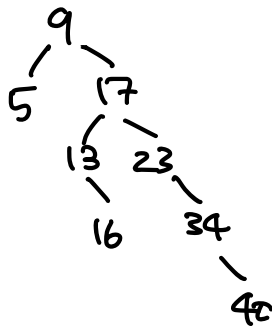
⇒



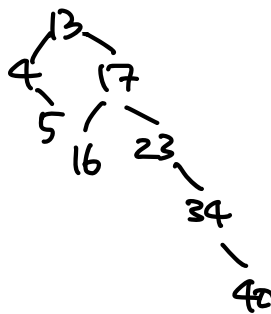
⇒



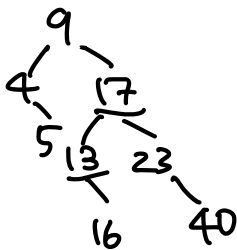
4. (a)



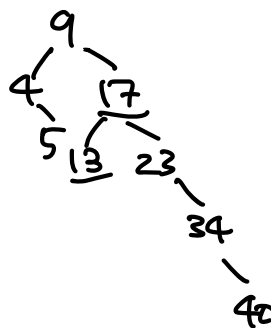
(b)



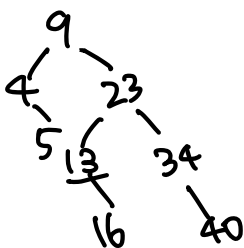
(c)



(d)

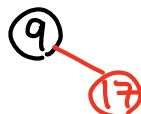


(e)



(NIL을 생략)

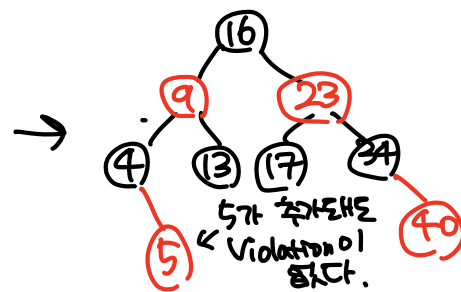
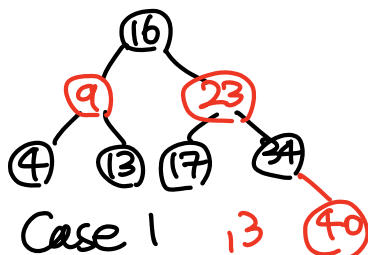
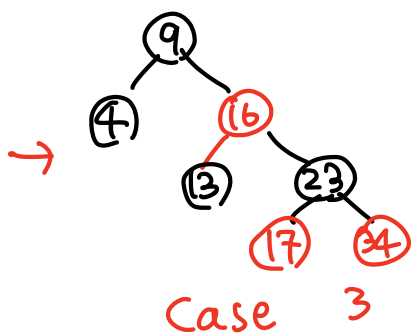
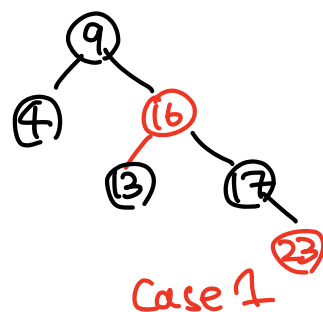
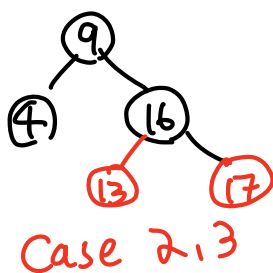
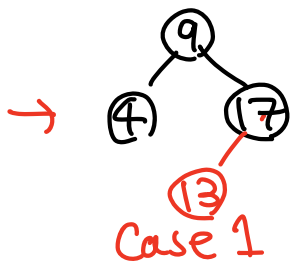
5. (a) →



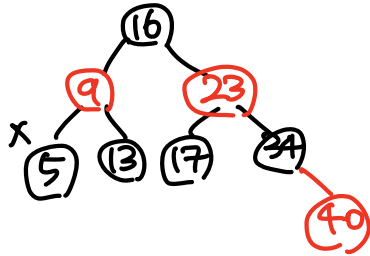
RB Tree Violation이 있다.

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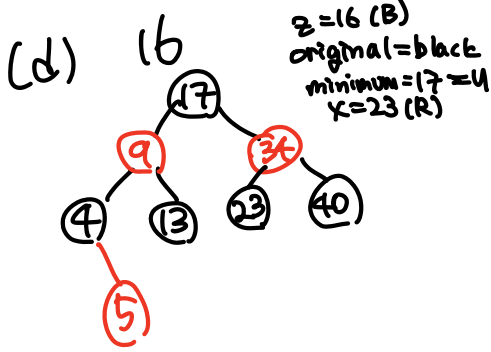
RB Tree Violation이 있다.



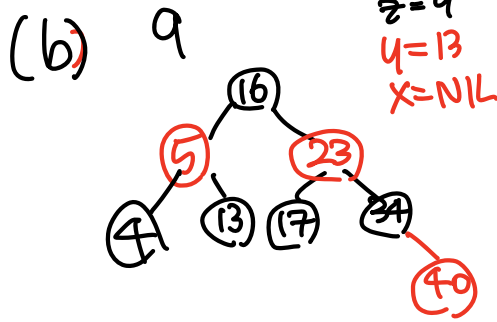
6. (a) 4 157-1



4와 5를 transplant하고  
추가적인 violation이 없다.

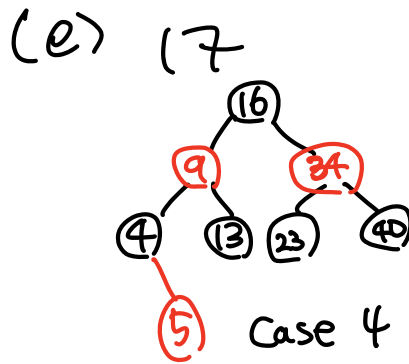


Case 4

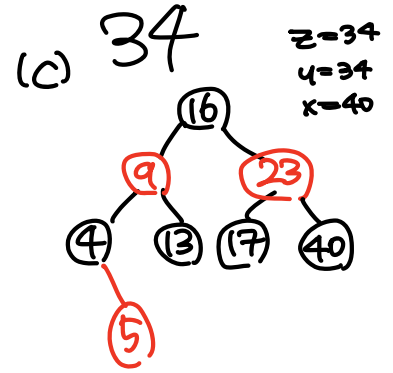


original=black

Case 3,4



Case 4



original=black

40의 값을 4로 바꾸고  
이후 추가적인 fixup  
이 필요하지 않음