Problem Set 2: Part I

Problem 1: Fixed-length and variable-length records

1.1 and 1.2

record contents

15172	Barbie#----------	2023	PG-13

length in bytes

34

show how you computed the length:

Id CHAR(5): 5 * 1 byte = 5 bytes
name VARCHAR(20): 20 * 1 byte = 20 bytes
year INTEGER: 4 bytes
rating VARCHAR(5): 5 bytes

Thus, 5 + 20 + 4 + 5 = 34 bytes

1.3 and 1.4

record contents

5	15172	6	Barbie	4	2023	5	PG-13

length in bytes

28

show how you computed the length:

four metadata: 4 * 2 bytes = 8 bytes
Id CHAR(5): 5 * 1 byte = 5 bytes
name VARCHAR(20): 6 * 1 byte = 6 bytes
year INTEGER: 4 bytes
rating VARCHAR(5): 5 bytes

Thus, 8 + 5 + 6 + 4 + 5 = 28 bytes

1.5 and 1.6

record contents

10	15	21	25	30	15172	Barbie	2023	PG-13

length in bytes

30

show how you computed the length:

4 fields in record → 5 offsets: 5 * 2 bytes = 10 bytes
Offset_0 = 10 as field_0 comes right after the header

Offset_1 =10 + len('15172') = 10 + 5 = 15
Offset_2 = 15 + len('Barbie') = 15 + 6 = 21
Offset_3 = 21 + len(2023) = 21 + 4 = 25
Offset_4 = offset of the end of the record = 25 + len('PG-13') = 25 + 5 = 30

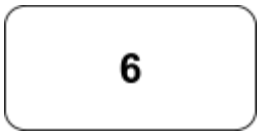
1.7

record contents

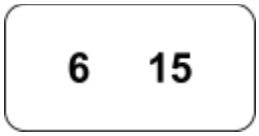
10	15	-1	31	36	87654	The Color Purple	PG-13

Problem 2.1: Insertions into a B-tree

1. Insert 6

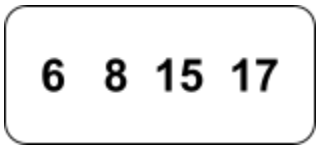


2. Insert 15

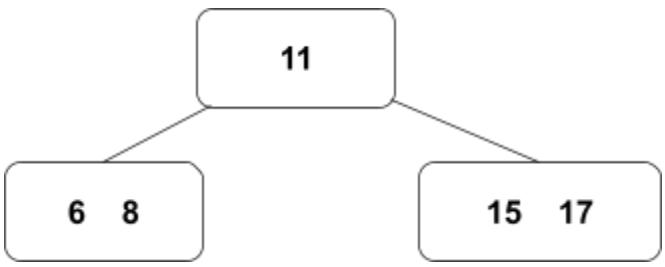


3. Insert 8

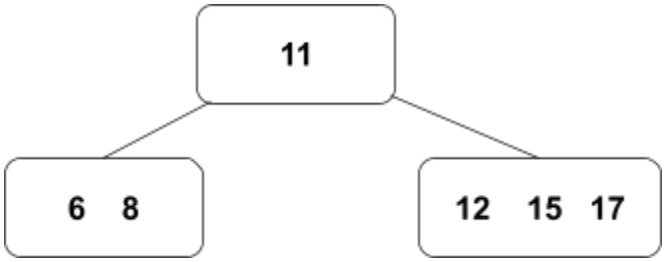
4. Insert 17



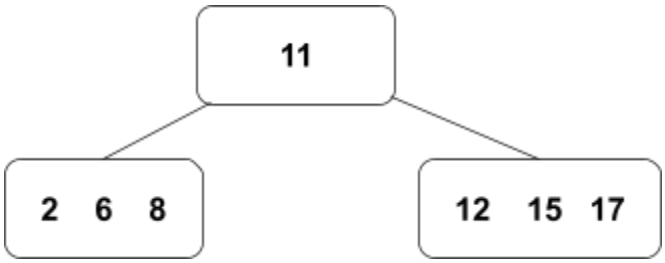
5. Insert 11



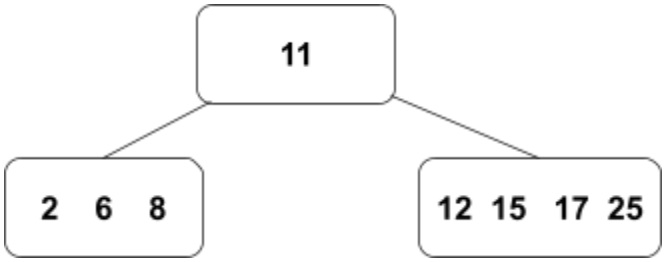
6. Insert 12



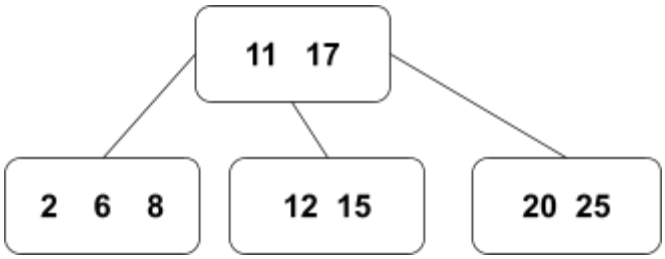
7. Insert 2



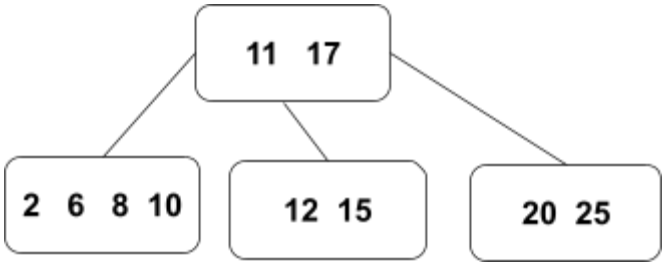
8. Insert 25



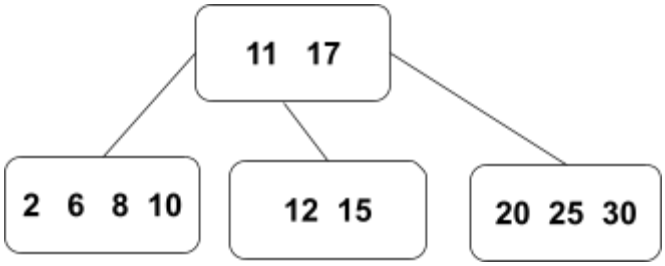
9. Insert 20



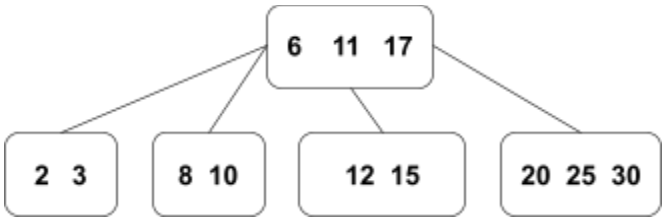
10. Insert 10



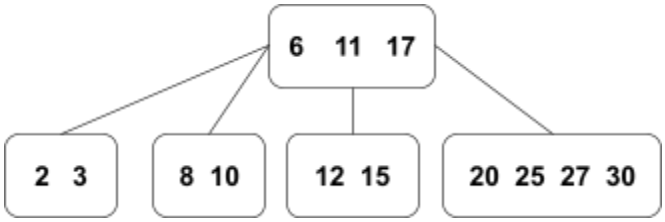
11. Insert 30



12. Insert 3



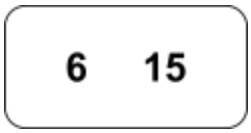
13. Insert 27



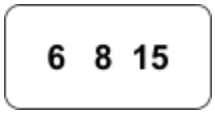
Problem 2.2: Insertions into a B+tree

1. Insert 6

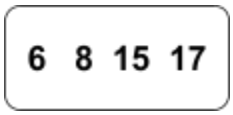
2. Insert 15



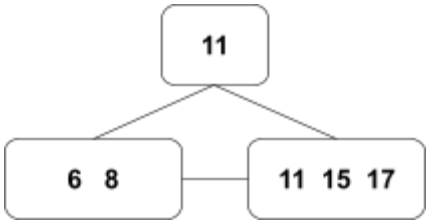
3. Insert 8



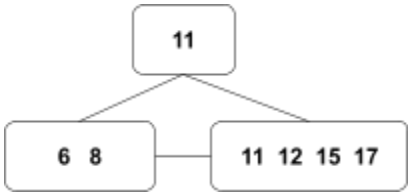
4. Insert 17



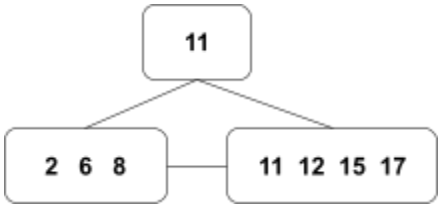
5. Insert 11



6. Insert 12



7. Insert 2



8. Insert 25

9. Insert 20

10. Insert 10

11. Insert 30

12. Insert 3

13. Insert 27

Problem 2.3: Insertions into a linear hash table

before first increase

0	6,8,12,2
1	15,17,11

after first increase

0	8,12
1	15,17,11
2	6,2

before second increase

0	8,12,20
1	15,17,11,25
2	6,2,10

after second increase

0	8,12,20
1	17,25
2	6,2,10
3	15,11

before third increase

0	8,12,20
1	17,25
2	6,2,10,30
3	15,11,3,27

after third increase

0	8
1	17,25
2	6,2,10,30
3	15,11,3,27
4	12,20

final state of the table

0	8
1	17,25
2	6,2,10,30
3	15,11,3,27
4	12,20