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1. What is Java?
    a. A physical machine
    b. A Hardware tool
    c. A platform Independent programming language
    d. A tool that creates another software

**Ans: c. A programming language and a platform**

**Explanation:** As a platform, it provides a runtime environment that enables Java applications to run on various devices and operating systems without modification.

2. Who is the founder of Java?
    a. Dennis Ritchie
    b. James Gosling
    c. Rasmus Lerdorf
    d. Brendan Eich

**Ans: b. James Gosling**

**Explanation:** James Gosling is known as the "father of Java" for his role in creating the Java programming language.

3. What company acquired Java in 2009?
    a. Google
    b. Microsoft
    c. Oracle
    d. IBM

**Ans: c. Oracle**

**Explanation:** Java was originally developed by Sun Microsystems and later acquired by Oracle.

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4. What does WORA stand for in Java?

   a. Write Once, Run Anywhere
   b. Work Once, Run Always
   c. Write Once, Read Anywhere
   d. Work On Repeated Applications

**Ans: a. Write Once, Run Anywhere**

**Explanation:** Java supports platform independence through bytecode and JVM.

5. Which of the following is a key reason to learn Java?

   a. Expensive tools
   b. Only for web apps
   c. Platform dependency
   d. Versatility across platforms

**Ans: d. Versatility across platforms**

**Explanation:** Java is used for desktop, mobile, and web development.

6. What kind of Language is Java?

   a. Procedural
   b. Non-Procedural
   c. Object Oriented
   d. Event Driven

**Ans: c. Object Oriented**

**Explanation:** Java is an object-oriented programming language. It emphasizes objects and classes, promoting concepts like encapsulation, inheritance, and polymorphism.

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7. What is the extension of the Java source file?

   a. .class
   b. .java
   c. .exe
   d. .txt

**Ans: b. .java**

**Explanation:** A Java source file is written with the .java extension. It contains human-readable code. After compilation, it is converted into a .class file containing bytecode.

8. Which of the following is not a Java feature?

   a. Dynamic
   b. Architecture Neutral
   c. Use of pointers
   d. Object-oriented

**Ans: c. Use of pointers**

**Explanation:** Java does not use pointers. Instead, it provides a safer alternative through references. The features of Java include being dynamic, architecture-neutral, and object-oriented.

9. Which of the following options leads to the portability and security of Java?

   a. Bytecode is executed by JVM
   b. The applet makes the Java code secure and portable
   c. Use of exception handling
   d. Dynamic binding between objects

**Ans: a. Bytecode is executed by JVM**

**Explanation:** Bytecode allows Java applications to run on any device or operating system with a compatible JVM, while the JVM provides a layer of security by managing memory and enforcing access controls.

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10. Which feature of Java enables programs to run on any operating system?

a. Object-Oriented
b. Platform-Independent
c. Syntax
d. Memory Management

**Ans: b. Platform-Independent**

**Explanation:** This is achieved through Java's use of bytecode, which can be executed on any platform with a compatible Java Virtual Machine (JVM).

11. The command javac is used to _____.

a. debug a java program
b. compile a java program
c. Interpret a java program
d. Execute a java program

**Ans: b. compile a java program**

**Explanation:** The javac command is used to compile a Java program. It translates the Java source code into bytecode, which can then be executed by the Java Virtual Machine (JVM).

12. Java programs are compiled into _____.

a. Assembly language code
b. Machine code
c. Bytecode
d. Source code

**Ans: c. Bytecode**

**Explanation:** This bytecode is platform-independent and can be executed by the Java Virtual Machine (JVM) on any device or operating system.

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13. In Java, the bytecode is _____.

    a. Platform-independent code
    b. Written by the user
    c. Only for Windows systems
    d. Same as Java source code

**Ans: a. Platform-independent code**

**Explanation:** Bytecode is generated by the Java compiler and can be executed on any system with a JVM, making Java platform-independent.

14. What is the primary purpose of the Java Virtual Machine (JVM)?

    a. To compile Java source code into bytecode.
    b. To interpret Java bytecode into machine code.
    c. To execute Java bytecode on different platforms.
    d. To provide an IDE for Java development.

**Ans: c. To execute Java bytecode on different platforms.**

**Explanation:** This allows Java programs to be platform-independent by running on any system with a compatible JVM.

15. Which component of the JVM is responsible for converting bytecode to machine code?

    a. Class Loader
    b. JIT Compiler
    c. Bytecode Verifier
    d. Interpreter

**Ans: b. JIT Compiler**

**Explanation:** The JIT Compiler in the JVM is responsible for converting bytecode to machine code. This process allows Java programs to run on different platforms.

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16. Which of the following is NOT a component of the JVM?

a. Java Compiler
b. JIT Compiler
c. Bytecode Generator
d. Class Loader

**Ans: c. Bytecode Generator**

**Explanation:** The Bytecode Generator is part of the Java compiler. The Java compiler (javac) compiles Java source code into bytecode.

17. The JVM specification ensures _____.

a. Platform independence for Java programs.
b. Efficient compilation of Java source code.
c. Compatibility with all programming languages.
d. High-level security for Java applications.

**Ans: a. Platform independence for Java programs.**

**Explanation:** This means that Java bytecode can be executed on any platform that has a compatible JVM, allowing Java applications to run on different operating systems without modification.

18. JDK stands for_____.

a. Java Development Kit
b. Java Virtual Machine
c. Java Run-time Environment
d. None of Above

**Ans: a. Java Development Kit**

**Explanation:** Stands for Java Development Kit, providing tools like the Java compiler and debugger for developing Java applications.

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19. What is the primary function of the Java Development Kit (JDK)?

    a. Write and test Java programs

    b. Run Java programs

    c. Change Java to machine code

    d. Read Java code

**Ans: a.Write and test Java programs**

**Explanation:** The JDK gives tools to create, check, and fix Java programs.Supplies essential tools for Java development, such as the compiler for converting code into bytecode and debugging tools for identifying and fixing issues.

20. Which component of the JDK is responsible for compiling Java source code?

    a. JRE (Java Runtime Environment)
    b. JVM (Java Virtual Machine)
    c. javac (Java Compiler)
    d. JDK Compiler

**Ans: c. javac (Java Compiler)**

**Explanation:** The javac (Java Compiler) is responsible for compiling Java source code into bytecode, which is then executed by the JVM. It is a key component of the JDK, converting .java files into .class files.

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21. Which of the following is a component of JVM.

a. Class loader
b. Java Interpreter
c. JIT Compiler
d. All the above

**Ans: d. All the above**

**Explanation:** The components of the Java Virtual Machine (JVM) include the Java Runtime Environment, Java Interpreter, and Just-In-Time (JIT) Compiler.

22. Which statement best describes the Java Virtual Machine (JVM)?

a. A physical machine used to execute Java applications.
b. A software-based machine that executes Java bytecode.
c. A hardware component designed for Java compilation.
d. An integrated development environment for Java programming.

**Ans: b. A software-based machine that executes Java bytecode**

**Explanation:** Best description of the Java Virtual Machine (JVM): The JVM is a software-based machine that executes Java bytecode, allowing Java programs to run on any platform.

23. What does JRE stand for?

a. Java Run-time Kit
b. Java Readable Machine
c. Java Run-time Environment
d. None of Above

**Ans: c. Java Run-time Environment**

**Explanation:** It provides the necessary environment to run Java applications.

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24. Which JDK tool is NOT part of the JRE?

a. javac

b. java

c. javap

d. jar

**Ans: a. Javac**

**Explanation:** javac is a Java compiler used for compiling source code into bytecode and is part of the JDK, not the JRE.

25. What is the primary role of the Just-In-Time (JIT) compiler in Java?

a. Change bytecode to machine code
b. Clean and manage memory
c. Make binary code
d. Run bytecode

**Ans: a. Change bytecode to machine code**

**Explanation:** The JIT compiler's role is to optimize and compile Java bytecode into native machine code, improving runtime performance by converting bytecode into machine code that runs directly on the hardware.

26. The JIT compiler in Java is part of which JVM component?

a. Bytecode Interpreter
b. Class Loader
c. Garbage Collector
d. Execution Engine

**Ans: d. Execution Engine**

**Explanation:** The JIT compiler is part of the Execution Engine, which is responsible for running and optimizing bytecode execution.

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27. When does JIT compilation occur in relation to Java bytecode execution?

a. Before bytecode execution starts.
b. During bytecode interpretation.
c. After bytecode execution completes.
d. Just before JVM initialization.

**Ans: b. During bytecode interpretation.**

**Explanation:** During bytecode interpretation, the JIT compiler optimizes and compiles bytecode into native machine code to improve performance.

28. Which of the following is the correct sequence of steps in the execution of a Java program?

a. Compile→ Load→ Execute
b. Load→ Compile→ Execute
c. Execute→ Load→ Compile
d. Compile → Execute → Load

**Ans: a. Compile→ Load→ Execute**

**Explanation:** Compile → Load → Execute. First, the Java source code is compiled into bytecode, then the bytecode is loaded into the JVM, and finally, it is executed.

29. What is the extension of the Java bytecode file?

a. .class file
b. .java file
c. .exe file
d. .obj file

**Ans: a. .class file**

**Explanation:** The compiler generates a .class file, which contains the bytecode that the JVM can execute.

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30. Which method is the entry point of any Java program?

a. init ()
b. start ()
c. main ()
d. run ()

**Ans: c. main ()**

**Explanation:** The main () method is the entry point where the Java application starts execution.

31. What is the extension of the compiled Java file?

a. .java
b. .exe
c. .class
d. .byte

**Ans: c. .class**

**Explanation:** The bytecode file has a .class extension, which contains the compiled bytecode of a Java program.

32. Which of the following is a benefit of using JIT compilation?

a. Reduced startup time
b. Better runtime performance
c. Simplified source code
d. Lower memory consumption

**Ans: b. Better runtime performance**

**Explanation:** JIT compilation improves performance by converting bytecode to native code during execution, which runs faster than interpreting bytecode.

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33. Which Java feature ensures that the same code works on different OS?

a. Syntax rules
b. JVM
c. Memory size
d. RAM speed

**Ans: b. JVM**

**Explanation:** JVM interprets bytecode on any supported platform.

34. Java code is compiled to which format before execution?

a. Source code
b. Assembly code
c. Bytecode
d. Object code

**Ans: c. Bytecode**

**Explanation:** Java compiler (javac) converts source code to bytecode.

35. Which component directly runs the bytecode?

a. JDK
b. JVM
c. JRE
d. IDE

**Ans: b. JVM**

**Explanation:** JVM executes the platform-independent bytecode.

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36. Java is both _____ and _____.

a. Interpreted and Assembled
b. Compiled and Interpreted
c. Designed and Debugged
d. Linked and Loaded

**Ans: b. Compiled and Interpreted**

**Explanation:** Java is compiled to bytecode and interpreted by JVM.

37. What is the function of the JVM in Java architecture?

a. Design GUIs
b. Store code
c. Execute bytecode
d. Manage databases

**Ans: c. Execute bytecode**

**Explanation:** JVM is responsible for running the compiled bytecode.

38. What is garbage collection in Java?

a. Manual memory cleanup
b. File deletion
c. Automatic memory deallocation
d. JVM installation process

**Ans: c. Automatic memory deallocation**

**Explanation:** JVM handles memory cleanup using garbage collection.

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39. Java programs need which virtual component to run?

a. RAM
b. JVM
c. Compiler
d. CPU

**Ans: b. JVM**

**Explanation:** JVM is necessary to run any Java program.

40. What language is JVM written in?

a. Java
b. Python
c. C/C++
d. Kotlin

**Ans: c. C/C++**

**Explanation:** JVM is written in platform-specific languages like C/C++.

41. What ensures Java is platform independent?

a. Bytecode + JVM
b. High RAM
c. Java syntax
d. Network speed

**Ans: a. Bytecode + JVM**

**Explanation:** Bytecode can run on any platform using the respective JVM.

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42. What is JIT in Java?

a. Java Internal Translator
b. Just-In-Time compiler
c. Java Immediate Tool
d. Java Indexed Translator

**Ans: b. Just-In-Time compiler**

**Explanation:** JIT improves performance by compiling bytecode at runtime.

43. JIT compiler is a part of which Java component?

a. IDE
b. JDK
c. JVM
d. Applet

**Ans: c. JVM**

**Explanation:** JIT resides inside JVM to enhance execution speed.

44. What does JDK include?

a. Only JRE
b. Only JVM
c. JRE + JVM + JIT
d. OS drivers

**Ans: c. JRE + JVM + JIT**

**Explanation:** Installing JDK gives access to all runtime and development tools.

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45. What is the role of javac in Java?

a. Run the code
b. Interpret bytecode
c. Compile source code
d. Optimize RAM

**Ans: c. Compile source code**

**Explanation:** javac compiles .java files into .class files.

46. What does JVM do before running bytecode?

a. Encrypt it
b. Verifies and loads it
c. Deletes it
d. Sends to API

**Ans: b. Verifies and loads it**

**Explanation:** JVM loads and verifies bytecode for secure execution.

47. What ensures security and portability in Java?

a. RAM and OS
b. JVM and Bytecode
c. Main method
d. Static blocks

**Ans: b. JVM and Bytecode**

**Explanation:** JVM executes bytecode, enforcing secure and portable execution.

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48. What is the primary role of the JRE?

a. Develop Java code
b. Run Java programs
c. Compile Java code
d. Design UI

**Ans: b. Run Java programs**

**Explanation:** JRE provides the runtime environment including JVM.

49. Which Java feature means "runs on any OS"?

a. Secure
b. Platform-independent
c. Robust
d. Distributed

**Ans: b. Platform-independent**

**Explanation:** Java runs anywhere using bytecode and JVM.

50. JVM is part of which Java component?

a. JDK
b. Compiler
c. Editor
d. Console

**Ans: a. JDK**

**Explanation:** JDK includes JRE, which includes JVM.

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51. What is the size of one bytecode unit?

a. 2 bytes
b. 1 byte
c. 4 bytes
d. 8 bytes

**Ans: b. 1 byte**

**Explanation:** Bytecode instructions are 1 byte in size.

52. What does Java use instead of manual memory deallocation?

a. Task cleaner
b. Garbage Collector
c. Manual free() call
d. JVM shutdown

**Ans: b. Garbage Collector**

**Explanation:** Garbage Collector handles memory deallocation automatically.

53. What kind of applications can Java create?

a. Standalone Application
b. Web Application
c. Enterprise & Mobile Application
d. Games only

**Ans: c. Enterprise & Mobile Application**

**Explanation:** Java is used to develop a wide range of applications, including desktop, web, enterprise-level, and mobile apps using technologies like Java SE, Java EE, and Android.

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54. Which component of Java executes bytecode?

a. Java Compiler
b. Java Virtual Machine
c. Java Runtime Environment
d. Java Development Kit

**Ans: b. Java Virtual Machine**

**Explanation:** The JVM loads and executes the .class bytecode, making Java programs platform-independent.

55. What does the .class file in Java contain?

a. Source code
b. Compiled bytecode
c. Executable machine code
d. Debug logs

**Ans: b. Compiled bytecode**

**Explanation:** After compiling Java source code with javac, a .class file is generated containing platform-independent bytecode to be run by the JVM.

56. What does "Write Once, Run Anywhere" mean?

a. Works on any device without changes
b. Runs only once
c. Must change for each device
d. Runs only on Windows

**Ans: a. Works on any device without changes**

**Explanation:** Java achieves platform independence through bytecode and the JVM, allowing the same program to run on any operating system with a JVM.

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57. What is meant by "Architectural Neutral" in Java?
    a. Runs only on one computer
    b. Works on any computer
    c. Needs special hardware
    d. Runs only on mobile phones

**Ans: b. Works on any computer**

**Explanation:** "Architectural Neutral" means Java code is compiled into bytecode, which is not tied to any hardware or operating system, so it can run anywhere with a JVM.