ASSIGNMENT-DAY 1- 10/03/2025

1. A bear starting from the point P, walked one-mile due south, then he changed direction and walked one-mile due east. Then he turned again to the left and walked one-mile due north and arrived at point P he started from what was the colour of the bear?

Solution:

The bear is white because the only place on Earth where a bear can walk one mile south, one mile east, and one mile north and end up at the same starting point is the North Pole. The only bears found in that region are polar bears, which are white.

2. Two towns A and B are 3 kms apart. It is proposed to build a new school serving 100 students in town A and 50 students in town B. How far from town A should the school be built if the total travel distance by all 150 students is to be as small as possible?

Solution: SCHOOL

. A B

A : B = 100 : 50 = 2 : 1

Divide the total distance 3 km in the ratio 2:1

**Calculating the Travel Distance**

**Case 1: School at 2 km from Town A**

Distance traveled by 100 students from A = 100 × 2 = 200 km

Distance traveled by 50 students from B = 50 × 1 = 50 km

Total travel distance = 200 + 50 = 250 km

**Case 2: School at 1 km from Town A**

Distance traveled by 100 students from A = 100 × 1 = 100 km

Distance traveled by 50 students from B = 50 × 2 = 100 km

Total travel distance = 100 + 100 = 200 km

**Since the total travel distance is minimized at 200 km, the optimal location for the school is 1 km from Town A.**

3. A traveller arrives at a hotel, he has no money but only a silver chain consisting of 6 links. He uses one link to pay for each day spent at the hotel but the hotel manager agrees to accept no more than one broken link.  
How should the traveller cut up the chain in order to settle the amount with the hotel manager on a daily basis?  
     1. What is the least number of links that have to be cut if the traveller stays 100 days at the hotel and has a chain consisting of 100 links? What is the answer in general case n days and n links?

Solution:

Using the Guess and Check algorithm:

**Checking with 1 Link**

If we cut only 1 link, it becomes impossible to make daily payments while following the hotel's condition.

**Checking with 2 Links**

By cutting 2 links, we can follow this pattern:

Day 1: Give 1 link.

Day 2: Take back the 1-link and give a 2-link piece instead.

Day 3: Give back the 1-link, making a total of 3 links paid.

Day 4: Take back all previous links and hand over a 4-link chain.

Day 5: Add the 1-link back, making a total of 5 links paid.

Day 6: Swap the 1-link for the 2-link again, reaching 6 links paid.

This confirms that cutting 2 links works efficiently.

**Applying the Strategy for 100 Days**

If we were to cut 1 link per day, we would need 99 cuts, which is highly inefficient.

**Optimized Cutting Strategy**

Instead of making unnecessary cuts, we divide the chain into power of 2 segments:

1, 2, 4, 8, 16, 32, and the remaining 37 links.

By combining these pieces strategically, we can represent every daily payment from 1 to 100 days.

This method significantly reduces the number of cuts required. Instead of 99 cuts, we only need 6 cuts, making it a much more efficient approach.

4. Rearrange the letters in the words **new door** to make one word.

Solution:

The letters in "NEW DOOR" can be rearranged to form different words:

"Wonder" (but one ‘o’ is missing).

"Wooden" (but the letter ‘r’ is missing)

However, The word "NEW DOOR” can also be arranged to make "ONE WORD”.

5.  Do divide and conquer: **6  5  1  4  3  2**

The Divide and Conquer strategy involves three steps:

1. Divide: Split the array into smaller subarrays until each contains only one element.

2. Conquer: Sort and merge the subarrays.

3. Combine: Recursively merge the sorted subarrays to get the final sorted array.

Step-by-Step Process:

Step 1: Divide the Array

Given array: 6, 5, 1, 4, 3, 2

1. Split into two halves:

Left Half: 6, 5, 1

Right Half: 4, 3, 2

2. Further divide each half:

Left Half (6, 5, 1) → Split into:

Left: 6

Right: 5, 1

5, 1 is further split into → 5 and 1

Right Half (4, 3, 2) → Split into:

Left: 4

Right: 3, 2

3, 2 is further split into → 3 and 2

Step 2: Conquer - Sorting and Merging

1. Merge (5, 1) → [1, 5]

2. Merge (6, [1, 5]) → [1, 5, 6]

3. Merge (3, 2) → [2, 3]

4. Merge (4, [2, 3]) → [2, 3, 4]

5. Merge ([1, 5, 6], [2, 3, 4]) → [1, 2, 3, 4, 5, 6]

Final Sorted Array:

[1, 2, 3, 4, 5, 6]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 6 | 5 | 1 | 4 | 3 | 2 |

|  |  |  |
| --- | --- | --- |
| 4 | 3 | 2 |

|  |  |  |
| --- | --- | --- |
| 6 | 5 | 1 |

|  |
| --- |
| 6 |

|  |
| --- |
| 4 |

|  |  |
| --- | --- |
| 3 | 2 |

|  |  |
| --- | --- |
| 5 | 1 |

|  |
| --- |
| 4 |

|  |  |
| --- | --- |
| 2 | 3 |

|  |
| --- |
| 6 |

|  |  |
| --- | --- |
| 1 | 5 |

|  |  |  |
| --- | --- | --- |
| 2 | 3 | 4 |

|  |  |  |
| --- | --- | --- |
| 1 | 5 | 6 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 |

6.  Draw flowchart for calculating simple interest.

Algorithm for Calculating Simple Interest

Step 1: Start

Step 2: Input Principal (P), Rate of Interest (R), and Time (T)

Step 3: Calculate SI = (P × R × T) / 100

Step 4: Display SI

Step 5: End

Stop

Print

S.I. = (P\*N\*R)/100

Initialize P,N,R

Start