

AP Computer Science Principles: Practice Exam 1

Answers and Explanations

1. **A**—The huge lottery winnings added to your previous balance were more than the largest integer the bank account could accommodate, so an overflow error occurred.
2. **B**—Floating point numbers, (e.g., numbers with fractions) are stored imprecisely in the computer and can cause rounding errors. This is why they should not be used for monetary transactions. The clerk owes you a nickel.
3. **B**—Take the binary number and create a table of the powers of 2, starting with 2^0 in the right-most position. For every column there is a 1 in the binary number, add the corresponding value of 2^x .

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
1	0	0	1	1	0	1	1

$$128 + 16 + 8 + 2 + 1 = 155_{10}$$
4. **C**—You need to convert the number for each color from hexadecimal to decimal: 50 for Red, C8 for Green, 78 for Blue.

$50_{16} = 0101\ 0000_2$
 Red: $64 + 16 = 80$

$C8_{16} = 1100\ 1000_2$
 Green: $128 + 64 + 8 = 200$

$78_{16} = 0111\ 1000_2$
 Blue: $64 + 32 + 16 + 8 = 120$

RGB (80, 200, 120)
5. **D**—The goal of the user interface is to provide a smooth and understandable experience. As an abstraction, images can provide the best way for users to understand the features of the software. If people do not speak the languages the software is using to display messages, then they may not understand that Google Translate and a dictionary are available options. Images provide the best option for this user interface.
6. **B**—Using a parameter with the procedure to indicate grade is the best solution. Due to security and privacy risks, the students should not integrate with the school system database. Adding a step to upload a photo is inefficient as is a loop to go through the district rosters each time.
7. **C**—Using well-named procedures and variable names makes code more readable and understandable. The original program requirements would not be useful as it may not have been updated as the program was modified. Similarly, a video may help to explain the original programmer's thought process, but it may be out of date and not very useful for understanding the code they wrote. Documenting the development process will not be useful to someone changing the code.
8. **B**—If the song the user typed is in the playlist, it will be played and a Boolean variable marked as true for ownership of the song. After checking all songs in the playlist, the song will be added to the playlist if it is not already there and then played.
9. **C**—When calling the procedure, play, the value passed to it is passed using an argument. It is a parameter when used internally in the procedure.

10. **A**—Lower-level languages are written in code closer to machine language. These are more difficult to debug for most people because the code is less like natural language.
11. **A**—A benefit of models and simulations is the ability to modify a variable and retest quickly. Running the test with the same values does not help the analysis. Running one test and then stopping is not an effective use of a simulation. Unless an error was identified, which it was not in this scenario, then rewriting the code will not determine if the glasses are effective to safely protect people's eyes.
12. **C**—Since the sensor is set to detect objects within 3 feet of it, the test should measure the sensor action at all of the boundary conditions.
13. **D**—A binary number can represent all types of data, but knowing the context for its use determines how it is interpreted. The software knows what the number represents at each point in the program and interprets it correctly.
14. **B**—The only time an AND condition is true is when both conditions are true. The only time an OR condition is true is when either or both conditions are true. Evaluating the conditions provided, only i and iii are true.
15. **C**—The only time an AND condition is true is when A and B are both true. The only time an OR condition is true is when either or both conditions are true. Evaluating the conditions in the diagram will produce the results in answer C.
16. **D**—Everything is data about the nest and the eagles using the nest except the number of frames the camera can record, which is data about the data, or metadata.
17. **A**—Only the lossless compression technique will allow the original uncompressed photo to be restored.
18. **C**—Data mining identifies patterns and correlations among the data. This will show similarities between songs to tag them as "like" others with comparable patterns for future selection.
19. **A**—Projects that are good for citizen scientists would be one where specialized equipment, such as a telescope or fish finder, would not be required and can be based on facts versus personal opinion. Counting trees would be the best use in this example.
20. **B**—Cleaning involves finding and either correcting or eliminating incomplete records. It also involves standardizing the data for the analysis to be performed. It could include removing some complete and correct data that is not needed for the planned analysis.
21. **B**—The survey results will show if students changed their mind in either direction or maintained their viewpoint about computer science if they felt the teacher communicated effectively and if they felt they gave their best effort. It will not show if students plan to major in computer science.
22. **C**—The data in the table shows that drivers in the 26–50 age bracket have the least number of accidents. The data cannot tell us when the drivers had an accident.
23. **D**—Analyzing big data can identify risk factors for all the issues except knowing exactly what consumers will purchase and when.
24. **A**—Smaller data sets may not have enough data to identify patterns or true trends. If a trend is noticed in a smaller data set, processing big data may not be necessary. It will not identify metadata issues, nor determine when hardware purchases should be made.
25. **B**—The World Wide Web is an application that uses HTTP to share documents, videos, images, and other files among devices connected to the Internet.
26. **A**—The redundancy designed into the Internet means data can be sent via different paths to reach its destination.
27. **C**—The domain levels go from the Top-Level Domain (.edu) to the left. Anyplace is the 2nd level, anyway is the 3rd level, and anytime is the 4th level.

28. **B**—Bandwidth measures the amount of data that can be transmitted in a specific amount of time. Therefore, knowing how much data needs to be downloaded on a regular basis is a key measurement as people generally download far more than they upload.
29. **C**—Certificate Authorities, or CAs, issue digital certificates to customers that confirm ownership of their encrypted keys with secure Internet communications. This enables us to have online shopping among other secure online transactions.
30. **C**—A Distributed Denial of Service attack floods a site with invalid requests, causing it to be unable to respond to legitimate requests.
31. **A**—Ensuring the security of your data is out of your control when you store it in the cloud.
32. **A**—The new name must be registered with a DNS site so the IP address will be associated with the new name and the site can be found. Your Internet Service Provider (ISP) can help with this or you can register it yourself.
33. **D**—Packets are created at the sending end of the transmission and reassembled at the final destination.
34. **C**—TCP creates packets and passes control of them to IP which routes them to their final destination. TCP then reassembles the packets to display.
35. **B**—Companies that take advantage of data mining can provide information that a majority of their customers want to see on their website. This is a benefit to the company and the consumer.
36. **C**—The ease in sharing digital files without the artist's permission is an ongoing concern in the music industry.
37. **A**—To protect intellectual property, the Digital Millennium Copyright Act (DMCA) works to prevent illegal file sharing, illegal movie and music downloads, and licensing violations. Peer-to-peer networks are often used to illegally share files of all types.
38. **D**—One of many benefits is that all businesses can access the data, making it easier for new businesses to have and analyze data the established businesses use.
39. **B**—This is the only option that will capture the smallest number in a list.
40. **B**—The data must be sorted for a binary search to work.
41. **C**—Booleans can only be true or false, and C is the only option that can evaluate to true or false.
42. **A**—The flow of procedures called indicate a game is being played. The procedure names and parameters are all correct.
43. **D**—You cannot have an ELSE statement without an IF statement.
44. **B**—The first algorithm sorts by name, but then uses a binary search using phone number. This may not return correct results. Therefore, option II using a linear search on a contact list sorted by area code will return the correct results and is more effective.
45. **C**—A heuristic is finding the best approximate solution when the actual solution is intractable. A computer checking all possible chess moves will slow the processing down, so a heuristic solution will improve the speed and the overall game experience for the player.
46. **B**—Iteration means “repeating,” so a loop will repeat until a condition is met causing it to end.
47. **C**—Since place is 5, the length of the snacks list, snacks[place] refers to the element at the 5th position of the list, which is “grapes”. List elements can be accessed using a constant, such as list[2] or a variable as in this example, list[place].
48. **A**—Block 1 produces correct results based on the temperature. Block 2 counts all temperatures ≤ 80 to be a perfectDay, rather than separating them by temperature. The IF condition is set up incorrectly.

49. C—Intractable algorithms do not run efficiently for large data sets.
50. D—Block-based languages are the closest to natural language and are the most abstract. Text-based language is next as it is also easy to read and use. Next is assembly language, which is less abstract and closer to machine language. Machine language is the least abstract and the hardest for people to work with.
51. C—Selection criteria filter data and only process those records that meet the criteria.
52. D—A causes any grade higher than 59 to be assigned the letter grade. B uses greater than rather than less than. C will be off by one. D is correct.
53. D—Only option D ends up in the correct block facing in the correct direction. Remember that ROTATE commands do not move the robot forward a block. They only change the direction in the current block the robot is in.
54. B—An API (Application Programming Interface) connects software modules making working programs available for use in other programs.
55. B—Follow the order of operations to determine the answer the code will return.
56. B—MOD calculations provide the remainder when the two numbers are divided.
57. A—An OR condition only needs one of the conditions to be true for the overall condition to be true. Since 10 is less than 15, the value of x will be displayed.
58. B—Block 1 calculates the total of the list indices. Block 2 calculates the sum of the elements of the list.
59. B—Code inside the loop will never run because $10 > 5$ before the loop runs the first time.
60. D—Each time the value in the list is not “banana,” the word “banana” is appended to the end of the list.
61. B—Apples is in the 4th position in the list. `snacks[4] = “apples”`.
62. A—The value at `snacks[j]` is replaced by number `[j+4]` which is 5, then 6, then 7, then 8 as j iterates through the values 1–4.
63. B—The plus `+` sign when used with text fields concatenates or glues them together.
64. A—None of the other options will produce better code or even code that works.
65. B—Programs developed for personal use do not have to have the same level of testing as apps that will handle sensitive transactions such as monetary ones or code that will be widely distributed.
66. A—This option is correct. The arrow is in the correct square and facing in the correct direction.
67. B, D—Cloud-based storage can be accessed from any location with an Internet connection, and is a good solution for storage when local storage options are limited. Sensitive data should not be stored in the cloud.
68. C, D—If aggregation is not done accurately, other data could be used in combination with the trial data and available public information to identify participants.
69. C, D—A team with diverse skills and backgrounds can provide different viewpoints that can result in a better product in a collaborative environment.
70. A, D—TCP makes the packets and puts them back together while IP sends them across the Internet.
71. B, C—Public key encryption creates such long keys that brute force techniques are ineffective. The keys are asymmetric meaning different keys are used to encrypt and decrypt the data.
72. A, B—A bit can only hold two possible values, 0 and 1. Therefore, any data it holds can only be represented by these two values. Any number

MOD 2 will produce 0 or 1 and Boolean values are either true or false.

73. **A, D**—Sending transaction data off-site can present a security concern if the data is not encrypted. Public key encryption is unbreakable at this point in time, so privacy issues would not be a concern. Companies should test their

disaster recovery plan by periodically bringing data back on-site to run on existing equipment. Compression issues could also occur as the data may be too large to send without it.

74. **A, B**—Both asynchronous and synchronous communication processes use the “cloud” or servers located remotely to enable communication.

