**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 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**.

Since the only bears found in the North Pole region are **polar bears**, the color of the bear must be **white**.

**2. Two towns A and B are 3 km 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:**

A : B = 100 : 50 = 2 : 1

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

**Consider the school is 2 km from A:** 100×2= 200 km

50×1= 50 km

Total travel distance = 200 + 50 = 250 km

**Consider the school is 1 km from A:** 100×1= 100 km

50×2= 100 km

Total travel distance = 100 + 100 = 200 km

Therefore, the school should be built 1 km from Town A to minimize total travel distance.

**Algorithm:**

Step 1: Get the distance between town A and town B along with the number of students.

Step 2: Divide the total distance according to the ratio.

Step 3: Using Guess and Check, get the distance.

**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?**

The traveller should **cut the chain at powers of 2** to minimize the number of cuts while ensuring that he can pay exactly for each day.

**For 6 links:**

The traveller can cut the chain as follows:

1. **Cut at 1st link** → (1, 5 remaining)
2. **Cut at 2nd link** → (1, 2, 3 remaining)
3. **Cut at 4th link** → (1, 2, 4 remaining)

Now, he can pay exactly for **any day from 1 to 6** by combining these links.

**For 100 links:**

To represent 100 days using the minimum cuts, break at **powers of 2:**  
1, 2, 4, 8, 16, 32, 37 (remaining)

* **Total cuts = 6** (since 2⁶ = 64 is close to 100).

**General Case (n links, n days):**

The minimum number of cuts required is: ⌊log2​n⌋

**4. Rearrange the letters in the words New Door to make one word**.

**Solution:**

Rearranging the letters in **"New Door"** forms the word **"One Word"**.

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

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

**Solution:**

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

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

|  |
| --- |
| 4 |

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

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

|  |
| --- |
| 6 |

|  |
| --- |
| 4 |

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

|  |
| --- |
| 6 |

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

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

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

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

**Algorithm:**

Step 1: If the array has one or zero elements, return it (already sorted).

Step 2: Find the middle index: mid = floor(n / 2)

Step 3: Split the array into two parts:

• Left subarray: arr[0:mid]

• Right subarray: arr[mid:n]

Step 4: Recursively apply Merge Sort to both subarrays.

Step 5: Merge the two sorted subarrays:

• Compare elements from both and insert them into a new sorted array.

Step 6: Return the merged sorted array.

**6.  Draw flowchart for calculating simple interest.**

**Solution:**

Start

Stop

Print S.I.

S.I. = P\*N\*R

100

Initialize P, N, R

**Algorithm:**

**Step 1:** Initialize the values of Principle(P), Number of years(N), Rate of Interest(R).

**Step 2:** S.I. = (P\*N\*R)/100.

**Step 3:** Print the calculated Simple Interest.