H2 Computing Practical Worksheet – T1W5

1a Write the code to:

i. Check for valid ISBN-10 and ISBN-13 numbers
   - Note that the above should correspond to a single function that detects the given ISBN type (either 10 or 13) and then returns True is valid or False if not.

ii. Generate n random ISBN-10 or ISBN-13 numbers
   - There should be 2 separate functions, 1 generating n random ISBN-10 numbers, and the other generating n random ISBN-13 numbers.

The details on the required check digit algorithms can be found on the following page:
https://en.wikipedia.org/wiki/International_Standard_Book_Number#Check_digits

1b Write the object-oriented code for a circular doubly-linked linked list. Your implementation should ensure the following methods:

- Fully object-oriented
- Doubly-linked
- Circular
- Able to store generic data objects
- Insert methods - both at the front and back of the list
- Find methods - returning True if the given data object is stored in the linked list, and False otherwise
- Delete method, which utilises the find method and then removes the given entry if possible; it must return True is successfully removed, or else will return False
- Print method should print the complete contents of the linked list, including any sentinel nodes and all linking data (i.e., there should be some formatting to indicate how the nodes are linked – ensure proper UI principles are adhered to when formatting this output)

1c Write the object-oriented code for a hash table that utilised chaining for conflict resolution. Your implementation should ensure the following methods:

- Fully object-oriented
- Initialisation should be based on a given expected size of the hash table
- For chaining, your buckets should be implemented using the linked list from 1b
- Able to store generic data objects
- Insert method using hash values
- You may use Python's inbuilt hash() method for all hash value calculations
- Find method - returning True if the given data object is stored in the linked list, and False otherwise; again, you must use hash values to perform this
- Delete method, which utilises the find method and then removes the given entry if possible; it must return True is successfully removed, or else will return False
- Print method should utilise the print method of each linked list with the appropriate separator

1d Use your code from parts 1a, 1b and 1c to implement a data entry interface to enter both ISBN-10 and ISBN-13 codes. This interface should be:

- Text-based
- Utilise the validation methods in 1a to ensure ISBN codes entered are valid (or else reject them)
- Utilise the hash table in 1c to store the values

1e Design a set of test cases to evaluate your code in 1d. Your test cases should evaluate all aspects of the data entry interface.