6406533039317. ✓ There might exist a student who has not read any book

6406533039318. ✖ An author can write at most one book

6406533039319. ✖ A student can read at most one book

PDSA

Section Id :	64065364075
Section Number :	7
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	25
Number of Questions to be attempted :	25
Section Marks :	100
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653133691
Question Shuffling Allowed :	No

Question Number : 129 Question Id : 640653902417 Question Type : MCQ Calculator : Yes

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : PROGRAMMING, DATA STRUCTURES AND ALGORITHMS USING PYTHON (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?
CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

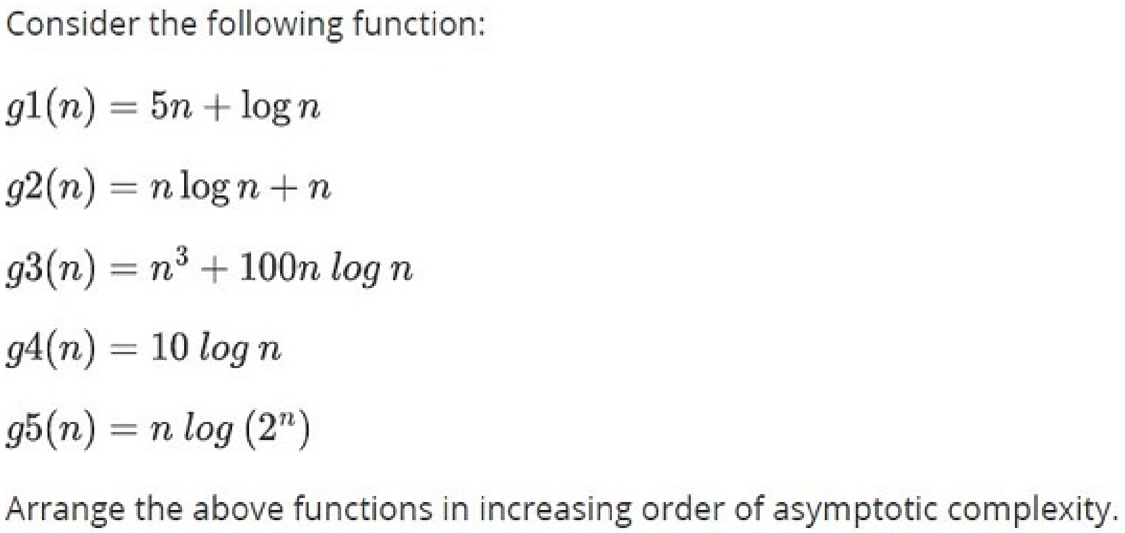
6406533039323. ✓ YES

6406533039324. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	640653133692
Question Shuffling Allowed :	Yes

Question Number : 130 Question Id : 640653902418 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question



Consider the following function:

$$g1(n) = 5n + \log n$$

$$g2(n) = n \log n + n$$

$$g3(n) = n^3 + 100n\ log\ n$$

$$g4(n) = 10\ log\ n$$

$$g5(n) = n\ log\ (2^n)$$

Arrange the above functions in increasing order of asymptotic complexity.

Options :

6406533039325. ✖ $g4(n), g1(n), g2(n), g3(n), g5(n)$

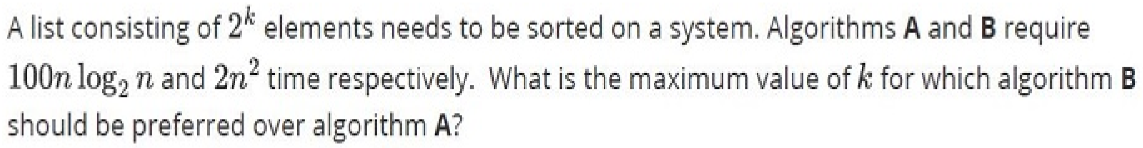
6406533039326. ✔ $g4(n), g1(n), g2(n), g5(n), g3(n)$

6406533039327. ✖ $g1(n), g4(n), g2(n), g3(n), g5(n)$

6406533039328. ✖ $g4(n), g1(n), g3(n), g2(n), g5(n)$

Question Number : 131 Question Id : 640653902419 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question



A list consisting of 2^k elements needs to be sorted on a system. Algorithms **A** and **B** require $100n \log_2 n$ and $2n^2$ time respectively. What is the maximum value of k for which algorithm **B** should be preferred over algorithm **A**?

Options :

6406533039329. ✔ 8

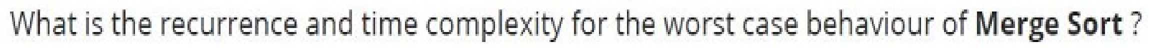
6406533039330. ✖ 9

6406533039331. ✖ 10

6406533039332. ✖ 11

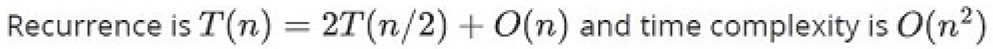
Question Number : 132 Question Id : 640653902420 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question

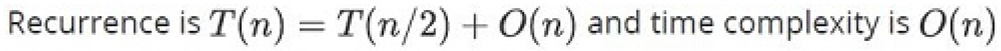


What is the recurrence and time complexity for the worst case behaviour of **Merge Sort** ?

Options :

6406533039333. ✗ 

Recurrence is $T(n) = 2T(n/2) + O(n)$ and time complexity is $O(n^2)$

6406533039334. ✗ 

Recurrence is $T(n) = T(n/2) + O(n)$ and time complexity is $O(n)$

6406533039335. ✓

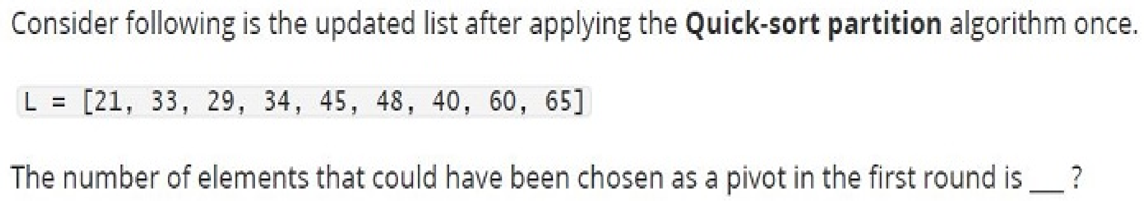
Recurrence is $T(n) = 2T(n/2) + O(n)$ and time complexity is $O(n\,log\,n)$

6406533039336. ✗

Recurrence is $T(n) = 2T(n/2) + O(1)$ and time complexity is $O(n\,log\,n)$

Question Number : 133 Question Id : 640653902422 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question



Consider following is the updated list after applying the **Quick-sort partition** algorithm once.

```
L = [21, 33, 29, 34, 45, 48, 40, 60, 65]
```

The number of elements that could have been chosen as a pivot in the first round is ___ ?

Options :

6406533039338. ✗ 1

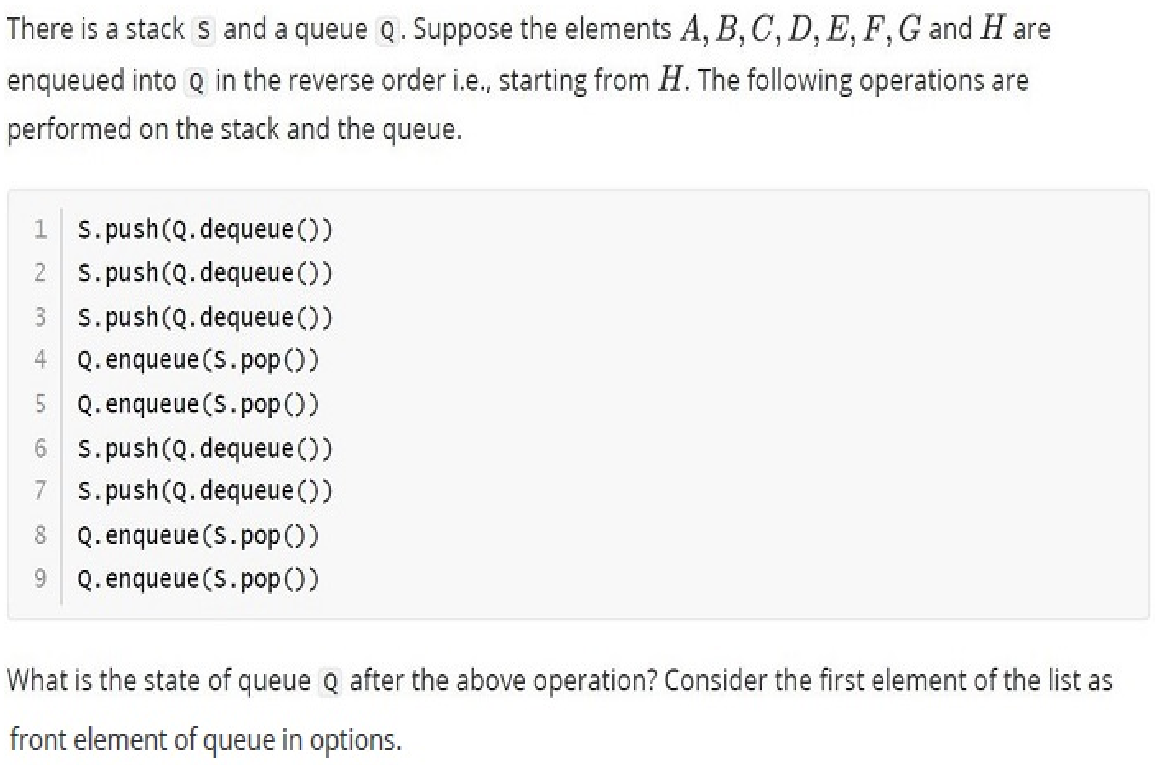
6406533039339. ✗ 2

6406533039340. ✗ 3

6406533039341. ✓ 4

Question Number : 134 Question Id : 640653902423 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question

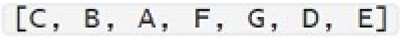


There is a stack `S` and a queue `Q`. Suppose the elements A, B, C, D, E, F, G and H are enqueued into `Q` in the reverse order i.e., starting from H. The following operations are performed on the stack and the queue.

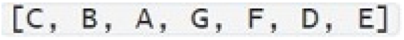
```
S.push(Q.dequeue())
S.push(Q.dequeue())
S.push(Q.dequeue())
Q.enqueue(S.pop())
Q.enqueue(S.pop())
S.push(Q.dequeue())
S.push(Q.dequeue())
Q.enqueue(S.pop())
Q.enqueue(S.pop())
```

What is the state of queue `Q` after the above operation? Consider the first element of the list as front element of queue in options.

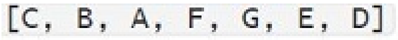
Options :

6406533039342. ✓ 

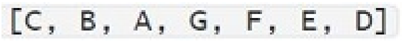
`[C, B, A, F, G, D, E]`

6406533039343. ✖ 

`[C, B, A, G, F, D, E]`

6406533039344. ✖ 

`[C, B, A, F, G, E, D]`

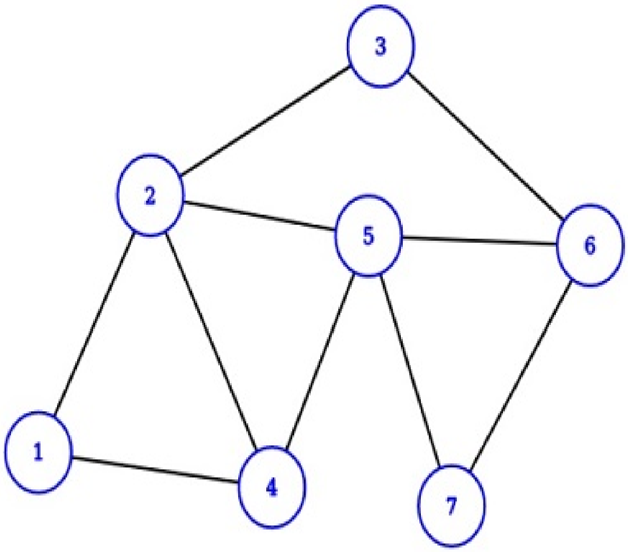
6406533039345. ✖ 

`[C, B, A, G, F, E, D]`

Question Number : 135 Question Id : 640653902424 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question

Consider the following graph



Which of the following vertex sequence is the correct **DFS traversal** on the graph started from node **6**? Assume that when a node has multiple neighbours, DFS would visit the numerically smaller valued node first.

Options :

6406533039346. ✓ 6,3,2,1,4,5,7

6406533039347. ✗ 6,3,2,1,5,4,7

6406533039348. ✗ 6,3,2,4,1,5,7

6406533039349. ✗ 6,3,5,7,2,4,1

Question Number : 136 Question Id : 640653902426 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question

To determine the minimum number of sequential steps required for a chef to prepare a dish J, consider the following dependencies and constraints for the preparation process, where each step represents a time unit during which one or more items can be prepared in parallel:

1. Item A is used to make items C and D.
2. Item B is added to cook items E and F.
3. Item G is prepared by mixing items D and E.
4. Item B is made by boiling item A.
5. Item H is made by mixing items C and G.
6. Item I is made by adding water to item F.
7. The dish J is prepared by cooking items H and I together.

Given that the chef has enough assistants to work on multiple items in parallel, what is the minimum number of steps required to complete the dish J, considering all dependencies?

Options :

6406533039354. ✗ 4

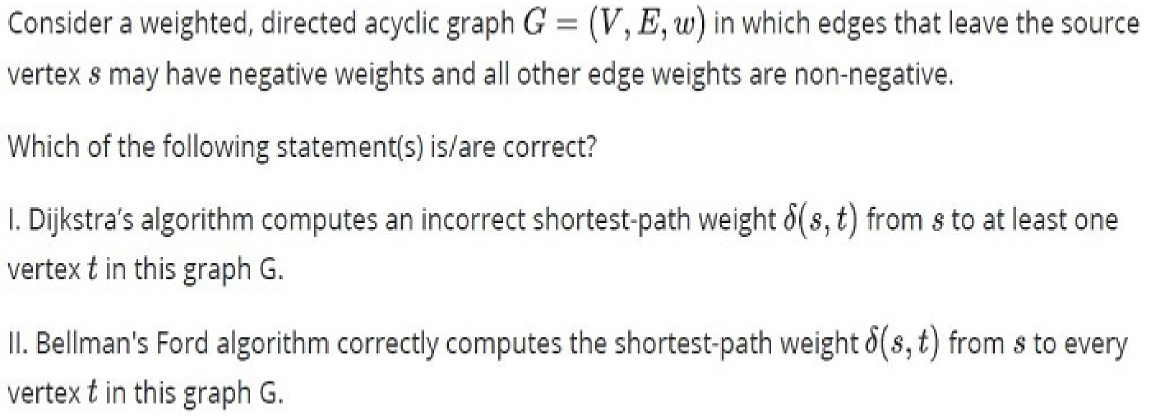
6406533039355. ✗ 5

6406533039356. ✗ 3

6406533039357. ✓ 6

Question Number : 137 Question Id : 640653902427 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question



Consider a weighted, directed acyclic graph $G = (V, E, w)$ in which edges that leave the source vertex s may have negative weights and all other edge weights are non-negative.

Which of the following statement(s) is/are correct?

I. Dijkstra's algorithm computes an incorrect shortest-path weight $\delta(s, t)$ from s to at least one vertex t in this graph G.

II. Bellman's Ford algorithm correctly computes the shortest-path weight $\delta(s, t)$ from s to every vertex t in this graph G.

Options :

6406533039358. ✗ Only I is correct

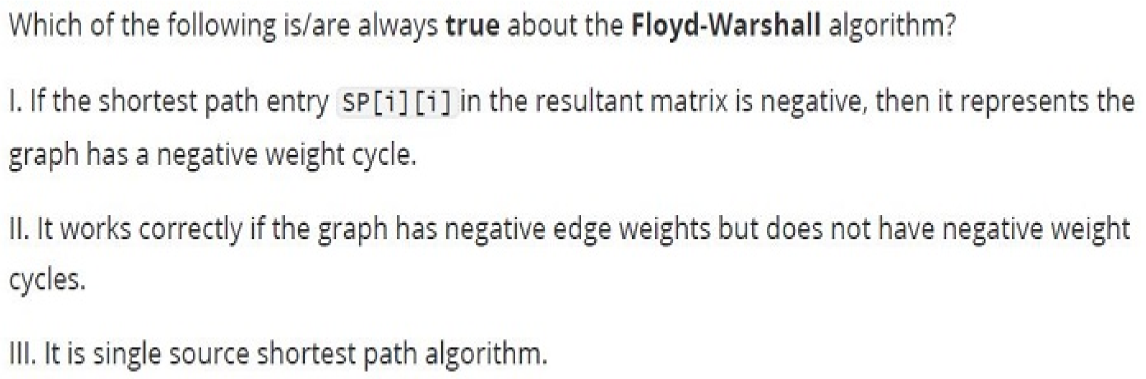
6406533039359. ✓ Only II is Correct

6406533039360. ✗ Both I and II are correct

6406533039361. ✗ Both I and II are incorrect

Question Number : 138 Question Id : 640653902428 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question



Which of the following is/are always **true** about the **Floyd-Warshall** algorithm?

I. If the shortest path entry `SP[i][i]` in the resultant matrix is negative, then it represents the graph has a negative weight cycle.

II. It works correctly if the graph has negative edge weights but does not have negative weight cycles.

III. It is single source shortest path algorithm.

Options :

6406533039362. ✓ Only statement I and II are correct

6406533039363. ✗ Only statement I and III are correct

6406533039364. ✗ Only statement II and III are correct

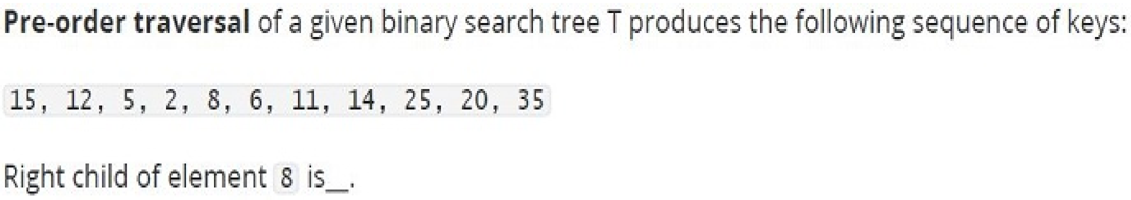
6406533039365. ✗ All statements are correct

6406533039366. ✗ All statements are incorrect

Question Number : 139 Question Id : 640653902431 Question Type : MCQ Calculator : Yes

Correct Marks : 4

Question Label : Multiple Choice Question



Pre-order traversal of a given binary search tree T produces the following sequence of keys:

`15, 12, 5, 2, 8, 6, 11, 14, 25, 20, 35`

Right child of element `8` is__.

Options :

6406533039369. ✖ 12

6406533039370. ✓ 11

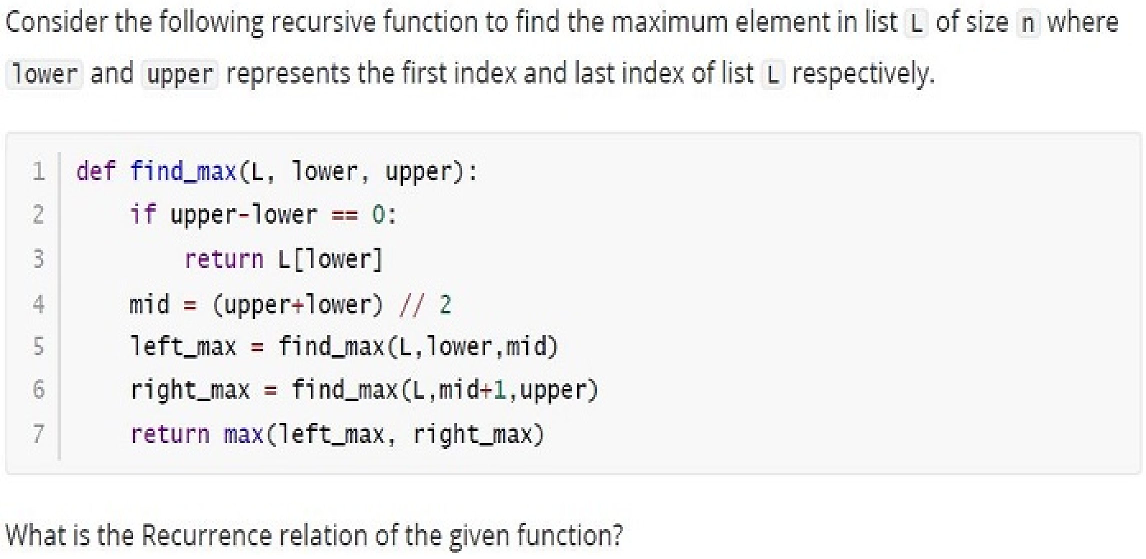
6406533039371. ✖ 14

6406533039372. ✖ 8 is a leaf node.

Question Number : 140 Question Id : 640653902436 Question Type : MCQ Calculator : Yes

Correct Marks : 4

Question Label : Multiple Choice Question



Consider the following recursive function to find the maximum element in list `L` of size `n` where `lower` and `upper` represents the first index and last index of list `L` respectively.

```python
def find_max(L, lower, upper):
    if upper-lower == 0:
        return L[lower]
    mid = (upper+lower) // 2
    left_max = find_max(L,lower,mid)
    right_max = find_max(L,mid+1,upper)
    return max(left_max, right_max)
```

What is the Recurrence relation of the given function?

Options :

6406533039383. ✓ $T(n) = 2T(n/2) + 1\ ,\ T(1) = 1$

6406533039384. ✖ $T(n) = 2T(n/2) + n\ ,\ T(1) = 1$

6406533039385. ✖ $T(n) = T(n/2) + n\ ,\ T(1) = 1$

6406533039386. ✖ $T(n) = T(n/2) + 1\ ,\ T(1) = 1$

Question Number : 141 Question Id : 640653902437 Question Type : MCQ Calculator : Yes

Correct Marks : 4

Question Label : Multiple Choice Question

Subsequence: A subsequence is a sequence that appears in the same relative order in the source strings, but not necessarily consecutively.

In the Longest Common Subsequence problem we are given two string $S_1 = a_1a_2\ldots a_m$ and $S_2 = b_1b_2,\ldots b_n$. To get the length of Longest Common Subsequence at $LCS[m][n]$, the recursion formula is given as follows to fill matrix $LCS[i][j]$ where $0 \le i \le m$ and $0 \le j \le n$.

$$LCS[i,j] = \begin{cases} 0, & if\ \ i = 0\ or\ j = 0 \\ 1 + LCS[i-1, j-1], & if\ \ a_i = b_j \\ \underline{\qquad\qquad}, & if\ \ a_i \neq b_j \end{cases}$$

Which among the following is the correct statement to fill the blank.

Options :

6406533039387. ✖ $min(LCS[i-1, j], LCS[i, j-1])$

6406533039388. ✓ $max(LCS[i-1, j], LCS[i, j-1])$

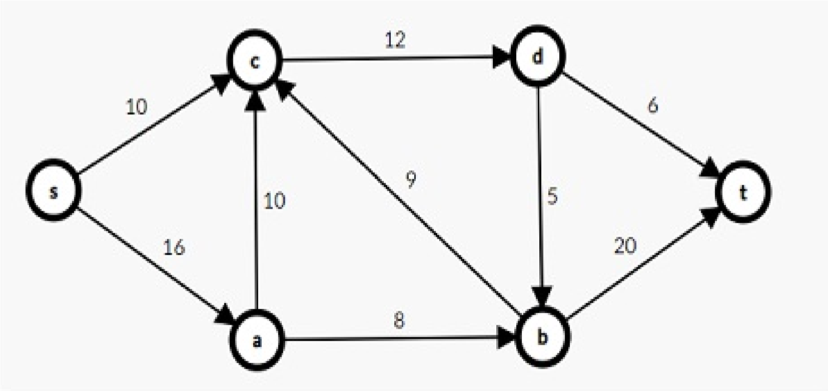
6406533039389. ✖ $min(LCS[i-1, j] + 1, LCS[i, j-1] + 1)$

6406533039390. ✖ $LCS[i-1, j-1] + 1$

Question Number : 142 Question Id : 640653902442 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question

Consider the network given below with source s and sink t, with the numbers on the edges denoting maximum capacity across a particular edge.



The value of the maximum flow in the given network is__

Options :

6406533039404. ✖ 14

6406533039405. ✖ 25

6406533039406. ✓ 19

6406533039407. ✗ 20

Question Number : 143 Question Id : 640653902443 Question Type : MCQ Calculator : Yes

Correct Marks : 4

Question Label : Multiple Choice Question

Let Z be an NP-complete problem and X and Y be two other problems not known to be in NP. X is polynomial time reducible to Z and Z is polynomial-time reducible to Y. Which one of the following statements is true?

Options :

6406533039408. ✗ Y is NP-complete

6406533039409. ✓ Y is NP-hard

6406533039410. ✗ X is NP-complete

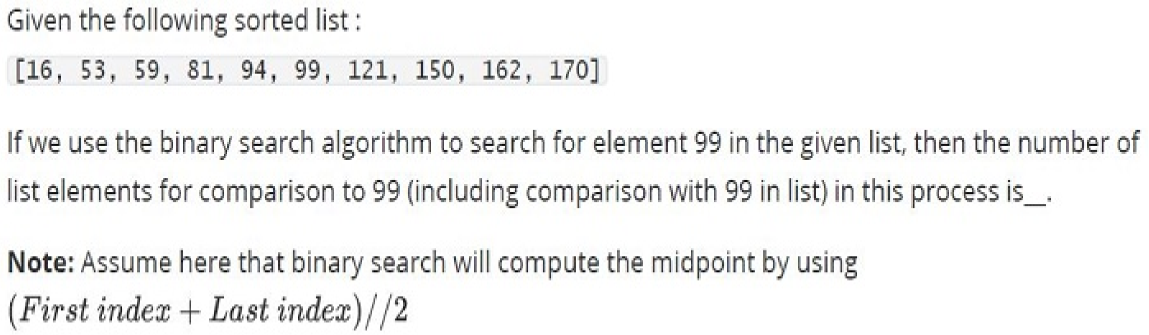
6406533039411. ✗ X is NP-hard

Sub-Section Number :	3
Sub-Section Id :	640653133693
Question Shuffling Allowed :	Yes

Question Number : 144 Question Id : 640653902421 Question Type : SA Calculator : None

Correct Marks : 4

Question Label : Short Answer Question



Given the following sorted list :

```
[16, 53, 59, 81, 94, 99, 121, 150, 162, 170]
```

If we use the binary search algorithm to search for element 99 in the given list, then the number of list elements for comparison to 99 (including comparison with 99 in list) in this process is_.

Note: Assume here that binary search will compute the midpoint by using $(First\ index + Last\ index)//2$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

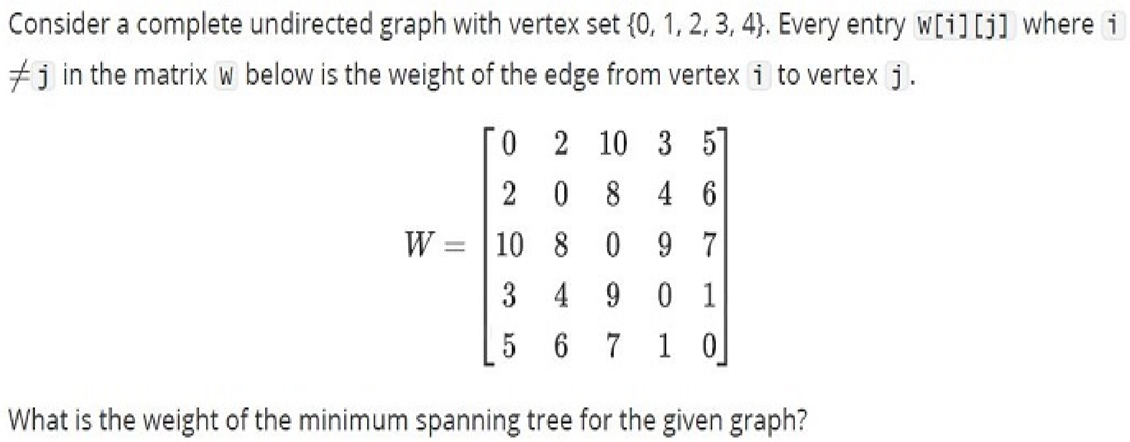
Possible Answers :

3

Question Number : 145 Question Id : 640653902429 Question Type : SA Calculator : None

Correct Marks : 4

Question Label : Short Answer Question



Consider a complete undirected graph with vertex set {0, 1, 2, 3, 4}. Every entry `W[i][j]` where `i` $\neq$ `j` in the matrix `W` below is the weight of the edge from vertex `i` to vertex `j`.

$$W = \begin{bmatrix} 0 & 2 & 10 & 3 & 5 \\ 2 & 0 & 8 & 4 & 6 \\ 10 & 8 & 0 & 9 & 7 \\ 3 & 4 & 9 & 0 & 1 \\ 5 & 6 & 7 & 1 & 0 \end{bmatrix}$$

What is the weight of the minimum spanning tree for the given graph?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

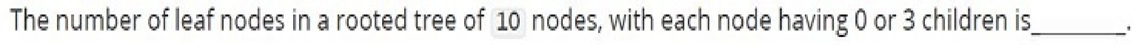
Possible Answers :

13

Question Number : 146 Question Id : 640653902430 Question Type : SA Calculator : None

Correct Marks : 4

Question Label : Short Answer Question



The number of leaf nodes in a rooted tree of `10` nodes, with each node having 0 or 3 children is________.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

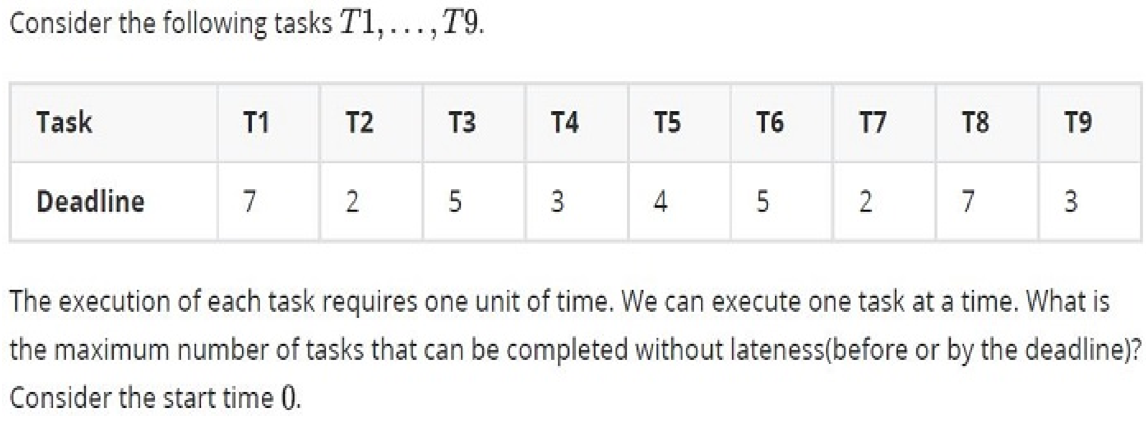
Possible Answers :

7

Question Number : 147 Question Id : 640653902433 Question Type : SA Calculator : None

Correct Marks : 4

Question Label : Short Answer Question



Consider the following tasks $T1, \ldots, T9$.

Task	T1	T2	T3	T4	T5	T6	T7	T8	T9
Deadline	7	2	5	3	4	5	2	7	3

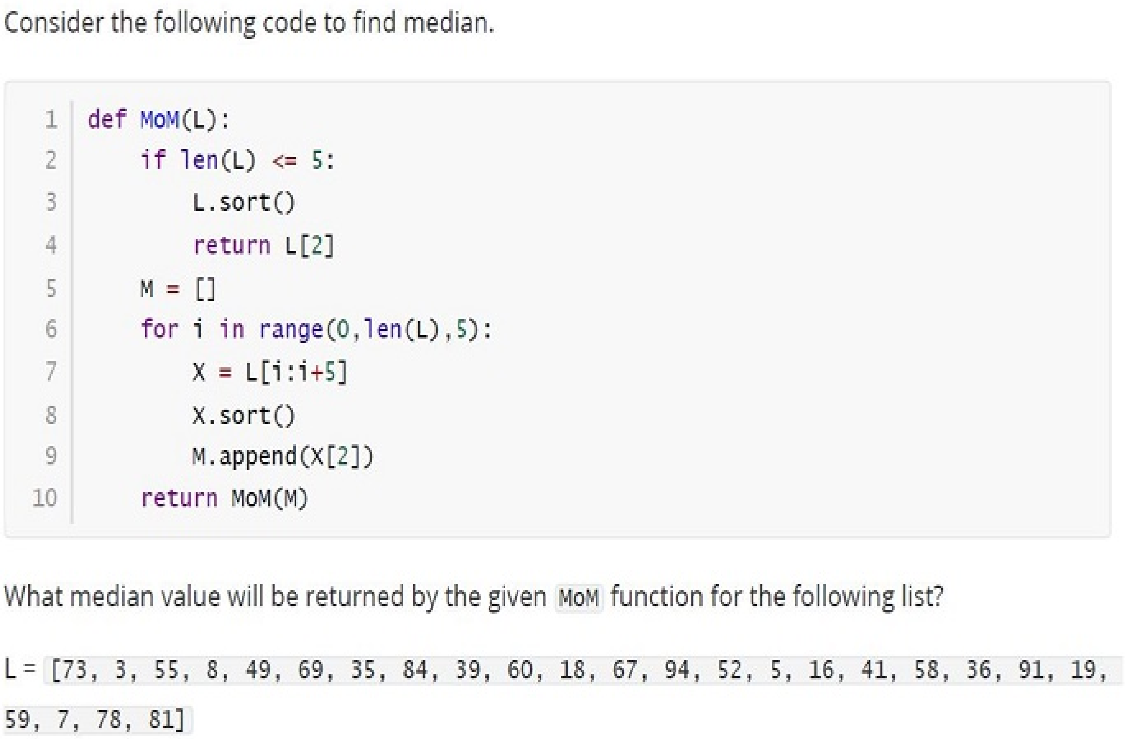
The execution of each task requires one unit of time. We can execute one task at a time. What is the maximum number of tasks that can be completed without lateness(before or by the deadline)? Consider the start time 0.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

7

Question Number : 148 Question Id : 640653902435 Question Type : SA Calculator : None
Correct Marks : 4

Question Label : Short Answer Question



Consider the following code to find median.

```
def MoM(L):
    if len(L) <= 5:
        L.sort()
        return L[2]
    M = []
    for i in range(0,len(L),5):
        X = L[i:i+5]
        X.sort()
        M.append(X[2])
    return MoM(M)
```

What median value will be returned by the given `MoM` function for the following list?

L = `[73, 3, 55, 8, 49, 69, 35, 84, 39, 60, 18, 67, 94, 52, 5, 16, 41, 58, 36, 91, 19, 59, 7, 78, 81]`

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

52

Sub-Section Number :	4
Sub-Section Id :	640653133694
Question Shuffling Allowed :	Yes

Question Number : 149 Question Id : 640653902425 Question Type : MSQ Calculator : Yes
Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Let T_B and T_D be the BFS tree and DFS tree respectively generated when BFS and DFS are applied on the node s in undirected and unweighted graph G. Let $d(x)$ be the shortest distance of node x from the node s in G. Which among the following statements is/are correct ?

Options :

6406533039350. ✓ For every neighbor v of s in graph G, the edge (s, v) must exist in T_B.

6406533039351. ✖ If (u, v) is an edge of G that is not in T_B then $|(d(u) - d(v)| > 1$.

6406533039352. ✖ If there is path from s to u in T_D, then u is in a different component from s.

6406533039353. ✓ The number of edges in T_B and T_D is equal.

Question Number : 150 Question Id : 640653902432 Question Type : MSQ Calculator : Yes
Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider a binary **max-heap** implemented using list. Which of the following lists represents a binary max-heap?

Options :

6406533039373. ✖ [25, 12, 16, 13, 10, 8, 14]

6406533039374. ✖ [25, 14, 13, 16, 10, 8, 12]

6406533039375. ✓ [25, 14, 16, 13, 10, 8, 12]

6406533039376. ✓ [25, 14, 16, 13, 12, 8, 10]

Question Number : 151 Question Id : 640653902434 Question Type : MSQ Calculator : Yes
Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following statement(s) is/are **true** about Huffman algorithm ?

Options :

6406533039378. ✓ In a Huffman tree, if a leaf labelled x is at depth(from root) smaller than the leaf labelled y, then $frequency(x) >= frequency(y)$.

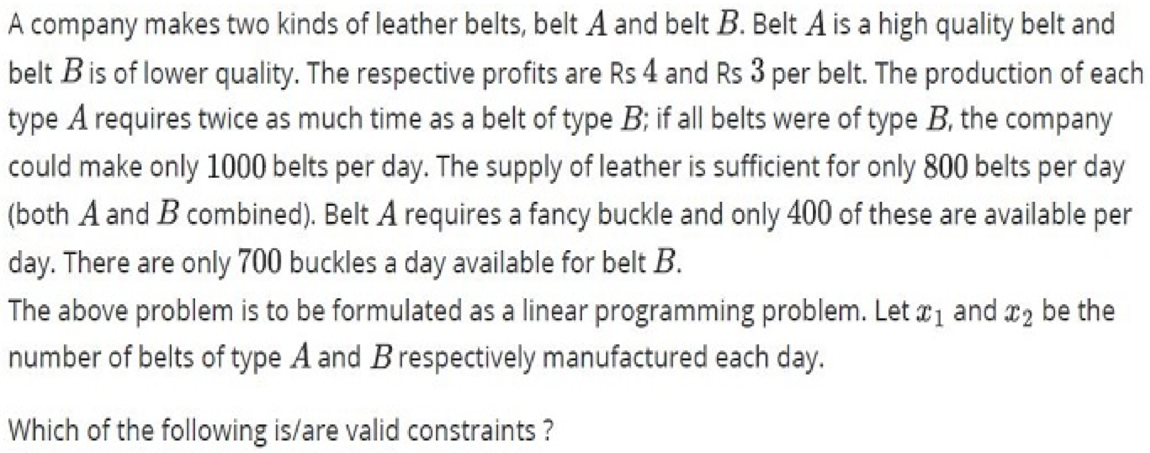
6406533039379. ✓ Huffman coding algorithm uses greedy approach to construct the Huffman tree.

6406533039380. ✖ In a Huffman tree, if a leaf labelled x is at depth(from root) smaller than the leaf labelled y, then $frequency(x) <= frequency(y)$.

6406533039381. ✖ In Huffman codes, The code of one character can be prefix of other character's code.

Question Number : 152 Question Id : 640653902441 Question Type : MSQ Calculator : Yes Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question



A company makes two kinds of leather belts, belt A and belt B. Belt A is a high quality belt and belt B is of lower quality. The respective profits are Rs 4 and Rs 3 per belt. The production of each type A requires twice as much time as a belt of type B; if all belts were of type B, the company could make only 1000 belts per day. The supply of leather is sufficient for only 800 belts per day (both A and B combined). Belt A requires a fancy buckle and only 400 of these are available per day. There are only 700 buckles a day available for belt B.

The above problem is to be formulated as a linear programming problem. Let x_1 and x_2 be the number of belts of type A and B respectively manufactured each day.

Which of the following is/are valid constraints ?

Options :

6406533039399. ✓ $x_1 \leq 400$

6406533039400. ✓ $x_2 \leq 700$

6406533039401. ✗ $x_1 + 2x_2 \leq 800$

6406533039402. ✓ $2x_1 + x_2 \leq 1000$

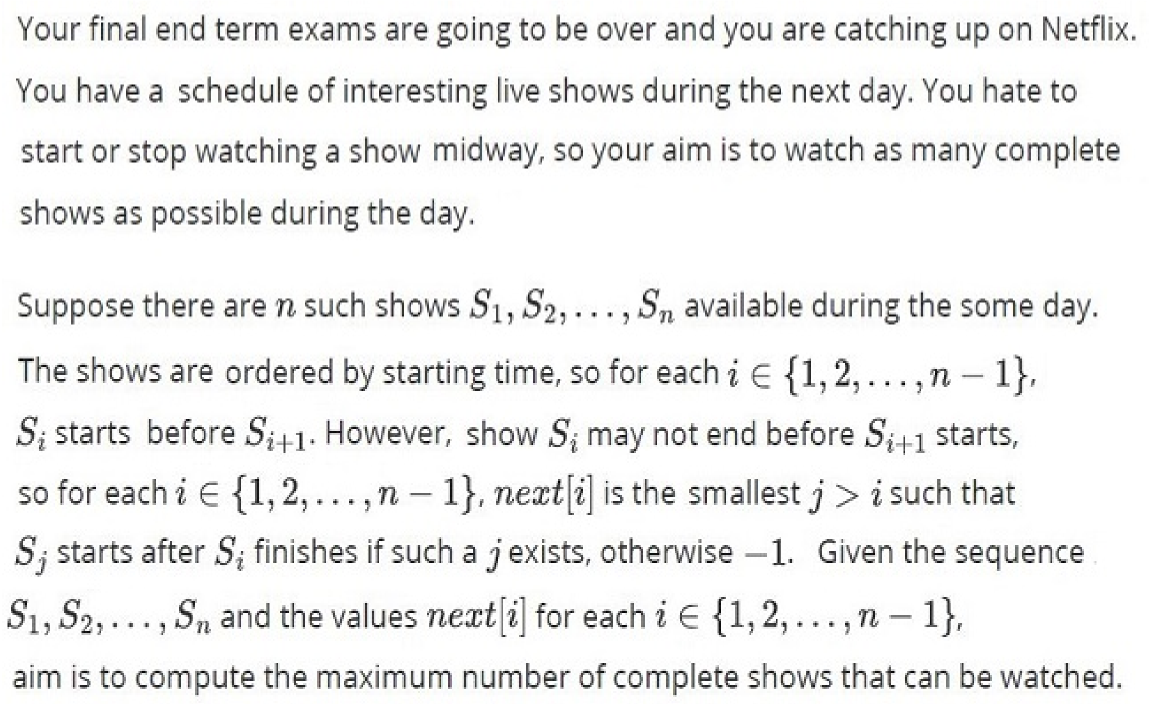
6406533039403. ✗ $x_1, x_2 \leq 0$

Sub-Section Number :	5
Sub-Section Id :	640653133695
Question Shuffling Allowed :	No

Question Id : 640653902438 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

Question Numbers : (153 to 154)

Question Label : Comprehension



Your final end term exams are going to be over and you are catching up on Netflix. You have a schedule of interesting live shows during the next day. You hate to start or stop watching a show midway, so your aim is to watch as many complete shows as possible during the day.

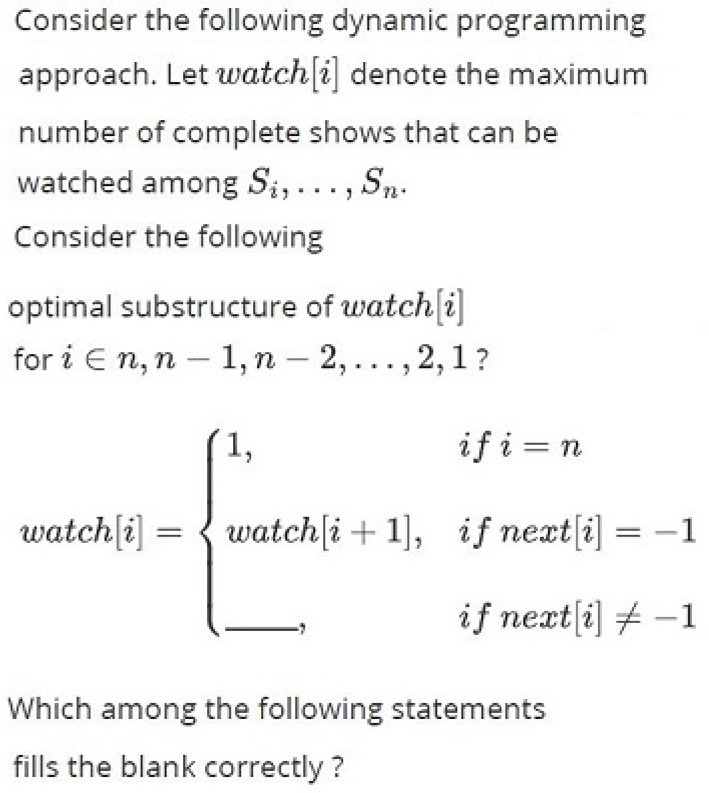
Suppose there are n such shows $S_1, S_2, \ldots, S_n$ available during the some day. The shows are ordered by starting time, so for each $i \in \{1, 2, \ldots, n-1\}$, S_i starts before S_{i+1}. However, show S_i may not end before S_{i+1} starts, so for each $i \in \{1, 2, \ldots, n-1\}$, $next[i]$ is the smallest $j > i$ such that S_j starts after S_i finishes if such a j exists, otherwise -1. Given the sequence $S_1, S_2, \ldots, S_n$ and the values $next[i]$ for each $i \in \{1, 2, \ldots, n-1\}$, aim is to compute the maximum number of complete shows that can be watched.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 153 Question Id : 640653902439 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question



Consider the following dynamic programming approach. Let $watch[i]$ denote the maximum number of complete shows that can be watched among $S_i, \ldots, S_n$.

Consider the following optimal substructure of $watch[i]$ for $i \in n, n-1, n-2, \ldots, 2, 1$?

$$watch[i] = \begin{cases} 1, & if\ i = n \\ watch[i+1], & if\ next[i] = -1 \\ \_\_\_\_, & if\ next[i] \neq -1 \end{cases}$$

Which among the following statements fills the blank correctly ?

Options :

6406533039391. ✓ $\max\{1 + watch[next[i]], watch[i+1]\}$

6406533039392. ✖ $\max\{watch[next[i]], watch[i+1]\}$

6406533039393. ✖ $\max\{watch[next[i]], 1 + watch[i+1]\}$

6406533039394. ✖ $\max\{1 + watch[next[i]], 1 + watch[i+1]\}$

Question Number : 154 Question Id : 640653902440 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question

What is the time complexity of the given algorithm ?

Options :

6406533039395. ✖ $O(n^2)$

6406533039396. ✖ $O(n \log n)$

6406533039397. ✔ $O(n)$

6406533039398. ✖ $O(n^3)$

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Section Id :	64065364076
Section Number :	8
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	32
Number of Questions to be attempted :	32
Section Marks :	100
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653133696
Question Shuffling Allowed :	No