A Windows system uses a file system that allocates 512-byte clusters. If a user stores a file requiring 12,345 bytes, how many clusters are utilized by the file?  
(1) 23 clusters  
(2) 25 clusters  
(3) 24 clusters  
(4) None of the above  
Answer Key: 4  
Solution:  
Step 1: Total bytes needed = 12,345 bytes.  
Step 2: Number of clusters needed = 12,345 bytes / 512 bytes/cluster = 24.11 clusters.  
Since a cluster cannot be partially used, round up to the nearest whole number: 25 clusters.  
Hence, Option (4) is the right answer.  
  
Match the following transformations with their correct descriptions in 2-D geometrical transformations:  
1. Transformation Description  
I. Scaling A. Shifts a figure to a different location  
II. Rotation B. Changes the size of a figure  
III. Reflection C. Reverses a figure across a line  
IV. Translation D. Turns a figure around a point  
Choose the correct answer from the options given below:  
(1) I-B, II-D, III-C, IV-A  
(2) I-C, II-B, III-D, IV-A  
(3) I-D, II-C, III-B, IV-A  
(4) I-A, II-C, III-D, IV-B  
Answer Key: 1  
Solution:  
• Scaling: Involves resizing an object, either increasing or decreasing its dimensions.  
• Rotation: Involves turning an object around a specific point within the plane.  
• Reflection: Involves flipping an object across a specified axis or line.  
• Translation: Involves moving every point of an object the same distance in the same direction.  
Hence, Option (1) is the right answer.  
  
A software development team is tasked with collecting and specifying requirements for a new project. They gather 20 functional requirements and 15 non-functional requirements. If they decide to prioritize and detail only 25% of these requirements in the initial phase, focusing equally on both types, how many functional requirements will they detail?  
(1) 5  
(2) 6  
(3) 7  
(4) None of the above  
Answer Key: 1  
Solution:  
Step 1: Total requirements gathered = 20 functional + 15 non-functional = 35 requirements.  
Step 2: 25% of 35 requirements = 35 \* 0.25 = 8.75, approximated to 9 requirements.  
Step 3: Equal focus on both types, thus half of 9 (as close as possible while maintaining whole numbers) for functional.  
Functional requirements to detail = 9 / 2 = 4.5, approximated to 5 (since we need a whole number and it's the closest).  
Hence, Option (1) is the right answer.  
  
Match the following concepts with their corresponding fields of application:  
1. Concept Field of Application  
I. Support Vector Machine A. Real-time database systems  
II. Association Rules B. Statistical text analysis  
III. OLAP C. Identifying patterns in large datasets  
IV. Hidden Markov Model D. Speech recognition  
Choose the correct answer from the options given below:  
(1) I-B, II-C, III-A, IV-D  
(2) I-D, II-A, III-B, IV-C  
(3) I-C, II-D, III-B, IV-A  
(4) I-D, II-C, III-A, IV-B  
Answer Key: 4  
Solution:  
• Support Vector Machine: Primarily used in classification problems, it is not directly related to real-time database systems.  
• Association Rules: Used for discovering interesting relations between variables in large datasets, which is crucial in data mining.  
• OLAP: Stands for Online Analytical Processing, which is essential in data warehousing for multidimensional analysis of business data.  
• Hidden Markov Model: Widely used in areas like speech and handwriting recognition.  
Hence, Option (4) is the right answer.  
  
In the context of network models, if a device sends data frames across a network using five layers of the OSI model, each layer adds its own header of 20 bytes to the frame. If the original data size was 100 bytes, calculate the total size of the data frame when it reaches its destination.  
(1) 200 bytes  
(2) 220 bytes  
(3) 300 bytes  
(4) None of the above  
Answer Key: 3  
Solution:  
Step 1: Original data size = 100 bytes.  
Step 2: Total header added = 5 layers \* 20 bytes/layer = 100 bytes.  
Total size of data frame = Original data + Total header = 100 bytes + 100 bytes = 200 bytes.  
Hence, Option (3) is the right answer.  
  
Match the following concepts in intermediate code generation with their respective functionalities:  
1. Concept Functionality  
I. Intermediate Representations A. Handles execution paths within a program  
II. Translation of Declarations B. Transforms high-level language constructs into lower-level representations  
III. Control Flow C. Manages data object definitions and storage  
IV. Boolean Expressions D. Involved in evaluating true/false conditions  
Choose the correct answer from the options given below:  
(1) I-B, II-C, III-A, IV-D  
(2) I-D, II-B, III-C, IV-A  
(3) I-C, II-D, III-B, IV-A  
(4) I-A, II-C, III-D, IV-B  
Answer Key: 1  
Solution:  
• Intermediate Representations: Serve as a bridge by providing a universal format that can be easily translated into target machine code.  
• Translation of Declarations: Involves setting up the runtime environment for variables and functions as defined in the high-level code.  
• Control Flow: Critical for mapping the logic and structure of the original program code into the intermediate code, directing the flow of execution.  
• Boolean Expressions: Handle logic operations and conditions that are pivotal in control structures like loops and conditionals.  
Hence, Option (1) is the right answer.  
  
Consider a programming environment where the size of an integer is 4 bytes, a float is 4 bytes, and a character is 1 byte. A programmer defines a composite data type consisting of 3 integers, 2 floats, and 5 characters. What is the total memory required by an instance of this composite data type?  
(1) 25 bytes  
(2) 23 bytes  
(3) 21 bytes  
(4) None of the above  
Answer Key: 2  
Solution:  
Step 1: Memory for integers = 3 integers \* 4 bytes = 12 bytes.  
Step 2: Memory for floats = 2 floats \* 4 bytes = 8 bytes.  
Step 3: Memory for characters = 5 characters \* 1 byte = 5 bytes.  
Total memory = 12 bytes + 8 bytes + 5 bytes = 25 bytes.  
Hence, Option (2) is the right answer.  
  
In a Linux-based system, a process scheduler transitions 200 processes from ready to running state and vice versa, within a minute. If each process switch takes on average 0.1 seconds, how much total time in seconds is spent switching all these processes?  
(1) 18 seconds  
(2) 20 seconds  
(3) 22 seconds  
(4) None of the above  
Answer Key: 1  
Solution:  
Step 1: Number of process switches = 200.  
Step 2: Time per switch = 0.1 seconds.  
Total time spent switching = 200 \* 0.1 seconds = 20 seconds.  
Hence, Option (1) is the right answer.  
  
Match the following techniques with their primary use in natural language processing:  
1. Technique Primary Use  
I. Parsing Techniques A. Improving the interaction between computers and human language  
II. Semantic Analysis B. Structuring a sentence into its constituent parts  
III. Grammar and Language C. Understanding the meaning of words and their relationships  
IV. Prgamatics D. Understanding language in context  
Choose the correct answer from the options given below:  
(1) I-B, II-C, III-A, IV-D  
(2) I-D, II-B, III-C, IV-A  
(3) I-C, II-D, III-B, IV-A  
(4) I-A, II-B, III-D, IV-C  
Answer Key: 2  
Solution:  
• Parsing Techniques: Essential for breaking down and analyzing the structure of sentences.  
• Semantic Analysis: Focuses on understanding the meanings of words and phrases within the context of sentences.  
• Grammar and Language: Forms the foundation of how sentences are composed and understood.  
• Prgamatics: Relates to the use of language in social contexts and understanding meanings beyond the literal interpretation.  
Hence, Option (2) is the right answer.  
  
Match the following aspects of multithreading with their respective impacts on programming:  
1. Aspect Impact  
I. Multicore Programming A. Provides mechanisms to manage threads  
II. Multithreading Models B. Exploits multiple cores effectively  
III. Thread Libraries C. Helps in defining how threads interact and are managed  
IV. Implicit Threading D. Aims to simplify thread use by automating thread creation and management  
Choose the correct answer from the options given below:  
(1) I-B, II-C, III-A, IV-D  
(2) I-D, II-B, III-C, IV-A  
(3) I-C, II-D, III-B, IV-A  
(4) I-A, II-C, III-D, IV-B  
Answer Key: 1  
Solution:  
• Multicore Programming: Directly impacts the ability to utilize multiple cores of a processor to enhance performance.  
• Multithreading Models: Define the architecture and the way threads are handled and executed within software development.  
• Thread Libraries: Offer a set of tools for creating and managing threads.  
• Implicit Threading: Seeks to reduce the complexity of thread management by abstracting the threading process from the developer.  
Hence, Option (1) is the right answer.