q) Write a short note on access specifier in Java

Ans Access specifier in Java determine. The acts visibility and accessibility of classes, methods and variables in a program. There are four access specifier in Java..

1) Java Public:-

Description:- The most permissive access level public members are accessible from any other class.

Example:-

```
Public class Example{
  Public int Public variable;
    Public void Public Method(){
}
}
```

2) Protected:-

Description:- Accessible within the same package and Subclass even if they a in different packages.

Example:-

```
class Example{
 Protected int protected variables
  Protected void Protected method,
       // code here.
}
}
```

8) Write in detail about static. Keyword

Ans In Java the static Keyword is used to declare members that belong to the class rather than instance of the class. It can be applied to variables methods, nasted classes and blocks. Here are detailied explanation to how the 'static' Keyword used in various contexts:

1) Static variables:-

- Definations:- variables declared with the static keyword are Known as static variable or class variables.
- scope:- They are shared by all instance of the class and belong to the class rather than individual object.
- Access:- Accessed using The class rather than an instance.

2) Static method:-

- Definition:- Methods declared with the static Keywords static methods.
- Access:- class used the class name rather than an instance. They cannot access non-static members dirctly.
- Example:- commonly used for utility method or operation. That donit on specific instance stat.

7. Explain The terms :- narrowing widening

Ans In Java narrowing and widening refer to type conversion between different data types specifically concerning numeric type.

1) widening :-
Defination :- widening also Known as implicit conversion occurs when a value of a smaller data type is automatically converted to a larger datatype.
Ex :- Converting an 'int' to a 'long' or a float to a double.

2) Automatic :- It happens automatically a there generally no loss of precision because the largest type of can represent the entire range of the source type.

3) Narrowing (Explicit Conversion) :-
Definition :- Narrowing or explicit conversion, occurs when a value of a larger data type is explicity converted a smaller data type.
4 Ex :- Converting 'double' to an int or a float to a short

4) Manual casting :- It require manual interventio through casting and There might be loss of precision if the target type cannot represen

6] Explain above memory management in Java with reference to stack and heap.

Ans In Java memory management in valus the allocation and deallocation of memory for objects during program execution. The memory is divide into two main area the stack and the heap.

i] Stack:-

purpose:- The stack is used for storing local variables and managing invocation.

. size and Allocation :- Memory allocation is automatic and follows a last in first out (LIFO structure each thread has its own stack and the size is usually smaller compared to the heap.

-Data Types:- stores ~~it~~ Primitive data type and reference to objects.

. Lifetime :- short-lived memory is automatically reclimed when the method execution complete

2] Heap:-

- Purpose:- The heap is used for dynamic memory allocation primarily for objects and arr

. size and Allocation:- memory allocation is managed by the Java virtual machine (JVM). The heap size can be adjusted using JVM parameter

. Data Types:- stores objects and arrays objects have a longer lifetime and may exist beyond The scope of a single method.

. Memory leaks:- If reference to objects are not properly managed memory leaks can occur, impacting performace.

- Logical operator:-
functionality:- Perform logical operation on boolean values
- operator:- booleon value
- Return value:- boolean.
- Assignment operator:-
- functionality:- Assign values the variable
- operator:- variable and values.
- Return type:- same as the assign values;
Example:- int x=1;
- Increment & Decrement operation:-
- functionlity:- Inverse or decrease the value of a variable
- operands:- variables
- Return type:- same as the variable type

5. What are the Primitive data type in Java? briefly explain their size range and other details

Ans

		size	range.
1	byte	8 bit	128 to 127
2	short	16 bit	32768 to 37767
3	int	32 bit	2731 to 2731
4	long	64 bit	2^{63} to 2^{63-1}
5	float	32 bit	Single - Precision floating point
6	double	64 bit	double - Precision floating point
7	char	16 bit	omcode character.

· stack :- stores local variables and methods call information for each Threads.
· Method Area :- stores class level data method information and static variables.

6. Execute Engine :-
Consits of the interpriter and the JIT compiler It executes The Java JIT bytecode either by interpreting it or ~~com~~ compiling it to native machine code for improved performance. Thes components works together to provide a platform-independent execute environment for Java Programs.

4. Write in details about different types of operations in Java, category write gouting functionality approach and return type. Given an example statement for each.

Ans Certainly in Java operators can be categorized based on their functionality. Here are same common type.

· Arithmetic operation :-
· functionality :- Perform basic Arithmetic operation.
· operation :- Numeric values.
· Return type :- same as the operands
Example :
int result = 10+5 ; // Addition

· Relational operator :-
· functionality :- compare values and return a boole result.
· operation :- Any primitive data type
· Return value :- boolean.

3. List and Explain the components of Java virtual machine.

Ans The Java virtual machine (JVM) is a components of the Runtime Environment (JRE) are played a central role in executing Java bytecode Here are the main components of the Java virtual machine.

1] Class header:-
Responsible for loading classes needed by the Java program during runtime. It takes the compiled Java classes and makes these available for the JVM.

2] Bytecode verifier:-
Ensure that the bytecode generate by the Java language and specification and does not vilatate security constarint. It helps prevent certain security Vulnerabilites.

3] Interpreter:-
Interpreter the bytecode line by line and executes it while This approach is straight forward. It can be efficient compared other executions methods.

4] Just - In - Time (JIT) compiler:-
Converts the bytecode into native machine code just before execution. This can significantly improve performance or native machine code is typically faster than interpreted byte code.

5] Memory Area:-
- Divided into several sections include heap memory for objects and is shared among all Threads.

1] Simple :-
Java is very easy to learn and its syntax is simple learn and easy to understand.

2] Object oriented :-
Java is an object-oriented programming language Everything in Java is an object
-Basic Concepts of oops are :-
object, class, inheritance, polymorphism, Abstraction, Encapsulation.

3] Portable :-
Java is Portable because it facilities you to carry the Java byte code to any Platform it doesn't require any implementation

4] Platform independent :-
Java is platform independent because it is different from other language like c, c++, etc.

5] Secured :-
Java is best Known for its security with Java we can develop virus free system.

6] Robust :-
Java is robust because it is uses strong memory mangement.

7] High Performance :-
Java is faster then other Traditional interpreted programming language because Java byte code is "close" to native code.

8] Dynamic :-
Java is Dynamic language it means closer are loaded are on demand.

Write a short note on Java Development Kit

Ans The Java Development Kit (JOK) is a software development kit used for Java Programming
It includes tools executable and binaries required for Java application developer
JOK comprises The Java Runtime Environment (JRE) exectial liberies and development tools like compilers and debuggers
Developers are JOK to create compile and rocu Java application
It plays a oracial role in building robust and Platform-independent software making it a fundamental component for Java-developers.
JOK Contains :-
- Java Runtime Environment (JRE)
- An interpreter loader (Java)
- A compiler Java ( )
- An archiver (Jar) and many more

You can use The JOK compiler to convert your Java text file into an executable Program

List and explain The sailent features of Java

The Primary Objective of Java Programming language creation was to make it Portable, simple and secure programming language. The features of Java are also Known as Java buzzwords.

A list of The most important features of the Java language is given below.

3) Default:-

Description:- If no access specfied is specfied The default acess level is package - private members are accessible only with in same package

Example:-

```
class Example {
   int defaultt variables;
     void default Method(){
        // code here
}
}
```