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| 1. The evolution of computer science began before the development of the first computer system.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 3 |
| *QUESTION TYPE:* | True / False |
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| 2. At its most basic level, computer science is the study of algorithms.

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| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 6 |
| *QUESTION TYPE:* | True / False |
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| 3. Computer science is the study of how to write computer programs.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 3–4 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
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| 4. Algorithms are exclusive to the field of computer science.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 7 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
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| 5. All conceivable problems can be solved algorithmically.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 11 |
| *QUESTION TYPE:* | True / False |
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| 6. Algorithms usually contain a set of instructions to be executed in a specific order.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 12 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
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| 7. When an operation is unambiguous, we call it a primitive operation, or simply a primitive of the computing agent carrying out the algorithm.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 13–14 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.3.1 |
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| 8. Mechanical devices for performing complex calculations existed prior to the twentieth century.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 18–19 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.1 |
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| 9. The Pascaline and Leibnitz’s Wheel are examples of early computers.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 22 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.1 |
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| 10. The first electronic programmable computer, ENIAC, was completed just after World War II.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 25 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.2 |
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| 11. According to Norman Gibbs’s and Allen Tucker’s definition of computer science, the central concept in computer science is the compiler. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| *ANSWER:* | False - algorithm |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 6 |
| *QUESTION TYPE:* | Modified True / False |
| *HAS VARIABLES:* | False |
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| 12. The statement “If the mixture is too dry, then add one-half cup of water to the bowl” is an example of a(n) iterative operation. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| *ANSWER:* | False - conditional |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 7 |
| *QUESTION TYPE:* | Modified True / False |
| *HAS VARIABLES:* | False |
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| 13. The discovery by Gödel places a limit on the capabilities of computers and computer scientists. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 11 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.2 |
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| 14. The Analytical Engine was the first computing device to use the base-2 binary numbering system. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| *ANSWER:* | False - Mark I, Harvard Mark I |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 25 |
| *QUESTION TYPE:* | Modified True / False |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.2 |
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| 15. FORTRAN and COBOL, the first high-level (English-like) programming languages, appeared during the first generation of computing. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| *ANSWER:* | False - second |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Complex |
| *REFERENCES:* | 30 |
| *QUESTION TYPE:* | Modified True / False |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.3 |
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| 16. The three types of operations used to construct algorithms are sequential, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and iterative.

|  |  |
| --- | --- |
| *ANSWER:* | conditional |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 7 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.2 |
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| 17. One of the most fundamentally important virtues of a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is that if we can specify one to solve a problem, then we can automate the solution.

|  |  |
| --- | --- |
| *ANSWER:* | algorithm |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 10 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.2 |
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| 18. Unlike the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Leibniz’s Wheel could carry out addition, subtraction, multiplication, and division.

|  |  |
| --- | --- |
| *ANSWER:* | Pascaline |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 22 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.3.2 |
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| 19. Charles Babbage gave up on his second \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because the current technology could not support his project.

|  |  |
| --- | --- |
| *ANSWER:* | Difference Engine |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 21 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.1 |
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| 20. Ultra-large-scale integrated circuits are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-generation innovation in computing.

|  |  |
| --- | --- |
| *ANSWER:* | fifth |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 33 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.3 |
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| 21. In \_\_\_\_ computer science, researchers study the logical and mathematical properties of problems and their solutions.

|  |  |  |
| --- | --- | --- |
|   | a.  | theoretical |
|   | b.  | scientific |
|   | c.  | practical |
|   | d.  | logical |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 5 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.1 |
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| 22. In computer science, it is not simply the construction of a high-quality \_\_\_\_\_\_\_\_\_\_ that is important but also the methods it embodies.

|  |  |  |
| --- | --- | --- |
|   | a.  | processor |
|   | b.  | program |
|   | c.  | memory module |
|   | d.  | storage device |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 4 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 23. Designing programming languages and translating algorithms into these languages is known as \_\_\_\_ realization.

|  |  |  |
| --- | --- | --- |
|   | a.  | programming language |
|   | b.  | compiler |
|   | c.  | linguistic |
|   | d.  | interpreter |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 6 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 24. \_\_\_\_\_\_ operations are the “looping” instructions of an algorithm.

|  |  |  |
| --- | --- | --- |
|   | a.  | Sequential |
|   | b.  | Looping |
|   | c.  | Iterative |
|   | d.  | Hierarchal |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 6 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 25. In computer science terminology, the machine, robot, person, or thing carrying out the steps of the algorithm is called a(n) \_\_\_\_.

|  |  |  |
| --- | --- | --- |
|   | a.  | computing agent |
|   | b.  | algorithmic agent |
|   | c.  | computing representative |
|   | d.  | algorithmic representative |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 10 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 26. An algorithm may be too \_\_\_\_ to be of any use.

|  |  |  |
| --- | --- | --- |
|   | a.  | difficult to read |
|   | b.  | inefficient |
|   | c.  | difficult to create |
|   | d.  | offensive |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 11 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.2 |
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| 27. An algorithm is a \_\_\_\_ collection of unambiguous and effectively computable operations that, when executed, produces a result and halts in a finite amount of time.

|  |  |  |
| --- | --- | --- |
|   | a.  | sequential |
|   | b.  | computing agent |
|   | c.  | mechanical calculator |
|   | d.  | well-ordered |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 11 |
| *QUESTION TYPE:* | Multiple Choice |
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| 28. An operation that is \_\_\_\_ is called a primitive operation of the computing agent carrying out the algorithm.

|  |  |  |
| --- | --- | --- |
|   | a.  | primary |
|   | b.  | complementary |
|   | c.  | basic |
|   | d.  | unambiguous |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 14 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.3.1 |
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| 29. What is wrong with the following algorithm?1.  Set X to be 12.  Increment X3.  Print X4.  If X > 0, repeat from 2

|  |  |  |
| --- | --- | --- |
|   | a.  | It does not produce a result. |
|   | b.  | It is ambiguous. |
|   | c.  | It does not halt in a finite amount of time. |
|   | d.  | It is not well ordered. |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 15 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 30. The \_\_\_\_ revolution enabled us to implement algorithms that automated the drudgery of repetitive mental tasks.

|  |  |  |
| --- | --- | --- |
|   | a.  | industrial |
|   | b.  | technological |
|   | c.  | computer |
|   | d.  | designer |

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| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 17 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 31. The history of \_\_\_\_ begins 3,000 years ago.

|  |  |  |
| --- | --- | --- |
|   | a.  | computer science |
|   | b.  | logarithms |
|   | c.  | the Pascaline |
|   | d.  | mathematics |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 18 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.1 |
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| 32. In 1672, a French philosopher and mathematician designed and built one of the first mechanical calculators named the \_\_\_\_ that could do addition and subtraction.

|  |  |  |
| --- | --- | --- |
|   | a.  | Pascaline |
|   | b.  | Leibniz Wheel |
|   | c.  | Abacus |
|   | d.  | TI-85 |

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| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 19 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 33. The first slide rule appeared around \_\_\_\_.

|  |  |  |
| --- | --- | --- |
|   | a.  | 1183 |
|   | b.  | 1622 |
|   | c.  | 1882 |
|   | d.  | 1945 |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 19 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 34. In 1614, John Napier invented \_\_\_\_ as a way to simplify difficult mathematical computations.

|  |  |  |
| --- | --- | --- |
|   | a.  | algorithms |
|   | b.  | logarithms |
|   | c.  | electronic computers |
|   | d.  | mechanical calculators |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 19 |
| *QUESTION TYPE:* | Multiple Choice |
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| 35. Jacquard’s Loom was considered the first “computing device” because it was \_\_\_\_ and had memory where information was stored in a machine-readable form.

|  |  |  |
| --- | --- | --- |
|   | a.  | compact |
|   | b.  | electric |
|   | c.  | mathematically efficient |
|   | d.  | programmable |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 20 |
| *QUESTION TYPE:* | Multiple Choice |
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| 36. In Babbage’s Analytical Engine, a mill was most like the \_\_\_\_ of modern-day computers.

|  |  |  |
| --- | --- | --- |
|   | a.  | RAM |
|   | b.  | processor |
|   | c.  | logic unit |
|   | d.  | input/output |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 22 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 37. The \_\_\_\_ was the first fully electronic, general-purpose, programmable computer.

|  |  |  |
| --- | --- | --- |
|   | a.  | EDVAC |
|   | b.  | EDSAC |
|   | c.  | ENIAC |
|   | d.  | Mark I |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 25 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 38. John Von Neumann’s stored program computer lay the groundwork for modern-day computing by allowing the computer to store instructions in \_\_\_\_ alongside the data.

|  |  |  |
| --- | --- | --- |
|   | a.  | binary values |
|   | b.  | external displays |
|   | c.  | vacuum tubes |
|   | d.  | data cylinders |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Complex |
| *REFERENCES:* | 27 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 39. Integrated circuits, built on silicon chips, were introduced during the \_\_\_\_ generation of computing.

|  |  |  |
| --- | --- | --- |
|   | a.  | first |
|   | b.  | second |
|   | c.  | third |
|   | d.  | fourth |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 29 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.3 |
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| 40. During the \_\_\_\_ generation of computing, the desktop machine shrunk to the size of a typewriter.

|  |  |  |
| --- | --- | --- |
|   | a.  | second |
|   | b.  | third |
|   | c.  | fourth |
|   | d.  | fifth |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Moderate |
| *REFERENCES:* | 29 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *OTHER:* | 1.4.3 |
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| 41. Briefly respond to the observation that every problem can be solved algorithmically, and discuss the implications of your response.

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| *ANSWER:* | While it might seem that every problem can be solved algorithmically, in the early 1930s the German logician Kurt Gödel proved that there are problems for which no generalized algorithmic solution can possibly exist. No matter how much time and effort is put into obtaining a solution to these problems, they are unsolvable and no solution will ever be found. This discovery, which staggered the mathematical world, effectively places a limit on the ultimate capabilities of computers and computer scientists. |
| *POINTS:* | 1 |
| *REFERENCES:* | 10 |
| *QUESTION TYPE:* | Essay |
| *HAS VARIABLES:* | False |
| *TOPICS:* | Critical Thinking |
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| 42. Explain the term “unambiguous operation.”

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| *ANSWER:* | An **unambiguous operation** is one that can be understood and carried out directly by the computing agent without further simplification or explanation. |
| *POINTS:* | 1 |
| *REFERENCES:* | 14 |
| *QUESTION TYPE:* | Essay |
| *HAS VARIABLES:* | False |
| *TOPICS:* | Critical Thinking |
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| 43. What was the major change brought about by the second generation of computing?

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| *ANSWER:* | In the late 1950s, the bulky vacuum tube of the first generation of computers was replaced by a single transistor only a few millimeters in size, and memory was now constructed using tiny magnetic cores only 1/50th of an inch in diameter, drastically changing the size and complexity of computers. |
| *POINTS:* | 1 |
| *REFERENCES:* | 29 |
| *QUESTION TYPE:* | Essay |
| *HAS VARIABLES:* | False |
| *TOPICS:* | Critical Thinking |
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| 44. What were the marks of the user-friendly systems that emerged in the fourth generation of computers?

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| --- | --- |
| *ANSWER:* | They included new graphical user interfaces with pull-down menus, icons, and other visual aids to make computing easier and more fun. |
| *POINTS:* | 1 |
| *REFERENCES:* | 31 |
| *QUESTION TYPE:* | Essay |
| *HAS VARIABLES:* | False |
| *TOPICS:* | Critical Thinking |
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| 45. Discuss the four basic components that Babbage’s Analytical Engine possessed that equate it to a modern-day computer.

|  |  |
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| *ANSWER:* | Babbage’s Term          Modern Terminologymill               arithmetic/logic unitstore                            memoryoperator                       processoroutput unit                  input/output His machine had four basic components: a *mill* to perform the arithmetic manipulation of data, a *store* to hold the data, an *operator* to process the instructions contained on punched cards, and an *output unit* to put the results onto separate punched cards. |
| *POINTS:* | 1 |
| *REFERENCES:* | 22–23 |
| *QUESTION TYPE:* | Essay |
| *HAS VARIABLES:* | False |
| *TOPICS:* | Critical Thinking |
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| 46. Respond to the observation that computer science is the study of how to write computer programs. Include an example to illustrate your argument.

|  |  |
| --- | --- |
| *ANSWER:* | Many people are introduced to computer science when learning to write programs in a language such as C++, Python, or Java. This almost universal use of programming as the entry to the discipline can create the misunderstanding that computer science is equivalent to computer programming.Programming is extremely important to the discipline—researchers use it to study new ideas and build and test new solutions—but like the computer itself, it is a tool. When computer scientists design and analyze a new approach to solving a problem or create new ways to represent information, they often implement their ideas as programs to test them on an actual computer system. This enables researchers to see how well these new ideas work and whether they perform better than previous methods.For example, searching a list is one of the most common applications of computers, and it is frequently applied to huge problems, such as finding one name among the approximately 20,000,000 listings in the New York City telephone directory. A more efficient lookup method could significantly reduce the time that customers must wait for directory assistance. Assume that we have designed what we believe to be a “new and improved” search technique. After analyzing it theoretically, we would study it empirically by writing a program to implement our new method, executing it on our computer, and measuring its performance. These tests would demonstrate under what conditions our new method is or is not faster than the directory search procedures currently in use.In computer science, it is not simply the construction of a quality program that is important but also the methods it embodies, the services it provides, and the results it produces. It is possible to become so enmeshed in writing code and getting it to run that we forget that a program is only a means to an end, not an end in itself. |
| *POINTS:* | 1 |
| *REFERENCES:* | 3–4 |
| *QUESTION TYPE:* | Essay |
| *HAS VARIABLES:* | False |
| *TOPICS:* | Critical Thinking |
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| 47. Define each of the categories to which the operations used to construct algorithms belong. Provide two to three examples within each category.

|  |  |
| --- | --- |
| *ANSWER:* | All the operations used to construct algorithms belong to one of only three categories:**Sequential operations.** A sequential instruction carries out a single well-defined task. When that task is finished, the algorithm moves on to the next operation. Sequential operations are usually expressed as simple declarative sentences. • Add 1 cup of butter to the mixture in the bowl. • Subtract the amount of the check from the current account balance. • Set the value of x to 1. **Conditional operations.** These are the “question-asking” instructions of an algorithm. They ask a question, and the next operation is selected on the basis of the answer to that question. • If the mixture is too dry, then add one-half cup of water to the bowl. • If the amount of the check is less than or equal to the current account balance, then cash the check; otherwise, tell the person there are insufficient funds. • If x is not equal to 0, then set y equal to 1/x; otherwise, print an error message that says you cannot perform division by 0. **Iterative operations.** These are the “looping” instructions of an algorithm. They tell us not to go on to the next instruction but, instead, to go back and repeat the execution of a previous block of instructions. • Repeat the previous two operations until the mixture has thickened. • While there are still more checks to be processed, do the following five steps. • Repeat Steps 1, 2, and 3 until the value of y is equal to 1.  |
| *POINTS:* | 1 |
| *REFERENCES:* | 6–7 |
| *QUESTION TYPE:* | Essay |
| *HAS VARIABLES:* | False |
| *TOPICS:* | Critical Thinking |
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| 48. Explain the achievement of the Difference Engine of Charles Babbage, and explain the challenge he faced in trying to construct the larger model.

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| *ANSWER:* | In 1823, Babbage extended the ideas of Pascal and Leibniz and constructed a working model of the largest and most sophisticated mechanical calculator of its time. This machine, called the Difference Engine, could do addition, subtraction, multiplication, and division to six significant digits, and it could solve polynomial equations and other complex mathematical problems as well. Babbage tried to construct a larger model of the Difference Engine that would be capable of working to an accuracy of 20 significant digits, but after 12 years of work, he had to give up his quest. The technology available in the 1820s and 1830s was not sufficiently advanced to manufacture cogs and gears to the precise tolerances his design required. Like Galileo’s helicopter or Jules Verne’s atomic submarine, Babbage’s ideas were fundamentally sound but years ahead of their time. (In 1991, the London Museum of Science, using Babbage’s original plans, built an actual working model of the Difference Engine. It worked exactly as Babbage had planned.) |
| *POINTS:* | 1 |
| *REFERENCES:* | 21 |
| *QUESTION TYPE:* | Essay |
| *HAS VARIABLES:* | False |
| *TOPICS:* | Critical Thinking |
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| 49. Explain the significance of the Von Neumann architecture.

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| *ANSWER:* | In 1946, John Von Neumann proposed a radically different computer design based on a model called the stored program computer. Until then, all computers were programmed externally using wires, connectors, and plugboards. The memory unit stored only data, not instructions. For each different problem, users had to rewire virtually the entire computer. For example, the plugboards on the ENIAC contained 6,000 separate switches, and reprogramming the ENIAC involved specifying the new settings for all these switches—not a trivial task.Von Neumann proposed that the instructions that control the operation of the computer be encoded as binary values and stored internally in the memory unit along with the data. To solve a new problem, instead of rewiring the machine, you would rewrite the sequence of instructions—that is, create a new program. Von Neumann invented programming as it is known today. The model of computing proposed by Von Neumann included many other important features found on all modern computing systems, and to honor him this model of computation has come to be known as the Von Neumann architecture.  |
| *POINTS:* | 1 |
| *REFERENCES:* | 26 |
| *QUESTION TYPE:* | Essay |
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| 50. List at least six of the recent developments of the fifth generation of computing.

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| *ANSWER:* | Some of the recent developments in computer systems include the following:• Massively parallel processors capable of quadrillions of computations per second • Smartphones, tablets, and other types of handheld digital devices • High-resolution graphics for imaging, animation, movie making, video games, and virtual reality • Powerful multimedia user interfaces incorporating sound, voice recognition, touch, photography, video, and television • Integrated digital devices incorporating data, television, telephone, camera, the Internet, the World Wide Web, and, struggling for relevancy, fax • Wireless communications • Massive cloud storage devices capable of holding 100 exabytes of data • Ubiquitous computing, in which miniature computers are embedded into cars, cameras, kitchen appliances, home heating systems, clothing, and even our bodies  |
| *POINTS:* | 1 |
| *REFERENCES:* | 31 |
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| *HAS VARIABLES:* | False |
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