

› Answers and Explanations

- D**—We do not need to know how a procedure works only that it does. The details are hidden or abstracted away inside the procedure's code.
- A**—Parameters allow a procedure to be more flexible by allowing different values from the program to be sent to the procedure. Code does not have to be re-written each time it needs to be used in the program.
- D**—Cleaning data refers to taking raw data and checking it for errors. These errors could be corrupt, incomplete, or duplicate data. Cleaning could include either correcting or removing the identified data, depending on the specifications for a particular dataset.
- A**—Intractable problems may have an algorithm that can solve some or a small number of values, but as the dataset grows large, the algorithm cannot be used due to a lack of resources, either memory or storage.
- B**—These are some of the abstractions that can be used in writing software.
- C**—Organizations handling large datasets must protect the data to ensure people's private information is not accidentally revealed.
- C**—Protocols are a set of rules for a variety of services on the Internet. Data will move across any brand of equipment as long as the protocols are followed.
- D**—Scalability means adding more resources, such as servers to store data, as the dataset grows and removing resources if the size decreases. These resources can be added and removed without impacting the current processing.
- A**—Text-based programming languages are usually high-level languages that are very natural-language based; pseudo-code is a combination of natural language and a programming language; and block coding uses high-level commands that can be dragged to the program. Each of these makes it much easier for people to code since they each use more natural language-type features.
- D**—Each of the events could occur when the house image is pressed, clicked, swiped, or called in some way depending on the software using it. Code is executed behind the scenes as a result of these actions, so the image is an abstraction.
- C**—The code with the selection statement is executed if the Boolean condition evaluates to be true. Additional code can be executed if the condition is false using the ELSE statement.
- A**—Each element in a list has an associated index position, starting at 1. To access an individual element, use the list name and the index position in brackets. For example `songList[4]` references the fourth element in this list.
- A**—Logical conditions are in a Boolean format, meaning each condition will always evaluate to either true or false.
- C**—Pressing a button on an app is an abstraction because we do not know or need to know the details of what happens behind the scenes once we press the button. Clicking the button initiates code for the feature a particular button represents.
- D**—Machine-learning algorithms learn from and make predictions based on data to improve the experience for those using it. One example is search algorithms. These often infer additional details of your search criteria, such as showing the Mustang car versus the mustang horse if your other search criteria include automobiles.
- C**—Most programming languages are written in a high-level language that resembles natural language, such as English. This high-level code is translated to machine language that computers can then "read" and process.
- C**—Logic gates are physical circuits that perform Boolean logic functions.
- D**—APIs provide pre-written, pre-tested program modules to be used by other programs greatly simplifying the process of writing a new program. This helps speed up writing and testing the code as well.

19. **A**—Empirical analysis involves implementing the algorithm through code and executing it to determine best case, worse case, average case, and error rates.
20. **B**—Different algorithms can be created to solve the same problem. These algorithms could provide new insights to the problem as well as be more efficient.
21. **A**—All algorithms can be written with a combination of sequential, selection, and iterative statements.
- Sequential statements run one after the other.
 - Selection statements are run only if the criteria are met.
 - Iterative statements repeat while a condition is being met and stops when it becomes false.
22. **A**—Viruses must be spread via an infected file. These are transmitted in ways to get people to click on them, and email attachments are the most common way.
23. **A**—Moore’s law indicates that the number of transistors that can fit on a circuit has doubled approximately every two years. This leads to faster processors.
24. **B**—Developing program components and testing them before combining them with other working, tested code helps create large correct programs.
25. **D**—A Binary search uses the “divide and conquer” method to halve (divide by 2) the size of the dataset, and continues to search the half of the dataset the number could still be in. This search is very efficient, and the dataset must be sorted for it to work.
26. **B**—By documenting what the program does, if code is changed, the programmer changing it can test to ensure the functionality is still correct.
27. **A**—The IP address is a number with sections that is much harder for humans to remember and use. The Domain Name is the natural language name for an IP location, such as a website. The DNS takes the website name and converts it to its IP address for processing.
28. **D**—The same binary number could represent a number, color, or text field. The program using the binary number knows how to interpret its meaning for each step in the program.
29. **B**—Iteration sets up conditions where code can be repeated either a specified number of times or until a condition is no longer met.
30. **B**—Undecidable problems do not have an algorithm that can solve all cases of them.
31. **A**—Computational tools process the data in iterative ways so patterns can begin to surface.
32. **C**—Procedures are blocks of code that can be reused making the program more readable and easier to maintain.
33. **A**—Efficient tools, such as information filtering and search tools, are needed to process these very large datasets.
34. **B**—Collaboration is the process of working with one or more individuals on an activity or task. It is an effective way to test and correct code. The collaborative efforts could occur in person or in a virtual format, such as editing a shared document stored in the cloud or a video-conference.
35. **B**—Certificate Authorities (CAs) issue digital certificates that allow others using a site to ensure the identity of that site is authentic.
36. **C**—Bandwidth measures how much data can be transmitted from a location to another in a given amount of time.
37. **C**—A FOR EACH loop will check each element in a list from start to end without having to specify each one individually.
38. **B**—This is the concept behind libraries and APIs. Prewritten and tested algorithms and code can be used by other programs needing the same functionality in their program. It saves time as well as helps ensure the new algorithms are correct.
39. **A**—With the increased ease of sharing and protecting information, doctors are now able to consult with other doctors located worldwide.

40. **D**—Hexadecimal can use fewer characters to represent larger numbers than binary. Hexadecimal needs 16 characters to represent numbers from 0–15. Since we run out of single digit numbers after 9, the letters A, B, C, D, E, and F are used for 10–15 in hexadecimal.
- A = 10 D = 13
 B = 11 E = 14
 C = 12 F = 15
41. **A**—Readability makes code easier to understand and therefore easier to debug, maintain, and enhance.
42. **B**—Having people with different perspectives and backgrounds helps identify new trends and potential solutions more easily than someone working alone or a homogeneous group.
43. **A**—Lossless data compression techniques enable the original, uncompressed file to be restored. Lossless techniques do not provide as much compression as a lossy technique, but always select this when you may need to restore the original file.
44. **A**—A good cryptographic model is easy to use in one direction, such as encrypting data, but very difficult to do in the other direction, the decryption of the data. This means that even if the information is intercepted, someone trying to exploit it may still not be able to identify the correct encryption key used.
45. **C**—Boolean logic can be used at a simple level or to build more complex conditions to represent needed functionality, but always evaluate to be true or false. This is useful in computer science where at its lowest level, machine code is made up of 0s and 1s.
46. **D**—There are many effective strategies for sharing the information gained. Choosing an appropriate level of detail and presentation method based on the audience is important to clearly communicate the findings.
47. **A**—While models are usually on a smaller scale than the real-world feature they represent, they can be used to simulate actual events to see the result of changes to variables. These can be run without actual constraints, such as emulating an eclipse without having to wait for an actual eclipse to occur to test the hypotheses.
48. **B**—Because of the sheer volume of data, both scientists and businesses have far more data to sift through to identify more insights than humans could possibly manage, making it useful to both.
49. **A**—Each module handles functionality independently but can be combined with other modules to create new functionality. For example, if a module adds a text field to a list, it can be added to functionality to create and maintain a contact list on a smartphone.
50. **A**—As the demand for Internet connections grows, new networks can be added along with additional routers as needed, without impacting existing service levels.
51. **C**—Social media, including blogs and Twitter, have helped spread information, both positive and negative. In a disaster situation, people often have their mobile device, and may be able to signal for help and communicate to family members that they are safe.
52. **A**—One algorithm is considered to be more efficient than another if it runs in less time for the same dataset. Efficiency may change as datasets get increasingly large. The more efficient algorithm will require less time and resources to successfully complete.
53. **C**—Parameter use enables a procedure to be more general, and therefore more abstract, by providing a way to get different values to the block of code.
54. **B**—One method of debugging involves following or tracing each line of code to determine what the program is doing versus what it should be doing based on current variable values.
55. **C**—Developing hypotheses and questions and testing these with the data helps gain insight.
56. **C**—*Metadata* means “data about data.” The only option that provides information about the data versus being data is information about the author.

57. **A**—The steps are:
- Investigate and fully define the problem to be solved
 - Plan to fully understand the scope of the problem
 - Design to identify a solution to solve the problem
 - Create to code the solution
 - Test to evaluate the solution
 - Document to create “how to” documentation along with comments to clarify the code
58. **B**—Variable names should be descriptive and use “camel case” by capitalizing the second and additional words, when two or more words are used for the variable name. Example: shoeSize
59. **B**—It makes use of the transistors at increasing levels of abstraction in physical layers to process binary data.
60. **D**—Using the AND and OR operators create a compound expression. Both conditions for the AND must be true for the expression to be true, and at least one of the conditions needs to be true for an OR compound expression to be true.
61. **B**—Internet redundancy means that if a path is down, then the packets can be sent via an alternate route to reach their destination.
62. **C**—Packets are same size groupings of information to be sent over the Internet along different paths.
63. **B**—Technology tools such as spreadsheets and databases are designed to organize data and easily set up inquiries and reports to analyze the data.
64. **B**—The efficiency of an algorithm measures the runtime or memory requirements as the size of the dataset increases. Algorithms with logarithmic efficiency are most efficient, followed by linear, and then quadratic efficiency.
65. **D**—Abstractions remove differing details to create a more general and more flexible concept.
66. **A**—Most programming languages can implement an algorithm, but some were designed for specific uses, such as for scientific calculations, and are best used in those situations.
67. **D**—The computer’s processor, or CPU, handles all the instructions for programs that are actively running.
68. **D**—All answers are correct. Combining algorithms saves time because you can reuse ones previously written and tested. Complexity is minimized because functionality is separated out into different modules, making it easier to identify unique functionality, and only coding it once. Flexibility is increased as different values can be passed to the algorithms so the same one can be used for many different values.
69. **B**—The Creative Commons licensing options allow creators to make their work available for view, and possibly for use by others, depending on the licensing option selected. Always note that artifacts on the Internet are not necessarily free. They are someone else’s intellectual property. You may not use it without paying the licensing fee or obtaining written permission from the owner to use it, even in an educational project.
70. **B**—OSI is a model for how to communicate over the Internet. Those who create a new way to do this must include the OSI steps to work successfully.
71. **A**—Like many aspects of computer science, abstractions are represented as a hierarchy from least abstract on the bottom to most abstract. The circuit diagram is very specific. The truth table shows the same combinations but uses true and false to represent the outcomes. The logic gate diagram uses symbols for the functionality making it the most abstract.
72. **B**—Algorithms are identified first, and then programs are written to implement the algorithm’s design.
73. **A**—In addition to finding information easily, technology tools can help determine the validity of the author.
74. **C**—Collaboration can help find and correct errors when developing and testing programs.