**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:**

We could consider the point **P as** the place where **Polar Bear** exists, and since polar bears are always white, we can logically conclude that the colour of the bearcould be **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

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

50×1= 50 km

Total travel distance = 200 + 50 = 250 km

**Consider the school is at 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:**

Begin

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.

End

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:**

Trying this in Guess and Check algorithm, 1 link is impossible.

Considering 2 links,

Day 1: Give 1 link

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

Day 3: Give the 1 link again → Total paid = 3 links

Day 4: Take back all previous links and give the 4-link chain

Day 5: Add the 1-link back → Total paid = 5 links

Day 6: Take back 1 link, give the 2-link again → Now 6 links paid.

So, the guess of considering 2 links is done right.

Considering for 100 days,

For staying for 100 days, cutting one link per day we would have to make 99 cuts!

Instead,

* We cut the chain into pieces that follow powers of 2:  
   1, 2, 4, 8, 16, 32, and remaining 37 links.
* By this way, we can combine the links as before

Therefore, we only need to make **6 cuts** instead of 99!

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

**Solution:**

The word “**NEW DOOR**” could be rearranged to make one word as:

* + - * Wonder (but one of the ‘o’ is missing)
      * Wooden (but ‘r’ is missing)

The word “**NEW DOOR**” can also be arranged to make “**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:**

Begin

**Step 1:** If the array has one or zero elements, it is already sorted. Return it.

**Step 2:** Divide the array into two halves:

* Left half: arr[0:mid]
* Right half: arr[mid:n]

**Step 3:** Sort both halves recursively using Merge Sort

**Step 4:** Merge the two sorted halves

* Compare elements from both halves and make a sorted one.

**Step 5:** Return the **final sorted array**.

End

6.  Draw flowchart for calculating simple interest.

**Solution:**

Start

Stop

Print S.I.

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

100

Initialize P, N, R

**Algorithm:**

Begin

**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.

End