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Answer to the Question No-1

① Polymorphism: Polymorphism refers to the ability of a variable, object or function to take on multiple forms.

② Class and object in java:

☐ Class: A class is user defined blueprint or prototype from which objects are created. It represents the set of properties or methods that are common to all objects of one type. In general, class declarations can include these components, in order:

* Modifiers: A class can be public or has default access.

* class name: The name should be with a initial letter.

* Superclass (if any): The name of the class's parent if any, preceded by the keyword extends. A class can only extend one parent.

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* Interfaces (if any): A comma-separated list of interfaces implemented by the class, if any, preceded by the keyword `implements`. A class can implement more than one interface.

* Body: The class body surrounded by braces, `{}`.

Objects: *** It is a basic unit of object oriented programming and represents the real life entities. A typical Java program creates many objects, which as you know, interact by invoking methods. An object consists of:

* State: It is represented by attributes of an object. It also reflects the properties of an object.

* Behavior: It is represented by methods of an object. It also reflects the response of an object with other objects.

* Identify: It gives a unique name to an object and enables one object to interact with other objects.

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③ Benefits of Object Oriented Programming:

- Through inheritance, we can eliminate redundant code and extend the use of existing classes.
- We can build programs from the standard working modules that communicate with one another, rather than having to start writing the code from scratch. This leads to saving of development time and higher productivity.
- The principle of data binding helps the programmer to build secure programs that cannot be invaded by code in other parts of the program.
- It is possible to map objects in the problem domain to those objects in the program.
- It is possible to have multiple objects to coexist without any interference.
- It is easy to partition the work in a project based on objects.

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- The data-centered design approach enables us to capture more details of a model in an implementable form.
- Objects-oriented systems can be easily upgraded from small to large systems.
- Message passing techniques for communication between objects makes the interface descriptions with external systems much simpler.

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Answer to the Question NO-2

a) Java Applets: An applet is a Java program that can be embedded into a web page. It runs inside the web browser and works at client side. An applet is embedded in an HTML page using the APPLET or OBJECT tag and hosted on a web server.

b) Types of applications that run on Java:

① Desktop GUI Application: Java provides GUI development through various means like Abstract Windowing Toolkit, swing and JavaFX. While AWT contains a number of pre-constructed components such as menu, button, list and numerous third-party components, Swing, a GUI widget toolkit, additionally provides certain advanced components like trees, tables, scroll panes, tabbed panel and lists. JavaFX, a set of graphics and

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media packages, provides Swing interoperability, 3D graphic features and self-contained deployment model which facilitates quick scripting of Java applets and applications.

② Mobile Applications: Java Platform, Micro Edition is a cross-platform framework to build applications that run across all Java supported devices, including feature phones and smart phones. Further, applications for Android, one of the most popular mobile operating systems, are usually scripted in Java using the Android Software Development Kit or other environments.

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③ Embedded Systems: Embedded systems, ranging from tiny chips to specialized computers are components of larger electromechanical systems performing dedicated tasks. Several devices, such as SIM cards, blue-ray disk players, utility meters and televisions, use embedded Java technologies. According to Oracle, 100% of Blu-ray Disc Players and 125 million TV devices employ Java.

④ Web Applications: Java provides support for web applications through Servlets, Struts or JSPS. The easy programming and higher security offered by the programming language has allowed a large number of government applications for health, social security, education and insurance to be based on Java. Java also finds application

④ in development of e-commerce web applications using open-source e-commerce platforms, such as Broadleaf.

⑤ Web Servers and Application Servers: The Java ecosystem today contains multiple Java web servers and applications servers. While Apache Tomcat, simple, Jol, Rimfax web server and project Jigsaw dominate the web server space, WebLogic, WebSphere and JBoss EAP dominate commercial application server space.

⑥ Enterprise Applications: Java Enterprise Edition is a popular platform that provides API and runtime environment for scripting and running enterprise software, including network applications and web-services. Oracle claims Java is running in 97% of enterprise computers. The higher performance guarantee and

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faster computing in Java has resulted in high frequency trading systems like Murex to be scripted in the language. It is also the backbone for a variety of banking applications which have Java running from front user end to back server end. *

② Scientific Applications: Java is the choice of many software developers for writing applications involving scientific calculations and mathematical operators. *

These programs are generally considered to be fast and secure, have a higher degree of portability and low maintenance. Applications like MATLAB use Java both for interacting user interface and as part of the core system. *

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① Multithreading: In Java, Multithreading refers to a process of executing two or more threads simultaneously for maximum utilization of the CPU.

* Advantages of multithreading:

- Improved throughput
- Superior application responsiveness
- Improved server responsiveness
- Minimized system resource usage
- Program structure simplification
- Better communication

* Disadvantages of multithreading:

- Difficulty of writing code.
- Difficulty of debugging
- Difficulty of managing concurrency
- Difficulty of testing
- Difficulty of porting existing code.