TITLE: PIRATE TREASURE HUNT - SORTING TREASURE CHESTS

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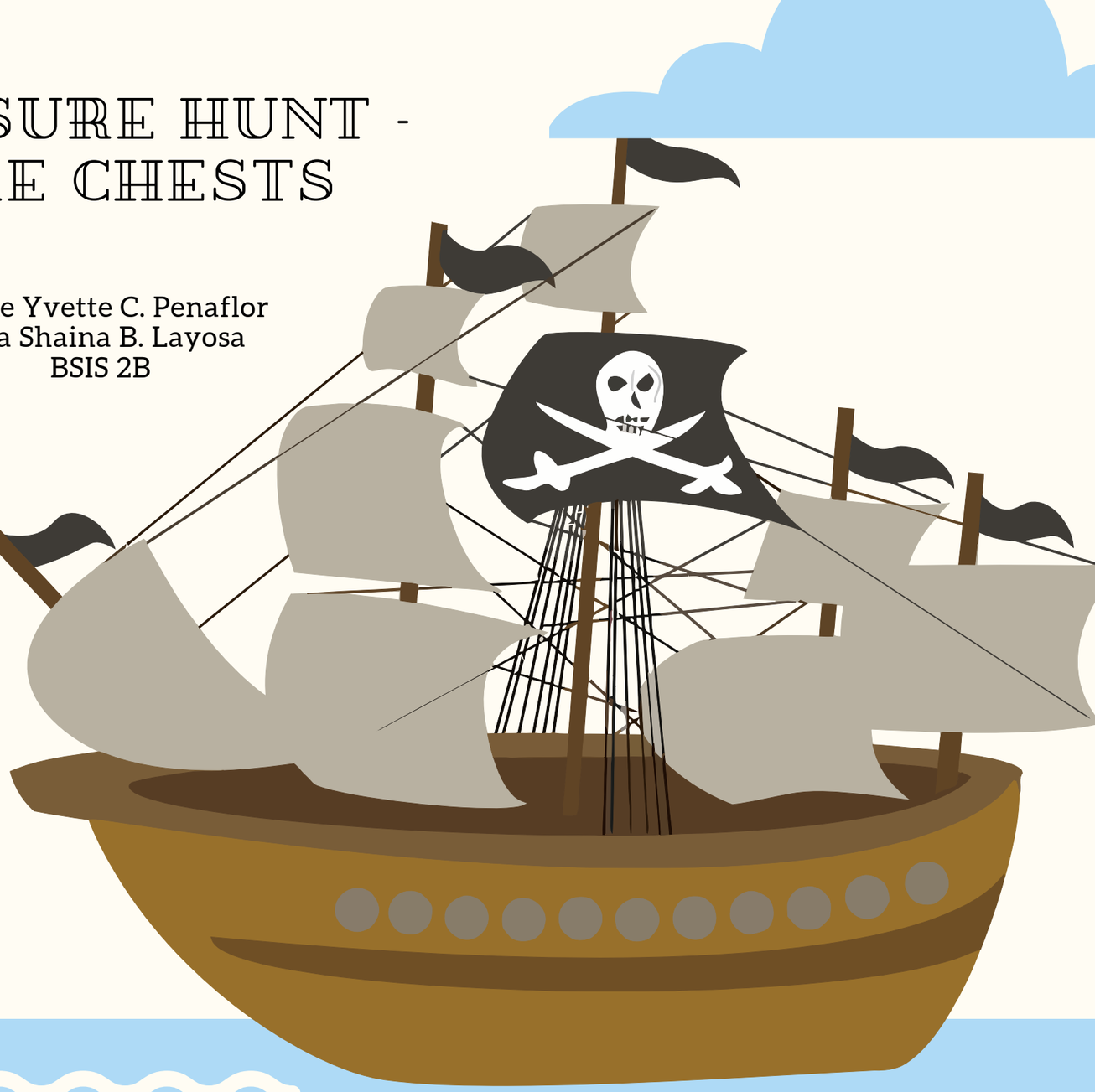

Theme:

Set sail on a pirate adventure where you, as the captain, need to sort and prioritize treasure chests with varying values. Using Max-Heaps and Min-Heaps, you'll prioritize the most valuable treasures for your pirate crew and organize your loot in the best possible way!

Learning Goals:

- *By completing this activity, participants will:*
- *Learn to insert values into a Max-Heap to prioritize larger values.*
- *Understand how to remove the root (most valuable treasure) and re-adjust the heap.*
- *Gain experience with heapify operations to convert a list of values into a Min-Heap for prioritizing smaller values.*
- *Understand the practical applications of Max-Heaps and Min-Heaps in real-world scenarios like sorting and prioritizing.*

INSTRUCTIONS:

TASK 1: INSERTING TREASURE CHESTS INTO A MAX-HEAP

GOAL: INSERT TREASURE CHESTS WITH VARYING VALUES INTO A MAX-HEAP TO PRIORITIZE THE MOST VALUABLE TREASURES.

- EXAMPLE: GIVEN CHEST VALUES [250, 150, 500, 100], AFTER INSERTION INTO A MAX-HEAP, THE MOST VALUABLE CHEST (500) SHOULD APPEAR AT THE ROOT.

STEPS:

1. CREATE AN EMPTY MAX-HEAP.
2. INSERT THE CHEST VALUES INTO THE MAX-HEAP ONE BY ONE.
3. AFTER EACH INSERTION, DISPLAY THE CURRENT STATE OF THE HEAP.

EXAMPLE INPUT:

CHEST_VALUES = [250, 150, 500, 100]

EXPECTED OUTPUT:

HEAP AFTER INSERTION: [500, 150, 250, 100]

TASK 2: REMOVE THE MOST VALUABLE CHEST

GOAL: REMOVE THE MOST VALUABLE CHEST (ROOT) FROM THE MAX-HEAP AND RE-ADJUST THE HEAP.

- ONCE THE ROOT (500) IS REMOVED, THE HEAP SHOULD RE-ADJUST ITSELF TO MAINTAIN THE MAX-HEAP PROPERTY.

STEPS:

1. REMOVE THE ROOT (MOST VALUABLE CHEST) FROM THE MAX-HEAP.
2. RE-ADJUST THE HEAP TO ENSURE THE NEXT MOST VALUABLE CHEST IS AT THE ROOT.
3. DISPLAY THE HEAP AFTER THE REMOVAL AND RE-ADJUSTMENT.

EXAMPLE INPUT:

HEAP = [500, 150, 250, 100]

EXPECTED OUTPUT:

HEAP AFTER REMOVAL: [250, 150, 100]

TASK 3: HEAPIFY A RANDOM SET OF CHEST VALUES INTO A MIN-HEAP

GOAL: CONVERT A RANDOM LIST OF CHEST VALUES INTO A MIN-HEAP TO PRIORITIZE THE LEAST VALUABLE TREASURES.

- AFTER HEAPIFYING, THE LEAST VALUABLE CHEST SHOULD APPEAR AT THE ROOT.

STEPS:

1. CREATE A RANDOM SET OF CHEST VALUES (E.G., [250, 150, 500, 100]).
2. HEAPIFY THE VALUES INTO A MIN-HEAP.
3. DISPLAY THE HEAP AFTER HEAPIFYING.

EXAMPLE INPUT:

CHEST_VALUES = [250, 150, 500, 100]

EXPECTED OUTPUT:

MIN-HEAP: [100, 150, 500, 250]