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1.1 Q1: Which of the following statements is *true*?
a. Hardware controls software.
b. Software controls hardware.
c. C is an object-oriented programming language.
d. Both (b) and (c) are *true*.
ANS: b.

1.1 Q2: Which of the following statements a), b) or c) is *false*?
a. Decades ago, most computer applications ran on networked computers.
b. Today's applications can be written with the aim of communicating among the world's computers via the Internet.
c. A key intersection between computer science and data science is artificial intelligence.
d. All of the above statements are *true*.
ANS: a. Decades ago, most computer applications ran on networked computers. Actually, decades ago, most computer applications ran on "standalone" computers (that is, *not* networked together).

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1.2 Q1: Which of the following statements is *false*?
a. Computers can perform calculations and make logical decisions phenomenally faster than human beings can.
b. Computers process data under the control of sequences of instructions called computer programs (or simply programs).
c. A computer consists of various physical devices referred to as hardware (such as the keyboard, screen, mouse, solid-state disks, hard disks, memory,
d. Computing costs are rising dramatically, due to the increasing complexity of hardware and software technologies.
ANS: d. Actually, computing costs are *dropping* dramatically, due to rapid developments in hardware and software technologies.

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1.2 Q2: Every year or two, the capacities of computers have approximately doubled inexpensively. This remarkable trend often is called _____.
a. the law of large numbers
b. the principal of least privilege
c. Moore's law
d. Wirth's law
ANS: c.

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1.2 Q3: Which logical unit of the computer is the receiving section?
a. input unit
b. output unit
c. memory unit
d. central processing unit.
ANS: a.

1.2 Q4: Information in the memory unit is _____. It's typically lost when the computer's power is turned off.
a. persistent
b. constant
c. sticky
d. volatile
ANS: d.

1.2 Q5: A gigabyte is approximately one _____ bytes.
a. thousand
b. million
c. billion
d. trillion.
ANS: c.

1.2 Q6: The arithmetic and logic unit contains the _____ mechanisms that allow the computer, for example, to compare two items from the memory unit to determine whether they're equal.
a. decision
b. calculation
c. addition
d. None of the above.
ANS: a.

1.2 Q7: Information on secondary storage devices is _____ — it's preserved even when the computer's power is turned off.
a. volatile
b. unstable
c. transient
d. persistent
ANS: d.

1.2 Q8: Secondary storage information takes much _____ to access than information in primary memory, but its cost per unit is much _____.
a. less time, less
b. longer, less

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c. less time, more
d. longer, more
ANS: b.

Error! Reference source not found.
1.3 Q1: A(n) _____ is the smallest data item in a computer. It can have the value **0** or **1**.
a. bit
b. byte
c. field
d. record
ANS: a.

1.3 Q2: Which of the following statements a), b) or c) is *false*?
a. A computer's character set represents every character as a pattern of 1s and 0s.
b. All Unicode® characters are composed of four bytes (32 bits).
c. Unicode contains characters for many of the world's languages.
d. All of the above statements are true.
ANS: b. Actually, Unicode® characters are composed of one, two, three or four bytes (8, 16, 24 or 32 bits, respectively).

1.3 Q3: The most popular database model is the _____ database, in which data is stored in simple tables.
a. network
b. graph
c. relational
d. hierarchical
ANS: c.

1.3 Q4: Which one of the following statements is *true*?
a. a terabyte is larger than a petabyte.
b. a kilobyte is exactly 1000 bytes.
c. a gigabyte is 1024 megabytes.
d. an exabyte is 1024 zettabytes.
ANS: c.

Error! Reference source not found.
1.4 Q1: Which of the following statements a), b) or c) is *false*?
a. Any computer can directly understand only its own machine language, defined by its hardware design.
b. Translator programs called assemblers convert assembly-language programs

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to machine language at computer speeds.
c. Interpreter programs, developed to execute high-level language programs directly, avoid the delay of compilation, and run faster than compiled programs.
d) All of the above statements are *true*.
ANS: c. Actually, interpreter programs run *slower* than compiled programs.

1.4 Q2: Which of the following statements is false?
a. With the advent of assembly languages, computer usage increased rapidly, but programmers still had to use numerous instructions to accomplish even the simplest tasks.
b. To speed the programming process, high-level languages were developed in which single statements could be written to accomplish substantial tasks.
c. Translator programs called assemblers convert high-level-language source code into machine language.
d. High-level languages instructions look almost like every-day English and contain commonly used mathematical notations.
ANS: c. Actually, those translator programs are compilers. Assemblers convert assembly language programs into machine language.

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1.5 Q1: Windows is a(n) _____ operating system—it's controlled by Microsoft exclusively.
a. proprietary
b. private
c. open source
d. None of the above.
ANS: a.

1.5 Q2: _____ is by far the world's most widely used desktop operating system.
a. Linux
b. MacOS
c. Windows
d. none of the above
ANS: c.

1.5 Q3: With _____ software development, individuals and companies contribute their efforts in developing, maintaining and evolving software in exchange for the right to use that software for their own purposes, typically at no charge.
a. object-oriented
b. high-level
c. open-source

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d. proprietary
ANS: c.

1.5 Q4: Which of the following organizations has millions of open-source projects under development?
a. Python Software Foundation
b. GitHub
c. The Apache Software Foundation
d. The Eclipse Foundation
ANS: b.

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1.6 Q1: Which of the following languages was an ancestor of C?
a. A
b. A+
c. B
d. B+
ANS: c.

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1.7 Q1: Which of the following are sources of building blocks that you'll use to build your C programs?
a. Functions from the C standard library.
b. Functions you create yourself.
c. Functions from open-source C libraries.
d. All of the above.
ANS: d.

1.7 Q2: Which of the following are true regarding why standard library functions can be more efficient?
a. They save programming time.
b. They are carefully written to perform optimally.
c. They increase program portability.
d. All of the above.
ANS: d.

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1.8 Q1: C++ was developed by _____.
a. Bjarne Stroustrup
b. Ada Lovelace
c. Blaise Pascal
d. Ken Thompson

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ANS: a.

1.8 Q2: Which language was developed by Microsoft for integrating the Internet and the web into computer applications?
a. Objective-C.
b. Java.
c. PHP.
d. C#.
ANS: d.

1.8 Q3: Java was developed by _____.
a. Sun Microsystems
b. Bell Labs
c. IBM
d. ANSI/ISO
ANS: a.

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1.9 Q1: The *compile* stage is when _____.
a. the object code is linked with code for functions in other files
b. the C program is translated into machine language code
c. the program is executed one instruction at a time
d. the program is placed in memory
ANS: b.

1.9 Q2: The linker creates _____.
a. an executable image
b. a preprocessor directive
c. object code
d. an input stream
ANS: a.

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No questions.

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1.11 Q1: Which of the following statements about the ARPANET and the Internet is *false*?
a. The ARPANET was the precursor to today's Internet.
b. Today's fastest Internet speeds are on the order of millions of bits per second with billion-bits-per-second (gigabit) speeds already being tested.
c. Although the ARPANET enabled researchers to network their computers, its main benefit proved to be the capability for quick and easy communication via

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what came to be known as electronic mail (e-mail).
d. The protocol (set of rules) for communicating over the ARPANET became known as the Transmission Control Protocol (TCP). TCP ensured that messages, consisting of sequentially numbered pieces called packets, were properly delivered from sender to receiver, arrived intact and were assembled in the correct order.
ANS: b. Actually, today's fastest Internet speeds are on the order of *billions* of bits per second with *trillion*-bits-per-second (terabit) speeds already being tested.

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1.11 Q2: Which of the following statements about the Internet is *false*?
a. One challenge was to enable different networks to communicate with each other. ARPA accomplished this by developing the Internet Protocol (IP), which created a true "network of networks," the current architecture of the Internet.
b. The combined set of Internet protocols is now called TCP/IP.
c. Each Internet-connected- device has a TCP address—a unique numerical identifier used by devices communicating via TCP/IP to locate one another on the Internet.
d. Bandwidth—the information-carrying capacity of communications lines—on the Internet has increased tremendously, while hardware costs have plummeted.
ANS: c. Each Internet-connected- device has a TCP address—a unique numerical identifier used by devices communicating via TCP/IP to locate one another on the Internet. Actually, each Internet-connected device has an IP address—a unique numerical identifier used by devices communicating via TCP/IP to locate one another on the Internet.

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1.11 Q3: Which of the following statements is *false*?
a. The World Wide Web is a collection of hardware and software associated with the Internet that allows computer users to locate and view documents (with various combinations of text, graphics, animations, audios and videos) on almost any subject.
b. In 1989, Tim Berners-Lee of CERN (the European Organization for Nuclear Research) began developing HyperText Markup Language (HTML)—the technology for sharing information via "hyperlinked" text documents.
c. Berners-Lee also wrote communication protocols such as JavaScript Object Notation (JSON) to form the backbone of his new hypertext information system, which he referred to as the World Wide Web.
d. In 1994, Berners-Lee founded the World Wide Web Consortium (W3C), devoted to developing web technologies.

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ANS: c. Actually, in 1989, Tim Berners-Lee of CERN (the European Organization for Nuclear Research) began developing HyperText Markup Language (HTML)—the technology for sharing information via "hyperlinked" text documents.

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1.11 Q4: The applications-development methodology of _____ enables you to rapidly develop powerful software applications by combining (often free) complementary web services and other forms of information feeds.
a. cloud computing
b. design patterns
c. proprietary computing
d. mashups
ANS: d.

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1.11 Q5: The Internet is no longer just a network of computers—it's an Internet of Things. A thing is any object with which of the following?
a. an IP address
b. the ability to send data over the Internet
c. in some cases, the ability to receive data over the Internet
d. Things can have all of the above.
ANS: **d.**

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1.12 Q1: Reworking programs to make them clearer and easier to maintain while preserving their correctness and functionality is called _____.
a. refactoring
b. design patterns
c. editing
d. None of the above.
ANS: a.

1.12 Q2: Proven architectures for constructing flexible and maintainable object-oriented software are called _____.
a. refactored architectures
b. software blueprints
c. engineered architectures
d. design patterns
ANS: d.

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1.13 Q1: Which of the following statements about big data is *false*?
a. For computer scientists and data scientists, data is now as important as writing programs.
b. One megabyte is exactly one million (1,000,000) bytes.
c. A March 2016 AnalyticsWeek article stated that by there would be over 50 billion devices connected to the Internet (most of them through the Internet of Things), and by 2020 there would be 1.7 megabytes of new data every second for every person on the planet.
d. The speed at which quantum computers now under development could operate at is so extraordinary that in one second, a quantum computer theoretically could do staggeringly more calculations than the total that have been done by all computers since the world's first computer appeared.
ANS: b. Actually, one megabyte is exactly 2^{20} = 1024 x 1024 = 1,048,576 bytes.

1.13 Q2: Which of the following statements about energy consumption is false?
a. According to a recent article, energy use for processing data in 2015 was growing at 20% per year and consuming approximately three to five percent of the world's power.
b. Another enormous electricity consumer is the blockchain-based cryptocurrency Bitcoin—processing just one Bitcoin transaction uses approximately the same amount of energy as powering the average American home for a year.
c. The energy use comes from the process Bitcoin "miners" use to prove that transaction data is valid.
d. Together, Bitcoin and Ethereum (another popular blockchain-based platform and cryptocurrency) consume more energy per year than Finland, Belgium or Pakistan.
ANS: b. Actually, processing just one Bitcoin transaction uses approximately the same amount of energy as powering the average American home for a *week*.

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1.13 Q3: Which of the following "V's of big data" is described by "the validity of the data—is it complete and accurate? Can we trust that data when making crucial decisions? Is it real?
a. Volume
b. Velocity
c. Variety
d. Veracity
ANS: d.

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No questions.

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1.14 Q1: Once Waze converts a spoken command to text, it must determine the correct action to perform, which requires:
a. JSON
b. speech recognition
c. natural language processing
d. speech synthesis
ANS: c.

1.14 Q2: Each of the following statements about a typical mobile social navigation app is *true* **and** most captures the essence of the application?
a. The app processes massive amounts of crowdsourced data—that is, the data that's continuously supplied by users through their mobile GPS-based devices worldwide.
b. The app uses speech synthesis to speak driving directions and alerts to you, and speech recognition to understand your spoken commands.
c. The app uses your phone as a streaming Internet of Things (IoT) device. Each phone is a GPS sensor that continuously streams data over the Internet to the app.
d. The app probably stores its routing information in a graph database. Such databases can efficiently calculate shortest routes.
ANS: a.

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1.15 Q1: What is the "ultimate goal" of the field of artificial intelligence?
a. Computers learning from massive amounts of data.
b. Computer vision.
c. Self-driving cars.
d. Artificial general intelligence—computers that perform intelligence tasks as well as humans.
ANS: d.

1.15 Q2: Which of the following statements about AI is *false*?
a. For many decades, AI has been a field with solutions and no problems.
b. Google's AlphaZero is a game-playing AI that teaches itself to play games.
c. In a 1997 match between IBM's DeepBlue computer system and chess Grandmaster Gary Kasparov, DeepBlue became the first computer to beat a reigning world chess champion under tournament conditions.
d. After training- itself in Go for just eight hours, AlphaZero was able to play Go

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vs. its AlphaGo predecessor, winning 60 of 100 games.
ANS: a. Actually, for many decades, AI has been a field with *problems and no solutions*.

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