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1. A cable television company stores information about movie purchases made by subscribers. Each day, the following information is summarized and stored in a publicly available database.
   • The day and date each movie was purchased
   • The title of each movie purchased
   • The cities where subscribers purchased each movie
   • The number of times each movie was purchased by subscribers in a given city

   A sample portion of the database is shown below. The database is sorted by date and movie title.

Day and Date	Movie Title	City	Number of Times Purchased
Sat 01 / 05 / 2014	Movie A	Houston, Texas	1
Sat 01 / 05 / 2014	Movie A	Detroit, Michigan	2
Sat 01 / 05 / 2014	Movie B	Houston, Texas	1
Sat 01 / 05 / 2014	Movie C	Anchorage, Alaska	1
Sun 01 / 06 / 2014	Movie A	Wichita, Kansas	3

   Which of the following CANNOT be determined using only the information in the database?

   (A) The date when a certain movie was purchased the greatest number of times

   (B) The number of movies purchased by an individual subscriber for a particular month ✓

   (C) The total number of cities in which a certain movie was purchased

   (D) The total number of movies purchased in a certain city during a particular month

2. Which of the following is an advantage of a lossless compression algorithm over a lossy compression algorithm?

   (A) A lossless compression algorithm can guarantee that compressed information is kept secure, while a lossy compression algorithm cannot.

   (B) A lossless compression algorithm can guarantee reconstruction of original data, while a lossy compression algorithm cannot. ✓

   (C) A lossless compression algorithm typically allows for faster transmission speeds than does a lossy compression algorithm.

   (D) A lossless compression algorithm typically provides a greater reduction in the number of bits stored or transmitted than does a lossy compression algorithm.

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3. A digital photo file contains data representing the level of red, green, and blue for each pixel in the photo. The file also contains metadata that describes the date and geographic location where the photo was taken. For which of the following goals would analyzing the metadata be more appropriate than analyzing the data?

(A) Determining the likelihood that the photo is a picture of the sky

(B) Determining the likelihood that the photo was taken at a particular public event   ✓

(C) Determining the number of people that appear in the photo

(D) Determining the usability of the photo for projection onto a particular color background

4. ASCII is a character-encoding scheme that uses 7 bits to represent each character. The decimal (base 10) values 65 through 90 represent the capital letters A through Z, as shown in the table below.

Decimal	ASCII Character	Decimal	ASCII Character
65	A	78	N
66	B	79	O
67	C	80	P
68	D	81	Q
69	E	82	R
70	F	83	S
71	G	84	T
72	H	85	U
73	I	86	V
74	J	87	W
75	K	88	X
76	L	89	Y
77	M	90	Z

What ASCII character is represented by the binary (base 2) number 1001010 ?

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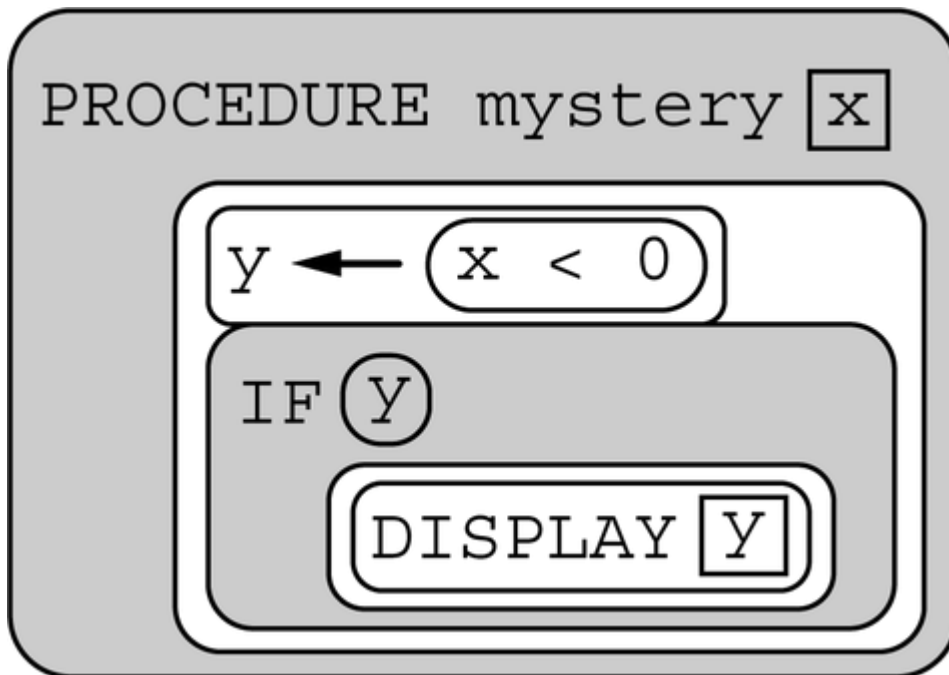
(**A**) H

(**B**) I

(**C**) J ✓

(**D**) K

5.   In the following procedure, assume that the parameter `x` is an integer.

Which of the following best describes the behavior of the procedure?

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A It displays nothing if `x` is negative and displays `true` otherwise.

B It displays nothing if `x` is negative and displays `false` otherwise.

C It displays `true` if `x` is negative and displays nothing otherwise. ✓

D It displays `true` if `x` is negative and displays `false` otherwise.

6. A video game character can face toward one of four directions: north, south, east, and west. Each direction is stored in memory as a sequence of four bits. A new version of the game is created in which the character can face toward one of eight directions, adding northwest, northeast, southwest, and southeast to the original four possibilities. Which of the following statements is true about how the eight directions must be stored in memory?

A Four bits are not enough to store the eight directions. Five bits are needed for the new version of the game.

B Four bits are not enough to store the eight directions. Eight bits are needed for the new version of the game.

C Four bits are not enough to store the eight directions. Sixteen bits are needed for the new version of the game.

D Four bits are enough to store the eight directions. ✓

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7. A large spreadsheet contains the following information about the books at a bookstore. A sample portion of the spreadsheet is shown below.

	A Book Title	B Author	C Genre	D Number of Copies in Stock	E Cost (in dollars)
1	Little Women	Louisa May Alcott	Fiction	3	13.95
2	The Secret Adversary	Agatha Christie	Mystery	2	12.95
3	A Study in Scarlet	Arthur Conan Doyle	Mystery	0	8.99
4	The Hound of the Baskervilles	Arthur Conan Doyle	Mystery	1	8.95
5	Les Misérables	Victor Hugo	Fiction	1	12.99
6	Frankenstein	Mary Shelley	Horror	2	11.95

An employee wants to count the number of books that meet all of the following criteria.

• Is a mystery book

• Costs less than $10.00

• Has at least one copy in stock

For a given row in the spreadsheet, suppose `genre` contains the genre as a string, `num` contains the number of copies in stock as a number, and `cost` contains the cost as a number. Which of the following expressions will evaluate to `true` if the book should be counted and evaluates to `false` otherwise?

A `(genre = "mystery") AND ((1 ≤ num) AND (cost < 10.00))` ✓

B `(genre = "mystery") AND ((1 < num) AND (cost < 10.00))`

C `(genre = "mystery") OR ((1 ≤ num) OR (cost < 10.00))`

D `(genre = "mystery") OR ((1 < num) OR (cost < 10.00))`

8. Which of the following are true statements about the data that can be represented using binary sequences?

1. Binary sequences can be used to represent strings of characters.

2. Binary sequences can be used to represent colors.

3. Binary sequences can be used to represent audio recordings.

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A I only

B I and II only

C II and III only

D I, II, and III ✓

DineOutHelper is a mobile application that people can use to select a restaurant for a group meal. Each user creates a profile with a unique username and a list of food allergies or dietary restrictions. Each user can then build a contact list of other users of the app.

A user who is organizing a meal with a group selects all the members of the group from the user's contact list. The application then recommends one or more nearby restaurants based on whether the restaurant can accommodate all of the group members' allergies and dietary restrictions.

Suppose that Alejandra is using DineOutHelper to organize a meal with Brandon and Cynthia.

---

9.   Which of the following data is not provided by Alejandra but is necessary for DineOutHelper to recommend a restaurant for the group?

1. Brandon's contact list

2. Information about which restaurants Brandon and Cynthia have visited in the past

3. Information about which food allergies and dietary restrictions can be accommodated at different restaurants near Alejandra

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A   II only

B   III only   ✓

C   II and III only

D   I, II, and III

10.   Which of the following data are needed for DineOutHelper to recommend a restaurant for the group?
    1. Each group member's list of food allergies or dietary restrictions
    2. Alejandra's geographic location
    3. The usernames of the people on Brandon and Cynthia's contact lists

A   I and II only   ✓

B   I and III only

C   II and III only

D   I, II, and III

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11. A company uses the following data files.

File Name	Description	Contents
Customers	A list of customers	Customer ID Customer address Customer e-mail address Customer phone number
Products	A list of products available for purchase from the company	Product ID Product name Type of battery used by the product, if any
Purchases	A list of customer purchases	Product ID Product serial number Customer ID

A new rechargeable battery pack is available for products that use AA batteries. Which of the following best explains how the data files in the table can be used to send a targeted e-mail to only those customers who have purchased products that use AA batteries to let them know about the new accessory?

(A) Use the customer IDs in the purchases file to search the customers file to generate a list of e-mail addresses

(B) Use the product IDs in the purchases file to search the products file to generate a list of product names that use AA batteries

(C) Use the customers file to generate a list of customer IDs, then use the list of customer IDs to search the products file to generate a list of product names that use AA batteries

(D) Use the products file to generate a list of product IDs that use AA batteries, then use the list of product IDs to search the purchases file to generate a list of customer IDs, then use the list of customer IDs to search the customers file to generate a list of e-mail addresses ✓

12. Which of the following is a true statement about data compression?

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A Data compression is only useful for files being transmitted over the Internet.

B Regardless of the compression technique used, once a data file is compressed, it cannot be restored to its original state.

C Sending a compressed version of a file ensures that the contents of the file cannot be intercepted by an unauthorized user.

D There are trade-offs involved in choosing a compression technique for storing and transmitting data. ✓

13. A certain social media Web site allows users to post messages and to comment on other messages that have been posted. When a user posts a message, the message itself is considered data. In addition to the data, the site stores the following metadata.
    • The time the message was posted
    • The name of the user who posted the message
    • The names of any users who comment on the message and the times the comments were made
    For which of the following goals would it be more useful to analyze the data instead of the metadata?

A To determine the users who post messages most frequently

B To determine the time of day that the site is most active

C To determine the topics that many users are posting about ✓

D To determine which posts from a particular user have received the greatest number of comments

14. A user wants to save a data file on an online storage site. The user wants to reduce the size of the file, if possible, and wants to be able to completely restore the file to its original version. Which of the following actions best supports the user's needs?

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Ⓐ Compressing the file using a lossless compression algorithm before uploading it   ✓

Ⓑ Compressing the file using a lossy compression algorithm before uploading it

Ⓒ Compressing the file using both lossy and lossless compression algorithms before uploading it

Ⓓ Uploading the original file without using any compression algorithm

15. Two lists, *list1* and *list2*, contain the names of books found in two different collections. A librarian wants to create *newList*, which will contain the names of all books found in either list, in alphabetical order, with duplicate entries removed.

    For example, if *list1* contains
    ["Macbeth", "Frankenstein", "Jane Eyre"]
    and *list2* contains
    ["Frankenstein", "Dracula", "Macbeth", "Hamlet"],
    then *newList* will contain
    ["Dracula", "Frankenstein", "Hamlet", "Jane Eyre", "Macbeth"].

    The following procedures are available to create *newList*.

Procedure	Explanation
Sort (list)	Sorts list in alphabetical order and returns the resulting list.
Combine (list1, list2)	Creates a new list consisting of the entries from list1 followed by the entries from list2. The resulting list is returned.
RemoveDuplicates (list)	Iterates through list. If any two or more entries have the same value, the duplicate entries are removed so that any entry appears at most once. The resulting list is returned.

    Which of the following code segments will correctly create *newList* ?

       →

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A   *newList ← Combine (list1, list2)*
newList ← Sort (newList)
newList ← RemoveDuplicates (newList) ✓

B   *list1 ← Sort (list1)*
list2 ← Sort (list2)
newList ← Combine (list1, list2)
newList ← RemoveDuplicates (newList)

C   *list1 ← RemoveDuplicates (list1)*
list2 ← RemoveDuplicates (list2)
newList ← Combine (list1, list2)
newList ← Sort (newList)

D   *list1 ← RemoveDuplicates (list1)*
list1 ← Sort (list1)
list2 ← RemoveDuplicates (list2)
list2 ← Sort (list2)
newList ← Combine (list1, list2)

16. The owner of a clothing store records the following information for each transaction made at the store during a 7-day period.

   • The date of the transaction
   • The method of payment used in the transaction
   • The number of items purchased in the transaction
   • The total amount of the transaction, in dollars

   Customers can pay for purchases using cash, check, a debit card, or a credit card.

   Using only the data collected during the 7-day period, which of the following statements is true?

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(A) The average amount spent per day during the 7-day period can be determined by sorting the data by the total transaction amount, then adding the 7 greatest amounts, and then dividing the sum by 7.

(B) The method of payment that was used in the greatest number of transactions during the 7-day period can be determined by sorting the data by the method of payment, then adding the number of items purchased for each type of payment method, and then finding the maximum sum.

(C) The most expensive item purchased on a given date can be determined by searching the data for all items purchased on the given date and then sorting the matching items by item price.

(D) The total number of items purchased on a given date can be determined by searching the data for all transactions that occurred on the given date and then adding the number of items purchased for each ✓ matching transaction.

17. A student is creating a Web site that is intended to display information about a city based on a city name that a user enters in a text field. Which of the following are likely to be challenges associated with processing city names that users might provide as input?

    Select <u>two</u> answers.

(A) Users might attempt to use the Web site to search for multiple cities.

(B) Users might enter abbreviations for the names of cities. ✓

(C) Users might misspell the name of the city. ✓

(D) Users might be slow at typing a city name in the text field.

18. A team of researchers wants to create a program to analyze the amount of pollution reported in roughly 3,000 counties across the United States. The program is intended to combine county data sets and then process the data. Which of the following is most likely to be a challenge in creating the program?

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(A) A computer program cannot combine data from different files.

(B) Different counties may organize data in different ways.   ✓

(C) The number of counties is too large for the program to process.

(D) The total number of rows of data is too large for the program to process.

19. A researcher is analyzing data about students in a school district to determine whether there is a relationship between grade point average and number of absences. The researcher plans on compiling data from several sources to create a record for each student.

The researcher has access to a database with the following information about each student.
• Last name
• First name
• Grade level (9, 10, 11, or 12)
• Grade point average (on a 0.0 to 4.0 scale)
The researcher also has access to another database with the following information about each student.
• First name
• Last name
• Number of absences from school
• Number of late arrivals to school
Upon compiling the data, the researcher identifies a problem due to the fact that neither data source uses a unique ID number for each student. Which of the following best describes the problem caused by the lack of unique ID numbers?

         →

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A Students who have the same name may be confused with each other.   ✓

B Students who have the same grade point average may be confused with each other.

C Students who have the same grade level may be confused with each other.

D Students who have the same number of absences may be confused with each other.

20. Central High School keeps a database of information about each student, including the numeric variables *numberOfAbsences* and *gradePointAverage*. The expression below is used to determine whether a student is eligible to receive an academic award.

   (*numberOfAbsences* ≤ 5) AND (*gradePointAverage* > 3.5)
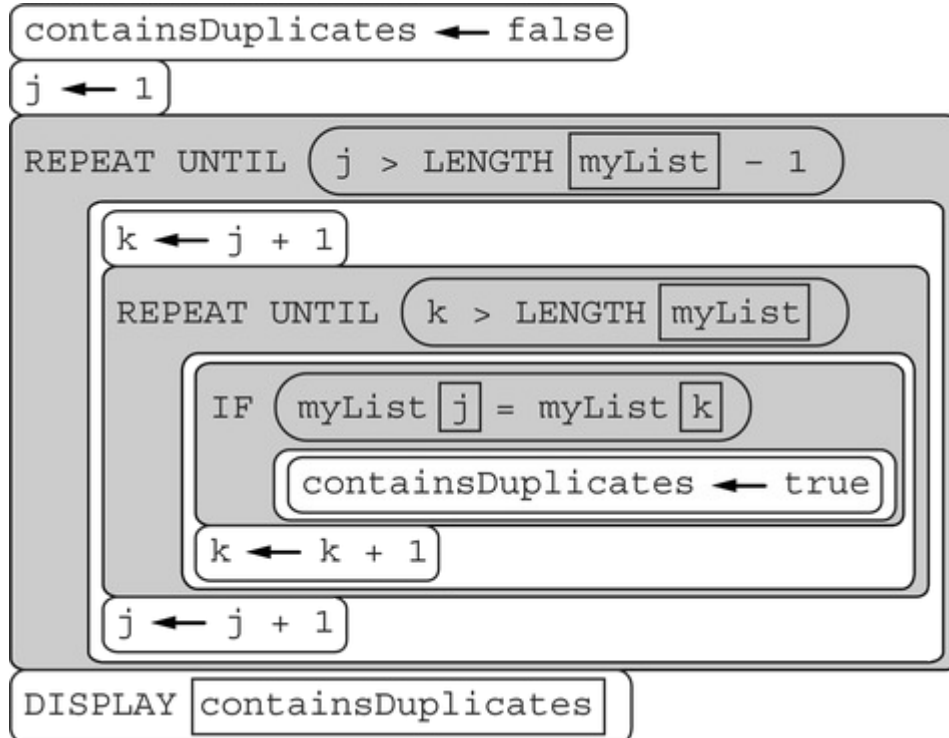   Which of the following pairs of values indicates that a student is eligible to receive an academic award?

A *numberOfAbsences* = 3, *gradePointAverage* = 3.5

B *numberOfAbsences* = 5, *gradePointAverage* = 3.8   ✓

C *numberOfAbsences* = 6, *gradePointAverage* = 3.4

D *numberOfAbsences* = 6, *gradePointAverage* = 3.6

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21. A student wrote the following code segment, which displays `true` if the list `myList` contains any duplicate values and displays `false` otherwise.

```
containsDuplicates ← false
j ← 1
REPEAT UNTIL (j > LENGTH myList - 1)
    k ← j + 1
    REPEAT UNTIL (k > LENGTH myList)
        IF (myList j = myList k)
            containsDuplicates ← true
        k ← k + 1
    j ← j + 1
DISPLAY containsDuplicates
```

The code segment compares pairs of list elements, setting `containsDuplicates` to `true` if any two elements are found to be equal in value. Which of the following best describes the behavior of how pairs of elements are compared?

(A) The code segment iterates through `myList`, comparing each element to all other elements in the list.

(B) The code segment iterates through `myList`, comparing each element to all subsequent elements in the list. ✓

(C) The code segment iterates through `myList`, comparing each element to the element that immediately follows it in the list.

(D) The code segment iterates through `myList`, comparing each element to the element that immediately precedes it in the list.

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22. In the following code segment, `score` and `penalty` are initially positive integers. The code segment is intended to reduce the value of `score` by `penalty`. However, if doing so would cause `score` to be negative, `score` should be assigned the value `0`.

    For example, if `score` is `20` and `penalty` is `5`, the code segment should set `score` to `15`. If `score` is `20` and `penalty` is `30`, `score` should be set to `0`.

    The code segment does not work as intended.
    ```
    Line 1: IF(score - penalty < 0)
    Line 2: {
    Line 3:    score ← score - penalty
    Line 4: }
    Line 5: ELSE
    Line 6: {
    Line 7:    score ← 0
    Line 8: }
    ```
    Which of the following changes can be made so that the code segment works as intended?

    (A) Changing line 1 to `IF(score < 0)`

    (B) Changing line 1 to `IF(score + penalty < 0)`

    (C) Changing line 7 to `score ← score + penalty`

    (D) Interchanging lines 3 and 7 ✓

23. The following procedure is intended to return the number of times the value `val` appears in the list `myList`. The procedure does not work as intended.
    Which of the following changes can be made so that the procedure will work as intended?

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(A) Changing line 6 to `IF(item = count)`

(B) Changing line 6 to `IF(myList[item] = val)`

(C) Moving the statement in line 5 so that it appears between lines 2 and 3 ✓

(D) Moving the statement in line 11 so that it appears between lines 9 and 10

24. In the following procedure, the parameter `numList` is a list of numbers and the parameters `j` and `k` are integers.

```
PROCEDURE swapListElements(numList, j, k)
{
    newList numList
    newList[j] numList[k]
    newList[k] numList[j]
    RETURN(newList)
}
```
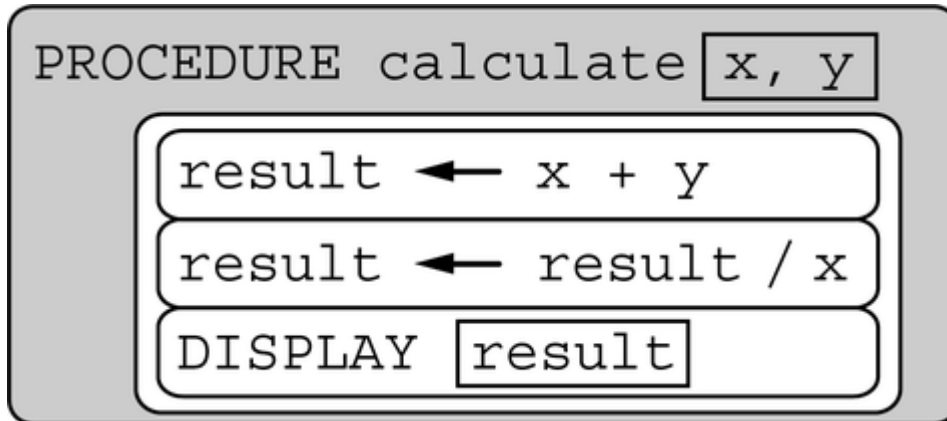
Which of the following is the most appropriate documentation to appear with the `swapListElements` procedure?

(A) Returns a copy of `numList` with the elements at indices `j` and `k` interchanged.
The value of `j` must be between `0` and the value of `k`, inclusive.

(B) Returns a copy of `numList` with the elements at indices `j` and `k` interchanged.
The values of `j` and `k` must both be between `1` and `LENGTH(numList)`, inclusive. ✓

(C) Interchanges the values of the parameters `j` and `k`.
The value of `j` must be between `0` and the value of `k`, inclusive.

(D) Interchanges the values of the parameters `j` and `k`.
The values of `j` and `k` must both be between `1` and `LENGTH(numList)`, inclusive.

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25. In the following procedure, the parameters `x` and `y` are integers.

```
PROCEDURE calculate x, y

    result ◄── x + y

    result ◄── result / x

    DISPLAY result
```

Which of the following is the most appropriate documentation to appear with the `calculate` procedure?

A Displays the value of `x + (y / x)`.
The value of the parameter `x` must not be `0`.

B Displays the value of `x + (y / x)`.
The value of the parameter `y` must not be `0`.

C Displays the value of `(x + y) / x`.
The value of the parameter `x` must not be `0`. ✓

D Displays the value of `(x + y) / x`.
The sum of the parameters `x` and `y` must not be `0`.

26. In the following procedure, the parameter `max` is a positive integer.

```
PROCEDURE printNums(max)
{
    count 1
    REPEAT UNTIL(count > max)
    {
        DISPLAY(count)
        count count + 2
    }
}
```

Which of the following is the most appropriate documentation to appear with the `printNums` procedure?

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(A) Prints all positive even integers that are less than or equal to `max`.

(B) Prints all positive odd integers that are less than or equal to `max`.   ✓

(C) Prints all positive even integers that are greater than `max`.

(D) Prints all positive odd integers that are greater than `max`.

A chain of retail stores uses software to manage telephone calls from customers. The system was recently upgraded. Customers interacted with the original system using their phone keypad. Customers interact with the upgraded system using their voice.
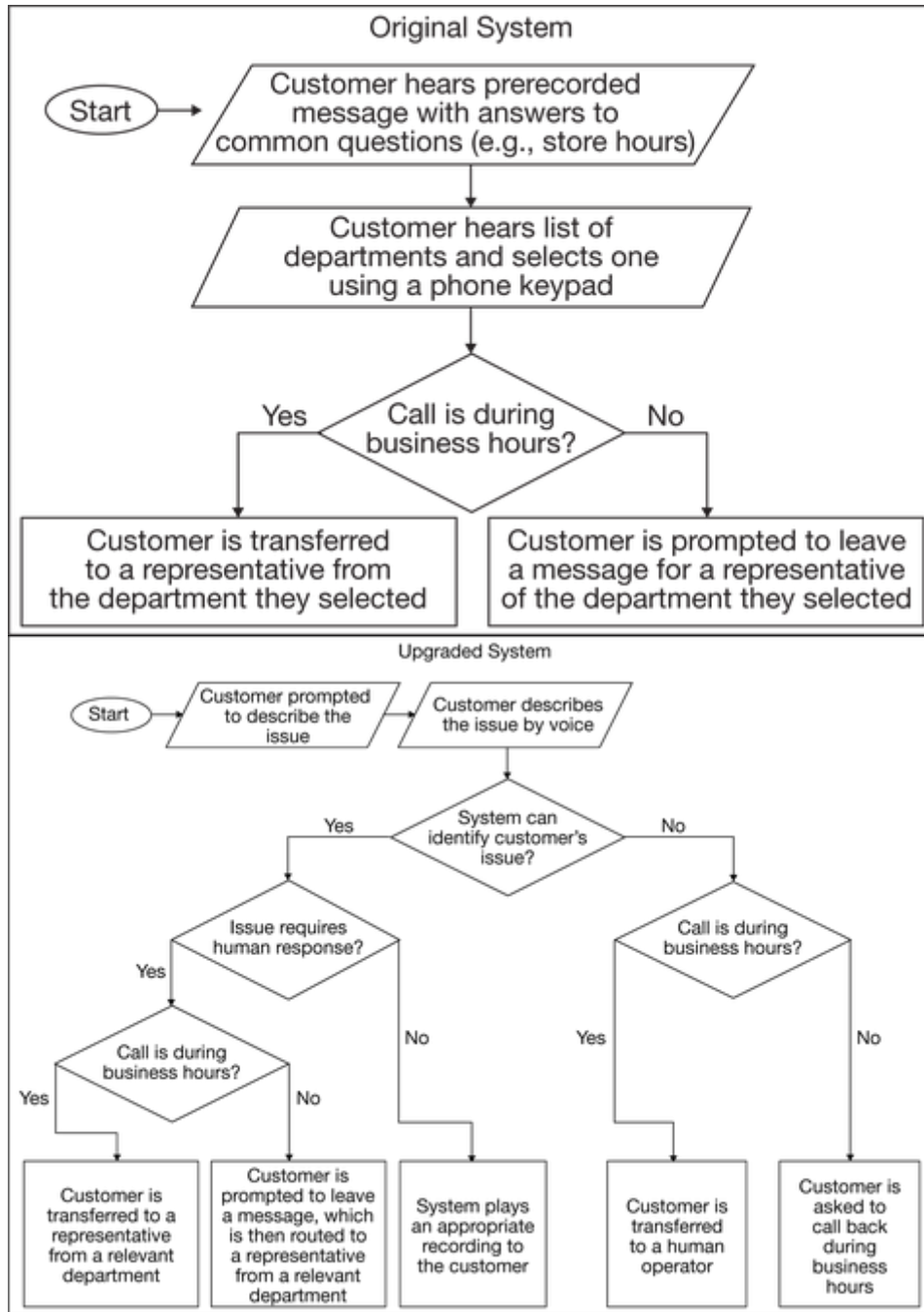
The upgraded system (but not the original system) stores all information from the calling session in a database for future reference. This includes the customer's telephone number and any information provided by the customer (name, address, order number, credit card number, etc.).

The original system and the upgraded system are described in the following flowcharts. Each flowchart uses the following blocks.

Block	Explanation
Oval	The start of the algorithm
Parallelogram	An input or output step
Diamond	A conditional or decision step, where execution proceeds to the side labeled "Yes" if the answer to the question is yes and to the side labeled "No" if the answer to the question is no
Rectangle	The result of the algorithm

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27. The upgraded system uses a directory containing additional information not supplied by the customer. The directory is used to help direct calls effectively. Which of the following is LEAST likely to be included in the directory?

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A A list of common issues and whether each issue requires a human representative

B A list of common keywords or phrases and a corresponding issue for each keyword or phrase

C A list of computers the company owns and the computers' corresponding IP addresses   ✓

D A list of human representatives and the corresponding department for each representative

---

28. To direct a call to the appropriate destination, which of the following input data is needed by the upgraded system that was NOT needed by the original system?
    1. Audio signal of the customer's voice
    2. The customer's keypad selection
    3. The customer's phone number

A I only   ✓

B II only

C I and III only

D I, II, and III

29. The position of a runner in a race is a type of analog data. The runner's position is tracked using sensors. Which of the following best describes how the position of the runner is represented digitally?

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A The position of the runner is determined by calculating the time difference between the start and the end of the race and making an estimation based on the runner's average speed.

B The position of the runner is measured and rounded to either 0 or 1 depending on whether the runner is closer to the starting line or closer to the finish line.

C The position of the runner is predicted using a model based on performance data captured from previous races.

D The position of the runner is sampled at regular intervals to approximate the real-word position, and a sequence of bits is used to represent each sample.   ✓

30. A database of information about shows at a concert venue contains the following information.
    • Name of artist performing at the show
    • Date of show
    • Total dollar amount of all tickets sold
    Which of the following additional pieces of information would be most useful in determining the artist with the greatest attendance during a particular month?

A Average ticket price   ✓

B Length of the show in minutes

C Start time of the show

D Total dollar amount of food and drinks sold during the show

31. A student is recording a song on her computer. When the recording is finished, she saves a copy on her computer. The student notices that the saved copy is of lower sound quality than the original recording. Which of the following could be a possible explanation for the difference in sound quality?

       →

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A The song was saved using fewer bits per second than the original song. ✓

B The song was saved using more bits per second than the original song.

C The song was saved using a lossless compression technique.

D Some information is lost every time a file is saved from one location on a computer to another location.

32. **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

    Computers are often used to search through large sets of data to find useful patterns in the data. Which of the following tasks is NOT an example where searching for patterns is needed to produce useful information?

    A A credit card company analyzing credit card purchases to identify potential fraudulent charges

    B A grocery store analyzing customers' past purchases to suggest new products the customer may be interested in

    C A high school analyzing student grades to identify the students with the top ten highest grade point averages ✓

    D An online retailer analyzing customers' viewing habits to suggest other products based on the purchasing history of other customers

33. **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

    Digital images are often represented by the red, green, and blue values (an RGB triplet) of each individual pixel in the image. A photographer is manipulating a digital image and overwriting the original image. Which of the following describes a lossless transformation of the digital image?

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(A) Compressing the image in a way that may lose information but will suffer only a small loss of image quality.

(B) Creating the gray scale of an image by averaging the amounts of red, green, and blue in each pixel and assigning this new value to the corresponding pixel in the new image. The new value of each pixel represents a shade of gray, ranging from white to black.

(C) Creating the negative of an image by creating a new RGB triplet for each pixel in which each value is calculated by subtracting the original value from 255. The negative of an image is reversed from the original; ✓ light areas appear dark, and colors are reversed.

(D) Modifying part of the image by taking the pixels in one part of the picture and copying them to the pixels in another part of the picture.

34. An Internet service provider (ISP) is considering an update to its servers that would save copies of the Web pages most frequently visited by each user.
    Which of the following is LEAST likely to occur as a result of the update?

(A) Average response time for user requests might decrease.

(B) Privacy of users might be negatively affected.

(C) Storage requirements for the servers might increase.

(D) Web sites that are not visited frequently might no longer be accessible to users. ✓

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35. A large spreadsheet contains information about the schedule for a college radio station. A sample portion of the spreadsheet is shown below.

	A Show Name	B Genre	C Day	D Start Time	E End Time
1	Dot Dot Dash	rock	Sunday	11:00 A.M.	1:00 P.M.
2	New Afternoon Show	talk	Sunday	1:00 P.M.	3:00 P.M.
3	Thursday Beats	hip-hop	Thursday	7:00 P.M.	9:00 P.M.
4	Gossip Time	talk	Friday	4:00 P.M.	6:00 P.M.
5	Campus Chat	talk	Saturday	6:00 P.M.	8:00 P.M.
6	Jazz Brunch	jazz	Saturday	12:00 P.M.	3:00 P.M.

A student wants to count the number of shows that meet both of the following criteria.

Is a talk show

Is on Saturday or Sunday

For a given row in the spreadsheet, suppose `genre` contains the genre as a string and `day` contains the day as a string. Which of the following expressions will evaluate to `true` if the show should be counted and evaluates to `false` otherwise?

(A) `(genre = "talk") AND ((day = "Saturday") AND (day = "Sunday"))`

(B) `(genre = "talk") AND ((day = "Saturday") OR (day = "Sunday"))` ✓

(C) `(genre = "talk") OR ((day = "Saturday") AND (day = "Sunday"))`

(D) `(genre = "talk") OR ((day = "Saturday") OR (day = "Sunday"))`

36. Consider the following numeric values.

- Binary 1011
- Binary 1101
- Decimal 5
- Decimal 12

Which of the following lists the values in order from least to greatest?

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(A) Decimal 5, binary 1011, decimal 12, binary 1101   ✓

(B) Decimal 5, decimal 12, binary 1011, binary 1101

(C) Decimal 5, binary 1011, binary 1101, decimal 12

(D) Binary 1011, binary 1101, decimal 5, decimal 12

37. **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

    A search engine has a trend-tracking feature that provides information on how popular a search term is. The data can be filtered by geographic region, date, and category. Categories include arts and entertainment, computers and electronics, games, news, people and society, shopping, sports, and travel. Which of the following questions is LEAST likely to be answerable using the trends feature?

    (A) In what month does a particular sport receive the most searches?

    (B) In which political candidates are people interested?

    (C) What is the cost of a certain electronics product?   ✓

    (D) Which region of the country has the greatest number of people searching for opera performances?

38. Each student that enrolls at a school is assigned a unique ID number, which is stored as a binary number. The ID numbers increase sequentially by 1 with each newly enrolled student. If the ID number assigned to the last student who enrolled was the binary number 1001 0011, what binary number will be assigned to the next student who enrolls?

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A 1001 0100 ✓

B 1001 0111

C 1101 0100

D 1101 0111

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39. A large spreadsheet contains information about the photographs in a museum's collection. A sample portion of the spreadsheet is shown below.

	A	**B**	**C**	**D**
	Photographer	**Subject**	**Year**	**Publicly Available**
1	Steven Greene	Geyser Eruption	2004	true
2	Linda James	Giant Sloth Fossil	-1	true
3	Yajaira Lopez	Diplodocus Skull	1997	false
4	Masahiro Higashi	Sea Turtle	1989	true
5	(unknown)	Solar Eclipse	2011	false
6	(unknown)	Giant Sequoia	-1	true

• In column A, each unknown photographer is set to `"(unknown)"`.

• In column C, each unknown year is set to `-1`.

A student is developing an algorithm to determine the name of the photographer who took the oldest photograph in the collection. Photographs whose photographer or year are unknown are to be ignored.

Once the algorithm is complete, the desired entry will appear in the first row of the spreadsheet. If there are multiple entries that meet the desired criteria, then any of them can appear in the first row.

The student has the following actions available.

Action	Explanation
Filter by photographer	Removes entries whose photographer is `"(unknown)"`
Filter by year	Removes entries whose year is `-1`
Sort by subject	Sorts the rows in the spreadsheet on column B alphabetically from A to Z
Sort by year	Sorts the rows in the spreadsheet on column C from least to greatest

Assume that applying either of the filters will not change the relative order of the rows remaining in the spreadsheet.

Which of the following sequences of steps can be used to identify the desired entry?

Select two answers.

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(A) Filter by photographer, then filter by year, then sort by subject

(B) Filter by photographer, then filter by year, then sort by year   ✓

(C) Sort by subject, then sort by year, then filter by photographer

(D) Sort by year, then filter by year, then filter by photographer   ✓

40. When a cellular telephone user places a call, the carrier transmits the caller's voice as well as the voice of the person who is called. The encoded voices are the data of the call. In addition to transmitting the data, the carrier also stores metadata. The metadata of the call include information such as the time the call is placed and the phone numbers of both participants. For which of the following goals would it be more useful to computationally analyze the metadata instead of the data?
    1. To determine if a caller frequently uses a specific word
    2. To estimate the number of phone calls that will be placed next Monday between 10:30 A.M. and noon.
    3. To generate a list of criminal suspects when given the telephone number of a known criminal

(A) I only

(B) II only

(C) II and III only   ✓

(D) I, II, and III

41. A student is creating an application that allows customers to order food for delivery from a local restaurant. Which of the following is LEAST likely to be an input provided by a customer using the application?

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$\textbf{A}$ The address where the order should be delivered

$\textbf{B}$ The cost of a food item currently available for order   ✓

$\textbf{C}$ The credit card or payment information for the purchaser

$\textbf{D}$ The name of a food item to be included in the delivery

42. The following code segment is intended to set `max` equal to the maximum value among the integer variables `x`, `y`, and `z`. The code segment does not work as intended in all cases.

```
IF (x > y) AND (x > z)
    max ← x
IF (y > x) AND (y > z)
    max ← y
ELSE
    max ← z
```

Which of the following initial values for `x`, `y`, and `z` can be used to show that the code segment does not work as intended?

$\textbf{A}$ x = 1, y = 2, z = 3

$\textbf{B}$ x = 1, y = 3, z = 2

$\textbf{C}$ x = 2, y = 3, z = 1

$\textbf{D}$ x = 3, y = 2, z = 1   ✓

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43. A teacher sends students an anonymous survey in order to learn more about the students' work habits. The survey contains the following questions.

• On average, how long does homework take you each night (in minutes) ?

• On average, how long do you study for each test (in minutes) ?

• Do you enjoy the subject material of this class (yes or no) ?

Which of the following questions about the students who responded to the survey can the teacher answer by analyzing the survey results?

1. Do students who enjoy the subject material tend to spend more time on homework each night than the other students do?

2. Do students who spend more time on homework each night tend to spend less time studying for tests than the other students do?

3. Do students who spend more time studying for tests tend to earn higher grades in the class than the other students do?

(A) I only

(B) III only

(C) I and II ✓

(D) I and III

44. A camera mounted on the dashboard of a car captures an image of the view from the driver's seat every second. Each image is stored as data. Along with each image, the camera also captures and stores the car's speed, the date and time, and the car's GPS location as metadata. Which of the following can best be determined using only the data and none of the metadata?

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Ⓐ The average number of hours per day that the car is in use

Ⓑ The car's average speed on a particular day

Ⓒ The distance the car traveled on a particular day

Ⓓ The number of bicycles the car passed on a particular day ✓

45. A retailer that sells footwear maintains a single database containing records with the following information about each item for sale in the retailer's store.
    • Item identification number
    • Footwear type (sneakers, boots, sandals, etc.)
    • Selling price (in dollars)
    • Size
    • Color
    • Quantity available

    Using only the database, which of the following can be determined?

Ⓐ Which items listed in the database are not currently in the store ✓

Ⓑ Which colors are more popular among men than women

Ⓒ Which type of footwear is most popular among adults

Ⓓ The total number of shoes sold in a particular month

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46.

> **Directions: For the question or incomplete statement below, two of the suggested answers are correct. For this question, you must select both correct choices to earn credit. No partial credit will be earned if only one correct choice is selected. Select the two that are best in each case.**
>
> Which of the following can be represented by a single binary digit?
>
> Select <u>two</u> answers.

A The position of the minute hand of a clock

B The remainder when dividing a whole number by 2 ✓

C The value of a Boolean variable ✓

D The volume of a car radio

47. A video-streaming Web site uses 32-bit integers to count the number of times each video has been played. In anticipation of some videos being played more times than can be represented with 32 bits, the Web site is planning to change to 64-bit integers for the counter. Which of the following best describes the result of using 64-bit integers instead of 32-bit integers?

A 2 times as many values can be represented.

B 32 times as many values can be represented.

C 2^{32} times as many values can be represented. ✓

D 32^2 times as many values can be represented.

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48. The procedure below is intended to display the index in a list of unique names *(nameList)* where a particular name *(targetName)* is found. If *targetName* is not found in *nameList*, the code should display 0.

```
PROCEDURE FindName (nameList, targetName)
{
    index ← 0
    FOR EACH name IN nameList
    {
        index ← index + 1
        IF (name = targetName)
        {
            foundIndex ← index
        }
        ELSE
        {
            foundIndex ← 0
        }
    }
    DISPLAY (foundIndex)
}
```

Which of the following procedure calls can be used to demonstrate that the procedure does NOT work as intended?

(**A**) *FindName* (["Andrea", "Ben"], "Ben")

(**B**) *FindName* (["Andrea", "Ben"], "Diane")

(**C**) *FindName* (["Andrea", "Ben", "Chris"], "Ben") ✓

(**D**) *FindName* (["Andrea", "Chris", "Diane"], "Ben")

49. A computer program uses 3 bits to represent integers. When the program adds the decimal (base 10) numbers 5 and 3, the result is 0. Which of the following is the best explanation for the result?

→

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A An overflow error occurred. ✓

B A round-off error occurred.

C The result was affected by lossy data compression.

D The result was approximated by a floating-point representation.

50. **Directions: The question or incomplete statement below is followed by four suggested answers or completions. Select the one that is best in each case.**

    Some programming languages use constants, which are variables that are initialized at the beginning of a program and never changed. Which of the following are good uses for a constant?

    I. To represent the mathematical value π (pi) as 3.14
    II. To represent the current score in a game
    III. To represent a known value such as the number of days in a week

    A I and II only

    B I and III only ✓

    C II and III only

    D I, II, and III

51. A company that develops mobile applications wants to involve users in the software development process. Which of the following best explains the benefit in having users participate?

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A Users can identify and correct errors they encounter when using released versions of the software.

B Users can review the algorithms used in the software to help improve their efficiency.

C Users can provide documentation for program code at the end of the software development process.

D Users can provide feedback that can be used to incorporate a variety of perspectives into the software. ✓

52. A wildlife preserve is developing an interactive exhibit for its guests. The exhibit is intended to allow guests to select the name of an animal on a touch screen and display various facts about the selected animal.

   For example, if a guest selects the animal name "wolf," the exhibit is intended to display the following information.

   • Classification: mammal
   • Skin type: fur
   • Thermoregulation: warm-blooded
   • Lifestyle: pack
   • Average life span: 10–12 years
   • Top speed: 75 kilometers/hour

   The preserve has two databases of information available to use for the exhibit. The first database contains information for each animal's name, classification, skin type, and thermoregulation. The second database contains information for each animal's name, lifestyle, average life span, and top speed.

   Which of the following explains how the two databases can be used to develop the interactive exhibit?
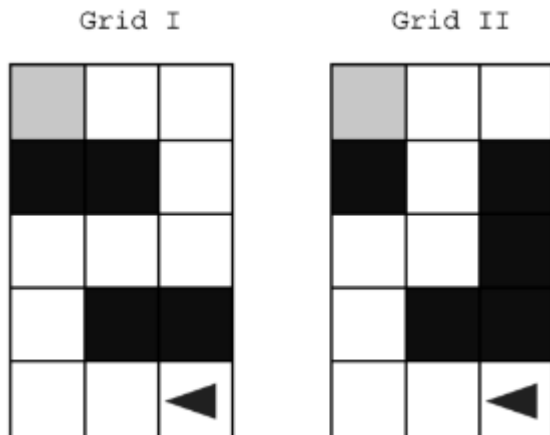
   →

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A Only the first database is needed. It can be searched by animal name to find all the information to be displayed.

B Only the second database is needed. It can be searched by animal name to find all the information to be displayed.

C Both databases are needed. Each database can be searched by animal name to find all information to be displayed. ✓

D The two databases are not sufficient to display all the necessary information because the intended display information does not include the animal name.

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53. Two grids are shown below. Each grid contains a robot represented as a triangle. Both robots are initially facing left. Each robot can move into a white or gray square, but cannot move into a black region.

Grid I   Grid II

For each grid, the program below is intended to move the robot to the gray square. The program uses the procedure *Goal_Reached ( )*, which evaluates to *true* if the robot is in the gray square and evaluates to *false* otherwise.

```
REPEAT UNTIL (Goal_Reached ())
{
    IF (CAN_MOVE (right))
    {
        ROTATE_RIGHT ()
    }
    ELSE
    {
        IF (CAN_MOVE (left))
        {
            ROTATE_LEFT ()
        }
    }
    IF (CAN_MOVE (forward))
    {
        MOVE_FORWARD ()
    }
}
```

For which of the grids does the program correctly move the robot to the gray square?

   →

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A Grid I only ✓

B Grid II only

C Both grid I and grid II

D Neither grid I nor grid II

54. A programmer is developing software for a social media platform. The programmer is planning to use compression when users send attachments to other users. Which of the following is a true statement about the use of compression?

A Lossless compression of video files will generally save more space than lossy compression of video files.

B Lossless compression of an image file will generally result in a file that is equal in size to the original file.

C Lossy compression of an image file generally provides a greater reduction in transmission time than lossless compression does. ✓

D Sound clips compressed with lossy compression for storage on the platform can be restored to their original quality when they are played.

55. The table below shows the time a computer system takes to complete a specified task on the customer data of different-sized companies.

Task	Small Company (approximately 100 customers)	Medium Company (approximately 1,000 customers)	Large Company (approximately 10,000 customers)
Backing up data	2 hours	20 hours	200 hours
Deleting entries from data	100 hours	200 hours	300 hours
Searching through data	250 hours	300 hours	350 hours
Sorting data	0.01 hour	1 hour	100 hours

Based on the information in the table, which of the following tasks is likely to take the longest amount of time when scaled up for a very large company of approximately 100,000 customers?

     →

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A Backing up data

B Deleting entries from data

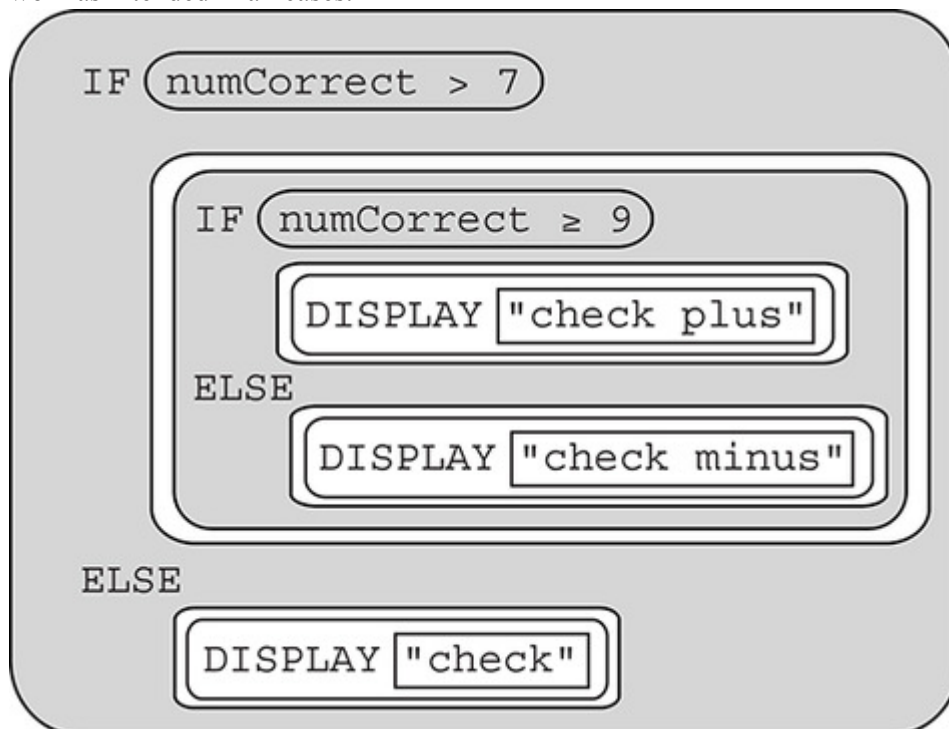**C** Searching through data

D Sorting data ✓

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56. A homework assignment consists of 10 questions. The assignment is graded as follows.

Number of Correct Answers	Grade
9–10	check plus
7–8	check
Under 7	check minus

Let `numCorrect` represent the number of correct answers for a particular student. The following code segment is intended to display the appropriate grade based on `numCorrect`. The code segment does not work as intended in all cases.

```
IF (numCorrect > 7)

    IF (numCorrect ≥ 9)

        DISPLAY "check plus"

    ELSE

        DISPLAY "check minus"

ELSE

    DISPLAY "check"
```

For which of the following values of `numCorrect` does the code segment NOT display the intended grade?

Select two answers.

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A 9

B 8 ✓

C 7

D 6 ✓

57. The following procedure is intended to return `true` if the list of numbers `myList` contains only positive numbers and is intended to return `false` otherwise. The procedure does not work as intended.

```
PROCEDURE allPositive(myList)
{
    index 1
    len LENGTH(myList)
    REPEAT len TIMES
    {
      IF(myList[index] > 0)
      {
RETURN(true)
      }
      index index + 1
    }
    RETURN(false)
}
```

For which of the following contents of `myList` does the procedure NOT return the intended result?

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A   `[-3, -2, -1]`

B   `[-2, -1, 0]`

C   `[-1, 0, 1]`   ✓

D   `[1, 2, 3]`