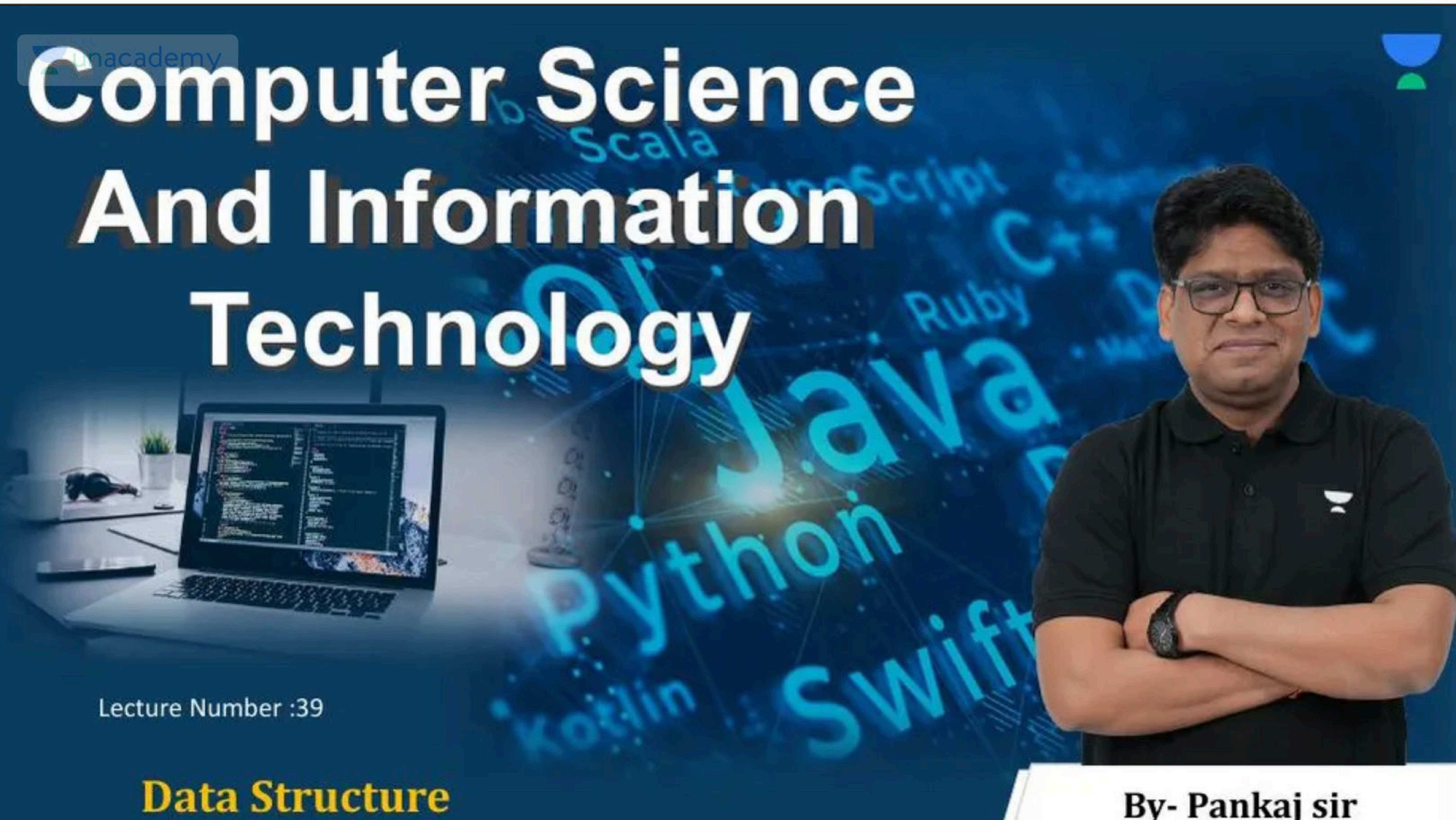
Problem solving - Part V

Course on Data Structure

Pankaj Sharma • Lesson 39 • Aug 27, 2024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Data Structure
By- Pankaj sir

Q1. Hash table with 1024 slots.

If 256 keys are to be stored in Table, the load factor is :

$$\lambda = \frac{256}{1024} \Rightarrow \frac{1}{4} = 0.25$$

Q A hash table with 9 buckets & it uses linear probing to resolve conflict.

hash function : key % 9

7

keys : 41, 157, 72, 76, 31

$h(41) = 5$

$h(157) = 4$

$h(72) = 0$

$h(76) = 4^{\times}, 5, 6$ ✓

$h(31) = 4^{\times}, 5^{\times}, 6^{\times}, 7$ ✓

hash key → ?

Q. Which one of the following hash functions on integer values will distribute keys most uniformly over 10 buckets numbered from 0 to 9, for i ranging from 0 to 2025?

~~A)~~ $h(i) = (14 * i) \bmod 10$ → Even (odd buckets will be Empty)

~~B)~~ $h(i) = (11 * i^2) \bmod 10$

C) $h(i) = i^3 \bmod 10$ ✓

~~D)~~ $h(i) = i^2 \bmod 10$

Q Double Hashing $h_1(k) = k \bmod 17$

$h_2(k) = 1 + (k \bmod 13)$.

Assume that table size $\Rightarrow$ 17.

then the location returned by probe 2 in the probe seq. (assume that probe seq begins at probe 0) for key 127 is ______

$m = 17$

$$H(k,i) = (h_1(k) + i \cdot h_2(k)) \bmod m$$

$$H(127,2) = (127 \bmod 17 + 2 \cdot (1 + 127 \bmod 13)) \bmod 17$$

$$= (8 + 2 \cdot (11)) \bmod 17$$

$$= 30 \bmod 17$$

$$= 13$$

$(1+0+0+0+1+1+1+1+0+3+2+2)/11 \Rightarrow 1$

$m = 11$ $h(K) = K \bmod 11$

0 → 33
1 →
2 →
3 →
4 → 15
5 → 60
6 → 28
7 →
8 → 19 → 30 → 63   3
9 → 20 → 42
10 → 32 → 43

CR ⇒ Chaining

Keys: 28, 19, 15, 20, 33, 30, 42, 63, 60, 32, 43 (in order)

(6, 8, 4, 9, 0, 8, 9, 8, 5, 10, 10)

Max, min & average chain lengths in the Hash table (3, 0, 1)

a) 3, 0, 1 b) 3, 3, 3 c) 3, 0, 2 d) 4, 0, 1

Q The max. no. of comparision to find max. element in a heap of 1024 ele.

$$\#\text{ leaf node} = \left\lceil \frac{n}{2} \right\rceil = \left\lceil \frac{1024}{2} \right\rceil = 512$$

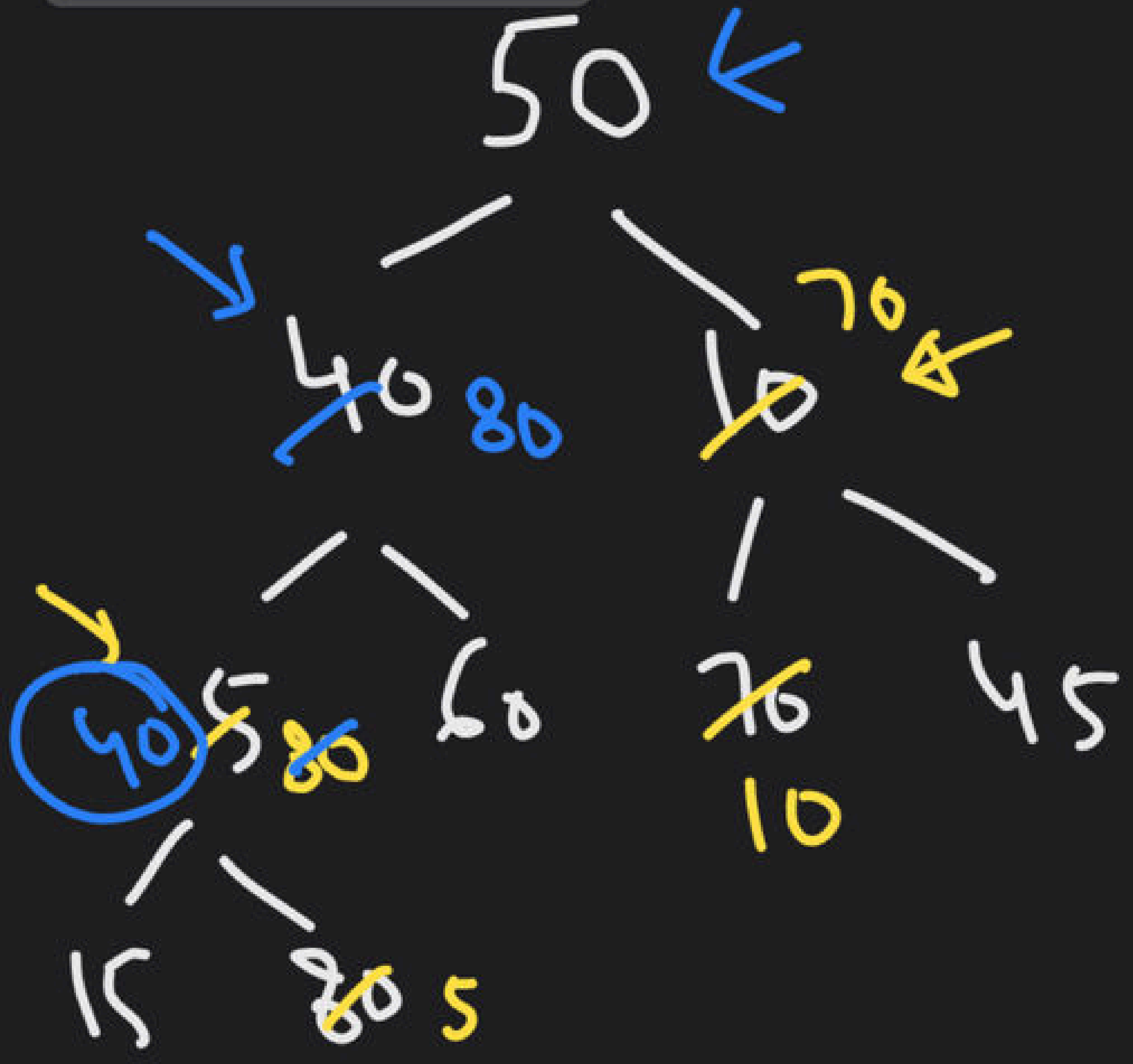
No. of comp $\Rightarrow 512 - 1$

$= 511$ ✓

Q. Consider the array given below:

50, 40, 10, 5, 60, 70, 45, 15, 80

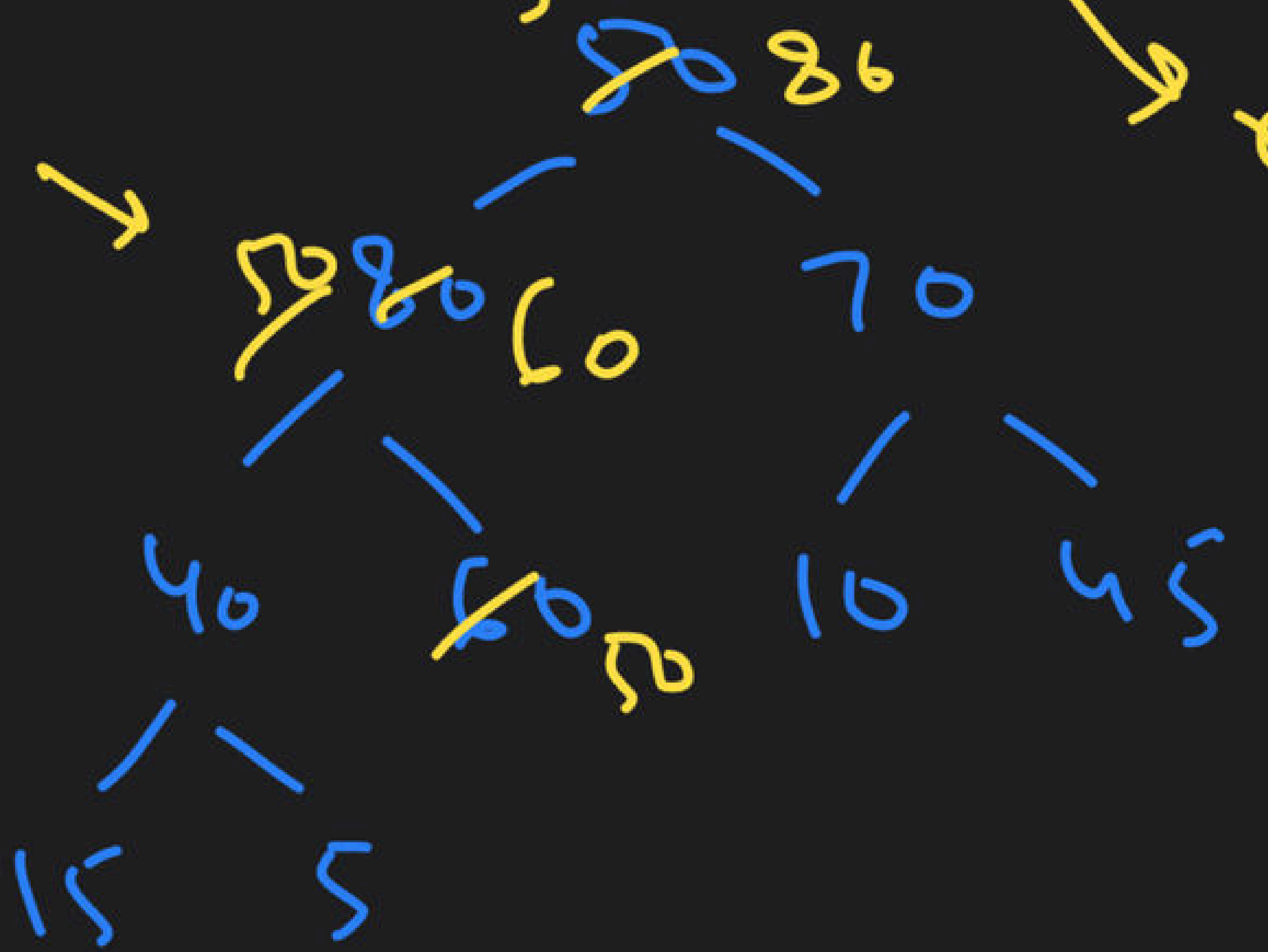
The min no. of comp. required to convert the above array into a max heap is ______



no swap

2+2+2+2+2+2

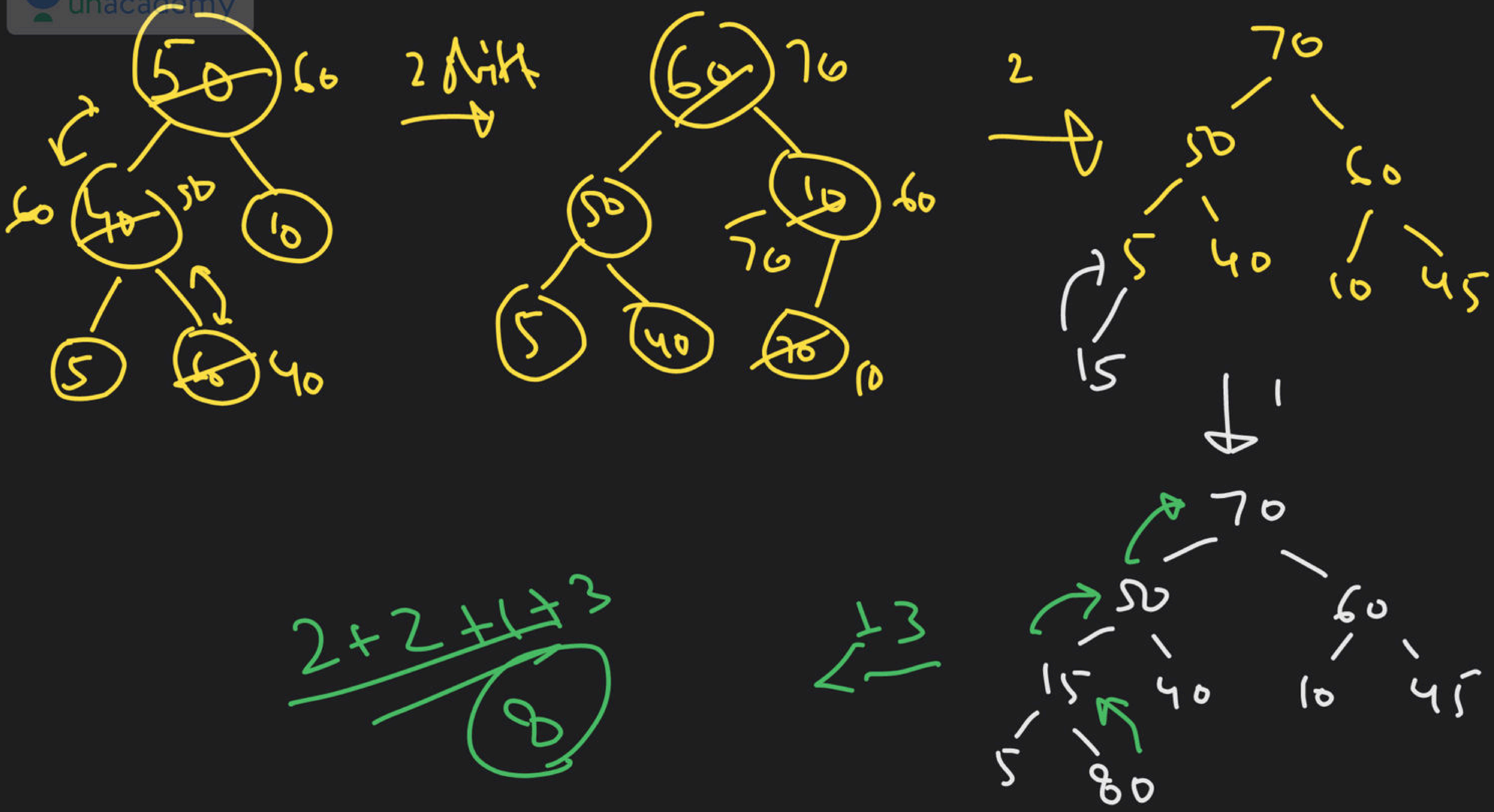
recursively



Q Consider a seq. of elements inserted into a max-heap one after another –

50, 40, 10, 5, 60, 70, 45, 15, 80

The no. of swap ~~shift~~ operation required in building the heap one elem. at a time is ______


2 shift
2
1
2+2+1+3
8
13

infix: $P - Q/(R*S) + T*U$

Prefix:

A) $- + P/Q*RS*TU$

B) $+ - P/Q*RS*TU$ ✓

C) $+ - /PQ*RS*TU$

D) None

Q. in: $P * Q / R - S * T + U / V * W$ in to Postfix

On reaching symbol V, the top 2 elements of the operator stack are:

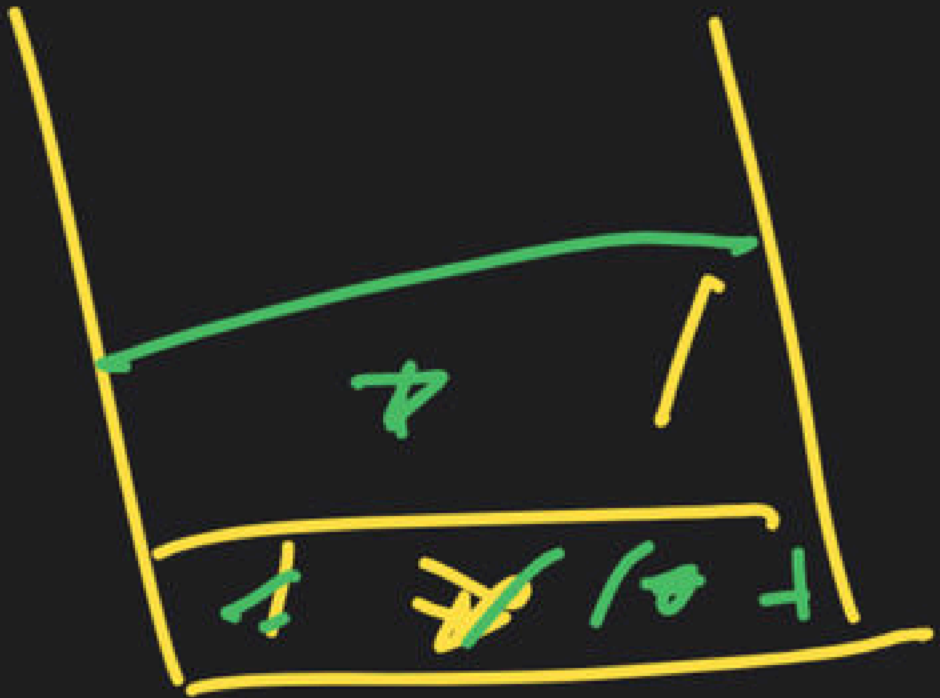
A) /, *

B) /, -

C) *, +

D) /, +

Post: $PQ*R/S$
$T*-U$



/, +

Q. AVL trees ⇒ Integer

Heap ⇒ Integer

A) Every non-Empty AVL tree is a heap, but not vice-versa.

B) Every non-Empty heap is an AVL tree, but not vice-versa.

C) Every non-Empty AVL tree is a heap and vice-versa.

D) None

Q — Correct

A) The height of a Binary tree with N nodes could be logN but not more.

B) The height of a binary tree with N nodes could be logN - 1 but not more.

C) The h. ——— N nodes could be N, but not more.

D) The hight of a binary tree with N nodes could be N-1 but not more.

$\lambda \Rightarrow 0.6 \rightarrow$

Linear Probing

Quadratic probing

Insertion $\Rightarrow$ Guarenteed.

$\boxed{n < m}$

2 hrs

$\lambda > 0.5$

Yt $\Rightarrow$

$1^3 = 1$

$2^3 = 8$

$3^3 = 7$

$4^3 = 4$

$5^3 = 5$

$6^3 = 6$

$7^3 = 3$

$8^3 = 2$

$9^3 = 9$

$10^3 = 0$

0

B: $11 * i^2 \bmod 10$

D: $i^2 \bmod 10$

last digit

$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 6$
$5^2 = 5$
$6^2 = 6$
$7^2 = 9$
$8^2 = 4$
$9^2 = 1$
$10^2 = 0$

0, 1, 4, 5, 6, 9

2, 3, 7, 8

THANK - YOU