

## B Tree Creation Example

01 October 2020 08:59

Construct a B-Tree of order 4 by inserting the following keys in sequence.

5, 3, 21, 9, 1, 13, 2, 7, 10, 12, 4, 8

Ans

Order / degree  $m = 4$

min child pointers  $\} = \lceil \frac{m}{2} \rceil$

$$(u) t = \lceil \frac{4}{2} \rceil = 2$$

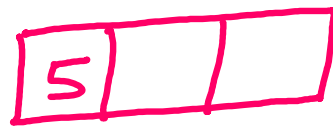
Child pointers	min 2	max 4
Keys	1	<span style="border: 1px solid black;">3</span>

Child pointer Range: 2-4

$\therefore$  B-Tree of "order 4" is called 2-3-4 B Tree  
(or) 2-4 B Tree

Similarly B-Tree of "order 3"  
is called "2-3 B Tree"

Step 1: Insert 5



(Max  
Keys = 3)

Step 2: Insert 3



Step 3: Insert 21



Step 4: Insert 9:

Node is full.

Before Insertion  
no. of keys is odd ✓

∴ Find median  
& split.

[3 (5) 21]

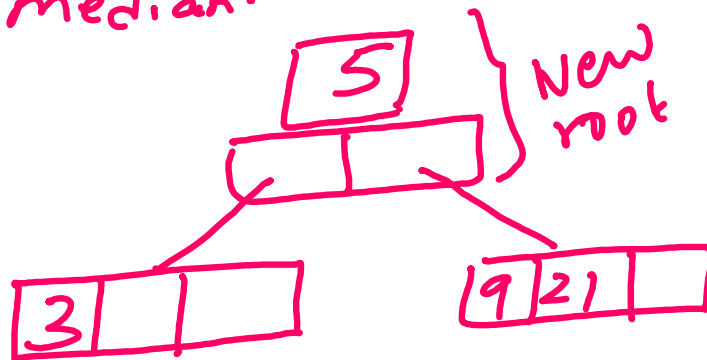
✓ 5 ✓

[3] [21]

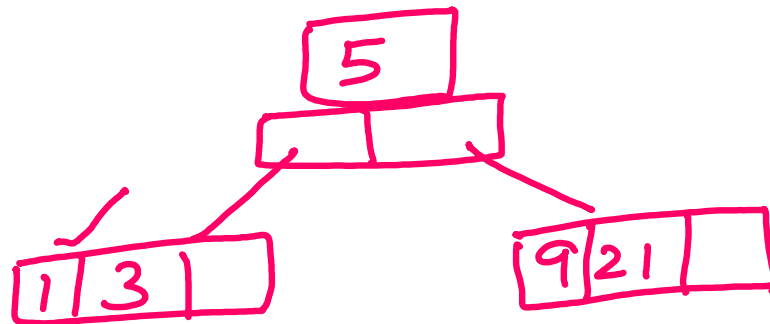
Now Insert 9

[3]<sup>5</sup> [(9) 21]

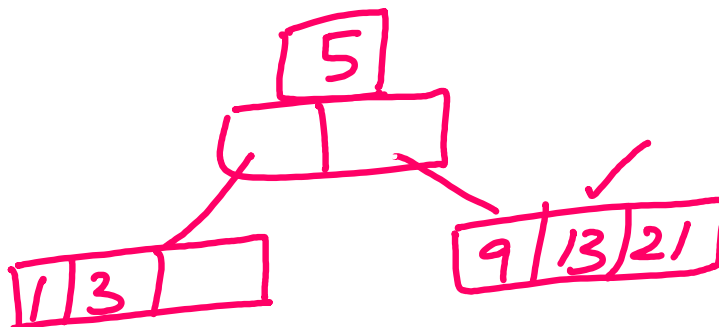
Push median to Parent.  
If Parent not available  
Create new root with  
median.

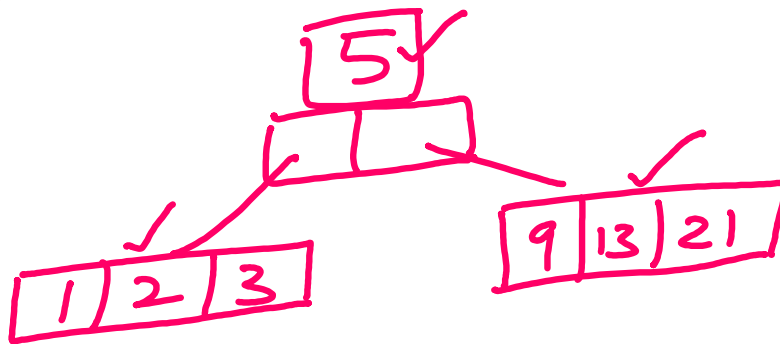


Step 5: Insert 1



Step 6: Insert 13



Step 7: InsertStep 8: Insert 7

Node is full.

Before insertion the number of keys is odd.

Hence find median & Split.

[9 (13) 21]

[9] <sup>13</sup> [21]

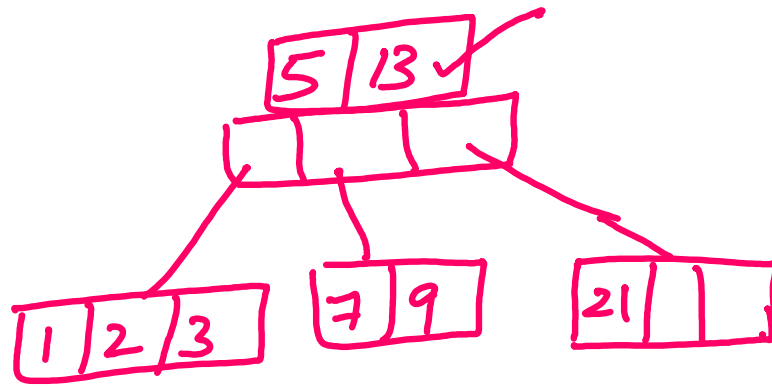
Now insert

[7 9] <sup>13</sup> [21]

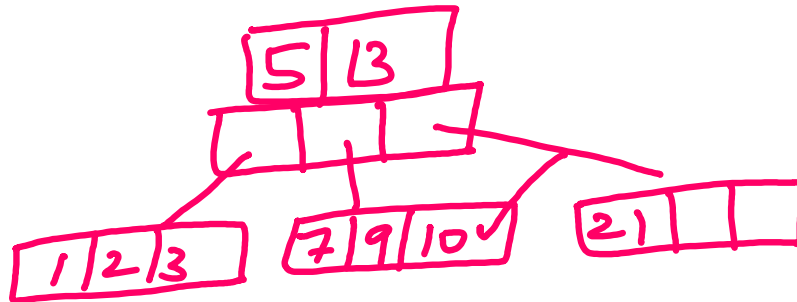
[Note: If no. of keys before insertion is even then insert first, and find median & split]

... to parent.

# Push median



Step 9: Insert 10



Step 10: Insert 12 ✓

Node full.

No. of keys before insertion  
is odd.

Hence find median & split.

[7 | 9 | 10]

[9]

[7]

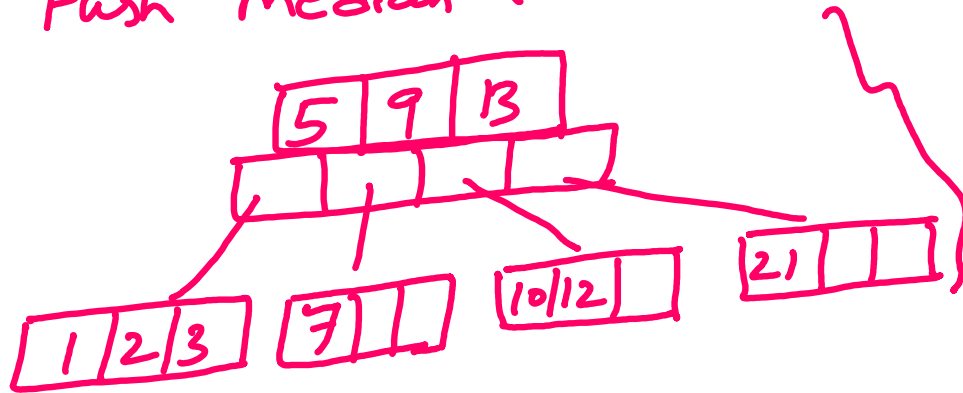
[10]

Now insert.

[7] <sup>9</sup> [10 12]

, , parent

Push median to



Step 11: Insert 4

Node is full.

No. of keys before insertion is odd. Hence find median & Split.

[1 (2) 3]

[1]<sup>2</sup> [3]

Now Insert

[1]<sup>2</sup> [3 4]

Push median to parent.

Parent node is also full.

Find median & split parent.

[5 (9) 13]

[7]<sup>9</sup> [12]

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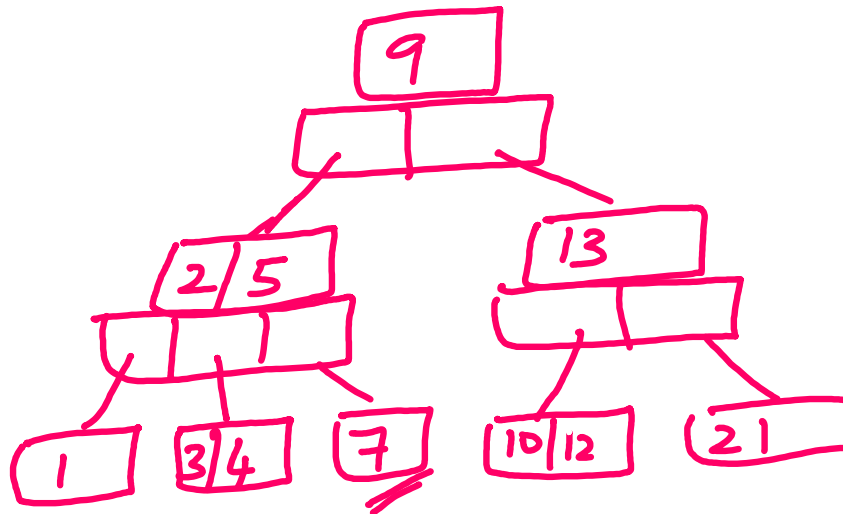
Now insert

[2 5]  $\rightarrow$  [13]

Push median to parent.

Parent is not available.

Hence create new root with median.

Step 12 : Insert 8