WEEK 3

INSERTING VALUES INTO A B+ TREE!

not only balanced;
all values are on leaves.

STUDENT OBJECTIVES

- Upon completion of this video, you should be able to:
  - Draw the nodes for a given order of a B+ tree
  - Insert the key values into a B+ tree in order given

FOR THIS COURSE WE ONLY DO INSERTIONS INTO A B+ TREE (WE WONT DEAL WITH DELETIONS)

- You need to understand how to insert values into a B+ tree in the order the values are given. No node; no deletion.
- You need to start with a correctly drawn node as your root node and keep inserting. As the nodes fill, you will need to move them around.

create leaves.

RULES FOR B+ TREE INSERTIONS

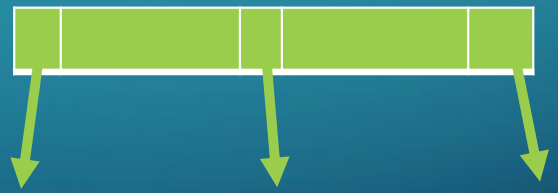
Written by former confused CS3319 students!

1. For CS3319, we will mainly do trees with Order 3 (can have 3 leaves)
2. Always traverse the tree to a leaf node before attempting insertion
3. If the leaf node has a free space, insert the data value
   - be sure to insert that value in the proper order within the node. i.e. Lower value to the left, higher to the right.
4. If the leaf node already contains two values, bump the middle value up one level
   - if there is no parent node create one
   - the middle value of the three existing values (the nodes two existing values plus the new one to be inserted) should be inserted into the parent node. The lower and higher values should each be split into two separate nodes branching off of the appropriate pointer in the parent.
   - if the parent node is full, repeat this process treating the parent like a leaf. Just make sure all the pointers are intact
   - finally the leaf containing the same value of the parent node should be included on the right most node in the left branch off of the parent.

confused yet?

LET'S TRY IT OUT.

- We will insert these values: 23, 65, 37, 60, 46, 92, 48, 71, 56, 59
- We have an order of 3, so each node can hold TWO values and 3 pointers.
- A node looks like this:



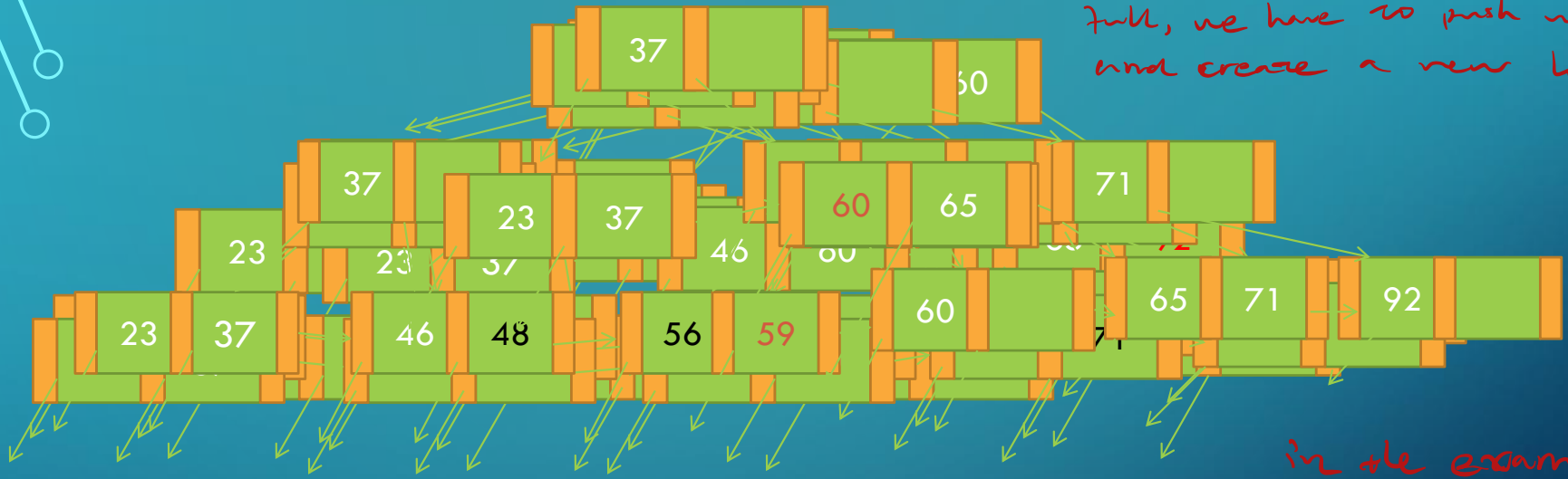

23
65

WARM UP QUESTION

PUT THE FOLLOWING DATA INTO A B+-TREE WITH ORDER P=3 AND PLEAF=2:

23, 65, 37, 60, 46, 92, 48, 71, 56, 59

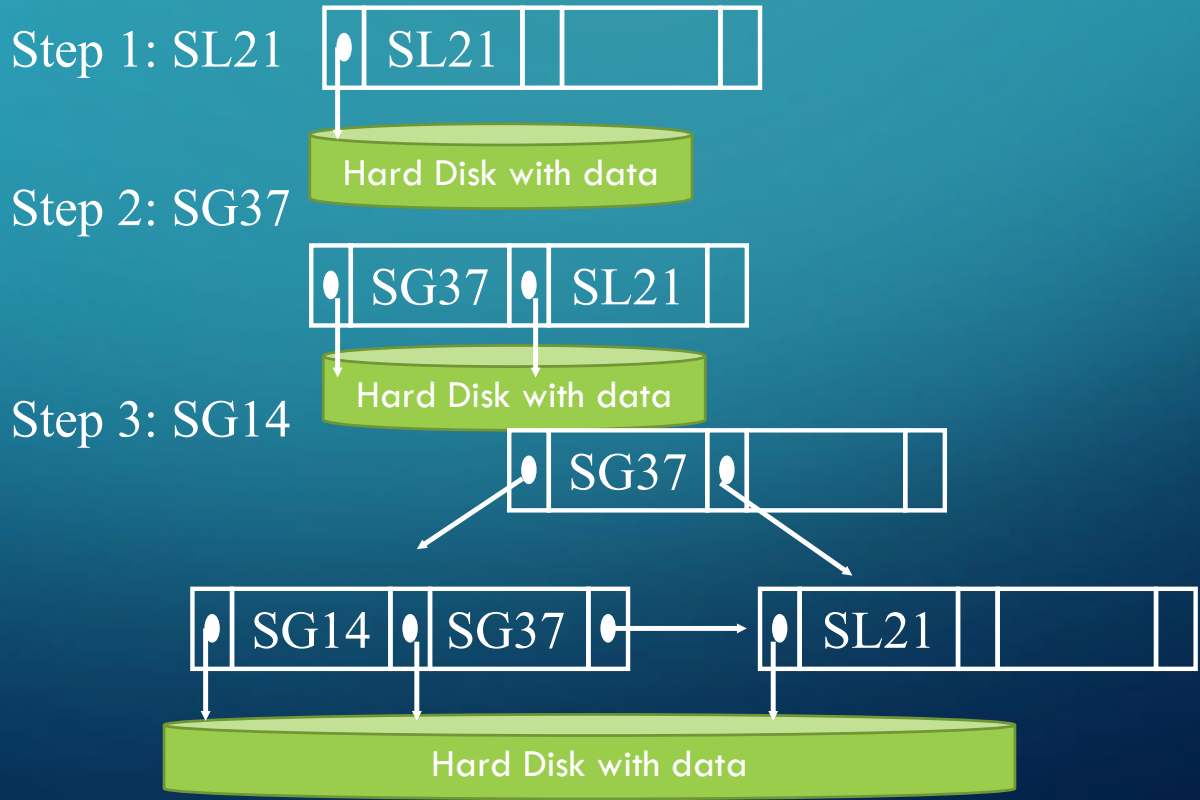
anytime a level is full, we have to push up and create a new level



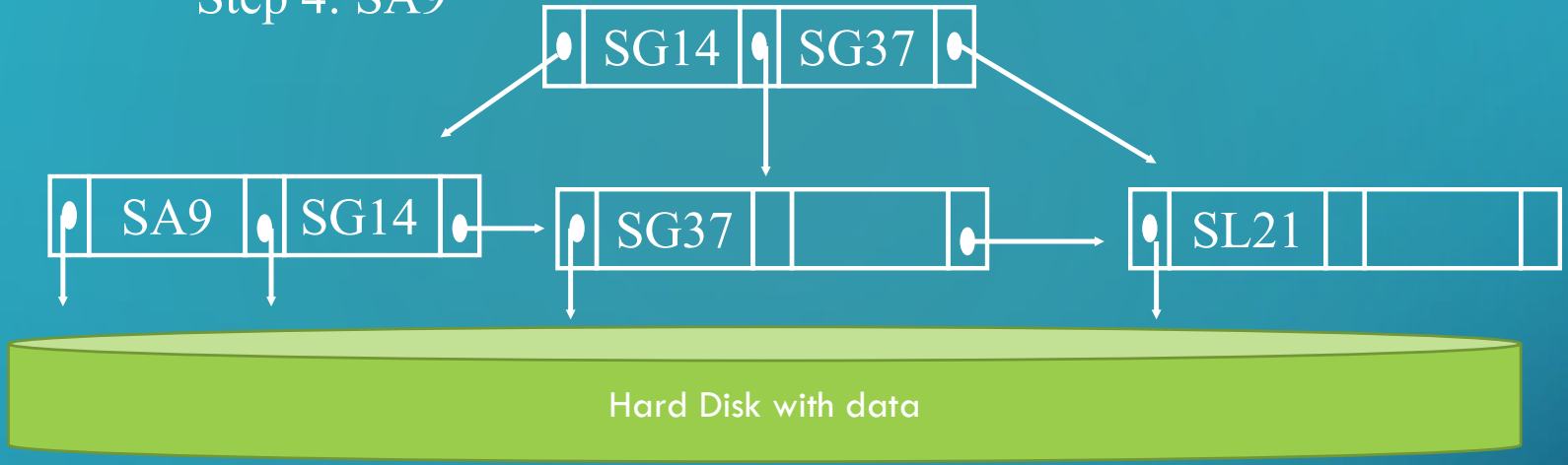
in the exam, always remember to draw a hard disk !!!

ANOTHER EXAMPLE:

- Insert the following values into a B + tree of order 3: SL21, SG37, SG14, SA9, SG12, SL41

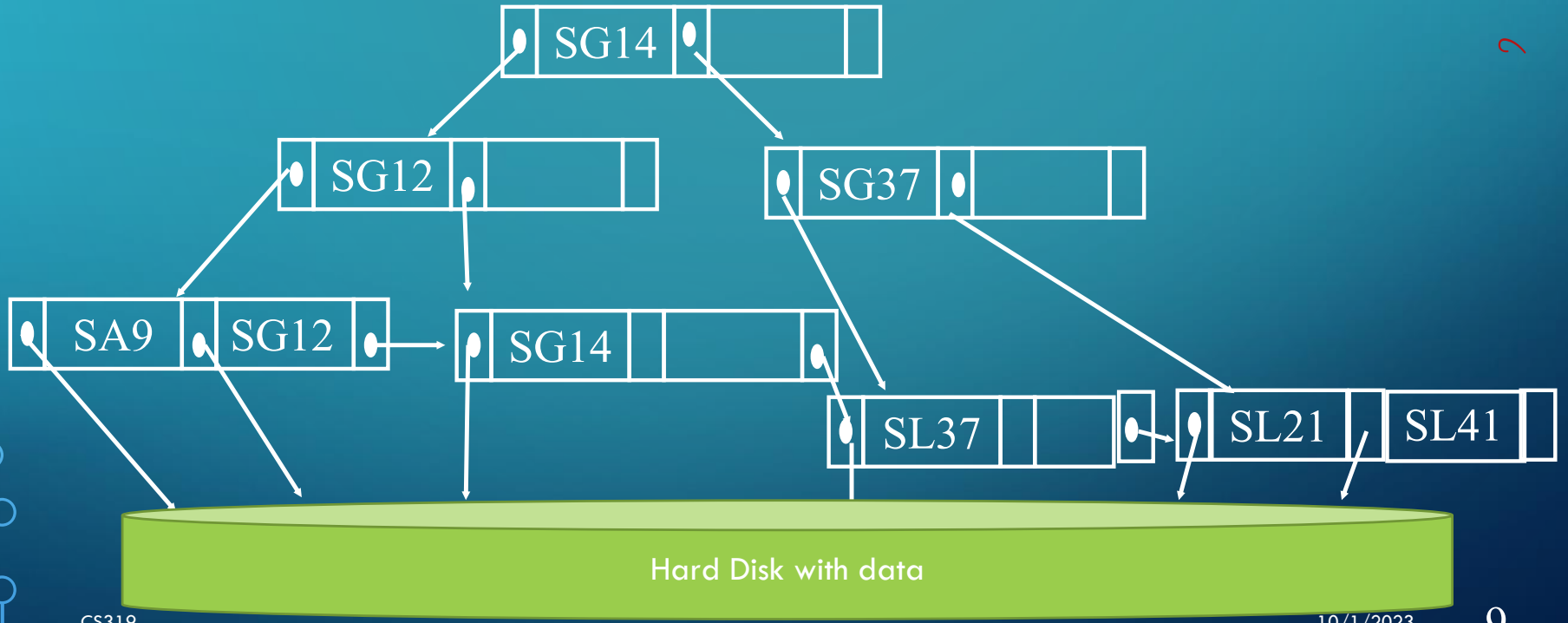


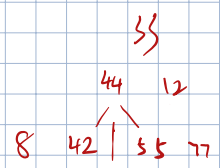
Step 4: SA9



Step 5: SG12

Step 6: SL41


SG14
SG12
SG37
SA9
SG12
SG14
SL37
SL21
SL41
Hard Disk with data


55
44
12
8
42
55
77