Java How to Program - An Objects - Natural Approach 12th edition Deitel Solutions Manual

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Chapter 1, Intro to Computers, the Internet, Java and Generative AI

1.1 Introduction

1.1.1 Which of the following statements is true about Java?
a) Java is one of the newest programming languages in the world
b) Java is one of the world's most popular and senior computer programming languages
c) Java is used only for web development
d) Java is primarily used for database applications
Answer: b

1.1.2 The Java Development Kit (JDK) is used to:
a) Create graphical user interfaces only
b) Develop Android applications only
c) Create and test Java applications
d) Develop software for iOS devices
Answer: c

1.1.3: Which edition of Java is geared toward developing large-scale, distributed networking applications and web-based applications?
a. Java Standard Edition.
b. Java Industrial Edition.
c. Jakarta EE (formerly Java Enterprise Edition).
d. Java Micro Edition.
Answer: c

1.2 Hardware

1.2.1 Computer Organization

1.2.1.1 Which of the following is not a characteristic of secondary storage?
a) It is volatile
b) It has high capacity
c) It is long-term
d) It is less expensive than RAM
Answer: a

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1.2.1.2 Which of the following is NOT considered an input device or input method?
a) Voice commands
b) Keyboard
c) Printer
d) Mouse
Answer: c

1.2.1.3 The "shipping" section of a computer that takes processed information and makes it available outside the computer is the:
a) Output unit
b) Input unit
c) Secondary storage unit
d) Memory unit
Answer: a

1.2.1.4 Which of the following statements is false?
a) Computers can perform calculations and make logical decisions phenomenally faster than human beings can.
b) Supercomputers are already performing thousands of trillions (quadrillions) of instructions per second.
c) Unfortunately, silicon is expensive, so it has made computing more costly.
d) Computers process data under the control of sequences of instructions called computer programs.
Answer: c. Unfortunately, silicon is expensive, so it has made computing more costly. Actually, silicon is inexpensive—it's an ingredient in common sand.

1.2.1.5 A computer consists of various devices referred to as _____ (e.g., the keyboard, screen, mouse, hard disks, memory, DVD drives and processing units).
a) objects
b) software
c) hardware
d) groupware
Answer: c

1.2.1.6 Which of the following is ***not*** one of the six logical units of a computer?
a) Input unit.
b) Output unit.
c) Central processing unit.
d) Printer.
Answer: d

1.2.1.7 Which of the following statements is ***false***?
a) Speaking to your computer is a form of input.
b) Playing a video is an example of output.

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c) A multi-core processor implements several processors on a single integrated-circuit chip.
d) Information in the memory unit is ***persistent***—it is retained when the computer's power is turned off.
Answer: d. Actually the information is ***volatile***—it's lost when power is turned off.

1.2.2 Moore's Law, Multi-Core Processors and Concurrent Programming

1.2.2.1 Which of the following statements about computing power is false?
a) The world's fastest supercomputer can perform over one quintillion calculations per second
b) Quantum computers theoretically operate at about the same speed as conventional computers
c) Some desktop computer today can perform trillions of calculations per second
d) As of November 2024, the USA's El Capitan is the world's fastest supercomputer
Answer: b

1.2.2.2 Which of the following is most closely associated with Moore's Law?
a) Every year or two, the price of computers has approximately doubled.
b) Object-oriented programming uses less memory than previous software-development methodologies.
c) Demand for communications bandwidth is decreasing dramatically each year.
d) Every year or two, the capacities of computers have approximately doubled without any increase in price.
Answer: d

1.3 Data Hierarchies

1.3.1 In a data hierarchy, which of the following is NOT a level of the hierarchy from lowest to highest?
a) Bit
b) Character
c) Algorithm
d) Field
Answer: c

1.3.2 Which of the following statements is ***false***?
a) The impressive functions performed by computers involve only the simplest manipulations of 1s and 2s .
b) ASCII is a popular subset of Unicode.
c) Fields are composed of characters or bytes.
d) On some operating systems, a file is viewed simply as a sequence of bytes.
Answer: a. The impressive functions performed by computers involve only the simplest manipulations of 1s and 2s . It's 1s and 0s.

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1.3.3 Which of the following data items are arranged from the smallest to the largest in the data hierarchy.
a) records, characters, fields, bits, files.
b) bits, files, fields, records, characters.
c) fields, characters, bits, files, records.
d) bits, characters, fields, records, files.
Answer: d. bits, characters, fields, records, files.

1.4 Machine Languages, Assembly Languages and High-Level Languages

1.4.1 Which of the following statements is false about interpreters?
a) They execute high-level language programs directly
b) They avoid compilation delays
c) They typically produce faster-running programs than compilers
d) They translate source code on-the-fly
Answer: c

1.4.2 Which of the following is ***not*** one of the three general types of computer languages?
a) Machine languages.
b) Assembly languages.
c) High-Level languages.
d) Spoken languages.
Answer: d

1.4.3 Which of the following statements is ***true***?
a) Interpreted programs run faster than compiled programs.
b) Compilers translate high-level language programs into machine language programs.
c) Interpreter programs typically use machine language as input.
d) None of the above.
Answer: b

1.5 Operating Systems

1.5.1 Which of the following is NOT a popular mobile device operating system?
a) Android
b) iOS
c) macOS
d) None of the above
Answer: c

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1.5.2 Which of the following statements about Windows is true?
a) It is an open-source operating system
b) It has a 28% market share on desktop and notebook computers (as of February 2025)
c) It is controlled exclusively by Microsoft
d) It was originally built on top of the Linux kernel
Answer: c

1.5.3 Which of the following statements is false?
a. Operating systems are software systems that make using computers more convenient for users, application developers and system administrators.
b. Operating systems provide services that allow each application to execute safely, efficiently and concurrently (i.e., in parallel) with other applications.
c. Popular desktop operating systems include Linux and Windows.
d. Popular mobile operating systems used in smartphones and/or tablets include Google's Android, Apple's iOS and macOS.
Answer: d. Actually, macOS is not a mobile operating system, it's a desktop operating system.

1.5.4 The software that contains the core components of the operating system is the _____.
a. colonel.
b. central processing unit
c. core
d. kernel.
Answer: d

1.5.5 Which of the following statements is ***false***?
a. The concepts of icons, menus and windows were originally developed by Xerox PARC.
b. Windows is an open source operating system.
c. The software that contains the core components of the operating system is called the kernel.
d. Linux source code is available to the public for examination and modification.
Answer: b. Actually, Windows is a proprietary operating system.

1.5.6 Which of the following is ***not*** a key organization in the open-source community?
a. Apache.
b. Mozilla.
c. Firefox.
d. Eclipse.
Answer: c. Firefox (it's a web browser made by the open source organization Mozilla).

1.5.7 Which of the following statements is false?
a. Apple, founded in 1976 by Steve Jobs and Steve Wozniak, quickly became a leader in personal computing.

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b. The Objective-C programming language added capabilities for object-oriented programming (OOP) to the C programming language.
c. Apple's macOS operating system is a descendant of Microsoft Windows.
d. All of the above statements are true.
Answer: c. Actually, Apple's macOS operating system is a actually descendant of NeXT's NeXTSTEP.

1.5.8 Which of the following statements is false?
a. Android is based on the Windows kernel and uses Java.
b. Android is open source and free.
c. Android smartphones include the functionality of a mobile phone, Internet client (for web browsing and Internet communication), MP3 player, gaming console, digital camera and more.
d. All of the above are true.
Answer: a. Actually, Android is based on the Linux kernel.

1.6 Java

1.6.1 Java's new versions are released on a _____ release cadence.
a) three-month
b) six-month
c) annual
d) two-year
Answer: b

1.6.2 What is a JEP in the context of Java?
a) Java Extension Package
b) Java Expansion Program
c) Java Enhancement Proposal
d) Java Execution Plan
Answer: c

1.6.3 Java was originally developed for:
a) Operating systems development.
b) Intelligent consumer devices.
c) Personal computers.
d) Distributed computing.
Answer: b

1.6.4 Which of the following statements about Java Class Libraries is ***false***:
a) Java class libraries consist of classes that consist of methods that perform tasks.
b) Java class libraries are also known as Java APIs (Application Programming Interfaces).

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c) An advantage of using Java class libraries is saving the effort of designing, developing and testing new classes.
c) Java class libraries are ***not*** portable
Answer: d. Actually, Java class libraries are portable.

1.7 C and C++

1.7.1 The C++ programming language:
a) Was developed as a replacement for Java
b) Was developed by Bjarne Stroustrup in 1979
c) Added object-oriented programming capabilities to COBOL
d) Was developed specifically for mobile applications
Answer: b

1.8 Other Popular Programming Languages

1.8.1 Which programming language was developed by Apple in 2014 for developing iOS, macOS and tvOS apps?
a) JavaScript
b) C#
c) Swift
d) Python
Answer: c

1.8.2 TypeScript is a _____ of JavaScript.
a) compiler
b) superset
c) subset
d) copy
Answer: b

1.9 Introduction to Object Orientation

1.9.1 A car's attributes, such as its color and speed, in object-oriented programming would be represented as _____.
a) objects
b) methods
c) interfaces
d) instance variables
Answer: d

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1.9.2 Which of the following statements about classes and objects is false?
a) A class is similar to a car's engineering drawings
b) Methods hide program statements from users
c) Objects can only be instantiated once from a class
d) Classes wrap attributes and methods into objects
Answer: c

1.9.3 _____ models software in terms similar to those that people use to describe real-world objects.
a) Object-oriented programming
b) Object-oriented design
c) Procedural programming
d) None of the above
Answer: b

1.9.4 Which of the following statements is ***true***?
a) Performing a task in a program requires a method.
b) A method houses the program statements that actually perform its tasks.
c) The method hides its statements from its user, just as the accelerator pedal of a car hides from the driver the mechanisms of making the car go faster.
d) All of the above are true.
Answer: d

1.9.5 Which of the following statements is ***false***?
a) Classes are reusable software components.
b) A class is to an object as a blueprint is to a house.
c) Performing a task in a program requires a method.
d) A class is an instance of its object.
Answer: d. Actually, the reverse is true.

1.9.6 Which of the following statements is false?
a) Each class can be used only once to build many objects.
b) Reuse helps you build more reliable and effective systems, because existing classes and components often have undergone extensive testing, debugging and performance tuning.
c) Just as the notion of interchangeable parts was crucial to the Industrial Revolution, reusable classes are crucial to the software revolution that has been spurred by object technology.
d) Avoid reinventing the wheel—use existing high-quality pieces wherever possible. This software reuse is a key benefit of object-oriented programming.
Answer: a. Actually, you can reuse a class many times to build many objects.

1.9.7 Which of the following statements is true?
a) When you drive a car, pressing its gas pedal sends a message to the car to perform a task—that is, to go faster.

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b) You send messages to an object; each message is implemented as a method call that tells a method of the object to perform its task.
c) A program might call a bank-account object's deposit method to increase the account's balance.
d) All of the above statements are true.
Answer: d

1.9.8 Which of the following statements is ***false***?
a) An object's attributes are specified as part of the object's class.
b) A bank-account object would likely have a balance attribute that represents the amount of money in the account.
c) Each bank-account object knows the balance in the account it represents, but not the balances of the other accounts in the bank.
d) Attributes are specified by the class's methods.
Answer: d. Acually, attributes are specified by the class's instance variables.

1.9.9 Which of the following statements is false?
a) Classes (and their objects) encapsulate, i.e., encase, their attributes and methods.
b) A class's (and its object's) attributes and methods are intimately related.
c) For objects to communicate effectively with one another, each must know how the other object is implemented.
d) Information hiding is crucial to good software engineering.
Answer: c. Actually, objects are normally not allowed to know how other objects are implemented—implementation details are hidden within the objects themselves.

1.9.10 A new class of objects can be created conveniently by _____; the new class (called the _____) starts with the characteristics of an existing class (called the _____), possibly customizing them and adding unique characteristicsof its own.
a) inheritance, superclass, subclass.
b) composition, subclass, superclass
c) inheritance, subclass, superclass
d) composition, superclass, subclass
Answer: c

1.9.11 Java supports _____; collections of related methods that typically enable you to tell objects what to do, but not how to do it.
a) classes
b) subclasses
c) superclasses
d) interfaces
Answer: d

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1.9.12 To create the best solutions, you should follow a detailed _____ process for determining your project's _____ (i.e., defining what the system is supposed to do) and developing a _____ that satisfies them (i.e., specifying how the system should do it).
a) design, requirements, analysis
b) analysis, requirements, design
c) requirements, design, analysis
d) analysis, design, set of requirements
Answer: b

1.9.13 _____ is a graphical language that allows people who design software systems to use an industry standard notation to represent them.
a) The Unified Graphical Language
b) The Unified Design Language
c) The Unified Modeling Language
d) None of the above
Answer: c

1.10 Java Application Programming Interface (API) and Open-Source Libraries

1.10.3 Which of the following is NOT typically a building block when developing Java applications?
a) Java API classes, interfaces and methods
b) Open-source Java library classes, interfaces and methods
c) Machine language instructions
d) Classes, interfaces and methods you create
Answer: c

1.11 Typical Java Program Development Environment

1.11.1 Which of the following is NOT a phase in the typical Java program development environment?
a) Editing
b) Compiling
c) Verification
d) None of the above
Answer: d

1.11.2 Errors like division by zero that occur as a program runs are called:
a) compile-time errors
b) execution-time errors

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c) syntax errors
d) None of the above
Answer: b

1.11.3 The `.class` extension on a file means that the file:
a) Contains java source code
b) Contains HTML
c) is produced by the Java compiler (`javac`).
d) None of the above.
Answer: c

1.9 Q2 : The command _____ executes a Java application.
a) `run`
b) `javac`
c) `java`
d) None of the above
Answer: c

1.13 Internet, World Wide Web, the Cloud and IoT

1.13.1 The World Wide Web was developed by:
a) Tim Berners-Lee
b) Bill Gates
c) Steve Jobs
d) Elon Musk
Answer: a

1.13.2 The protocol that ensured messages were properly delivered from sender to receiver on the ARPANET was:
a) TCP
b) HTTP
c) FTP
d) SMTP
Answer: a

1.13.3 The World Wide Web is:
a) The same as the Internet
b) A hardware component of the Internet
c) A collection of hardware and software that allows computer users to view hyperlinked documents
d) A proprietary technology owned by Microsoft
Answer: c

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1.13.4 Edge computing refers to:
a) Processing data within centralized data centers
b) Data processing, analysis and storage on or close to the devices producing the data
c) Using quantum computers for data processing
d) Offshore data processing in remote locations
Answer: b

1.13.5 Which of the following best describes mashups?
a) Applications that combine complementary web services and information feeds
b) Web servers that host multiple websites
c) IoT devices connected to the cloud
d) Devices that can connect to multiple networks simultaneously
Answer: a

1.14 Metaverse

1.14.1 According to Gartner, the Metaverse is defined as:
a) A social media platform for virtual interactions
b) The collective virtual shared space created by the convergence of virtually enhanced physical and digital reality
c) A blockchain-based cryptocurrency platform
d) A new operating system for virtual reality devices
Answer: b

1.14.2 Augmented reality:
a) Completely replaces the real world with a simulated environment
b) Projects computer-generated content onto what is seen in the real world
c) Can only be experienced using specialized headsets
d) Is used exclusively for gaming applications
Answer: b

1.14.3 Mixed reality differs from augmented reality in that it:
a) Operates without any hardware
b) Requires no internet connection
c) Enables users to interact with virtual objects projected into the real world
d) Can only be used indoors
Answer: c

1.14.4 Which of the following is NOT a key feature of Ethereum?
a) It's a programmable blockchain platform
b) It uses smart contracts

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c) Its native cryptocurrency is Ether
d) It's government-regulated and controlled
Answer: d

1.14.5 Web3 is best described as:
a) The decentralized Internet built on distributed technologies like blockchain
b) A specific web browser developed by blockchain companies
c) A social media platform based on virtual reality
d) None of the above
Answer: a

1.15 Software Development Technologies

1.15.1 Which of the following best describes refactoring?
a) Completely rewriting software from scratch
b) Reworking programs to make them clearer and easier to maintain while preserving functionality
c) Testing software for bugs and security vulnerabilities
d) None of the above
Answer: b

1.15.2 Microservices architecture is one where:
a) Applications are built as a single, monolithic unit
b) Only small applications can be developed
c) Applications are built from many small, independent services that work together
d) Applications are limited to using minimal computing resources
Answer: c

1.15.3 _____ involves reworking programs to make them clearer and easier to maintain while preserving their correctness and functionality.
a) Object-oriented programming
a) Refactoring
a) Agile software development
a) None of the above
Answer: b

1.16 Data Analytics and Data Science

1.16.1 The distinction between data analytics and data science is that:
a) They are completely unrelated fields
b) Data analytics focuses on understanding past data, while data science focuses on predicting future outcomes

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c) Data science is always quantitative while data analytics is always qualitative
d) Data analytics requires programming skills while data science does not
Answer: b

1.17 How Big Is Big Data?

1.17.1 Which of the following statements a), b) or c) is false?
a) One megabyte (MB) is exactly one million bytes.
b) One gigabyte (GB) is exactly 1024 megabytes.
c) One terabyte (TB) is exactly 1024 x 1024 megabytes.
d) All of the above statements are true.
Answer: a. Actually, one megabyte is exactly 1024 x 1024 bytes.

1.17.2 The high energy consumption associated with using Bitcoin cryptocurrency comes from the process Bitcoin _____ use to prove that transaction data is valid.
a) collectors
b) aggregators
c) miners
d) None of the above.
Answer: c

1.18 AI—at the Intersection of Computer Science and Data Science

1.18.1 The term "AI" was coined by:
a) Alan Turing
b) John McCarthy
c) James Gosling
d) Tim Berners-Lee
Answer: b

1.18.2 Which of the following is NOT an example of AI-based systems mentioned in the chapter?
a) Computer vision
b) Speech recognition
c) Dial-up internet
d) Self-driving cars
Answer: c

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1.18.3 Deep learning involves:
a) Building artificial neural networks with multiple layers
b) Only using supervised learning techniques
c) Programming computers with specific rules for each decision
d) Learning exclusively from small datasets
Answer: a

1.18.4 The ultimate goal of the field of AI is _____.
a) large language models
b) chatbots like ChatGPT
c) generative AI
d) artificial general intelligence
Answer: d

1.18.5 Which of the following statements is false?
a) AI has been a field with problems and no solutions. That's because once a particular problem is solved, people say, "Well, that's not intelligence; it's just a computer program that tells the computer exactly what to do."
b) AI-based systems now permeate our daily lives. Examples include, computer vision, speech recognition, natural language translation and self-driving cars.
c) With AI techniques like machine learning and deep learning, we pre-program solutions to specific problems.
d) Many of the most interesting and challenging AI problems are being pursued with deep learning.
Answer: c) is false. We're having computers solve problems by learning from data.

1.18.6 Which of the following statements is false?
a) Deep learning is a subset of machine learning that involves building artificial neural networks, which use "algorithms inspired by the structure and function of the brain."
b) The term "deep" comes from the deep insights required to understand such complex networks.
c) The network learns more from its training data as it proceeds through the network layers.
(d) The availability of big data, significant processor power, faster Internet speeds and advancements in parallel computing hardware and software are making it possible for more organizations and individuals to pursue resource-intensive deep-learning solutions that are producing impressive results in computer vision, speech recognition, speech synthesis and newer generative AI applications.
Answer: b) is false. The term "deep" comes from the number of software "layers" in an artificial neural network—the more layers, the deeper the network.

1.18.7 Which of the following statements a), b) or c) about reinforcement learning is false?
a) It's a subset of machine learning in which algorithms learn from their environment, like how humans learn—for example, a video game enthusiast learning a new game or a baby learning to walk or recognize its parents.

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b) The algorithm implements an agent that learns by trying to perform a task, receiving feedback about success or failure, adjusting then trying again.
c) The agent receives a positive reward for doing a right thing and a negative reward (that is, a punishment) for doing a wrong thing. The agent uses this information to determine the next action to perform and must try to maximize the reward.
d) All of the above statements are true.
Answer: d.

1.19 Generative AI

1.19.1 Which of the following is NOT a capability of generative AI mentioned in the chapter?
a) Creating original images from text descriptions
b) Generating code
c) Writing essays and stories
d) All of the above are generative AI capabilities
Answer: d

1.19.2 Which of the following statements about generative AI is false?
a) Generative AI describes algorithms that can generate new content—including text, images, audio and video—based on prompts provided by a user as input.
b) OpenAI's ChatGPT is an AI-based chatbot you can converse with using natural language. ChatGPT responds to queries with answers that look and feel as if they were generated by a human.
c) ChatGPT is based on a large language model named GPT (Generative Pre-Trained Transformer), which was trained on massive amounts of text using several artificial intelligence techniques.
d) Powerful, large-language-model apps like ChatGPT and Google's Bard sometimes produce incorrect results generally referred to as "dreams," so you should verify the information that tools like these provide.
Answer: d) is false. The incorrect results are generally referred to as "hallucinations."

1.19.3 Which of the following statements a), b) or c) is false?
a) When you converse with ChatGPT and similar tools, it may seem like you're chatting with another person.
b) In 1950, Alan Turing proposed the imitation game—now known as the Turing test—as a way to determine whether a computer exhibits intelligent behavior. In this test, three computer terminals would be hidden from one another, with two people operating terminals via text-based inputs and the third being computer-operated. One person would ask text-based questions that would be sent to the other two terminals. The second person and the computer would send text responses. If the person asking the questions could not determine whether the answers came from the other person or the computer, then the computer would be considered to have exhibited intelligent behavior.

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c) OpenAI's Dall-E 2 is a generative AI for creating images from natural-language text prompts such as, "Generate an image of a golden retriever dog in the style of Claude Monet.".
d) All of the above statements are true.
Answer: d

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