AP Computer Science Principles: Practice Exam 1

Multiple-Choice Questions

Time: 2 hours
Number of questions: 74
The multiple-choice questions represent 60% of your total score.

Directions: Choose the one best answer for each question. Some questions at the end of the test have more than one correct answer; for these, you will be instructed to choose two answer choices.

Tear out the answer sheet on the previous page and grid in your answers using a pencil.

Consider how much time you have left before spending too much time on any one problem.

AP Computer Science Principles Exam Reference Sheet

On the AP Computer Science Principles Exam, you will be given a reference sheet to use while you're taking the multiple-choice test. A copy of this seven-page reference sheet is included in the Appendix of this book (reprinted by permission from the College Board).

To make taking this practice test like taking the actual exam, you should tear out the reference sheet so you can easily refer to it while taking the test. Save these reference pages since you'll need to use them when you take AP Computer Science Principles Practice Exam 2.

If you lose the pages, the reference sheet is also available near the end of the PDF publication, "Assessment Overview and Performance Task Directions for Students" on the College Board Website. Here is the URL:

https://apcentral.collegeboard.org/pdf/ap-csp-student-task-directions.pdf?course=ap-computer-science-principles

1. You won the lottery and elected to receive a lump sum! The largest number the bank's computer can store is $2^{31} - 1$ or 2,147,483,647. After depositing your lottery winnings of $2,500,000,000.00, what will the result be?

   (A) Your winnings were more than the largest number the bank's computers could hold, so an overflow error will occur.
   (B) Since decimal numbers are stored imprecisely in computers, a rounding error will occur.
   (C) The amount will be represented in machine code format, so converting it to decimal will show the balance in a more readable format.
   (D) The amount will be represented in hexadecimal, so converting it to decimal will make the balance more readable.

2. You stop by and purchase your favorite snack after school one day. You notice the cash register shows the change you are owed as: $0.04999999 rather than $0.05. How is this possible?

   (A) The cash register DISPLAY procedure has an error.
   (B) Since decimal numbers are stored imprecisely in computers, a rounding error occurred.
   (C) It's displaying the change owed in a different currency.
   (D) The amount is represented in hexadecimal rather than decimal. Alert the store clerk to make the conversion to decimal.

3. You are assigned a parking space in a large parking lot by an automated machine. You recognize that the parking space number is displayed in binary, but the parking spots are labeled in decimal numbers. Convert the parking space number 10011011 to decimal to know where to park and avoid getting towed.

   (A) 154
   (B) 155
   (C) 157
   (D) 9F

4. When designing a web page, you see a color you want to use listed in hexadecimal as #50C878. Which color is it, given the decimal equivalents (Red, Green, Blue)?

   (A) (32, 76, 414)
   (B) (50, 118, 78)
   (C) (80, 200, 120)
   (D) (128, 310, 170)

5. You are designing a UI (user interface) for use by multiple international travelers. How can you best communicate the options and features of the software program so most people can understand them?

   (A) Write the UI in Spanish and Chinese, two of the most common languages spoken worldwide.
   (B) Use an API to interface with a translation website for those who need it.
   (C) Provide a link to an online dictionary so words users do not know can be quickly looked up.
   (D) Use images to represent features of the program.

6. The principal hired the programming class to write a program to reserve parking spots in the student parking lot. She wants seniors to have the best spots. What is the best way the programming class can verify a student is a senior?

   (A) The program can loop through the school district rosters for every student name.
   (B) Grade can be an input field that is then passed to the procedure to select an available spot.
   (C) Use an API to integrate with the school's information system hosted off-site to check grade level.
   (D) Have students upload a photo from the school registrar showing their school grade with their parking spot request.

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7. You have to change a program written a year ago by someone else. A sample section of code is below. How could the original program author have helped someone making changes at a later date?

```
PROCEDURE a(x, y, z)
    IF x < y
    {
        x ← z
    }
```

(A) Provided the original program requirements
(B) Added a video describing the program design and functionality
(C) Used procedure and variable names that described their purpose and content
(D) Provided written documentation of the application development process

Questions 8–9 are based on the code below. Assume all lists and variables have been properly initialized.

```
ownIt ← false
song ← INPUT()
FOR EACH songName IN playList1
    IF songName = song
        play(song)
        ownIt ← true
    IF NOT(ownIt)
        APPEND (playList1, song)
        play(song)
```

8. What does the code do?

(A) Plays a song from the playlist.
(B) If a song requested by the user is in the playlist, plays it; otherwise adds it to the end of the playlist and then plays it.
(C) Moves a song from its current position in the playlist to the end of it, then plays the next one in the list.
(D) Identifies songs the user wants to hear, but does not own. Provides a way to purchase the song and appends it to their playlist.

9. In the code, if "play" is a procedure, what does "song" represent in the line: play(song)?

(A) It is the name of the procedure for documentation purposes.
(B) It is an input value where the user requests the song to be played.
(C) It is a value being passed to the procedure via an argument that will be used as a parameter in the procedure.
(D) It is an expression that must be evaluated to be used in the procedure.

10. Which statement is NOT true?

(A) Lower-level languages are easier to debug because the language is closest to what the computer executes.
(B) Higher-level languages are easier to debug because the language is closer to natural language.
(C) Lower-level languages provide less abstraction.
(D) Higher-level languages are easier for people to code in because they are more like natural language.

11. If a simulation of the solar eclipse is set up to test the effectiveness of glasses to safely view the sun, which scenario below is most likely if the first test shows the glasses are inadequate?

(A) The team can modify the degree of darkness and retest quickly to determine the threshold of effectiveness.
(B) The team should stop the test and notify the company that makes the glasses.
(C) The team should rerun the test multiple times to ensure the results are valid.
(D) The team should rewrite the code for the simulation, and then retest.

12. A simulation of conditions for a new sensor to be used with self-driving cars is being designed. The pseudo-code for the test is below.

```
When car starts, turn sensor on and
set incident_counter to 0
When detect object 3 feet or closer,
redirect steering wheel away from
object
Add one to incident_counter
```

Which conditions should the simulation test about the sensor?

(A) If the incident_counter > 10, then the sensor is successful.
(B) If the incident_counter is 0, then the sensor is successful.
(C) Set up objects at 3 feet, less than 3 feet, and greater than 3 feet to determine the action taken.
(D) If the car avoids an accident, then the sensor is successful.

13. A series of binary numbers appears on your computer screen. What do they represent?

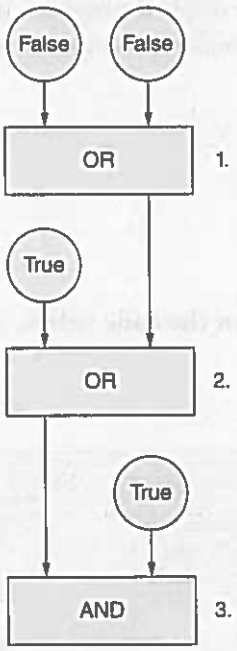
(A) The source code for the program after compilation.
(B) The machine instruction that caused the error.
(C) The error message before converting it to words using the ASCII table.
(D) It is impossible to tell the representation without knowing the context of their use.

14. Which of the following will evaluate to "true"?

i. (true AND true) OR (true AND false)
ii. NOT(true OR false)
iii. NOT(false) AND NOT(true AND false)

(A) i and ii
(B) i and iii
(C) ii and iii
(D) i, ii, and iii

15. What outcome will the Boolean conditions in the diagram produce at steps 1, 2, and 3?



(A) 1-True, 2-True, 3-True
(B) 1-False, 2-False, 3-True
(C) 1-False, 2-True, 3-True
(D) 1-True, 2-False, 3-False

16. A camera watching an eagle's nest starts recording when a motion detector starts. Which of the following is metadata?

(A) The latitude and longitude of the nest
(B) The date and time the motion is detected
(C) The number of eagles using the nest
(D) The number of frames per second the camera records

17. Susie's mother wants a copy of a photo from a family vacation that Susie took. The picture is too large to email. How should Susie compress the image if her mother wants to print a large copy of it suitable for framing?

(A) She should use a lossless compression technique, which will be needed to print a version with high enough quality to frame.
(B) She should use a lossy compression technique to obtain enough compression to send the image.
(C) They should be combined for the best compression technique.
(D) Any compression technique will be sufficient in this case.

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18. When listening to an online music service, you request songs "like" a specific song. How does the music site determine what to play?

(A) It plays songs you have played previously.
(B) It plays the most requested songs from all listeners.
(C) It uses data-mining techniques to determine patterns in the music that are similar.
(D) It plays a random selection.

19. Which one of the following would be a good project for citizen scientists and why?

(A) Counting pine trees in urban conditions to get accurate data about the spread of the pine beetle
(B) Identifying new stars using personal telescopes to keep costs lower for the tracking organization
(C) Reading different genre books and evaluating them so book publishers know which types of book manuscripts to accept and market
(D) Counting fish in a lake to know if the fish are safe to consume

20. What describes the process of searching data sets for incomplete data records to process?

(A) Classifying
(B) Cleaning
(C) Clustering
(D) Filtering

21. A teacher wants to determine student opinions of computer science before and after taking a course. She gives students a survey on the first and last days of class. The survey includes questions about students' impressions about computer science, if the teacher communicated effectively, if the teacher was positive about the course material, and if students gave their best effort in the course. What questions can be determined from the survey data?

i. If students who moved from a negative to positive impression of computer science after taking the course also thought the teacher communicated effectively
ii. Which students plan to major in computer science after taking the course
iii. If the students who did not change their existing view of computer science after taking the course gave their best effort in the course

(A) i
(B) i and iii
(C) ii and iii
(D) i, ii, and iii

22. Given the table of data about car accidents, which outcome is supported by the data?

(A) Drivers ages 16–25 have the fewest accidents.
(B) More accidents occur on the weekdays.
(C) Drivers age 26–50 have fewer accidents than the other two age groups.
(D) Adult drivers have more accidents on weekdays during rush hour.

Most common type of accident	Number of accidents by 16–25 yr. old drivers	Number of accidents by 26–50 yr. old drivers	Number of accidents by 51–100 yr. old drivers	Total number of accidents	Accident occurred on weekday	Accident occurred on weekend
Rear-end collision	311	211	250	772	257	515
Ran light at intersection	215	121	152	488	191	297
Ran stop sign	182	87	92	361	177	184

23. Which of the following is an example where analysis of large data sets would NOT be able to identify potentially valuable information?

(A) Identifying risk factors for certain health issues
(B) Identifying which aspects banks should focus on to minimize loan defaults
(C) Enabling companies to know when to schedule replacement of equipment parts because of usage and increased maintenance on them
(D) Enabling businesses to know what to produce and when for maximum sales

24. Why do businesses and scientists attempt to analyze big data?

(A) To gain insights smaller subsets of data may not provide
(B) To confirm findings from smaller data sets
(C) To identify potential problems in the metadata
(D) To obtain economies of scale with hardware needed to store the data based on Moore's law

25. How do the World Wide Web and the Internet work together?

(A) They perform the same functionality.
(B) The Web uses HTTP to share computational artifacts using the Internet.
(C) The Internet uses the Web to connect devices to share data.
(D) The Internet has the "deep" net and "dark" net but the Web does not.

26. If a fire occurs at a major Internet hub, what is the result?

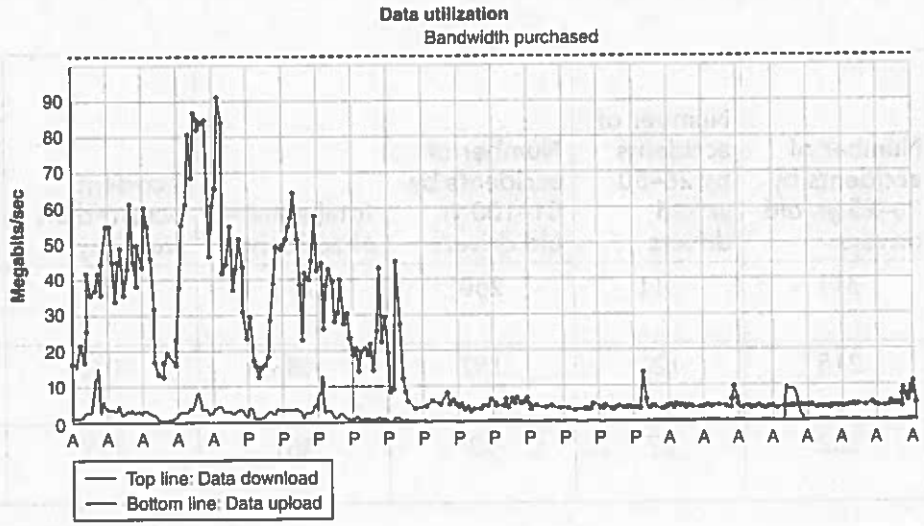
(A) Internet traffic will be routed to its destination a different way because of the redundancy built into the Internet.
(B) The part of the globe that is served by that Internet hub will be down because of the end-to-end architecture of the Internet.
(C) Different IP addresses will be assigned to devices that were impacted by the unavailability of the Internet hub.
(D) People can use dedicated phone lines as a backup with no change in service.

27. In the following web address, how many domain levels are there?
http://anytime.anyway.anyplace.edu/lessons/notes/apex.docx

(A) 6
(B) 5
(C) 4
(D) 3

28. If a company is trying to determine whether to upgrade its bandwidth based on the following graph, what should they measure?

(A) Amount of data uploaded as it includes strategic company backup data
(B) Amount of data downloaded as it has the largest impact on the bandwidth
(C) Frequency of the peak times
(D) Type of devices employees use on the network



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29. Why is the trust model of the Internet important?

(A) It ensures the private security key has not been compromised.
(B) It establishes a dedicated line between two destinations to ensure security.
(C) It enables the secure transfer of data, such as a credit card transaction, which allows online purchasing.
(D) It ensures the privacy of customers making online transactions

30. What happens in a DDoS attack?

(A) Bots search for malware-detecting software that is out of date and prevents the uploading of new versions without the owner knowing.
(B) Firewalls are deactivated so malware can enter the network.
(C) The targeted site is flooded with too many false requests and crashes.
(D) Sensitive data is not encrypted before being transmitted over the Internet making it vulnerable to interception.

31. Which option below is a potential negative result of storing data in the cloud?

(A) You have to rely on someone else to maintain the security of the data.
(B) Online collaboration could result in accidentally overwriting someone's changes to a document.
(C) You must store duplicates of data stored in the cloud in case you cannot access your data when needed.
(D) The company storing your data could hold it for ransom until you paid extra fees.

32. If an organization wants to change its website name from .org to .edu, what do they need to do to ensure they can still be found on the Web?

(A) Register the new name with a DNS (Domain Name System) site.
(B) The organization can start using the new name immediately since only the top-level domain changed.
(C) Notify IETF, the organization that maintains names on the Internet.
(D) Post the new name on the organization's website up to 10 days prior to the switchover.

33. Which of the following is true about packets?

(A) The receiving device acknowledges the first and last packets to indicate receipt of the data stream.
(B) Packets travel in order to their destination.
(C) Packets follow the shortest path to their destination.
(D) Packets are reassembled at their final destination.

34. How do TCP and IP interact?

(A) IP forwards the data to the DNS server to identify which TCP to use.
(B) TCP hands off control to HTTP, which passes it to IP.
(C) TCP creates packets from the data to be sent and transfers control to IP for routing. TCP then reassembles the packets at the destination.
(D) IP uses the SSL in conjunction with TCP to securely send data.

35. Data mining allows organizations to process huge data sets to find new patterns, connections, or opportunities. Which of the following is NOT a downside of data mining?

(A) It may require having to train staff and allocate resources based on data results.
(B) More relevant information is included on the company's website.
(C) It is expensive to collect, store, and process data.
(D) It is risky for decision making if the data is interpreted incorrectly.

36. Computers have enabled new innovations in a variety of industries. In the entertainment business it has become much easier to purchase and share new music. What concern has been raised as a result?

(A) People are modifying other people's content and claiming the Creative Commons licensing allows it.
(B) People are being discovered for their music because others are posting it to music-sharing sites.
(C) People are sharing content without the author/owner's permission.
(D) Artists are adding their music to streaming services with Creative Commons licensing.

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37. Which of following are legal and ethical concerns because of DMCA?

(A) Peer-to-peer networks used for illegal file sharing
(B) Music and movie downloads and streaming services not charging enough for their services
(C) Licensing stipulations that allow incorporating music into other artforms
(D) Controlled intellectual property sharing

38. What is a benefit of the government posting databases for public use?

(A) It is a way to identify the need for new policies and regulations.
(B) Consumers can learn more about how their individual data is being collected, stored, and used.
(C) Companies can opt out to prevent competitors from learning about their business.
(D) All businesses can access the data at no cost, aiding those businesses that would otherwise not have the resources to obtain the data on their own.

39. Which algorithm will display the smallest number in a list of positive numbers? Assume Max is a variable holding the largest number in the list.

(A)
```
smallest ← -1
FOR EACH num IN list
{
      IF (smallest < num)
      {
         smallest ← num
      }
}
DISPLAY (smallest)
```

(B)
```
smallest ← Max
FOR EACH num IN list
{
      IF (smallest > num)
      {
         smallest ← num
      }
}
DISPLAY (smallest)
```

(C)
```
smallest ← -1
FOR EACH num IN list
{
      IF (smallest > num)
      {
         smallest ← num
      }
}
DISPLAY (smallest)
```

(D)
```
smallest ← Max
FOR EACH num IN list
{
      IF (smallest < num)
      {
         smallest ← num
      }
}
DISPLAY (smallest)
```

40. For a binary search to produce accurate results, what must be true of the data?

(A) The data must be unsorted.
(B) The data must be sorted.
(C) The data must not have duplicates.
(D) The data must be fewer than a billion records. Otherwise the search requires too many resources for processing.

41. Which of these is a Boolean expression?

(A) `X ← 57`
(B) `Y ← temp * 120 / 100`
(C) `(temp > 32)`
(D) `72 + 12 - (12 * 6) → z`

42. What can be determined from the following program flow?

```
Intro()
Rules()
Play()
Score()
DISPLAY (HighScore())
```

(A) A game is played by calling different procedures.
(B) An error will occur due to invalid procedure names.
(C) Parameters are missing from the procedures resulting in a runtime error.
(D) A compile time error occurs due to Score() and HighScore().

43. Which statement's format is incorrect?

(A)
```
IF (NOT (x > y))
{
   DISPLAY(message)
}
```

(B)
```
x ← x + y
```

(C)
```
list[i] ← list[j]
```

(D)
```
ELSE
   DISPLAY(new message)
```

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44. Which algorithm should be used to find a phone number on a contact list?

I.
Sort the contact list by name
Search for the phone number using a binary search
Display the correct phone number

II.
Sort the contact list by area code
Search for the phone number using a linear search
Display the correct phone number

(A) I
(B) II
(C) I and II are equally effective.
(D) A combination of both I and II should be used.

45. Why does a computer playing chess use a heuristic algorithm?

(A) It ensures the computer only wins a certain number of times making it a more enjoyable experience for people.
(B) It ensures humans only win a certain percentage based on statistics.
(C) It takes too long to analyze all possible moves, so the computer takes the next best move.
(D) It checks each possible combination of moves for the best move.

46. What does iteration with computer science loops mean?

(A) Executing code once
(B) Repeating a block of code until a condition is met
(C) Duplicating a section of code multiple times in a program
(D) Identifying the error condition

47. If a list named **snacks** contains the values:

```
snacks ← ["chocolate", "peanuts",
"granola", "chips", "grapes"]
A variable place is assigned the
value:
place ← LENGTH(snacks)
```

What will the value snacks[place] contain?
(A) 5, the number of items in the list
(B) 6, the number of letters in the word "grapes"
(C) grapes, which is the value in the 5th position of the list
(D) Error, a list cannot be accessed in this way.

48. Will both of the following two blocks produce correct results? Assume all variables have been properly initialized.

(A) Only Block 1 is correct.
(B) Only Block 2 is correct.
(C) Both blocks are correct.
(D) Neither block is correct.

Block 1

```
IF (temp ≥ 80)
{
   hotDay ← hotDay + 1
}
ELSE IF (temp ≥ 60)
{
   perfectDay ← perfectDay + 1
}
ELSE
{
   coldDay ← coldDay + 1
{
```

Block 2

```
IF (temp ≤ 80)
{
   perfectDay ← perfectDay + 1
}
ELSE IF (temp ≤ 60)
{
   coldDay ← coldDay + 1
}
ELSE
{
   hotDay ← hotDay + 1
}
```

49. Determining that an algorithm is intractable means it runs in:

(A) an acceptable amount of time even for large data sets.
(B) less time for worst-case scenarios than average scenarios.
(C) an exponential amount of time possibly even for small data sets making it unable to run for large data sets.
(D) a fractional amount of time for fractional values.

50. Which order has the programming languages in most abstract to least abstract order?

(A) Text-based language, assembly language, block-based language, machine language
(B) Block-based language, text-based language, machine language, assembly language
(C) Machine language, assembly language, block-based language, text-based language
(D) Block-based language, text-based language, assembly language, machine language

51. Which type of programming statement includes Boolean conditions to determine the section of code to execute?

(A) Functions
(B) Complex
(C) Selection
(D) Contrasting

52. Which set of code will calculate the letter grade correctly? Assume the average is a variable holding the student average.

(A)

```
IF (average > 59)
{
   grade ← D
}
   ELSE
   {
      IF (grade > 69)
      {
         grade ← C
      }
      ELSE
      {
         IF (grade > 79)
         {
            grade ← B
         }
         ELSE
         {
                  IF (grade > 89)
                  {
                     grade ← A
                  }
                  ELSE
                  {
                     grade ← F
                  }
         }
      }
   }
```

(B)

```
IF (average < 59)
{
   grade ← D
}
ELSE
{
   IF (grade < 69)
   {
      grade ← C
   }
   ELSE
   {
      IF (grade < 79)
      {
         grade ← B
      }
      ELSE
      {
         IF (grade < 89)
         {
            grade ← A
         }
         ELSE
         {
            grade ← F
         }
      }
   }
}
```

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(C)

```
IF (average > 90)
{
   grade ← A
}
ELSE
{
   IF (grade > 80)
   {
      grade ← B
   }
   ELSE
   {
      IF (grade < 70)
      {
         grade ← C
      }
      ELSE
      {
         IF (grade < 60)
         {
            grade ← D
         }
         ELSE
         {
            grade ← F
         }
      }
   }
}
```

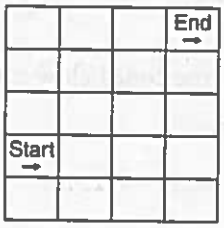
(D)

```
IF (average > 89)
{
   grade ← A
}
ELSE
{
   IF (grade > 79)
   {
      grade ← B
   }
   ELSE
   {
      IF (grade < 69)
      {
         grade ← C
      }
      ELSE
      {
         IF (grade < 59)
         {
            grade ← D
         }
         ELSE
         {
            grade ← F
         }
      }
   }
}
```

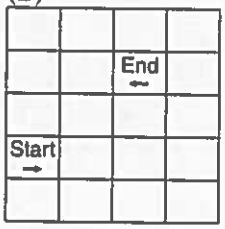
53. The code below is a robot algorithm. Which diagram matches the code?

```
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_LEFT()
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_RIGHT()
MOVE_FORWARD()
ROTATE_LEFT()
```

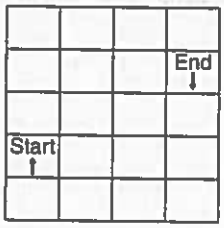
(A)



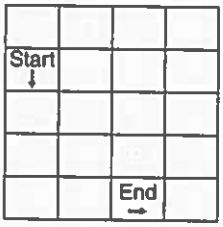
(B)



(C)



(D)



54. What benefit does an API provide?

(A) It allows programmers to share their code via the API for others to test.
(B) It connects software components providing pre-written and tested code available for use.
(C) It provides algorithms for difficult code to be reviewed.
(D) It provides documentation programmers can use for their programs rather than creating their own.

55. What is the value of *x* after the code below runs?

```
PROCEDURE calcTemp (temp)
{
   newTemp ← (5/9 * (temp - 32))
   RETURN (newTemp)
}

x ← calcTemp(50)
```

(A) –10
(B) 10
(C) 4
(D) –4

56. What is the value of *y* after the following statements?

```
x ← 10
x ← x + 4
y ← x MOD 3
```

(A) 0
(B) 2
(C) 3
(D) 4

57. What is displayed after the following code runs?

```
x ←10
y ←15
z ←20
IF (x < y OR y > z)
   DISPLAY(x)
ELSE
   DISPLAY(x + y)
```

(A) 10
(B) 15
(C) 20
(D) 25

58. Which of the following two algorithms produces the sum of the elements in the list? Assume the list is initialized and is not empty.

(A) Block 1
(B) Block 2
(C) Blocks 1 and 2
(D) Neither Block 1 nor 2

Block 1

```
x  ← 1
sum  ← 0
REPEAT LENGTH(list) TIMES
{
   sum  ← sum + (x)
   x ← x + 1
}
DISPLAY("The total is: ", sum)
```

Block 2

```
x  ← LENGTH(list)
sum  ← 0
REPEAT x TIMES
{
      sum ← sum + list[x]
      x ← x - 1
}
DISPLAY("The total is: ", sum)
```

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59. What will the following code produce?

```
x ← 5
y ← x
x ← y + 5

REPEAT UNTIL x > y
{
        DISPLAY ("Hello World!")
}
```

(A) "Hello World!" will be printed multiple times.
(B) The code inside the REPEAT UNTIL loop never executes.
(C) The REPEAT UNTIL loop never ends, creating an infinite loop.
(D) The program will have a runtime error.

Questions 60–62 refer to the following code.

```
snacks ← ["popcorn", "candy", "grapes",
"apples"]
FOR EACH snack IN snacks
{
   IF NOT(snack = "banana")
   {
         APPEND(snacks, "banana")
   }
   DISPLAY snack
}
```

60. What will the code display?

(A) popcorn, candy, grapes, apples, banana
(B) popcorn, candy, grapes, apples, banana, banana
(C) popcorn, candy, grapes, apples, banana, banana, banana
(D) popcorn, candy, grapes, apples, banana, banana, banana, banana

61. What is the index position of apples?

(A) 3
(B) 4
(C) 5
(D) 6

62. What is the value of snacks after the following code is run?

```
snacks ← ["donut", "french fries",
"candy", "popcorn", "candy", "grapes",
"apples", "banana"]
j ← 1
REPEAT UNTIL j = 5
{
    snacks[j] ← [j + 4]
    j ← j + 1
}
```

(A) 5, 6, 7, 8, candy, grapes, apples, banana
(B) popcorn, candy, grapes, apples, popcorn, candy, grapes, apples,
(C) popcorn, popcorn, popcorn, popcorn, candy, grapes, apples, banana
(D) popcorn, popcorn, popcorn, popcorn, popcorn, popcorn, popcorn, popcorn

63. What is displayed after the following code runs?

```
line1 = "Good luck"
line2 = " on the AP exam!"
DISPLAY (line1 + line2)
```

(A) Error message, cannot add text fields
(B) Good luck on the AP exam!
(C) Good luck
on the AP exam!
(D) 24, which is the number of characters in the text fields

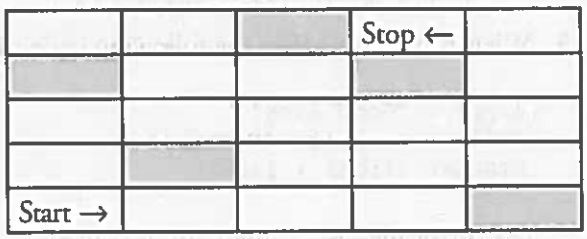
64. What is an iterative software development process designed to do?

(A) To produce better software with a proven process
(B) To shorten the time of developing software by beginning to code while the requirements are being determined
(C) To eliminate the testing step by using only APIs
(D) To develop it right the first time through the iterative process

65. The programmer tests an app she wrote using one set of test cases. Since the app was developed for her personal use, does it need to undergo further testing?

(A) Yes, all software should be tested with a variety of test cases to ensure the code works as expected.
(B) No, since the app is for personal use, less stringent testing is acceptable.
(C) Additional testing is required only when there are more than 25 lines of code
(D) Additional testing is needed when procedures are used.

66. Which set of code will move the robot from start to stop and end facing the correct direction? The robot may not move into gray blocks.



(A)
```
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_LEFT()
MOVE_FORWARD()
ROTATE_RIGHT()
MOVE_FORWARD()
ROTATE_LEFT()
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_LEFT()
MOVE_FORWARD()
```

(B)
```
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_LEFT()
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_LEFT()
MOVE_FORWARD()
```

(C)
```
MOVE_FORWARD()
ROTATE_LEFT()
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_RIGHT()
MOVE_FORWARD()
MOVE_FORWARD()
```

(D)
```
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_RIGHT()
MOVE_FORWARD()
ROTATE_LEFT()
MOVE_FORWARD()
ROTATE_RIGHT()
MOVE_FORWARD()
MOVE_FORWARD()
MOVE_FORWARD()
ROTATE_RIGHT()
MOVE_FORWARD()
```

67. Cloud-based data storage is best when what conditions are true of those working with the data? Select two answers.

(A) They are in a secured location.
(B) They are in separate locations.
(C) They are dealing with sensitive data.
(D) They have limited storage at their location.

68. Data has been collected about medicine trial results. The privacy of those in the trial needs to be protected. Is data aggregation sufficient if the patient name is not used but zip code, doctor name, and pharmacy are used and the data is password protected? Select two answers.

(A) Yes, because a name is not associated with it.
(B) Yes, because the data is aggregated.
(C) No, because the zip code and pharmacy could be used to drill down to potentially identify patients in the trial.
(D) No, because the data filtering could still search for doctors involved in the trial and, if used with zip code, could identify potential participants.

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69. In putting together a team, the project manager wants to have scientists, gamers, artists, and computer scientists. What is the argument for creating this team? Select two answers.

(A) It will help get budget money from each division.
(B) Each can work independently on their part and then combine their work.
(C) Collaboration efforts help save time and produce better results.
(D) Different perspectives will help develop a better product.

70. Which two protocols are responsible for breaking the data into packets and putting it back together at the destination and routing the packets to their destination? Select two answers.

(A) TCP
(B) HTTP
(C) FTP
(D) IP

71. Why should public key encryption be used? Select two answers.

(A) It is shorter than other ciphers.
(B) It cannot be broken with brute force techniques.
(C) It uses an asymmetric key making it harder to decrypt.
(D) It uses a symmetric key making it harder to decrypt.

72. Which of the following can be stored in a bit? Select two answers.

(A) The result of a number MOD 2
(B) A Boolean variable
(C) A variable that could hold a range of positive values
(D) A computer that can be on, off, or in "sleep" mode

73. Sending data off-site is a disaster recovery backup strategy. Which concerns can occur from this strategy? Select two answers.

(A) Security concerns if unencrypted data is transferred off-site on a regular basis
(B) Privacy concerns if the data were intercepted and decrypted exposing personal data
(C) Compatibility issues as computers and software change, the data may be unusable on newer systems
(D) Compression issues with sending large quantities over the network to a server in a different location

74. How has cloud computing helped with communication? Select two answers.

(A) By allowing asynchronous communication with email and text messaging
(B) By allowing synchronous methods of communication such as video conferencing
(C) By reducing the need for translation services since data can be quickly accessed from anywhere
(D) By providing cloud-based presentation tools to use with local data

STOP. End of Exam

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 rightmost 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: $128 + 64 + 8 = 200$

$78_{16} = 0111\ 10002_2$ 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.