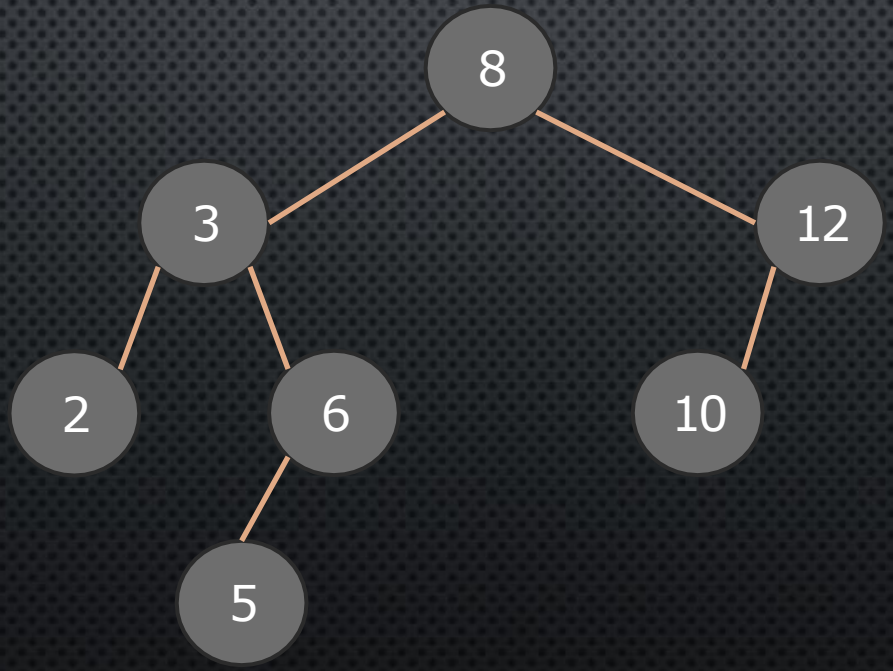
DSA 02 HOME-WORK

EXERCISE 01 :

a) We have the following AVL tree :



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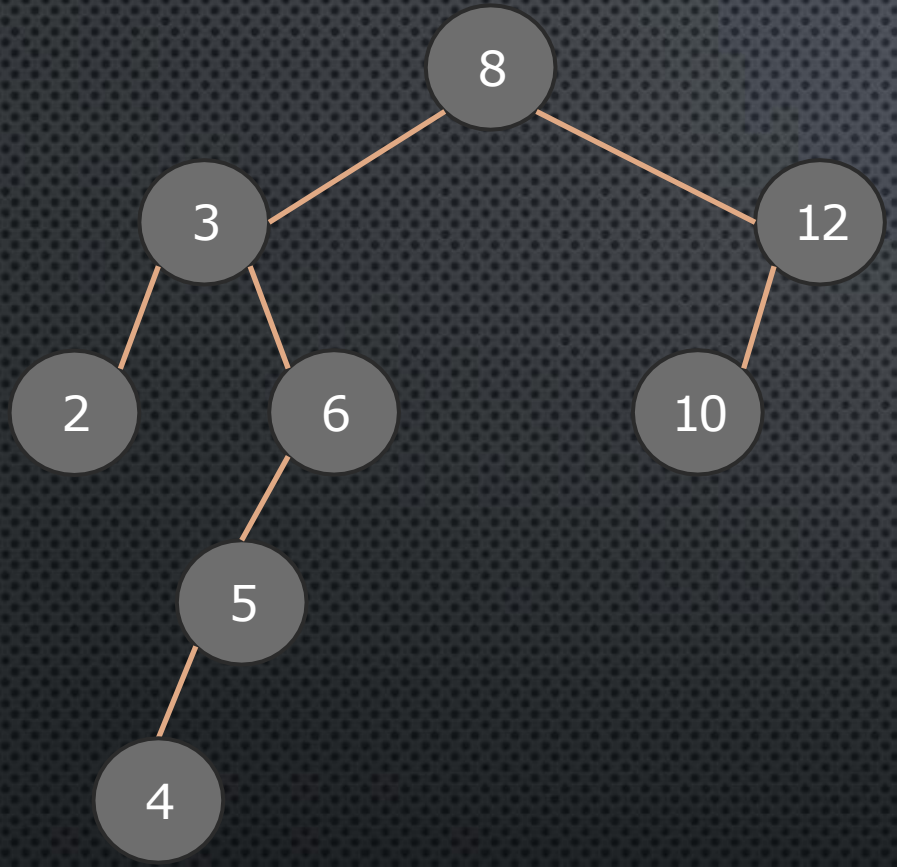
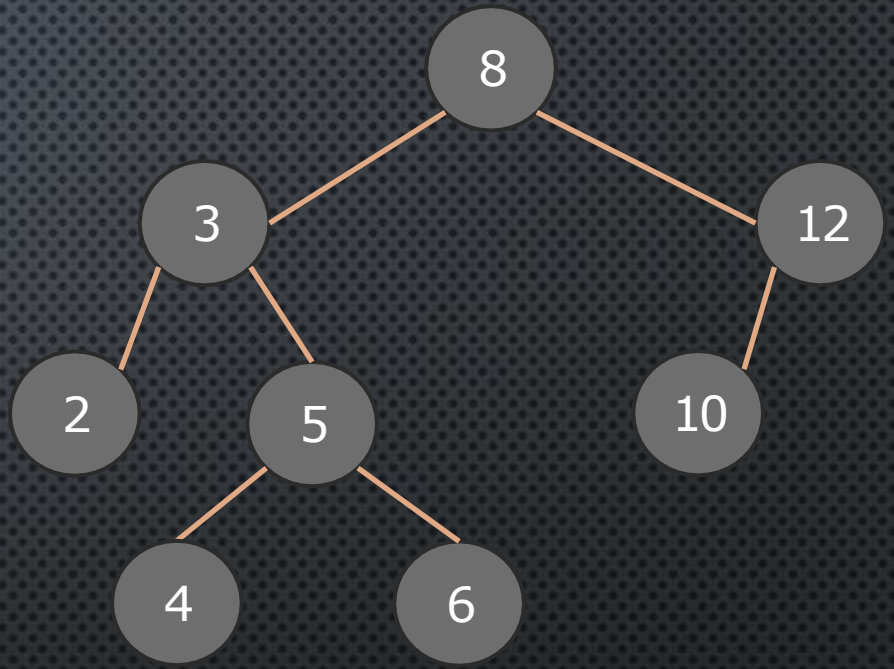


INSERT (4)



AFTER BALANCING

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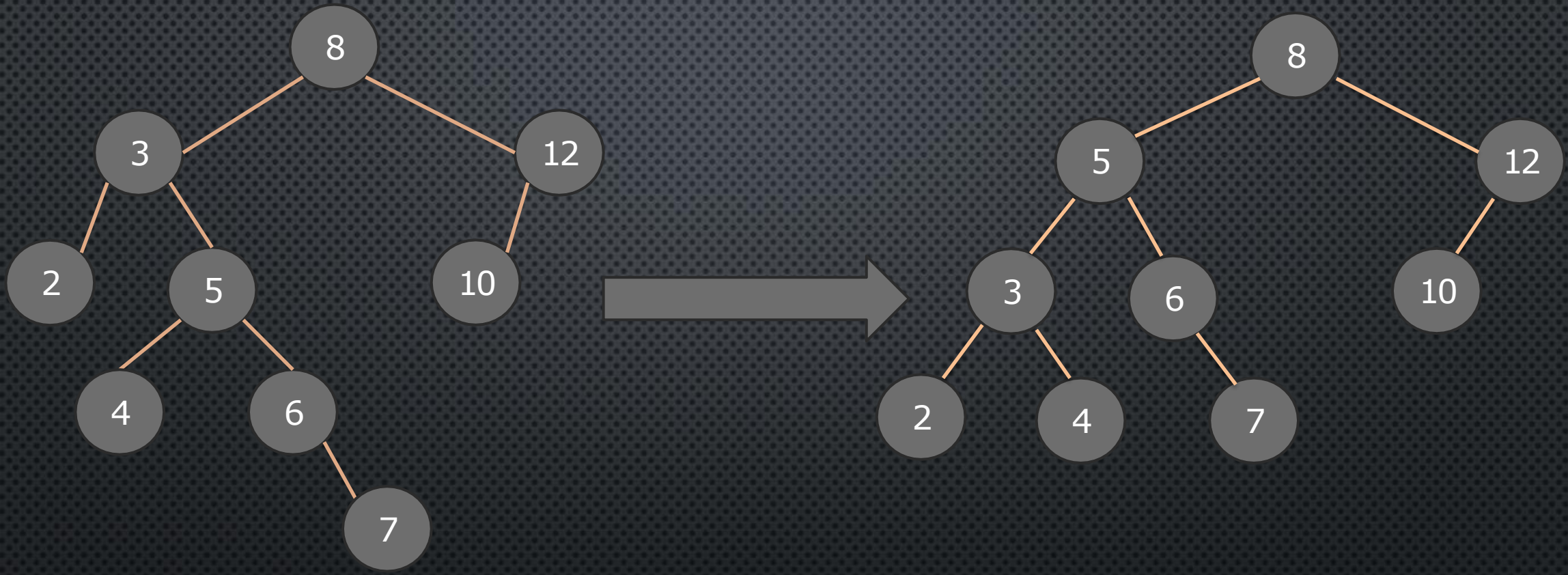

INSERT (7)

AFTER BALANCING

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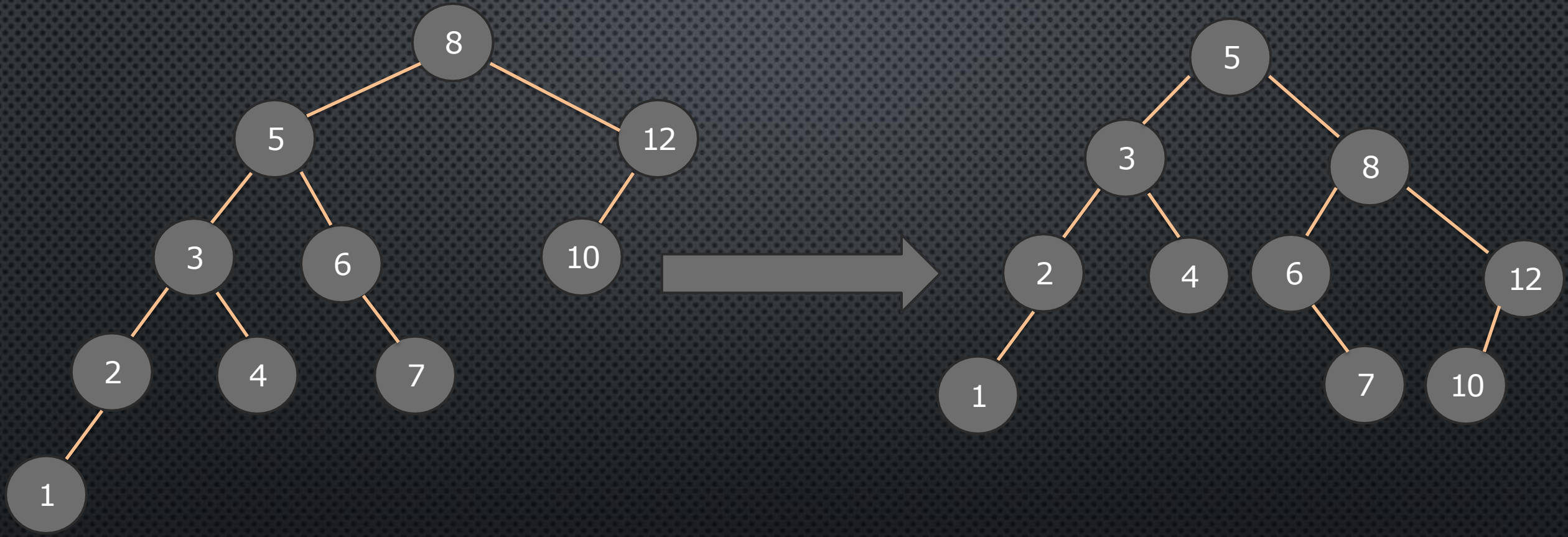
b) Now We have the following AVL tree :



INSERT (1)

AFTER BALANCING

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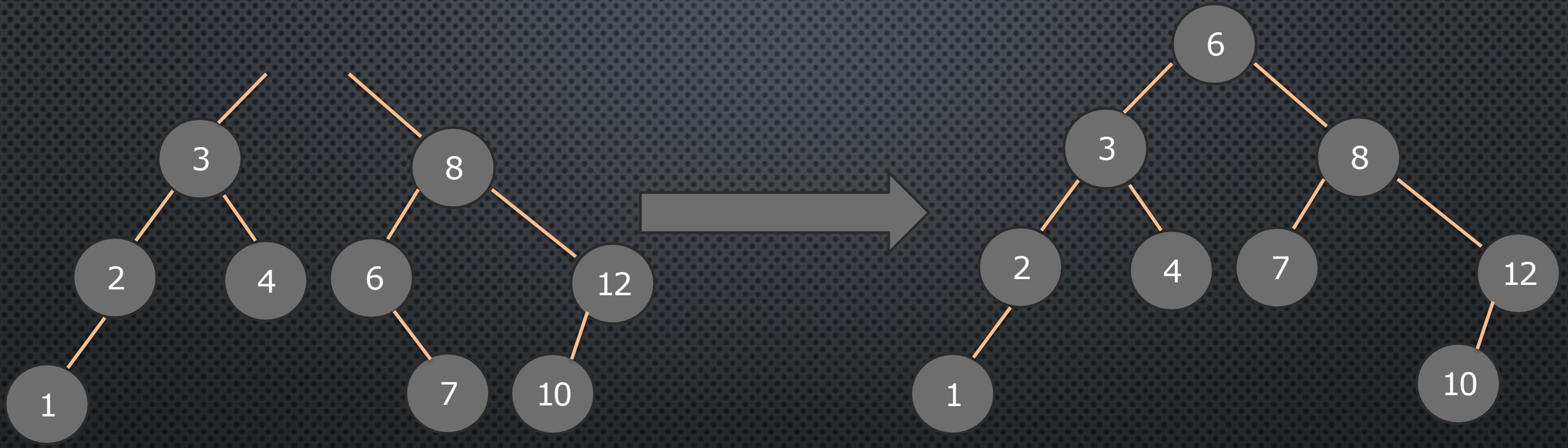

DELETE (5)

Replace it with the min in its Right-Subtree (6 in our case)

AFTER REPLACING

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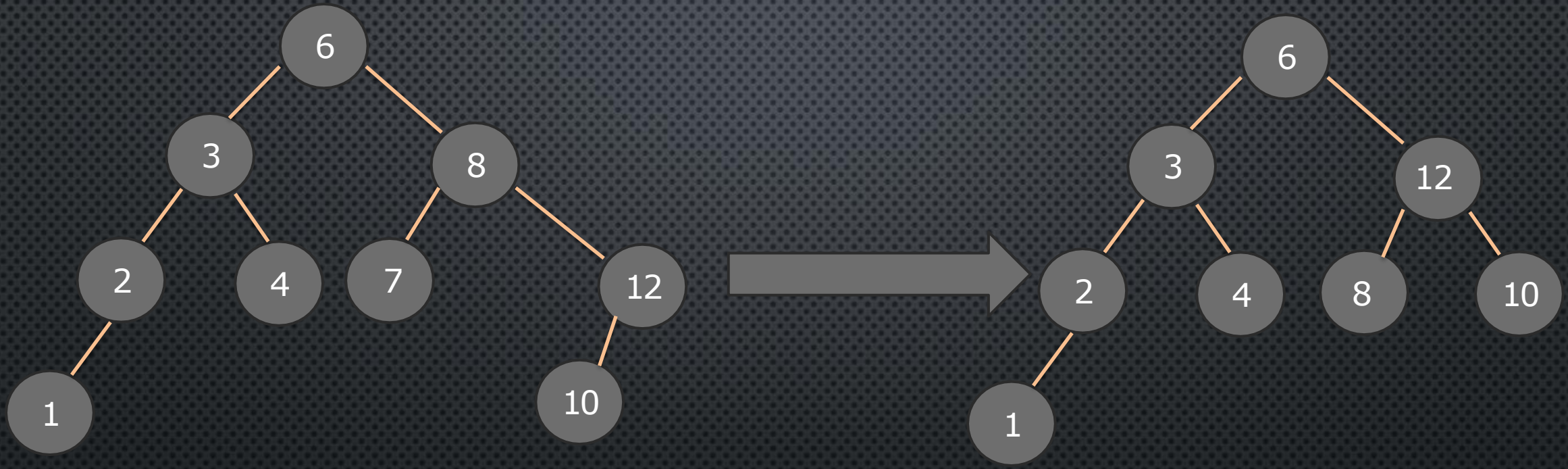

DELETE (7)

AFTER BALANCING

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EXERCISE 02 :

INITIALLY EMPTY B+ TREE :
WITH M = 5 && L = 4

INSERT 10 :

INSERT 20 :

INSERT 07 :

INSERT 15 :

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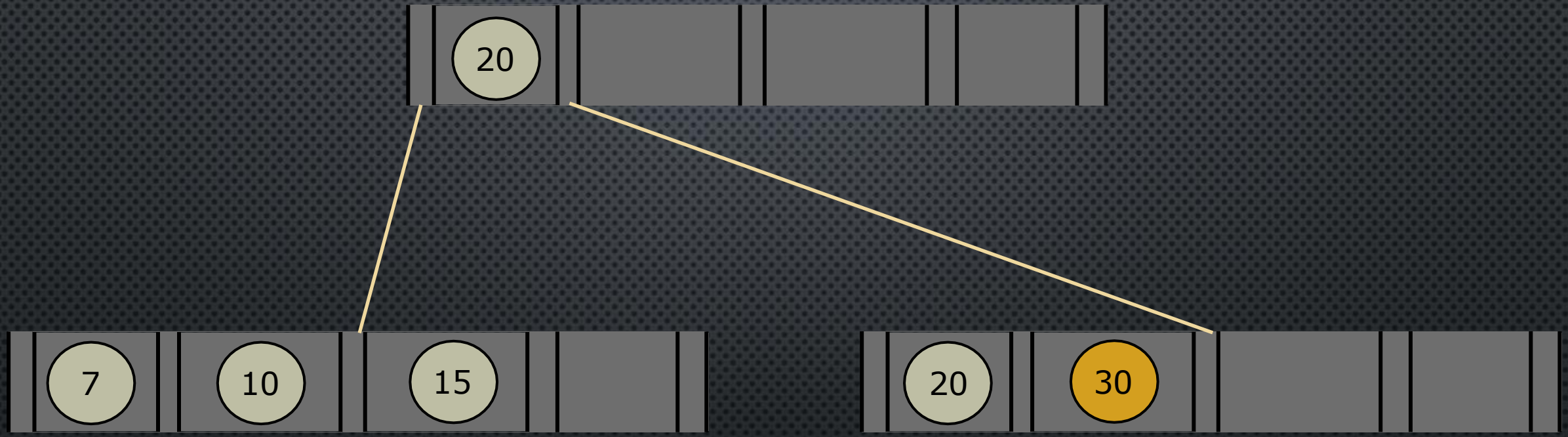
INSERT 30 :

(HEAD IS FULL , SPLIT IS NEEDED)



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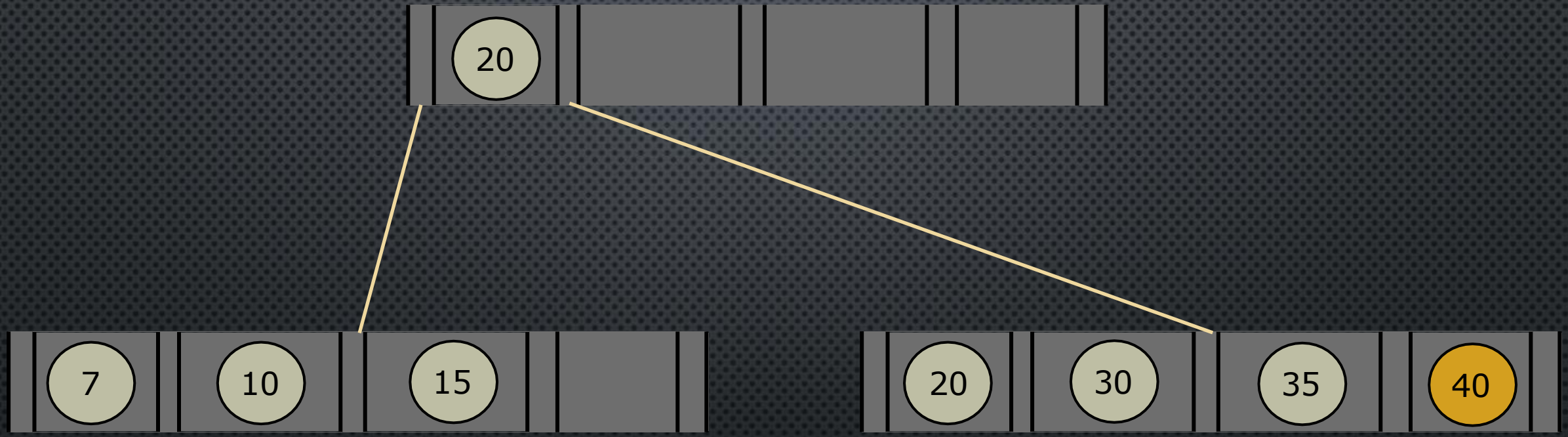
INSERT 35 , 40 :



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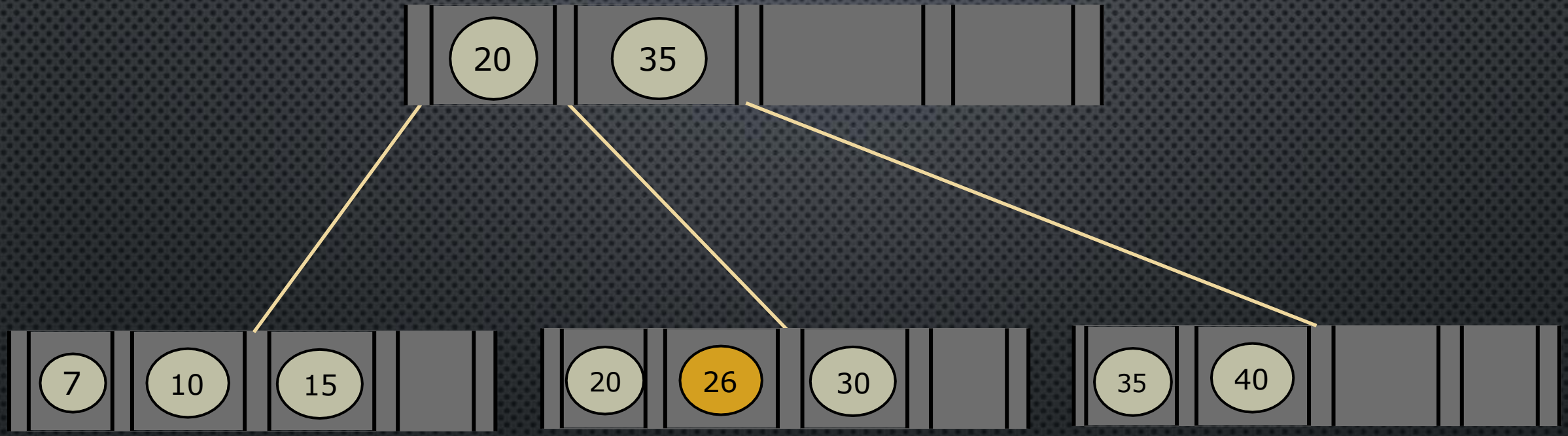
INSERT 26 :

LEAF IS FULL , SPLIT NEEDED



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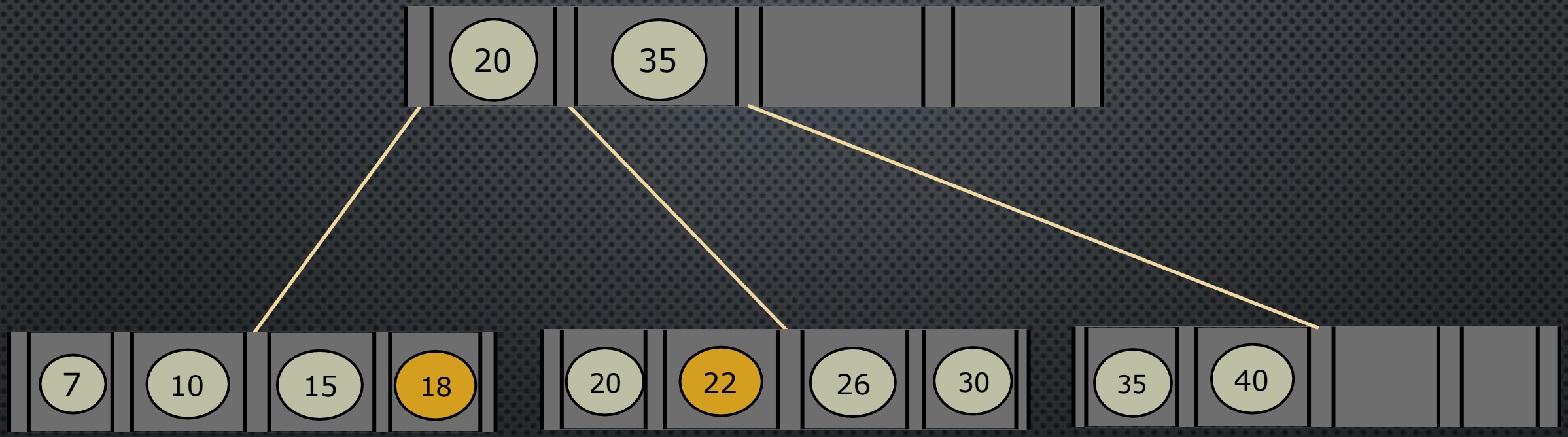
INSERT 18 , 22 :



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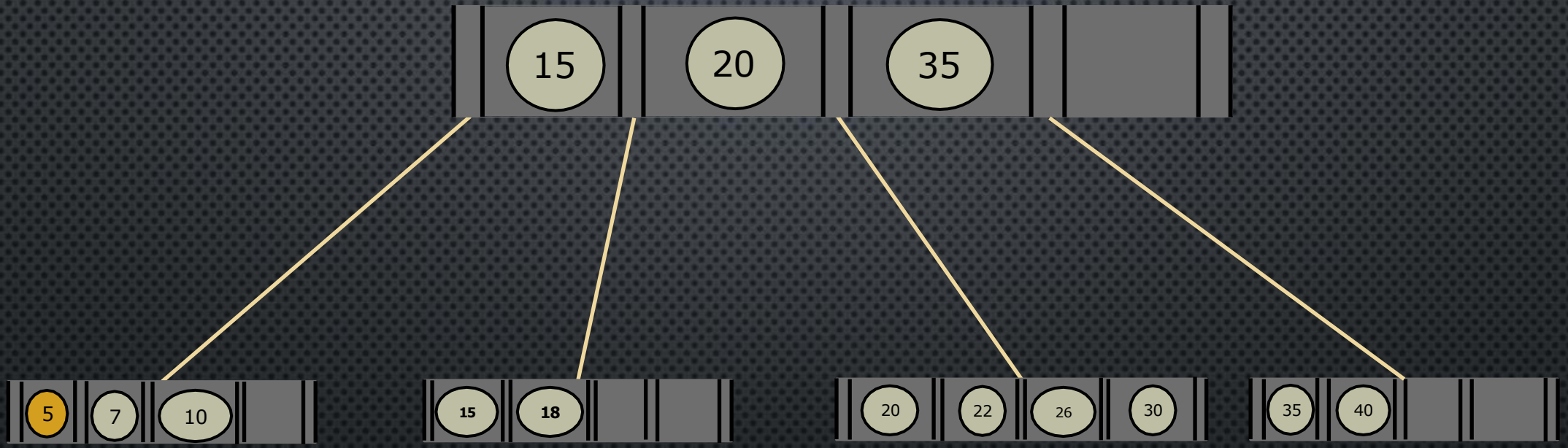
INSERT 5 :

LEAF IS FULL , SPLIT NEEDED



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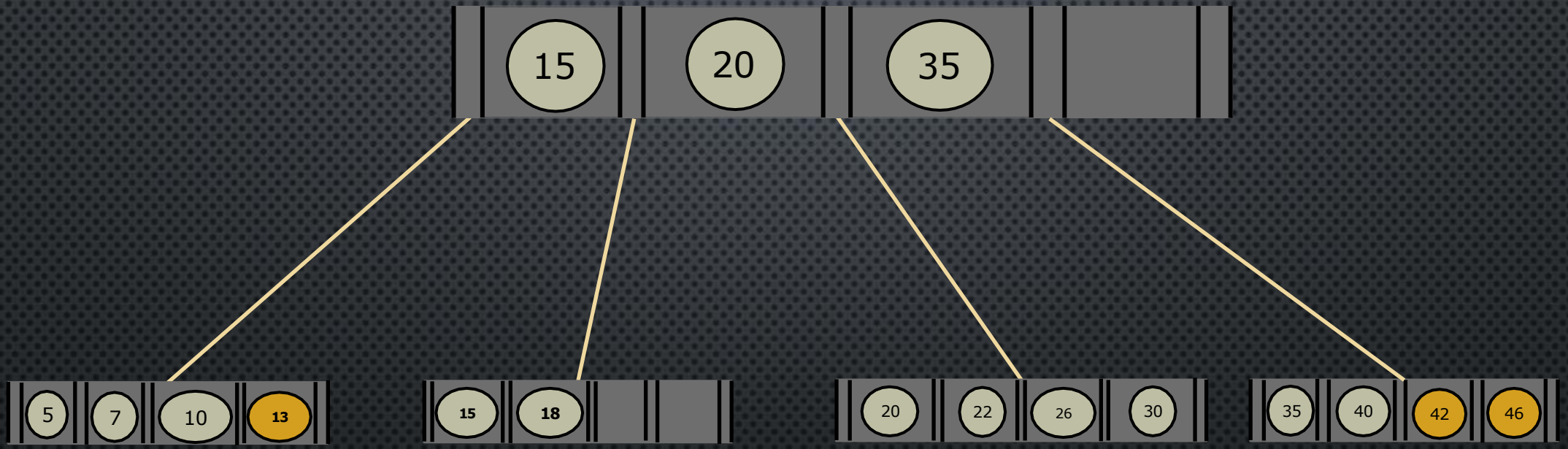
INSERT 42 , 13 , 46 :



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INSERT 27:

Leaf is full , split needed

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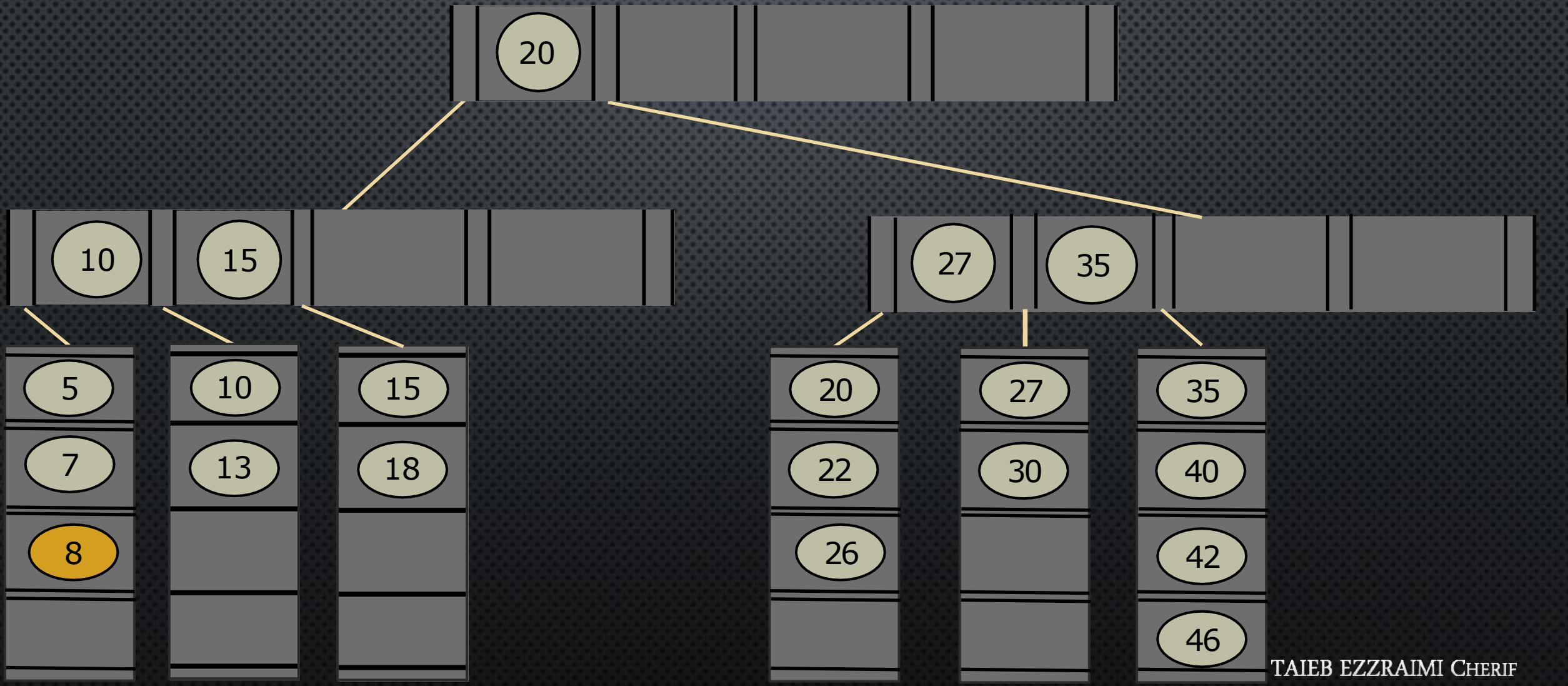
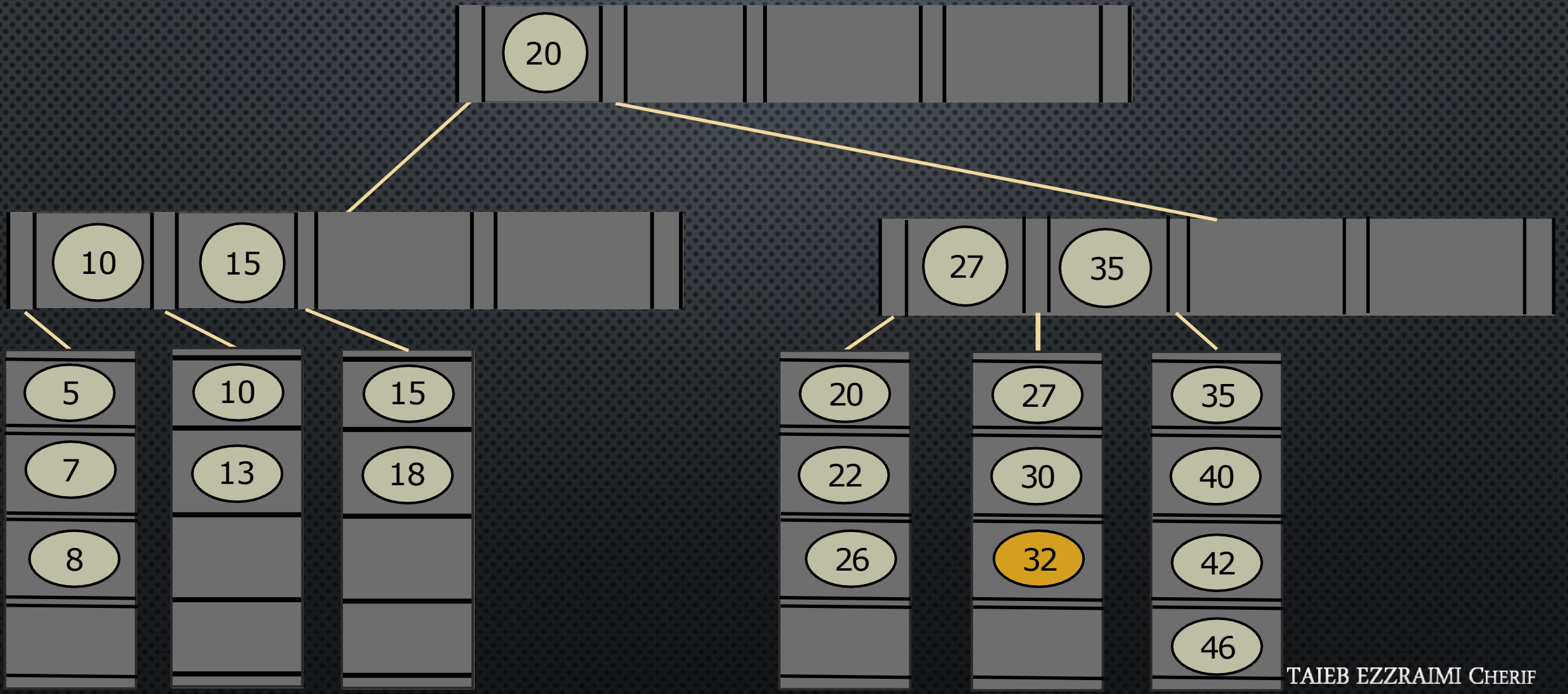
INSERT 8:

Leaf is full , double split needed
(head is full)



INSERT 32:



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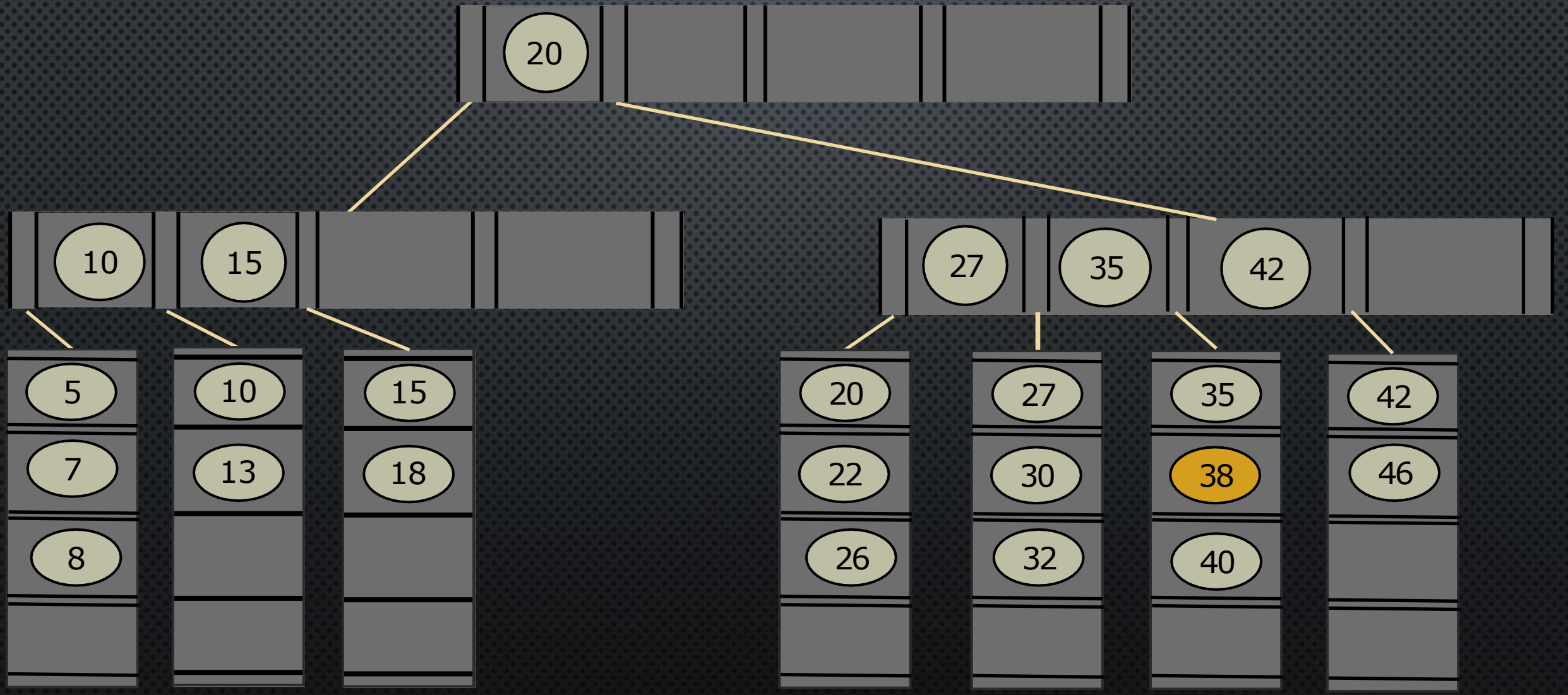
INSERT 38:

Leaf is full , split needed



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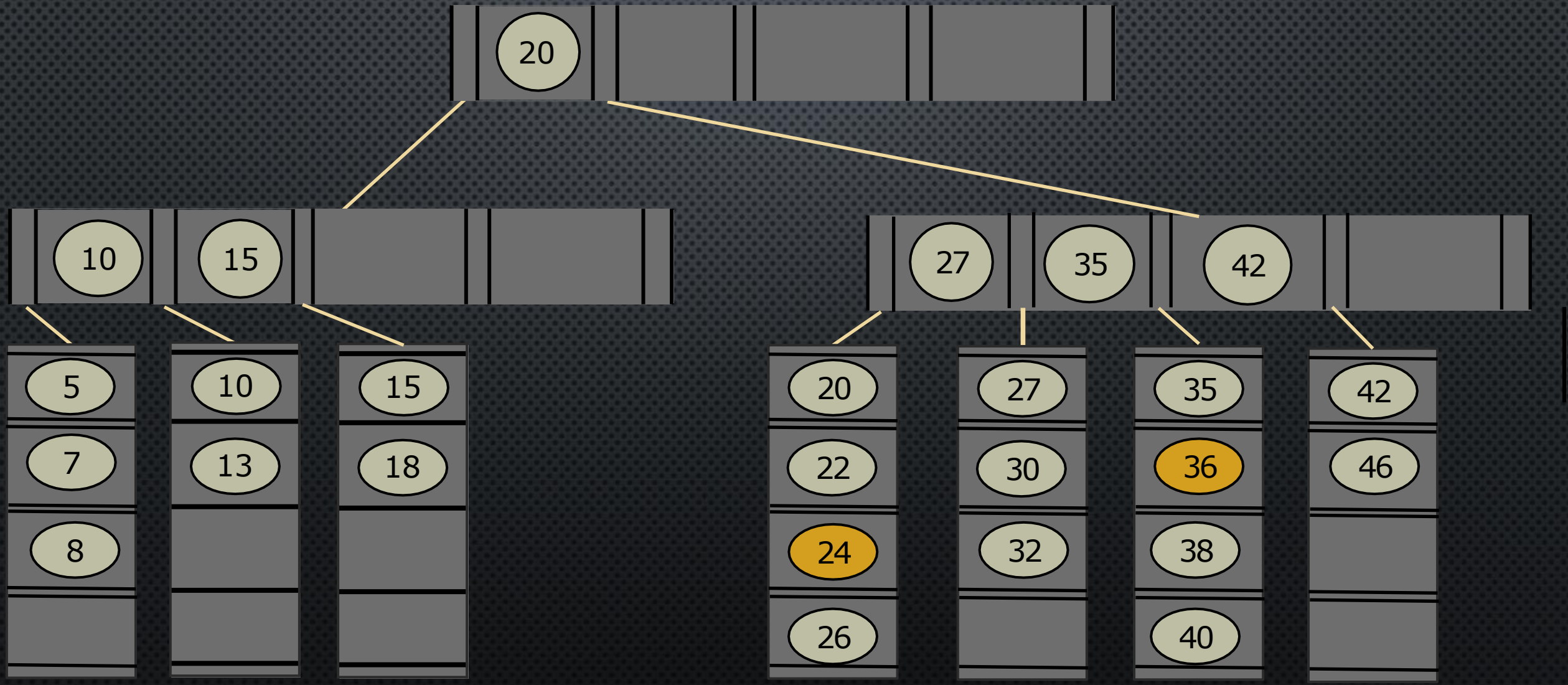
INSERT 24 , 36:



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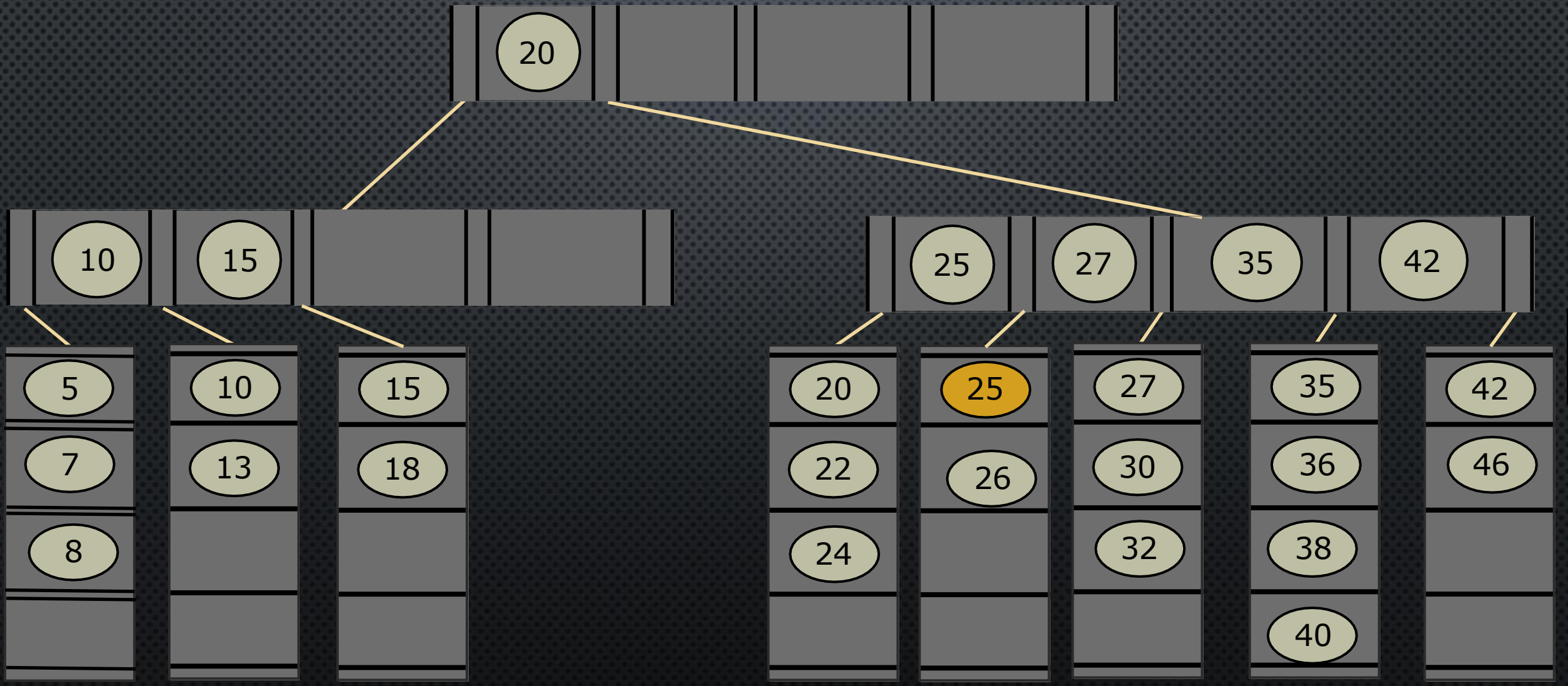
INSERT 25:

Leaf is full , split is needed



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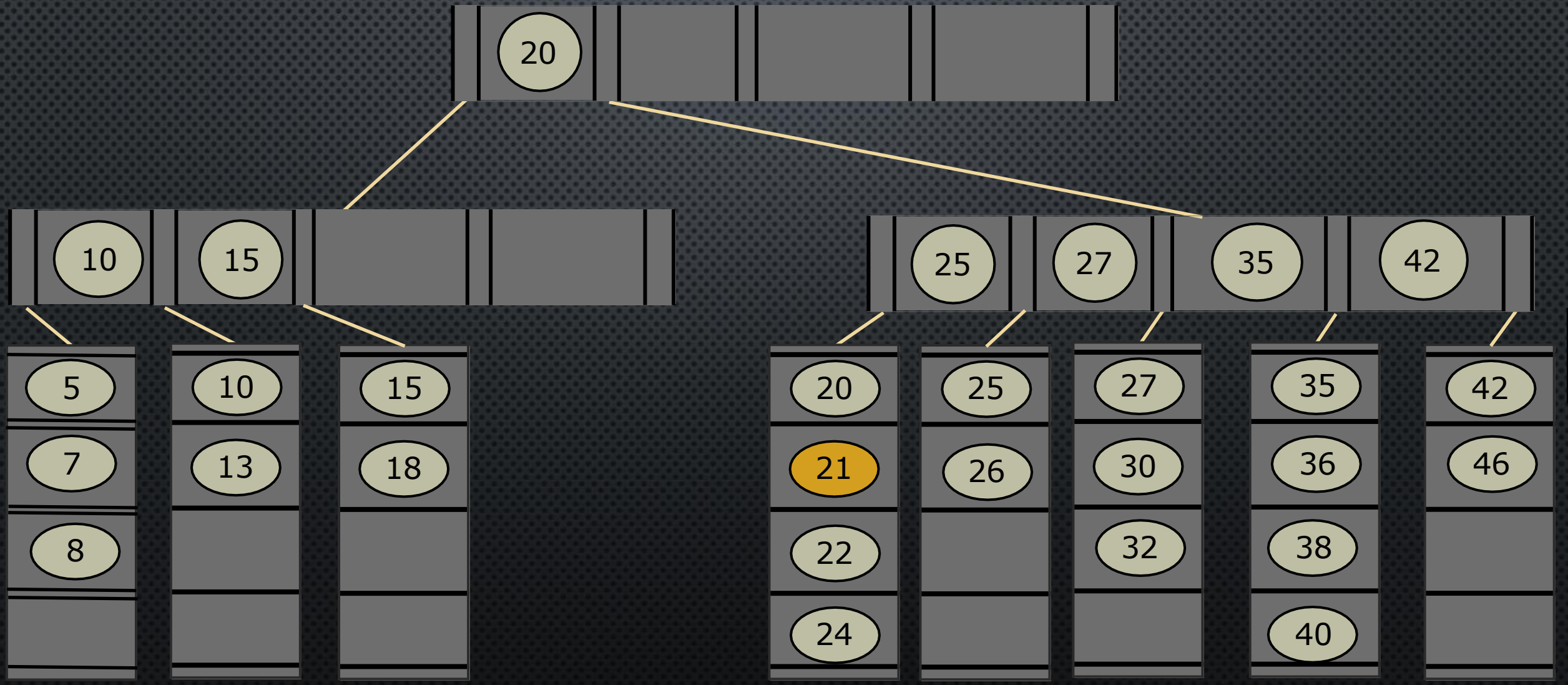
INSERT 21:



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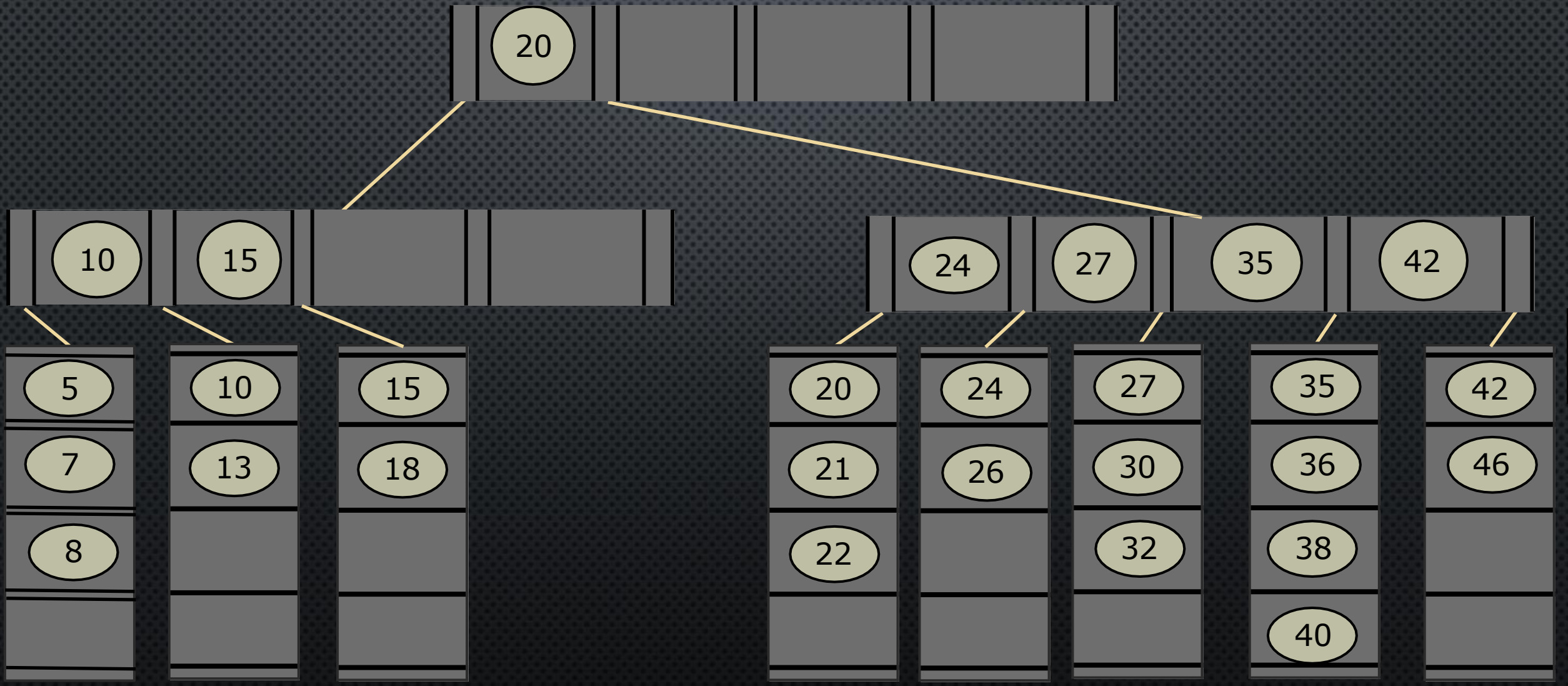
Delete 25:

underFlow Occurs
adoption from the left



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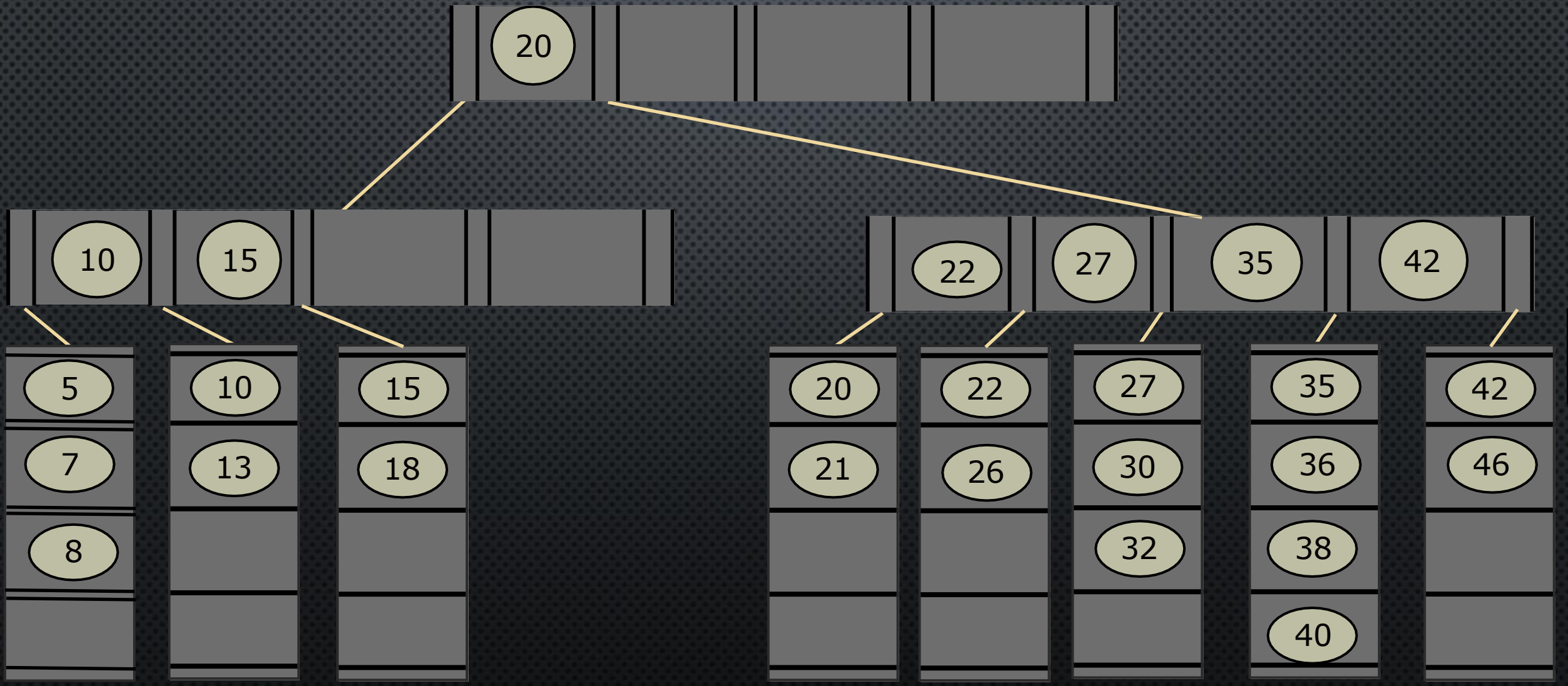
Delete 24:

underFlow Occurs
adoption from the left



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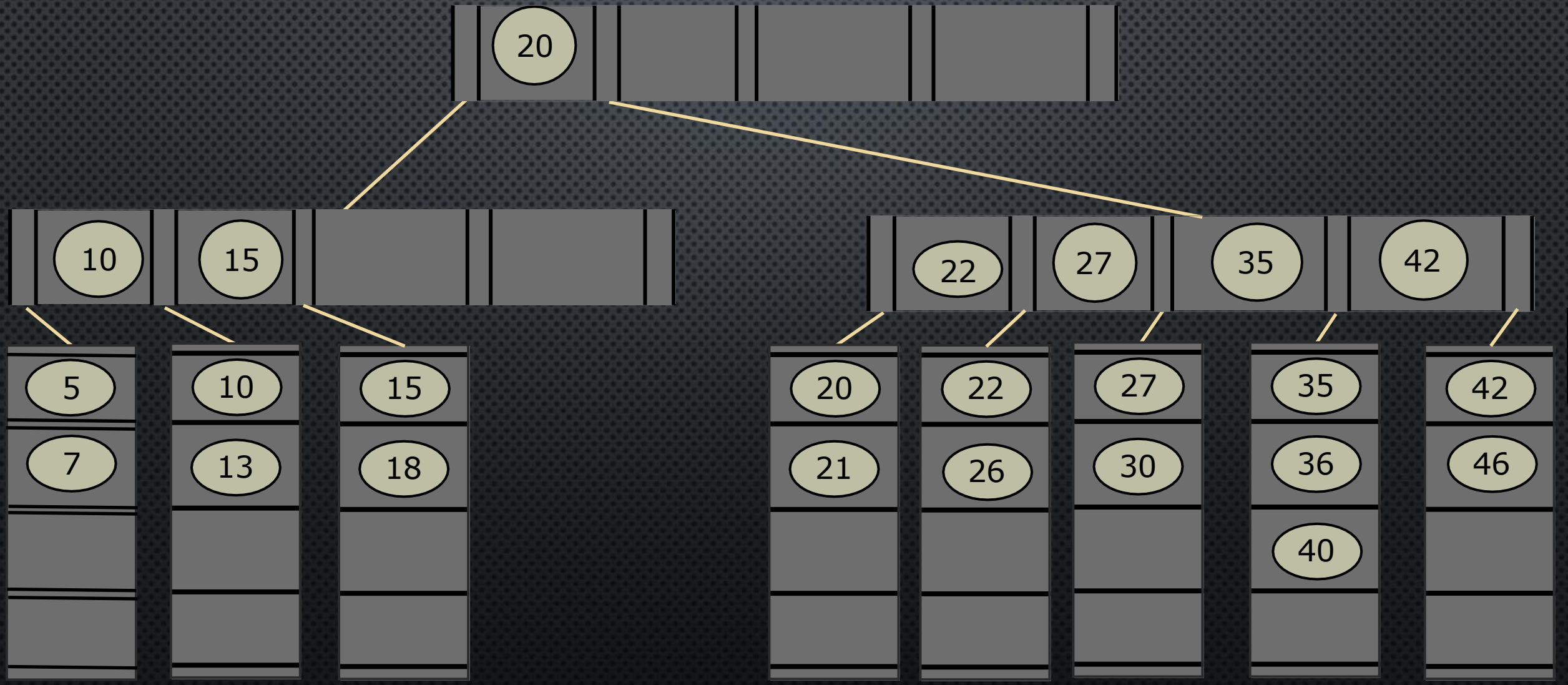
Delete 38 , 32 , 8:



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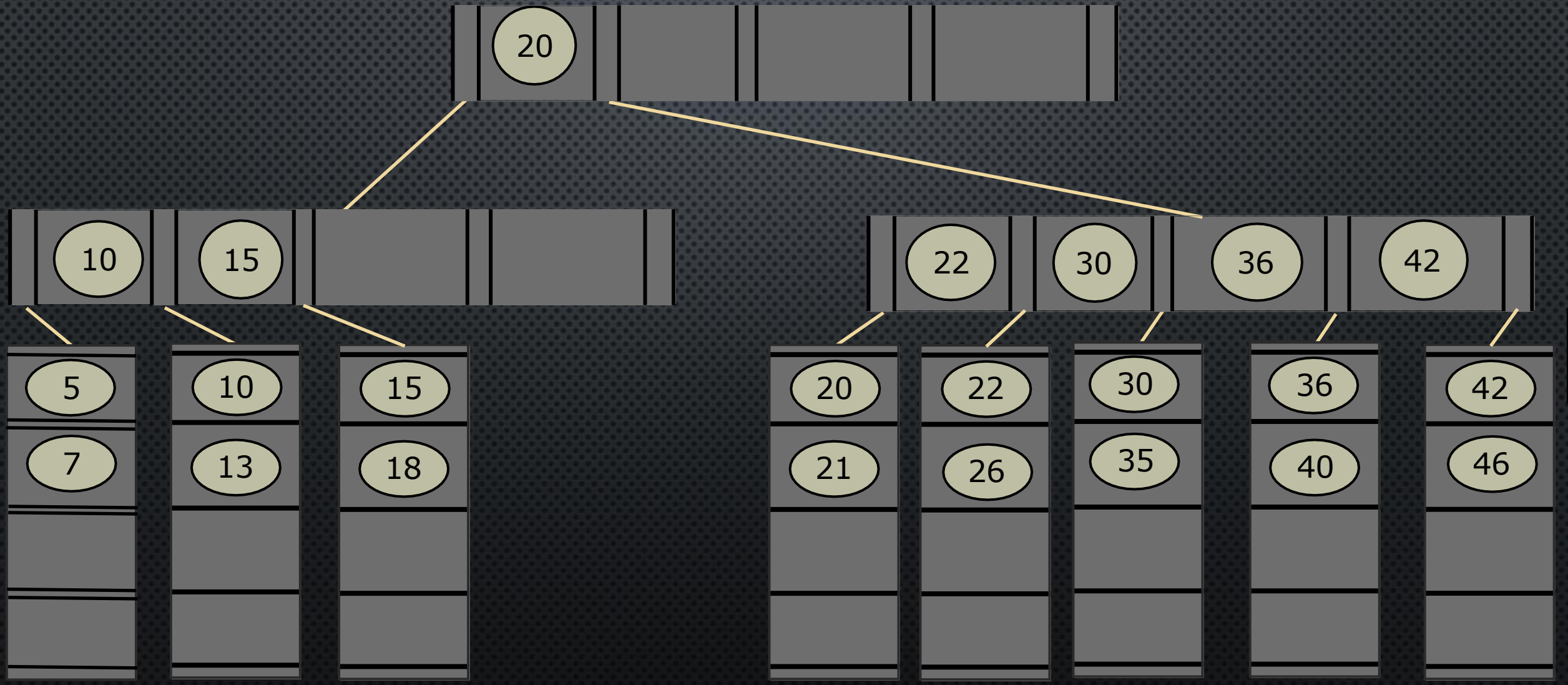
Delete 27:

undelflow occurs , adoption from right



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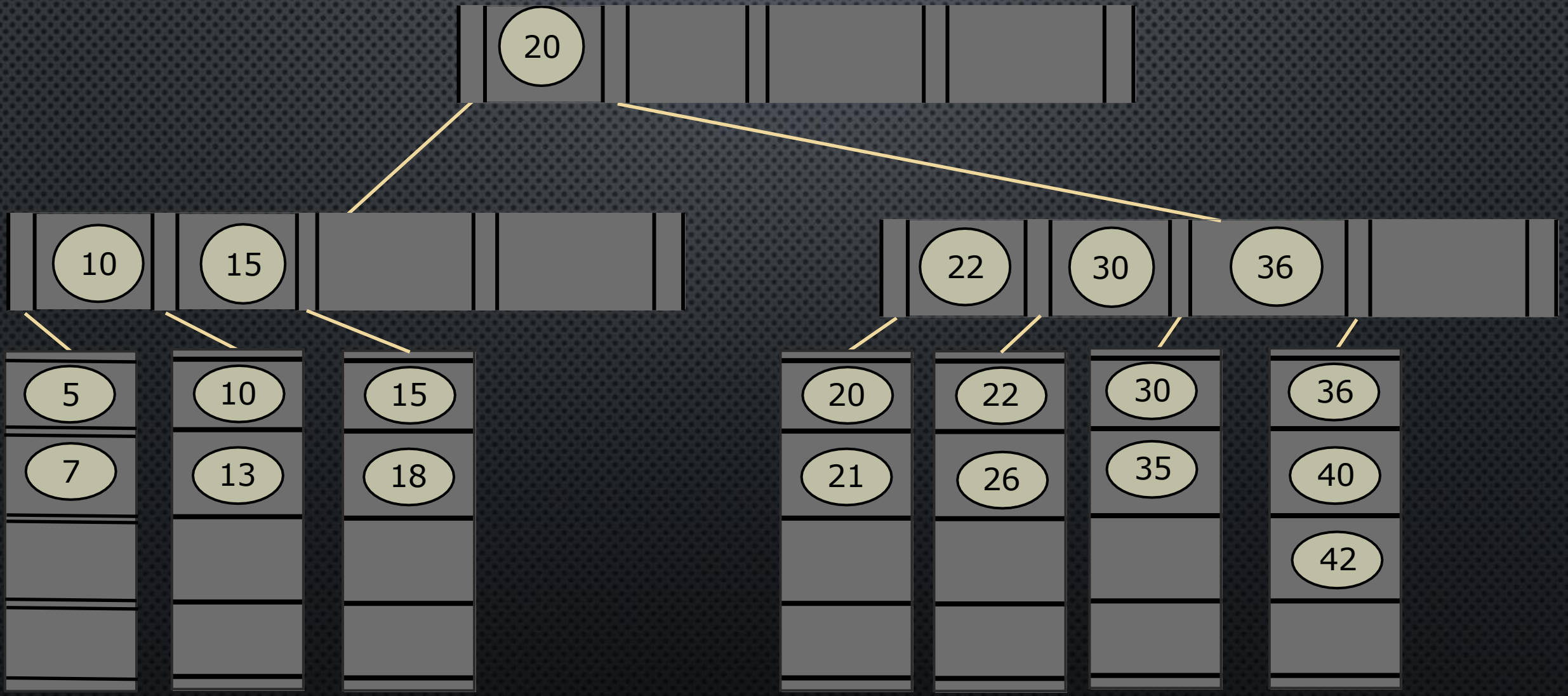
Delete 46:

undelflow occurs , merge with left



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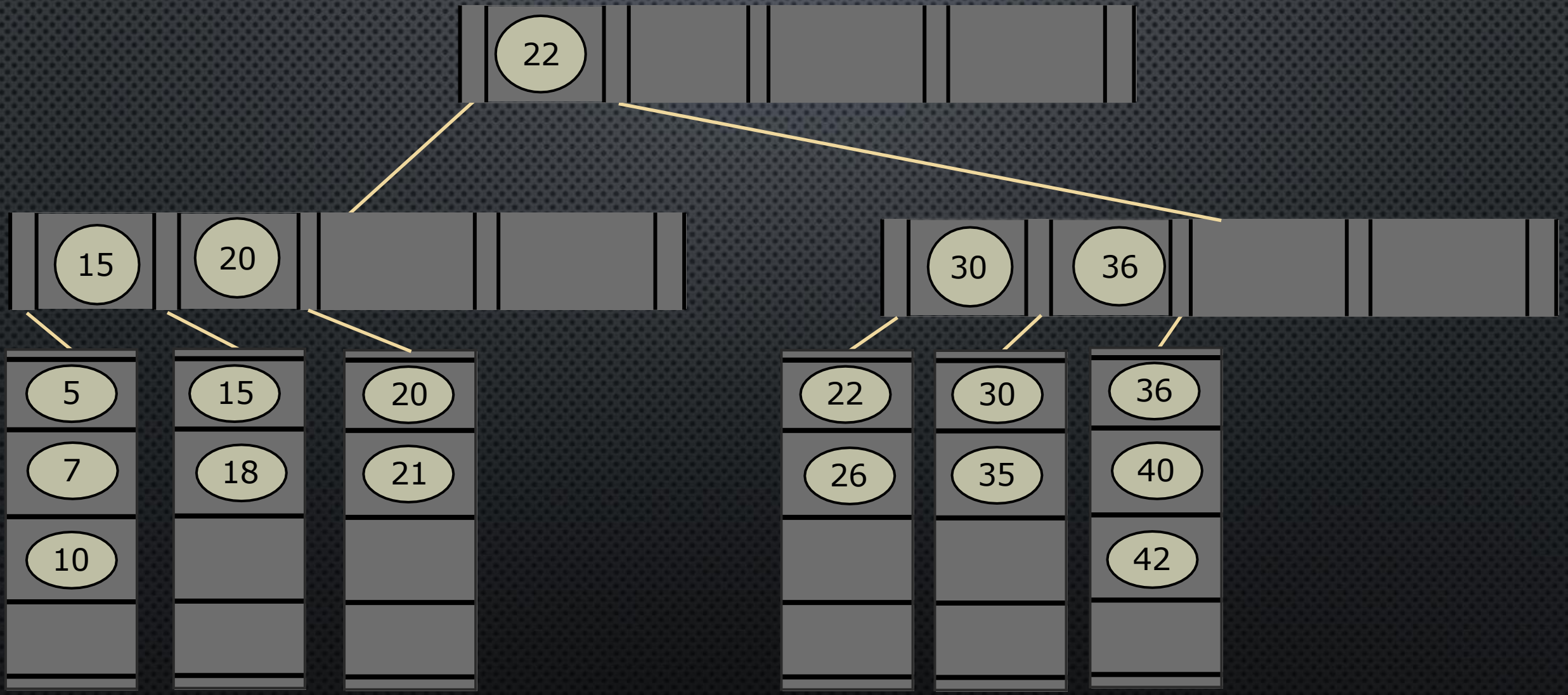
Delete 13:

undelflow occurs , merge with left
then adopt from right for its parent



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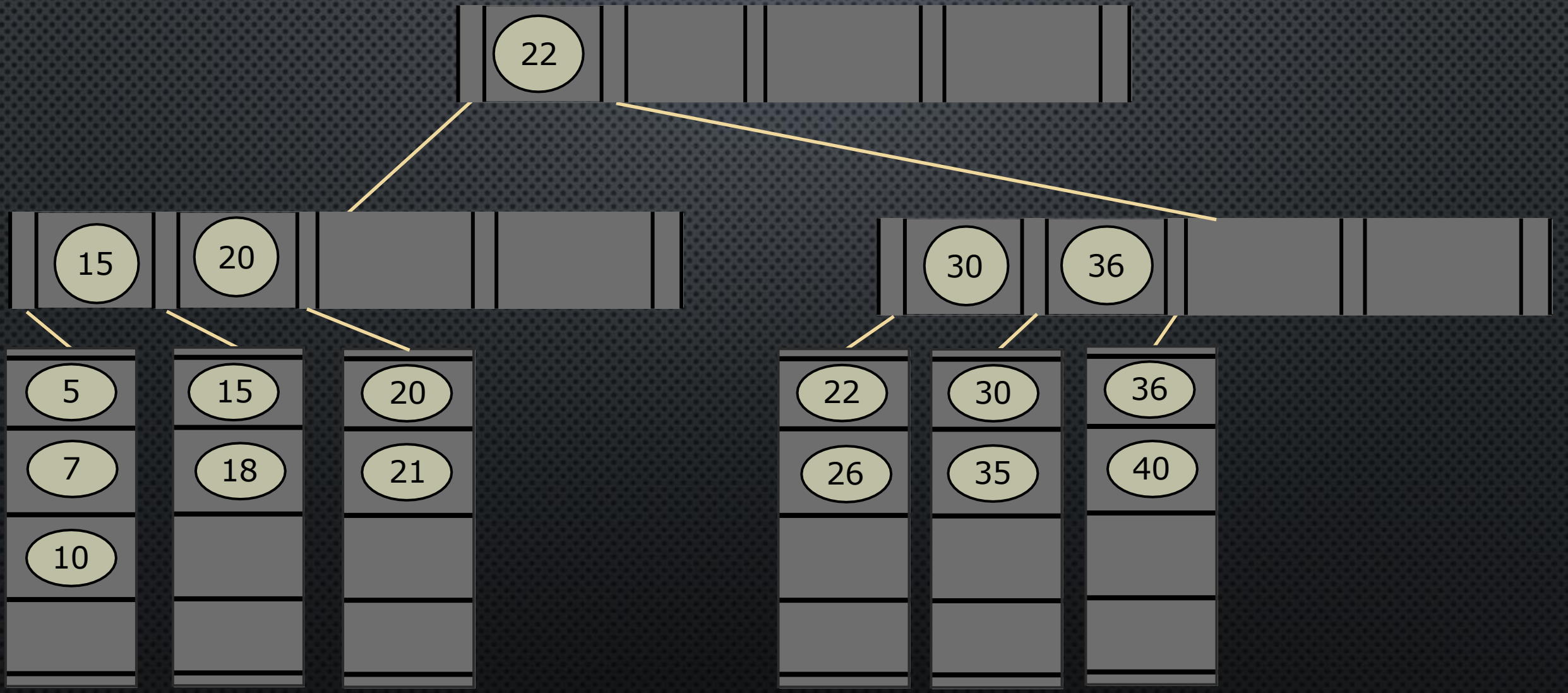
Delete 42:



02) Let's Find M first :

- EACH BLOCK HAS : M – 1 KEY SO 10(M – 1)
- EACH BLOCK HAS UP TO M CHILD SO M POINTER SO : 8M
- ADDITIONAL POINTER TO THE PARENT : +8

$$\text{so} : 10M - 10 + 8M + 8 = 128$$

$$\Rightarrow M = 7 .$$

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NOW FOR L:

- EACH LEAF HAS : UP TO L KEYS SO : 10 L
- EACH LEAF HAS A POINTER TO ITSPARENT SO: +8
- DATA-SIZE FOR EACH RECORD: 4L

so : $10L + 8 + 4L = 128$

$\Rightarrow L = 8$.