

AP CSP - Multiple Choice By Topic ANSWERS

<u>Abstraction</u>	<u>Algorithms</u>	<u>Data & Info</u>	<u>Global Impact</u>
① D	① A	① C	① A
② A & B	② C	② D	② D
③ C	③ A	③ C	③ A
④ D	④ A	④ A	④ A & C
⑤ C	⑤ A	⑤ B	⑤ D
⑥ A	⑥ D	⑥ B	⑥ D
⑦ A	⑦ D	⑦ C	⑦ A & D
⑧ B	⑧ D	⑧ D	⑧ D
⑨ A	⑨ B	⑨ A	⑨ C & D
			⑩ A

<u>Internet</u>	<u>Programming</u>
① C	⑥ A & C
② B	⑦ C
③ A	⑧ B
④ A	⑨ B & C
⑤ A	⑩ A

Abstraction

1. Which of the following are equivalent representation of the same number?

(A) Binary 11010
Hexadecimal FF
Decimal 32

(B) Binary 1010
Hexadecimal A
Decimal 11

(C) Binary 1101
Hexadecimal BB
Decimal 13

(D) Binary 1110
Hexadecimal E
Decimal 14

$$1110_2 = \frac{\text{base } 10}{8+4+2+0} = 14_{10}$$

$$E_{16} = 14_{10}$$

$$1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ \frac{A}{10} \ \frac{B}{11} \ \frac{C}{12} \ \frac{D}{13} \ \frac{E}{14}$$

2. Which of the following can be represented in a binary state? Choose two answers.

- (A) A Power Supply on/off
(B) Voting on a House Bill yes/no
(C) A byte of data
(D) A trend

3. How many binary place values are required for the sum of decimal numbers 2 and 6?

- (A) 2
(B) 3
 (C) 4
(D) 5

$$2+6=8$$

$$8_{10} = 1000_2$$

4. What of the following accurately defines a binary question?

- (A) A question with multiple choice answers.
(B) Two questions sharing the same answer.
(C) A question with two possible answer types.
 (D) A question which can be answered in only one of two possible ways. - ex: True or False

5. With 8 bits, it's possible to represent 256 different integer values. How many bits do you need to represent as many integer values (512)?

- (A) 16
- (B) 10
- (C) 9
- (D) 12

$$2^8 = 256$$
$$2^9 = 512$$

Including another bit →
twice as many values are
represented

6. What is Abstraction?

- (A) Complexity made simple
- (B) Step by step instructions → algorithms
- (C) Mathematical operations
- (D) Breaking data

7. Which of the following only requires a single bit of storage to represent the data?

- (A) Any number modulo 2 returns 0 or 1
- (B) The temperature outside
- (C) A score on a math test
- (D) Hertz (Hz)

8. Which of the following is one way to describe abstraction in computer programming?

- (A) Creating a series of smaller programs rather than one large set of code.
- (B) Giving meaningful names to a set of statements (function/procedure/method) that accomplish a particular task. → readability
- (C) Adding detailed comments to help a programmer read the code easily.
- (D) Using global variables whenever possible to allow values to be easily accessed.

9. Which of the following are equivalent?

- I. 11110 (base 2) \rightarrow 30 (base 10)
- II. 1E (base 16) \rightarrow 30 (base 10)
- III. 24 (base 10)

(A) I and II

(B) I and III

(C) II and III

(D) I, II, and III

$$11110_2 = \underset{\text{base 10}}{16 + 8 + 4 + 2 + 0} = 30_{10}$$

$$1E_{16} = \underset{\text{base 10}}{16 \times 1 + 1 \times 14} \\ 16 + 14 = 30_{10}$$

Algorithms

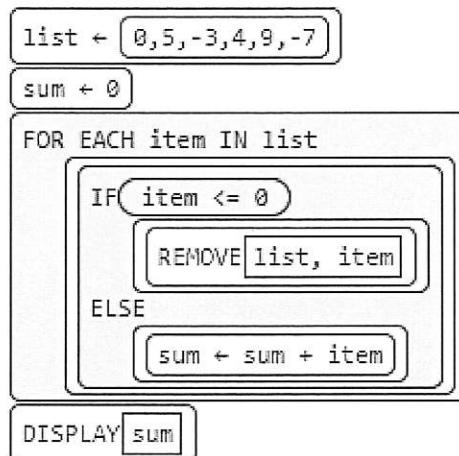
1. Predict the output of the following code block

```
list ← [27, 44, 13, 16, 29, 32, 55]
list1 ← [0]
FOR EACH item IN list
{
    IF (item MOD 2 = 0) → check if item is even
    {
        APPEND(list1, item)
    }
}
DISPLAY(list1)
```

→ add item to list 1

- (A) 0, 44, 16, 32
- (B) 44, 16, 32
- (C) 0, 27, 44, 13, 16, 29, 32, 55
- (D) 27, 44, 13, 16, 29, 32, 55

2. Consider the following program. Predict the output produced by this program.



0
5
9
18

- (A) 8
- (B) 0
- (C) 18
- (D) 9

3. Which of the following operations performed by an algorithm would most likely use both selection and iteration?

In a hand of number cards:

- (A) determine the number of cards with the suit equal to hearts.
- (B) compute the average value of the cards.
- (C) determine the number of cards in the hand.
- (D) compute the sum of the cards' value.

do not require selection
since all cards are involved

4. As a computer science student, you are writing a program to help your administration search for a student from a list of students in your school. Assume the student records in the list are not sorted.

Which statement is true regarding your choice of program algorithm?

Binary search requires
a sorted list.

- (A) A linear search algorithm would be more appropriate than a binary search algorithm because the list is not sorted.
- (B) A binary search algorithm would be more appropriate because it is more efficient than a linear search algorithm in all cases.
- (C) A binary search algorithm would be more appropriate than a linear one because it is more efficient for a large list.
- (D) You may use either the linear search or the binary search algorithm because both will yield correct results.

5. Trudy is writing a program to input student grades from a particular test. It will also use the variable count to keep track of the number of times a user enters the particular score of 85. Of the steps below, which should appear earliest in her pseudocode?

- (A) count <- 0
- (B) grade <- INPUT()
- (C) count <- count + 1
- (D) IF (grade = 85)

Variable must be initialized
before incrementing.

6. What is the difference between the encryption and decryption key in a symmetric key encryption system?
- (A) The decryption key is the reverse of the encryption key.
(B) The decryption key is longer than the encryption key.
(C) The decryption key is shorter than the encryption key.
(D) The keys are identical.

↓
example...
Caesar
cipher

7. What does the binary sequence 1010 1101 1101 represent in a computer?

- (A) The hexadecimal number ADD (decimal 2781)
(B) A variable named ADD
(C) The ADD instruction

Data and instructions
are both stored as
0s & 1s.

- (D)** It cannot be determined. It depends on the context in which it is used. ✓

8. Which statement correctly distinguishes between linear search and binary search?

- (A) Linear search is faster for long lists of items but requires that the list of items be sorted in advance.
(B) Linear search is faster for long lists of items, while binary search is more suitable for short lists of items.
(C) Binary search is slower for shorter lists but has the advantage of not requiring the list items to be sorted in advance.
(D) Binary search is faster for long lists of items but requires that the list items be sorted in advance.

sorted

9. Complete the following sentence with the best pair of word choices. A(n) _____ is a set of steps we follow to complete a task while a(n) _____ is a procedure intended to provide a reasonable, though not necessarily best, solution.

- (A) heuristic, algorithm
(B) algorithm, heuristic
(C) abstraction, heuristic
(D) heuristic, abstraction

Data & Info

- At the end of each day, the owners of a local fruit stand tabulate the following information in a CSV file.

- Date
- Name of fruit
- Count sold that day
- Count remaining in sellable condition

Sample data from one day are shown here:

2016-08-18, Apples, 12, 25
2016-08-18, Cucumber, 5, 6
2016-08-18, Peaches, 1, 9
2016-08-18, Watermelon, 1, 4

Using only the information from the database, which of the following can be determined:

- The types of fruit that need to be re-ordered
- Most popular fruit among men *- gender not mentioned*
- Average number of each fruit type sold per month

- (A) I only
(B) I and II only
(C) I and III only
(D) II, and III only

- Which of the following statements about data analysis and processing is NOT true given modern computing technology?

- (A) Storage, processing, or curation often present significant challenge when processing large datasets.
(B) Data scientists typically combine multiple data sources as more can be learned when each data source is analyzed independently.
(C) Information cleansing and classification are often employed in the processing of data by which patterns can emerge.
(D) Metadata is only useful for datasets that are small enough to be analyzed by hand, so it is often not considered in modern data analysis.

Metadata is useful in analysis of datasets of all sizes.

3. Which of the following statements about compression are true?
- I. Compression is only useful when transferring files over a network
 - II. After a file is compressed, it can never be restored to its original state without some loss of information or quality.
 - III. In some situations, it is more appropriate to use lossy data compression rather than lossless data compression.
- (A) I only
(B) I and II only
(C) III only
(D) II and III only
4. Which of the following is the best definition of metadata?
- (A) Data that describes other data**
(B) Data processed by an algorithm
(C) A compression scheme
(D) A small part of a picture
5. A team of students are working on a project for science class. For the project, the students keep track of the weather forecast for 30 days. Each day they record the date, the weather forecast for that day, and whether the forecast was essentially correct for that day. The information collected would be an example of:
- (A) The Date
(B) The Weather Forecast
(C) The Source
(D) The Correctness of the Forecast
6. Data cleaning is usually undertaken before collected data is ready for analysis. From the choices given, what statement best explains the concept of Data Cleaning?
- (A) Cleaning of Data refers to fixing incorrect information in the original data collected.
(B) Cleaning of Data is when collected data is standardized for easy processing by a computer.
(C) Cleaning of Data is the process where only relevant data is allowed to be collected in the first place.
(D) Cleaning of Data is the addition of more Metadata in order to give some context to the data collected.

data → forecast
metadata → correctness of
the forecast

7. What observation states that computing power roughly doubles every two years?
- (A) Murphy's Law
 - (B) Solomon's Law
 - (C) Moore's Law
 - (D) Sutton's Law
8. As the president of her school's student council, Kayla is in charge of organizing a fundraiser for the Fall Thriller program. After the event, she is expected to submit a written report with an analysis of how the money was spent, for audit purposes. Kayla has categorized her spending into 4 categories: Promotional material, Decorations, Food, and Entertainment. She is wondering what data chart would be best suited to analyze the percentage spending of the different categories?
- (A) A pictograph
 - (B) A scatter plot
 - (C) A histogram
 - (D) A pie chart
- pie slices → percentages*
9. Martin is helping his Technology teacher create a website for his school. They decide to upload all the senior yearbook pictures to a link on the school website. Senior students can securely login and retrieve their yearbook picture from this link. The students will then be able to print the pictures digitally using a high-resolution color printer made available to them at their school. Martin is nervous about his responsibility because he knows that these pictures are cherished and valued by the seniors. Help Martin choose the correct format for saving the pictures and uploading it to the website.
- (A) .PNG because it offers lossless compression, and it compatible for viewing on the web.
 - (B) .JPG because although it is lossy, it is compatible for viewing on the web.
 - (C) .GIF because it is a lossless compression. Although it is lower quality than a .PNG, it offers the added feature of animation. *- not needed for a yearbook photo*
 - (D) Martin can choose any one of the 3 choices, and the quality of the prints will be the same.

Global Impact

1. Which of the following correctly describes the processes used by modern search engines to provide results to users?
 - I. Search engines work by searching their index of the web.
 - II. Search engines use algorithms to rank the results of the search.
 - III. Search engines use software programs called spiders to index the web.
 - IV. Search engines index the content of all webpages on the internet each day. *← doesn't always happen daily*

(A) I, II, and III
(B) I and IV
(C) II and III
(D) I only
2. Which of the following is NOT true about personal data that technology companies potentially collect about their users?

(A) Companies frequently offer their services free of charge in exchange for access to data about their users
(B) Personal data about users may be saved by a company and never deleted
(C) Companies can legally sell the personal information of users to advertisers or other businesses
(D) Companies are required by law to give users options to personalize what data they collect
3. Which of these is NOT a computing-related innovation for the medical field?

(A) Manual blood pressure monitor → *done by a nurse, not a computer*
(B) Social media based health support groups
(C) Heart rate monitors in smart watches
(D) A database with patient information
4. Which of the following should be considered when making an ethical decision concerning an innovation?

Select two answers.

(A) What the beneficial and harmful effects of the innovation will be on a population
(B) What data is required for the innovation and how accessible it is
(C) How the cost of the innovation will affect the digital divide
(D) What the time and resource requirements to build the innovation will be — *economic decision*

5. All of the following are examples of machine learning EXCEPT...?
- (A) finding patterns in big (or other) data that would have otherwise been missed by human beings.
 - (B) training a neural network to draw inferences with large data sets.
 - (C) anticipating when credit card transactions are likely to be fraudulent.
 - (D) using asymmetric encryption to provide data confidentiality. *- algorithms are designed by humans*
6. Which of the following are examples of machine learning?
- I. An online graphing calculator *- do not learn as they graph*
 - II. A smart thermostat
 - III. Keyboard suggestions for mobile phones
 - IV. Product recommendations from an online store
- (A) I and III only
- (B) II and III only
- (C) III and IV only
- (D) II, III, and IV only
7. Which of the following are advantages of Computer Aided Design (CAD)?
- Select two answers.
- (A) Being able to share a design with peers across the globe.
 - (B) Being certain that a design is going to function correctly.
 - (C) Being able to solve any architecture or design problem.
 - (D) CAD is more accurate than hand-drawn designs.
8. Which of the following is true about the Digital Millennium Copyright Act?
- (A) The act ensures all files are distributed on the internet strictly under the terms of their copyright.
 - (B) The act has been a benefit to commercial interests without any benefit to artists.
 - (C) The act has been a benefit to artists without any benefit to commercial interests.
 - (D) The act has both benefits and challenges in making copyrighted material available worldwide.
- ||

9. Which of the following is NOT an example of plagiarism?

Select two answers.

(A) A student copies and pastes an analysis of a poem from another person's literary review site into her own paper and submits it as her own. **not original work**

(B) A student changes the tense of a written piece from first person to second person and submits it as his own work. **not original work**

(C) A student uses a complicated idea from a source in her paper and gives attribution. **citing source**

(D) A student refers to the fact that Washington D.C. is the capital of the United States, without providing a citation. **general knowledge**

10. The Digital Millennium Copyright Act (DMCA) does all of the following EXCEPT:

(A) Protects copyright owners from liability for the misuse of their intellectual property.

(B) Makes it a crime to create or use digital tools designed to bypass copy protection.

(C) Allows players to break authentication on games that they own if access to an external authentication server is no longer supported.

(D) Protects online service providers that store copyright infringing material if they are unaware of it and aren't making money from it.

Internet

1. Select the benefits of HTTPS protocol

- I. HTTPS ensures that only the client and the server can view the packets sent during their communication and they cannot be intercepted by a third party. **False**
- II. HTTPS verifies the identity of the server through a Certificate Exchange **True**
- III. HTTPS provides reasonable assurance by which the user can assume minimal cybersecurity risk of transactions carried out on that site. **True**

- (A) I only
- (B) I, II, and III
- (C) II and III**
- (D) III only

2. Which one of the following URLs is a subdomain of cnn.com?

- (A) https://www.cnn.com/vr
- (B) http://money.cnn.com/**
- (C) https://www.cnn.com/specials/space-science
- (D) https://www.cnn.com/2018/03/29/health/amusement-park-incidents/

3. The Internet is a packet-switched system through which digital data is sent by breaking data into packets which contain both the data being transmitted and the control information for routing the data. Which one of the following statements is an accurate statement about packet-switching?

- (A) Packets from a sender can take different routes to reach the same destination computer.** *reassembled later*
- (B) All packets from a sender take the same exact path to reach the destination computer.
- (C) Irrespective of the route taken, all packets must arrive to the destination computer at the same time.
- (D) If even a single packet gets dropped along the path, the entire message has to be resent to the destination computer.

4. What is the term used to describe a network system in which many paths exist between any two devices?
- (A) Redundancy
- (B) Latency
- (C) Abstraction
- (D) Protocol
5. Which is a subdomain of computer.com?
- (A) help.computer.com
- (B) computer.co.us
- (C) computer.com.org
- (D) computer.org
6. The Internet Engineering Task Force is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. Which of the following is NOT one of its responsibilities?
- (A) To provide a long-range technical direction for Internet standards and protocols.
- (B) To close the digital divide between those who have access to cutting-edge communications services and those who do not. **FCC, not IETF**
- (C) To conduct research on topics related to Internet protocols, applications, architecture and technology.
- (D) To acquire, hold, and maintain intellectual property and other property used in connection with Internet standards.
7. Internet Protocol version 4 (IPV4) uses a 32 bit binary number to represent an IP address. Internet Protocol version 6 (IPv6) uses a 128 bit binary number to represent the same. Which one of the following BEST describes the reason for this changeover in IP address representation?
- (A) IPv6 format allows for 96 times more IP addresses. This will ensure that we will have enough IP addresses to address the exponential demand for IP addresses in the future.
- (B) IPv6 allows for 2^{32} times more IP addresses. This will ensure that we will have enough IP addresses to address the exponential demand for IP addresses in the future.
- (C) IPv6 format allows for 32 times more IP addresses. This will ensure that we will have enough IP addresses to address the exponential demand for IP addresses in the future.
- (D) IPv6 allows for 2^{96} times more IP addresses. This will ensure that we will have enough IP addresses to address the exponential demand for IP addresses in the future.

$$\frac{2^{128}}{2^{32}} = 2^{96}$$

8. A hierarchy is a classification of items in different levels relative to each other. Which one of the following examples does NOT function in a hierarchical classification or arrangement?
- (A) The IP Addressing System of the Internet
 - (B) Addressing system adopted by the US Postal System
 - (C) An iteration performed in an Algorithm *not a hierarchy*
 - (D) The Domain Name System of the Internet
9. The working of the Internet can be modeled by the 4 layer TCP/IP Model. Which ways does TCP, the Transport Control Protocol layer interact with the other layers of the internet?
- Select two answers.
- (A) While sending messages, the TCP layer breaks information down into packets and hands it off to the IP layer.
 - (B) TCP applies to and from addresses to each packet of information and hands it off to the physical internet layer.
 - (C) TCP assembles all packets received in the correct order, and transmits it to the Application layer that uses Protocols like SMTP for email, VOIP for Skype, etc.
 - (D) The TCP layer regulates the traffic flow on the Internet by monitoring the Routing Tables.

- public private Keys ✓ Caesar ciphers*
10. The main advantage that Asymmetric Encryption provides over Symmetric Encryption is that:
- (A) It takes longer to encrypt using Asymmetric Encryption.
 - (B) It may necessitate Key Validation services such as a Certificate from a trusted authority
 - (C) Asymmetric Encryption is much faster than Symmetric Encryption
 - (D) It solves the Key Exchange Problem in Cryptography

Programming

1. A programmer wrote the following code that should simulate rolling a die 10 times and determining the number of times an even number appears. The code below has an error. Which line needs to be modified to correct the error?

```
Line 1: count ← 1
Line 2: REPEAT 10 TIMES
Line 3: {
Line 4:     roll ← RANDOM(1,6)
Line 5:     IF (roll MOD 2 = 0)
Line 6:     {
Line 7:         count ← count + 1
Line 8:     }
Line 9: }
Line 10: DISPLAY (count)
```

- (A) Line 1 **Should start at Count ← 0**
(B) Line 2
(C) Line 5
(D) Line 7

2. Which of the following variable types hold a single numerical value?

Select two answers.

- (A) Floating point
(B) String **characters**
(C) List **multiple values possible**
(D) Integer

3. Consider the goal of displaying if a random integer, a, between 1 and 100 is even or not even. Which of the following code segments will produce the appropriate results?

(A) `a ← RANDOM (1,100)`
`IF (a MOD 2 = 0) ← divide by 2, remainder 0`
`{`
`DISPLAY ("The integer ", a, " is even.")`
`}`
`IF (a MOD 2 = 1) ← divide by 2, remainder 1`
`{`
`DISPLAY ("The integer ", a, " is not even.")`
`}`

(B) `a ← RANDOM (1,100)`
`IF (a MOD 2 = 1)`
`{`
`DISPLAY ("The integer ", a, " is even.")`
`}`
`IF (a MOD 2 = 0)`
`{`
`DISPLAY ("The integer ", a, " is not even.")`
`}`

(C) `a ← RANDOM (1,100)`
`IF (a MOD 2 = 1)`
`{`
`DISPLAY ("The integer ", a, " is even.")`
`}`
`IF (a MOD 2 = 2)`
`{`
`DISPLAY ("The integer ", a, " is not even.")`
`}`

(D) `a ← RANDOM (1,100)`
`IF (a MOD 2 = 0.5)`
`{`
`DISPLAY ("The integer ", a, " is even.")`
`}`
`IF (a MOD 2 = 50)`
`{`
`DISPLAY ("The integer ", a, " is not even.")`
`}`

4. Which of the following is associated with, or an example of, sequencing?
- (A) IF statement **selection**
 - (B) REPEAT or FOR EACH loops **iteration**
 - (C)** Code will start at line 1, then execute line 2, then line 3, and so on, until it reaches the last line of the program. **sequencing**
 - (D) Retrieves data from a list or other structure **searching**

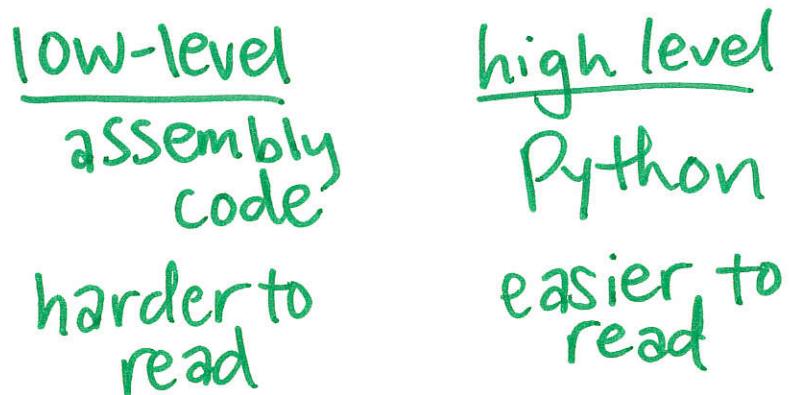
5. Which of the following is associated with, or an example of, selection?
- (A)** IF statement
 - (B) REPEAT or FOR EACH loops
 - (C) Code will start at line 1, then execute line 2, then line 3, and so on, until it reaches the last line of the program.
 - (D) Retrieves data from a list or other structure

6. What affects the ability of a program to process large data sets?
- Select two answers.
- (A)** How long the program takes to run
 - (B) How many program statements the program contains
 - (C)** How much memory the program requires as it runs
 - (D) The programming language used

7. Which of the following statements are true about using a low-level programming language instead of a high-level programming language?

- I. Programs written in a low-level language are generally easier for people to read than programs written in a high-level language. **FALSE**
- II. A low-level language provides programmers with less abstractions than a high level language. **TRUE**
- III. Programs written in a low-level language are generally harder to debug than programs written in a high-level program. **TRUE**

- (A) I only
- (B) II only
- (C) II and III
- (D) I and II



8. In order to manage complexity, programmers often create a function or procedure which combines several programming statements. This is an example of what programming concept?

- (A) Algorithms
- (B) Abstraction
- (C) Iteration
- (D) Scalability

9. Which of the following are NOT advantages of using procedures?

Select two answers.

- (A) Reduced debugging time
- (B) Faster run time
- (C) Increased creative expression
- (D) Reduced coding time

—decreasing volume of code
↳ developers debug
more easily—correct
error in one location
instead of several

10. Consider the following procedure:

```
PROCEDURE Min (num1, num2, num3)
{
    <missing code>
}
```

The procedure `Min` is intended to return the smallest of three numbers. Which of the following is a replacement for `<missing code>` so it works as intended?

(A) `IF ((num1 < num2) AND (num1 < num3))
{
 RETURN num1
}
ELSE
{
 IF ((num2 < num1) AND (num2 < num3))
 {
 RETURN num2
 }
 ELSE
 {
 RETURN num3
 }
}`

(B) `IF (num1 < num2)
{
 RETURN num1
}
ELSE
{
 IF (num2 < num3)
 {
 RETURN num2
 }
 ELSE
 {
 RETURN num3
 }
}`

(C) `IF ((num1 < num2) AND (num1 < num3))
{
 RETURN num1
}
ELSE
{
 IF ((num3 < num2) AND (num2 < num1))
 {`

```
        RETURN num2
    }
    ELSE
    {
        RETURN num3
    }
}

(D) IF (num1 < num2)
{
    RETURN num1
}
ELSE
{
    IF ((num2 < num1) AND (num2 < num3))
    {
        RETURN num2
    }
    ELSE
    {
        RETURN num3
    }
}
```