Example 1:  
71. Match the following concepts with their corresponding theoretical framework or methodology:  
Concept Theoretical Framework or Methodology  
I. Comparison Trees A. Empirical analysis of algorithms  
II. Lower Bounds through Reductions B. Algorithmic complexity theory  
III. Logic C. Knowledge representation in AI  
IV. Association Rules D. Data mining techniques  
Choose the correct answer from the options given below:  
(1) I-A, II-B, III-C, IV-D  
(2) I-B, II-C, III-D, IV-A  
(3) I-C, II-D, III-A, IV-B  
(4) I-D, II-A, III-B, IV-C  
Answer Key: 2   
Solution:   
• Comparison Trees: Utilized primarily in algorithm analysis, particularly in sorting and searching, where the tree structure helps to describe decisions taken by the algorithm.  
• Lower Bounds through Reductions: A fundamental concept in computational complexity, essential for proving the minimal computational effort needed to solve problems by reducing them to other known hard problems.  
• Logic: Central to artificial intelligence for formalizing rational thought and reasoning, especially in expert systems and other knowledge-based applications.  
• Association Rules: A common technique in data mining aimed at finding interesting correlations between variables in large databases.  
Hence, Option (2) is the right answer.  
  
Example 2:  
73. Match the following advanced topics with their primary field of application:  
Advanced Topic Field of Application  
I. Self Organizing Maps A. Neural network architectures  
II. Regression B. Statistical modeling in data analysis  
III. Conceptual Dependency C. Knowledge representation in artificial intelligence  
IV. Link Analysis D. Web data and social network analysis  
Choose the correct answer from the options given below:  
(1) I-A, II-B, III-C, IV-D  
(2) I-C, II-D, III-A, IV-B  
(3) I-B, II-C, III-D, IV-A  
(4) I-D, II-A, III-B, IV-C  
Answer Key: 1   
Solution:   
• Self Organizing Maps: A type of unsupervised learning neural network that uses a competitive learning technique to place inputs into a two-dimensional map.  
• Regression: A fundamental statistical technique used to understand the relationship between variables and often employed in predictive modeling.  
• Conceptual Dependency: A theory in artificial intelligence that focuses on representing the meanings of sentences in a manner that is independent of the language in which the sentences are written.  
• Link Analysis: Often used in the analysis of social networks and the web, focusing on relationships and flows between website nodes or social entities.  
Hence, Option (1) is the right answer.  
  
Example 3:  
75. Match the following techniques with their most aligned computational paradigm:  
Technique Computational Paradigm  
I. Hidden Markov Model A. Statistical learning  
II. Multi Layer Perceptron B. Deep learning  
III. Lower Bounds through Reductions C. Theoretical computer science  
IV. Summarization D. Natural language processing  
Choose the correct answer from the options given below:  
(1) I-A, II-B, III-C, IV-D  
(2) I-C, II-D, III-A, IV-B  
(3) I-B, II-C, III-D, IV-A  
(4) I-D, II-A, III-B, IV-C  
Answer Key: 4   
Solution:   
• Hidden Markov Model: Predominantly used in areas like speech recognition and bioinformatics, relying heavily on statistical probabilities.  
• Multi Layer Perceptron: A class of feedforward artificial neural network (ANN), a core component of deep learning.  
• Lower Bounds through Reductions: Central to theoretical computer science, especially in complexity theory to establish computational limits.  
• Summarization: A process in natural language processing aimed at reducing a large body of text into a condensed form, preserving key information.  
Hence, Option (4) is the right answer.  
  
Example 4:  
77. Match the following data-centric techniques to their corresponding usage scenarios:  
Technique Usage Scenario  
I. Clustering A. Identifying inherent groupings in data  
II. Support Vector Machine B. Classifying data into predefined categories  
III. Lower Bounds through Reductions C. Proving theoretical limits in computational complexities  
IV. Frames D. Structuring knowledge in artificial intelligence systems  
Choose the correct answer from the options given below:  
(1) I-A, II-B, III-C, IV-D  
(2) I-C, II-D, III-A, IV-B  
(3) I-B, II-C, III-D, IV-A  
(4) I-D, II-A, III-B, IV-C  
Answer Key: 1   
Solution:   
• Clustering: Used extensively in exploratory data analysis to find natural groupings in data, such as in market segmentation or social network analysis.  
• Support Vector Machine: A powerful classifier that works by finding the hyperplane that best divides a dataset into classes.  
• Lower Bounds through Reductions: Essential in establishing minimum computational requirements for solving problems, a key aspect of theoretical computer science.  
• Frames: Utilized in AI to represent stereotypical situations, aiding in understanding and reasoning about domain knowledge.  
Hence, Option (1) is the right answer.  
  
Example 5:  
79. Match the following concepts with their appropriate analytic focus:  
Concept Analytic Focus  
I. Comparison Trees A. Optimization of search and sort algorithms  
II. Regression B. Prediction and correlation analysis in statistics  
III. Expert Systems C. Decision making in artificial intelligence  
IV. Data Modeling for Data Warehouses D. Organizing large-scale historical data for analysis  
Choose the correct answer from the options given below:  
(1) I-A, II-B, III-C, IV-D  
(2) I-C, II-D, III-A, IV-B  
(3) I-B, II-C, III-D, IV-A  
(4) I-D, II-A, III-B, IV-C  
Answer Key: 1   
Solution:   
• Comparison Trees: A structured representation used to optimize and evaluate the performance of sorting and searching algorithms.  
• Regression: A statistical tool used to model and analyze relationships between variables, crucial for predictive analytics.  
• Expert Systems: AI systems designed to make decisions based on complex rules and databases, mimicking human expert decision-making capabilities.  
• Data Modeling for Data Warehouses: Involves structuring data specifically for query and analysis, supporting business intelligence activities.  
Hence, Option (1) is the right answer.