**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:**

From the given information above its impossible to find the color of the bear because the given information only talks about the movement of the bear, and all the bear can move in all the directions. In other words, any bear with X color can walk the same path. Bears can be white, brown, black, or even blonde. In the riddle the **bear ends at the north** so it might be a **north po**le so if we had to bet we can choose **white with this logic**.

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:**

A. . B

SCHOOL

A : B = 100 : 50 = 2 : 1

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

**Consider the school is at 3 km from A (school in town B):** 100×3= 300 km

50×0= 0 km

Total travel distance = 300 + 0 = 300 km

**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

**Consider the school is at 0 km from A (school in town A):** 100×0= 0 km

50×3= 150 km

Total travel distance = 150 + 0 = 150 km

Therefore, the school should be built in Town A that is 0 Km from town A to minimize total travel 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?

**Solution:**

Breaking one link per day for 100 days would mean making 99 cuts, which is highly inefficient. Instead, we can use a smarter strategy to minimize the number of cuts while still being able to pay exactly what is needed each day.

First, let's see how payments can be made efficiently.

* Day 1: Give 1 link.
* Day 2: Take back the 1 link and give the 2-link piece instead.
* Day 3: Add the 1-link back, making a total of 3 links paid.
* Day 4: Take back all previous links and give a 4-link chain.
* Day 5: Add the 1-link back, making a total of 5 links.
* Day 6: Swap the 1-link for the 2-link piece, bringing the total to 6 links paid.

This pattern follows a power of 2 system, allowing us to represent any number efficiently.

Instead of cutting one link per day, we cut the chain into specific sections that follow powers of 2:1 , 2, 4, 8, 16 ,32

The remaining 37 links

By doing this, we can combine and exchange links as needed, covering every payment amount from 1 to 100 days without unnecessary cuts.

**Final Result:**

this method requires only 6 cuts, making it much more efficient and practical.

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

**Solution:**

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

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

**Solution:**

**Algorithm:**

**Base Case:**

* If the array has one or zero elements, it's already sorted. Just return it.

**Divide the Array:**

Find the middle point of the array:

* Left half → first part of the array.
* Right half → second part of the array.

**Sort Each Half:**

* Recursively apply Merge Sort to both halves until they are individually sorted.

**Merge the Sorted Halves:**

* Compare elements from both halves and combine them in sorted order.

**Final Step:**

* Return the fully sorted array!

**Steps:**

**Divide:**

* Split the array into two halves:
* [6, 5, 1] and [4, 3, 2]

**Divide Further:**

* Left half: [6, 5, 1] → Split into [6] and [5, 1]
* Right half: [4, 3, 2] → Split into [4] and [3, 2]

**Divide Again:**

* [5, 1] → Split into [5] and [1]
* [3, 2] → Split into [3] and [2]

**Conquer (Merge & Sort):**

* Merge [5] and [1] → [1, 5]
* Merge [3] and [2] → [2, 3]
* Merge [6] and [1, 5] → [1, 5, 6]
* Merge [4] and [2, 3] → [2, 3, 4]

**Final Merge:**

* Merge [1, 5, 6] and [2, 3, 4] → [1, 2, 3, 4, 5, 6]

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

|  |  |  |
| --- | --- | --- |
| 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 |

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

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