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Course outline

How does an NPTEL online course work? ()

Week 0 ()

Week 1 ()

- Welcome and Initial Setup (unit?unit=17&lesson=18)
- Reversort (unit?unit=17&lesson=19)
- Engineering Reversort (unit?unit=17&lesson=20)

Week 1: Assignment 1

Your last recorded submission was on 2023-01-26, 12:39 IST Due date: 2023-02-08, 23:59 IST.

1) ***1 point***

```
int fun(int n)
{
    int i = 1;
    int s = 1;
    while (i*i < n)
    {
        s = s + 1;
        i += 1;
    }
    return s;
}
```

Let $T(n)$ denote the time complexity for given function `fun(n)` where `n` is a positive integer. Which of the following options is correct ?

- ○ $T(n) = O(n)$
- ◉ $T(n) = O(\sqrt{n})$
- ○ $T(n) = O(n^2)$
- ○ $T(n) = O(logn)$

- Number Game (unit?unit=17&lesson=21)
- Will It Stop? (unit?unit=17&lesson=22)
- Practice: Week 1: Assignment 1(Non Graded) (assessment?name=145)
- Week 1 Feedback Form: Getting Started with Competitive Programming (unit?unit=17&lesson=24)
- Week 1 Programming Assignment Q1 (/noc23_cs30/progassignment?name=176)
- Week 1 Programming Assignment Q2 (/noc23_cs30/progassignment?name=177)
- **Quiz: Week 1: Assignment 1 (assessment?name=178)**
- Week 1 Practice Programming Assignment 1 (/noc23_cs30/progassignment?name=179)
- Week 1 Practice Programming Assignment 2 (/noc23_cs30/progassignment?name=180)

Week 2 ()

2) ***1 point***

```
Reversort(L):
  for i := 1 to length(L) - 1
    j := position with the minimum value in L between i and length(L), inclusive
    Reverse(L[i..j])
```

What is the time complexity of the given `Reversort` algorithm if input array is already sorted in increasing order ? Where `n` is the size of input list.

- (●) $O(n^2)$
- ( ) $O(n)$
- ( ) $O(nlogn)$
- ( ) $O(n^3)$

3) In `Reversort algorithm` , For which of the following input array of size N = 9, Cost C will be the maximum of 44 ? ***1 point***

- ( ) [9, 8, 7, 6, 5, 4, 3, 2, 1]
- ( ) [1, 3, 5, 7, 9, 8, 6, 4, 2]
- (●) [2, 4, 6, 8, 9, 7, 5, 3, 1]
- ( ) [9, 1, 8, 2, 7, 3, 6, 4, 5]

4) If we try to sort the list of integers in descending order instead of ascending order, which of the following updated `Reversort` algorithm(s) is/are correct? ***1 point***

- [x]
```
Reversort(L):
  for i := 1 to length(L) - 1
    j := position with the maximum value in L between i and length(L), inclusive
    Reverse(L[i..j])
```
- [ ]
```
Reversort(L):
  for i := length(L) to 2
    j := position with the maximum value in L between i and 1, inclusive
    Reverse(L[j..i])
```
- [ ]
```
Reversort(L):
  for i := length(L) to 2
    j := position with the minimum value in L between i and 1, inclusive
    Reverse(L[j..i])
```

```
Reversort(L):
  for i := 1 to length(L) - 1
    j := position with the minimum value in L between i and length(L), inclusive
    Reverse(L[i..j])
  Reverse(L)
```

5) Let's say there are 2 players playing a game, Krishna and Radha. The number game is as follows: ***1 point***

Initially, two positive integers `A` and `B` are written on a blackboard. The players take turns, starting with Krishna. On his or her turn, a player can replace `A` with `A - kB` for any positive integer `k` or replace `B` with `B - kA` for any positive integer `k` .

Which of the following is a losing position for Krishna ?

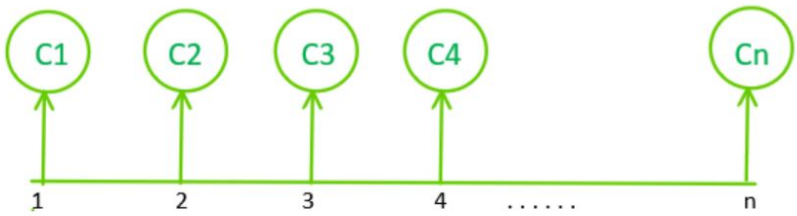
- ○ `A >= 2B`
- ○ `A >= (89/55)B`
- ◉ `A <= (144/89)B`
- ○ `A >= (5/3)B`

6) The **game of "25"** is played with two players who take turns saying a number, and neither player is allowed to pass. The first player says "1" and each player in turn increases the number by 1, 2, or 3, but the number may not exceed 25, the player forced to say "25" loses. ***1 point***

If the first player starts with 1 then which of the following will be the winning strategy for the second player?

- ○ If the second player always says a multiple of 3
- ○ If the second player always adds 3
- ○ If the second player always adds 2
- ◉ If the second player always says a multiple of 4

7) Consider a two-player coin game where each Player `A` and Player `B` get the turn one by one and neither player is allowed to pass. ***1 point***



There is a row of `n` number of places(1,2...n), where n is even, and each place contains a coin with some value and the sum of all coin's values is odd. A player on his/her turn can pick a coin from any of the two corners of the row. The player that collects coins with more value wins the game.

If player `A` starts the game, which of the following is a winning strategy for player `A` ?

- ○ Always select from the corner which has the maximum among both corners.
- ○ If (sum of all even-placed coin value > sum of all odd-placed coin value), always select from the right-hand corner, otherwise always select from the left-hand corner.
- ○ If (sum of all even-placed coin value > sum of all odd-placed coin value), always select from the left-hand corner, otherwise always select from the right-hand corner.
- ◉ If (sum of all even-placed coin value > sum of all odd-placed coin value), start choosing from the right-hand corner and select all the even-placed coins, otherwise start choosing from the left- hand corner and select all the odd-placed coins.
- ○ If (sum of all even placed coin value > sum of all odd-placed coin value), start choosing from the left-hand corner and select all the odd-placed coins, otherwise start choosing from the right-hand corner and select all the even-placed coins.

8) Consider a problem where you begin with a stack of `n` boxes, and you make a sequence of moves. In each move, you divide one stack of boxes into two non-empty stacks. The game ends when you have `n` stacks, each containing a single box. You earn points for each move; in particular, if you divide one stack with boxes `a + b` into two stacks with boxes `a` and `b` , then you get score `a * b` points for that move. Your overall score is the sum of the points that you earn for each move, and it should be maximum in all possible strategy to dividing the stack.

For example `n = 8`

```
One possible way of dividing:-
8
6 2 (Points for that move is 6 * 2 = 12)
3 3 2 (Points for that move is 3 * 3 = 9)
2 1 3 2 (Points for that move is 2 * 1 = 2)
2 1 2 1 2 (Points for that move is 2 * 1 = 2)
1 1 1 2 1 2 (Points for that move is 1 * 1 = 1)
1 1 1 1 1 1 2 (Points for that move is 1 * 1 = 1)
1 1 1 1 1 1 1 1 (Points for that move is 1 * 1 = 1)
Total Score = 12 + 9 + 2 + 2 + 1 + 1 + 1 = 28
```

What would be the maximum score if `n = 20` ?

190

1 point

9) The game **Race of 50** proceeds as follows. ***1 point***

There are two players, A and B. The player `A` starts by picking a number between 1 and 5 (inclusive). The players take turns, one by one. On each turn, the current player has to add a number between 1 and 5 to the current number. Neither player is allowed to pass. The player which reaches to 50 first, win the game.

For which of the following options, player `B` has a winning strategy?

- (●)

Turn	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Picking Number	4	8	10	14	17	20	24	26	31	32	35	38	42	44	49	50

- ( )

Turn	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Picking Number	1	6	8	10	15	19	24	27	32	37	40	44	49	50

- ( )

Turn	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Picking Number	5	10	14	18	21	24	29	34	35	36	38	40	43	44	49	50

- ( )

Turn	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Picking Number	4	8	10	14	17	20	24	26	31	32	35	38	42	44	49	50

10) Consider the code given in the lecture "Will It Stop?". If we replace the term $3n + 3$ with $4n + 3$, then the code will look like below: ***1 point***

```
while n > 1 do:
    if n mod 2 = 0 then:
        n = n/2
    else:
        n = 4 * n + 3
```

Which of the following options are correct for the code given in the question?

- [x] If n is odd, then the code will never stop.
- [ ]

If n is even, then the code will always stop.

- [x] It will definitely stop for all values of n which are of the form 2^k, where k is a positive integer.
- [ ] It can stop for some values (at least one value) of n which are not of the form 2^k , where k is a positive integer.
- [x] It can stop for some values (at least one value) of n, if n is even and greater than 1.

You may submit any number of times before the due date. The final submission will be considered for grading.

Submit Answers