1(a)(i)	Logic error	
1(a)(ii)	In line `09`, the conditional statement `MaxSize[i] > NumberOfCustomers` is incorrect as this means that each seat can only accommodate one less person than the intended maximum capacity. To rectify the error, the conditional statement should be changed to: `MaxSize[i] >= NumberOfCustomers` In line `13`, the loop should terminate when either an available table has been found or no available tables can be found as the pointer `TableNumber` exceeds the size of the array, instead of both conditions together that is illogical. To rectify the error, the line of code should be changed to: `UNTIL Found = TRUE OR TableNumber = 10`	
1(a)(iii)	`IsBooked[i] ← TRUE` should be inserted between lines `17` and `18`.	
1(b)	Any two of the following: - Presence check can be used to ensure that both the name and the mobile number are keyed in instead of left blank. - Length check can be used for the mobile number, e.g. in the Singapore context, the mobile number should have 8 digits. - Format check can be used for the mobile number, e.g. in the Singapore context, the mobile number should have 8 or 9 as the first digit.	
1(c)	- Static memory allocation applies to an array, where the elements are stored as a single continuous block of memory cells with consecutive addresses. - Dynamic memory allocation applies to a linked list, where the nodes are stored in different parts of the computer memory and so they are linked using pointers.	
2(i)(a)	`'Grover'`:4 `'Horsburgh'`:2 `'Island'`:3 `'Jordan'`:3 `'Kalman'`:4	

2(ii)(a)

Key	Value
1	
2	'Horsburgh'
3	'Island'
4	'Grover'
5	'Jordan'
6	'Kalman'
7	
8	

2(ii)(b)

Key	Value
1	
2	'Horsburgh'
3	'Island'
4	'Grover'
5	
6	'Jordan'
7	'Kalman'
8	

2(iii)

The letters occupy ASCII numbers 65 to 90 and 97 to 122. All of these numbers have two or more `1`s in their binary representation (since the closest numbers with one `1` are 64 and 128).

3(i)

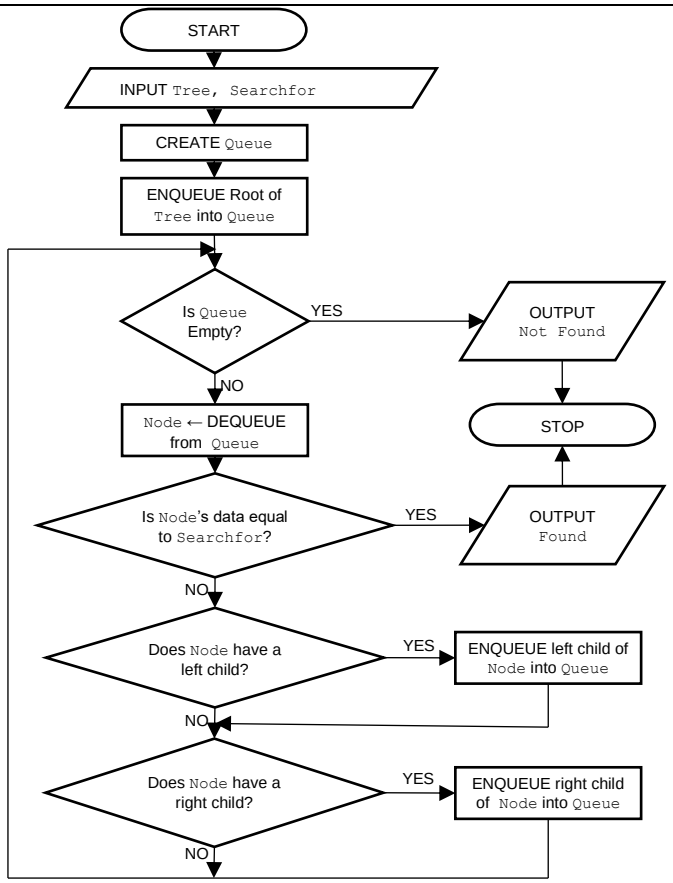
Searchfor: 5

Stack	Node	Output
[7]	7	
[3, 13]	13	
[3, 11, 17]	17	
[3, 11]	11	
[3]	3	
[2, 5]	5	Found

3(ii)

Depth-first

3(iii)



3(iv)

Searchfor: 5

Queue	Node	Output
[7]	7	
[3, 13]	3	
[13, 2, 5]	13	
[2, 5, 11, 17]	2	
[5, 11, 17]	5	Found

4(a)

- Merge sort recursively splits the list of integers into two halves until each list consists of a single element, followed by merging those lists to give a single sorted list.

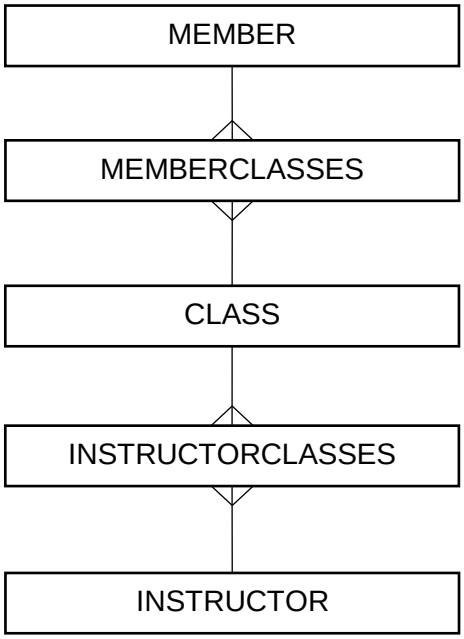
- Bubble sort compares adjacent unsorted elements in the list and swap them when required in each pass for a total of n–1 passes, where n is the number of elements in the list, with a time complexity of $O(n^2)$.

- As such, merge sort with a time complexity of $O(n \log n)$ would be more efficient than bubble sort with a time complexity of $O(n^2)$.

4(b)

It is a function that:
- is defined in terms of itself / calls itself,
- with each call breaking down a problem into smaller ones until a base / terminating case is reached.

4(c)	**A:** `MaxIndex > 1` **B:** `MaxIndex DIV 2` **C:** `Result ← MyList`	
4(d)	- Define a new empty list that will be returned at the end of the function call. - For each of the input list, define a pointer that points to the first integer in the list. (For simplicity, pointer1 is for one of the input lists and pointer2 is for the other input list.) - Compare the integer at pointer1 and the integer at pointer2. Add the larger integer into the result list and increment the respective pointer. - Continue the previous step until one of the pointers has reached the end of the list. - Add the remaining integers from the other list to the result list in order from the pointer to the end of the list.	
5(a)(i)	Any of the following: - When another instructor takes over a particular class, the record for every person enrolled in the class has to be updated one by one. Missing out on any one of them will lead to inconsistency. - Information on classes with no sign ups cannot be inserted into the database. - Any other logical answer.	
5(a)(ii)	The table is not in 1NF as there are attributes that do not contain atomic values. Under one particular `MemberNo`, there are multiple `ClassName` and `InstCode` data.	
5(b)(i)	Primary key is a field that uniquely identifies each record in a table.	
5(b)(ii)	`MEMBER` to `MEMBERCLASSES` is a one-to-many relationship. The primary key `MemberNo` in the `MEMBER` table links to the foreign key `MemberNo` in the `MEMBERCLASSES` table.	
5(b)(iii)	`CREATE TABLE MEMBER (` `  MemberNo INTEGER PRIMARY KEY,` `  MemberName TEXT NOT NULL,` `  MemberTier TEXT NOT NULL` `)`	

5(c)(i)	Five tables: `MEMBER`, `MEMBERCLASSES`, `CLASS`, `INSTRUCTORCLASSES`, `INSTRUCTOR`	
5(c)(ii)		
5(c)(iii)	`MEMBER(MemberNo, MemberName, MemberTier, MemberJoinDate)` `MEMBERCLASSES(MemberNo*, ClassName*, Attendance)` `CLASS(ClassName, Fee)` `INSTRUCTORCLASSES(ClassName*, InstCode*)` `INSTRUCTOR(InstCode, InstName, InstSalary)` *Underline = primary key* *Asterisk = foreign key*	
5(d)	- Backup saves copies of live data to allow for quick recovery from hardware failure or recent data corruption or loss. - Archive saves data that are usually not subjected to any more changes for long term retention.	
6(a)	The `CAR` class is a subclass of the `VEHICLE` class.	
6(b)(i)	Abstraction shows only the essential information (e.g. speed and position of the vehicle) and hides the unnecessary details. This helps to improve programming efficiency and reduce confusion.	

6(b)(ii)	Inheritance allows a subclass to take on properties and methods of the superclass without having to write them all over again. This reduces the amount of editing if something is changed in the superclass and hence, the chance of making a mistake.	
6(c)	The petrol use rate depends on different attributes in each subclass – the number of `Passengers` in the case of `CAR`, and the `Current_Load` in the case of `TRUCK`. Hence, the attribute would need to be written differently for each of the subclasses, and this is an example of polymorphism.	
7(a)	Any two of the following: - Social media platforms tend to evolve quickly to keep up with the latest trends by constantly adding or removing certain features. An SQL database requires predefined schemas that are difficult to change, whereas a NoSQL database is dynamic and can handle changes more easily as data are stored in documents that can have different formats from one another. - SQL database is stored in one server only, while a NoSQL databases makes use of multiple servers. As such, when one server fails, the other servers can continue to support the social media platform. - Improving the performance of an SQL database requires upgrading of the existing server with faster processors and more memory space (vertical scalability), which may be costly. On the other hand, the improving the performance of a NoSQL database can be done by simply increasing the number of servers, which are cheaper overall. - Any other logical answer.	

7(b)(i)	Conditions	Valid username?	Y	Y	Y	Y	N	N	N	N	
		3rd login attempt?	Y	Y	N	N	Y	Y	N	N	
		Valid password?	Y	N	Y	N	Y	N	Y	N	
	Actions	Grant login	X		X						
		Lock account		X							
		Alert user of invalid password				X					
		Alert user of invalid username					X	X	X	X	

7(b)(ii)	Conditions	Valid username?	Y	Y	Y	N		
		3rd login attempt?	-	Y	N	-		
		Valid password?	Y	N	N	-		
	Actions	Grant login	X					
		Lock account		X				
		Alert user of invalid password			X			
		Alert user of invalid username				X		
7(c)	Any two of the following: - Mistyping is a common issue that cannot be identified visually with a masked password field. As such, a button to unmask the password can be provided next to the password field to allow users to see the password typed. - Forgetting a password is another common issue. As such, a link for password reset can be provided below the password field to direct users to the relevant webpage. - Users needs to be made aware that their accounts will be locked when the wrong password is keyed in three times. As such, in addition to the message alerting users of the wrong password, the number of remaining attempts can also be shown. - Any other logical answer.							

7(d)	The submitted username and password are recorded in the resulting URL when using HTTP GET method, whereas they are stored separately when using HTTP POST method. As such, the data cannot remain in the web browser history / be bookmarked / be cached, providing a secure way of handling sensitive data.	
8(a)	The data security company did not reveal the vulnerability to the client and therefore pretended that the product was better than it actually was. They were not completely honest and transparent with them about potential flaws in their product, and hence this constitutes a breach of integrity.	
8(b)	They did not accept responsibility for the vulnerability but attempted to cover it up until a later date. They did not adhere to the client's standards of creating a secure product or explain why the standards could not be met.	
8(c)	Instead of trying to fix the vulnerability, they pretended that it did not exist, thus pretending to have a level of competence that they did not actually have. They also did not attempt to learn more about the vulnerability at that point in time, but chose to defer it until the database was sold to the client and they had time to figure it out before the next maintenance.	
8(d)	They acted to save the image of the company and profits instead of being honest and upfront about the limitations of their product. In doing so, they chose to put their client at risk (of a data breach).	