•Name three typical type of data values in common data collections.

Integer, String, Floating

•Name three typical structures seen in common data collections.

list, queue, stack

•Name three typical operations seen in common data collections.

get, add, delete

•Can we program data structure in Java?

Yes

•Can we program data structure in C?

Yes

•Why do we insist an algorithm must terminate?

The algorithm need an output, so it must terminate

•Why do we insist an algorithm must be precise?

Easy to translate and in order to get result

•Why instructions in an algorithm are written in a sequence?

Because the computer should execute the instructions that in the sequence

•Write down an algorithm to start up IE Explorer on a computer.

•Input: a computer equipped with Windows which is shut down

•Output: a computer up & running with Windows IE Explorer

1. Switch the computer into 'On' position

2. Wait til Windows coming up, click upon 'Start'

3. Choose 'IE Explorer' to run by clicking upon it

•Write down an algorithm to shutdown a computer safely from Windows.

•Input: a computer equipped with Windows which is running under Windows

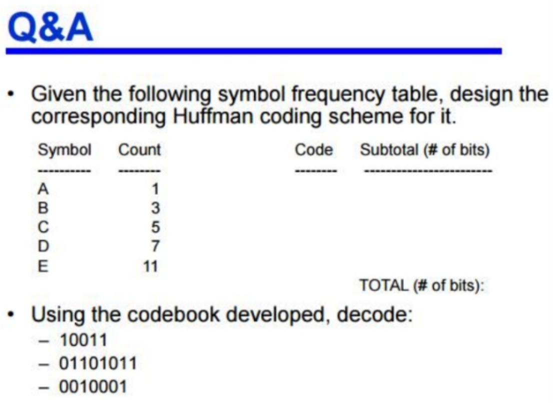
•Output: a computer which is shutdown

1. Close all running programs

2. Click upon 'Start', choose 'Shutdown' & click on it

3. Confirm 'Shutdown' by choosing 'Shutdown' & click on it in the dialogue box

Strategy Group

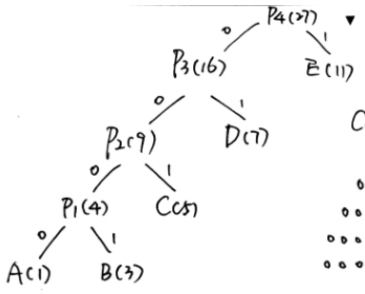


Q&A

- Given the following symbol frequency table, design the corresponding Huffman coding scheme for it.

Symbol	Count	Code	Subtotal (# of bits)
A	1		
B	3		
C	5		
D	7		
E	11		
			TOTAL (# of bits):

- Using the codebook developed, decode:
  - 10011
  - 01101011
  - 0010001



Code	Subtotal (# of bits)
1	E(11)
01	D(14)
001	C(15)
0001	B(12)
0000	A(4)

Decode.

- 10011 ⇒ 1, 001, 1 ⇒ ECE
- 01101011 ⇒ 01, 1, 01, 01, 1 ⇒ DEDDE
- 0010001 ⇒ 001, 0001 ⇒ CB

•Both space efficiency & time efficiency are metrics used to evaluate the performance of an algorithm (and a data structure). (T or F?) **T**

•Dynamic data structures are more space efficient in general. (T or F?) **T**

•Static data structures are more time efficient in general. (T or F?) **T**

•Information hiding is the principle that users of a software component need to know only the essential details of how to initializeand accessthe component, and do not need to know the details of the implementation (T or F?) **T**

•Name 3 type of collections that can be implemented under Java Programming with Linear collections

Lists, Stacks, Queues

•Name 3 operations that can be implemented under Java Programming with Linear collections

Programming with collections

Searching & Sorting Data

Implementing sorting algorithms

•Name 2 type of collections that can be implemented under Java Programming with Hierarchical collections

general trees, binary trees

•Name 4 operations that can be implemented under Java Programming with Hierarchical collections

Building tree structures

Searching tree structures

Traversing tree structures

Implementing tree structured collections

•What is a software "library"?

Libraries are collections of code designed for reuse

•Define Java "Package".

collections of classes

•Name Java's IO library.

java.io【Classes for input and output】

•Name Java's GUI library.

javax.swing

java.awt

【Large library of classes for GUI programs】

•What is the Java statement to include package or class into your program?

Import

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- What does it store inside?

Use array

- How does it keep track of the size?

size()；

int size = myList.size();

- How does it grow when necessary?

Extend the size of the array with ensureCapacity and copy the content

- How does its iterator work?

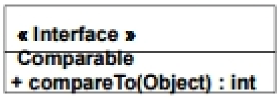
```
Integer value = null;
Iterator iter = list.iterator();
while (iter.hasNext()) {
        value = (Integer)iter.next();
}
```

• (a+n)*(b-8*m)	**an+b8m*-***
• b/v^7	**bv7^/**
• {3+[d-7*(g+5)]/w}	**3d7g5+*-w/+**
• [(4+b]-2)	**不能输出结果**

- Java has specified a “Queue” interface. (T or F) **T**
- Java does not have any class support for “Priority Queue”. (T or F) **F**
- peek() operation under the Queue interface will throw an exception if the queue is empty. (T or F) **F**
- poll() operation under the Queue interface will throw an exception if the queue is empty. (T or F) **F**
- There is an element() method under the Queue interface. (T or F) **T**
- Iterable is an interface specification for a class that is equipped with an Iterator. **T**
- Iterator is an interface specification for a class that can generate iterative elements. **T**
- An object defined under a comparable class will have a “natural ordering”. (T or F) **T**
- Objects declared under a comparable class can be compared using which method?

compareTo()

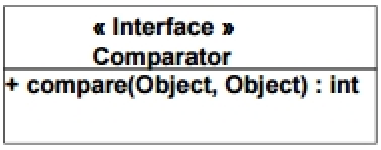
- What is the signature of the compareTo method?



- Which method can be used to sort list of comparable objects?

Collections.sort() and Arrays.sort()

- Comparator is an object that can compare other objects. (T or F) **T**
- What is the signature for the compare() method?



- A comparable class can implement multiple comparators. (T or F) **F**
- A method will do what when something goes wrong?

Throw an exception

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- An exception provides a local exit when something goes wrong. (T or F) **F**
- Name 3 cases when an exception can be thrown.

file doesn’t exist

dividing by zero

calling an undefined method

- What do we do with exceptions?

throwing exceptions

handling (catching) exceptions

- Exceptions can be caught using what Java statement?

try and catch

- Does exception have a type?

Yes

- After the exception handler finishes its work, what will the program do next?

perform the actions, and jump to code after all the catch clauses

- Can exception handler use information in the exception object?

Yes

- What does “e.getMessage()” do where e is an exception object?

Get the specific exception name

- Name 3 common Java exceptions.

AclNotFoundException

ActivationException

AlreadyBoundException

- RuntimeExceptions doesn’t have to be handled. (T or F) **T**
- IOException doesn’t have to be handled. (T or F) **F**
- Which Java statement can cause an exception?

throw

- What happens when we try adding an element to an immutable List?

throws new UnsupportedOperationException(“Immutable List”)

- Does a Java Interface provide a ‘constructor’?

No

- ArrayList implements which Interface?

List <E>

- public interface List <E> extends which Java Interface?

Collection <E>

- What are the key features of an abstract class?

Modified with the keyword "abstract"

Instantiation is not allowed

Cannot create objects directly

- Can an abstract class be instantiated?

No

- Abstract methods can be defined within a class to save implementation efforts. (T or F) **T**
- What are the key issues of implementation when we remove an element from an ArrayList?

should delete previous last element

- What are the key issues of implementation when we add an element from an ArrayList?

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should ensure the capacity of the list so that the element can be added

- remove() is compulsory in Iterator implementation. (T or F) **F**
- How does ArrayList make use of the 'type parameter' in its implementation?

ArrayList<T>

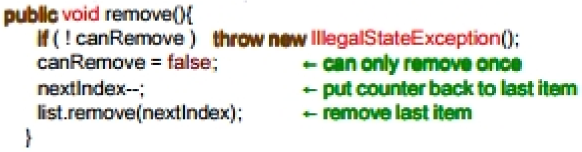
- Which element will be removed by ArrayList.remove()?

The last item

- What does ArrayList.next() check before returning the next element in the list?

whether nextIndex >= list.count or not

- How does ArrayList.remove() ensure only 1 element can be removed after each call to next()?



```
public void remove(){
    if ( ! canRemove )   throw new IllegalStateException();
    canRemove = false;              ← can only remove once
    nextIndex--;                    ← put counter back to last item
    list.remove(nextIndex);         ← remove last item
  }
```

- What can happen if 2 or more Iterators running concurrently under the same ArrayList? Name 2 scenarios.

Iterator 的迭代位置不可预置，因此在同一个 ArrayList 下并发运行时可能会出现迭代混乱的情况。可能会出现想要 remove A 但实际却 remove B 的情况。

- O(log(n)) < O(sqrt(n)) (T or F) **T**
- O(n^n) < O(n!) (T or F) **F**
- O(2^n) < O(n^n) (T or F) **T**
- When analysing the cost of an algorithm, loop usually is the focus. (T or F) **T**
- Which of the following operations is more expensive?
  - Reading a line from a file
  - Reading a line from a user

Reading a line from a user

- Worst case cost analysis is usually more difficult than average cost analysis. (T or F) **F**
- What is the key step in designing a recursive function?

A recursion step is needed to divide the problem into sub-problems

- Every recursive function can be rewritten as an iterative function. (T or F) **T**
- When do you write test cases for "black box" testing? Before or after implementation?

Before

- Explain why array implementations of queue are slow.

Arrays store in contiguous chunk of memory

- Linked list allows data removal by?

changing links

- Define references/pointers.

Pointers/references are an address or a chunk of memory, where data can be stored.

- What is the purpose of garbage collection in memory management?

The garbage collector automatically frees up any memory chunks that no longer have anything pointing/referring to them

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