List of sample questions and topics for the entrance exam for second-cycle studies: Computer Science and Intelligent Systems (Artificial Intelligence and Data Analysis)

1. Which of the following statements is true

   a.   The pessimistic computational complexity for Quicksort sorting is O(n log n)

2. Indicate true sentences:

   a.   Dijkstra's algorithm for finding shortest paths is a heuristic algorithm with complexity $O(n^2 \log n)$, where n = |V| and G=(V, E).

3. Which of the following statements is true:

   a.   Every graph has at least one spanning tree.

4. Which of the following statements is true

   a.   Open-addressing is one strategy for resolving collisions in hash tables (mixed arrays).

5. Which statements about asymptotic notation are true:

   a.   There is no sorting algorithm that runs with worse time complexity than $O(n^2)$.

6. A task of size n implemented with an algorithm of complexity f(n) has been reduced to two sub-tasks of size 1/n and the execution of n operations with a fixed execution cost. The complexity of f(n) is

   a.   O(n log n)

7. A random set of n mutually different numbers was inserted into the BST tree. Which answer is true?

   a.   The pessimistic complexity of the operation to insert the next element in the tree is O(log n).

8. A mound-building operation has been started for an array of ten elements: 1,2,3,4,5,6,7,8,9,0. Are the following statements true about the resulting tree:

   a.   The smallest elements, i.e. 0, 1 and 2, can be found among the leaves.

9. Which statements of the following are true

   a.   Counting Sort has better computational complexity than QuickSort)

10. See answers true

   a.   The pessimistic search time for an element in a skip list is $O(n^2)$.

11. A binary tree was built containing the numbers from 1, 2, to 15 in such a way that 1 was taken as the root of the tree, as its children the numbers 2 and 3 and in the next row 4,5,6,7 so that 4 and 5 are the children of the node with key 2 and 6, 7 are the children of the node with key 4. Similarly, in the next row, nodes 8 through 15 were created.

   a.   On the undirected graph thus created, the DFS algorithm was run starting from node 15, adopting the principle that in the neighborhood list of each node, the neighbors are ordered from the smallest key to the largest. The order in which the nodes were browsed was as follows: 15, 7, 14, 3, 6, 12, 13, 1, 2, 4, 8, 9, 5, 10, 11

12. A binary tree containing the numbers from 1, 2, to 15 was built in such a way that 1 was taken as the root of the tree, as its children the numbers 2 and 3 and in the next row 4,5,6,7 so that 4 and 5 are children of the node with key 2 and 6, 7 are children of the node with key 4. Similarly, in the next row, nodes 8 to 15 were created. Determine the truth of the following statements:

   a.   15, 7, 3, 14, 1 , 6 ,2, 21, 13, 4, 5, 8, 9, 10, 11

13. Predicate calculus:

   a.   does not contain any axioms for quantifiers.

14. The law of transposition:

   a.   is not a theorem of classical propositional calculus, but is a contradiction in this calculus

15. In the logical sense, in a fixed language L, a theory is called:

   a.   the set of well-formed formulas of language L.

16. Model for a theory in predicate calculus

    a. must necessarily contain some relations—regardless of the language of the theory it interprets.

17. The completeness theorem for classical propositional calculus states that:

    a. every sentence of classical propositional calculus is a formula (in its language), but not every formula is a sentence.

18. In the language of predicate calculus, we can distinguish:

    a. terms, atomic formulas, and (proper) formulas

19. The sentence "If Słowacki was a great poet, then if the Nile flows through Krakow, then Słowacki was a great poet" is:

    a. false

20. A tautology of predicate calculus is:

    a. a theorem of this calculus

21. First-order logic is:

    a. logic without any quantifiers

22. The quantifiers "there exists an x such that" and "for every x such that":

    a. have their semantic interpretations in models for the language in which they appear.

23. The semantic interpretation function defined for the language of predicate calculus:

    a. interprets this language into the language of classical propositional calculus.

24. The deduction theorem:

    a. allows us to state that if A is a premise of our reasoning, and B is its conclusion, then the implication $B \to A$ is also a conclusion.

25. Every permutation

    a. can be decomposed into not necessarily disjoint transpositions

26. In a simple undirected graph

    a. if the graph is connected, then it must have a bridge.

27. The symmetry group of a geometric figure is the group of plane transformations under which the figure remains invariant. The group operation is the composition of transformations.

    a. In the symmetry group of a regular dodecagon, there are two different inverses of a 30-degree rotation.

28. Which of the following is *not* a group:

    a. $(GL(n, \mathbb{R}), +)$ - the set of all non-singular n×n real matrices with addition.

29. Let X be a partially ordered set.

    a. If X is finite, then it must have a greatest element.

30. The hypercube Q_n is a graph whose vertices are labeled with all possible zero-one sequences of length n, and edges connect vertices whose labels differ in exactly one position.

    a. The cube Q_3 has 8 vertices.

31. The chromatic number of a graph is the minimal number of colors needed to color the vertices so that no two adjacent vertices share the same color.

    a. The graph formed by the vertices and edges of a cube has a chromatic number equal to 2.

32. Every partially ordered set

    a. if finite, is isomorphic to some family of natural numbers ordered by divisibility.

33. Indicate the true statements.

   a.   In a well-ordered set, there exists a least element.

34. If X is a set with n elements and Y is a set with m elements, n > 0, m > 0, then

   a.   the cardinality of the power set of X is equal to 2^n.

35. Let P_n denote the set of n-element permutations.

   a.   In P_3, there are exactly 2 cyclic permutations.

36. Let X be a set with n elements, n > 2, and let R be an equivalence relation on X.

   a.   The set X/R can have exactly n − 1 elements.

37. Numbers in floating-point format (IEEE 754 standard).
Positive real numbers in range $VALMIN = 2.2 \cdot 10^{-308}$ to $VALMAX = 1.8 \cdot 10^{308}$ are stored in double-precision format with a relative rounding error not greater than $\varepsilon = 2^{-52} \approx 2.2 \cdot 10^{-16}$.

Select correct statement(s)

   a.   All integers in the range $[VALMIN, VALMAX]$ are represented precisely i.e. without rounding error.

38. Let a, b, c denote non-zero numbers stored on a computer in floating-point format with machine precision ε. The number c is a result of an arithmetic operation $\circ$ performed by a computer and stored in the same floating-point format.
Let δ_c denotes the relative error of the result of the operation $c = a \circ b$ (more precisely: its absolute value).

In which case(s) the error of the result δ_c can be many times greater (several orders of magnitude) than the errors of the arguments a and b, i.e.
$\delta_c \gg 2\varepsilon$

   a.   when we divide two numbers differently from zero.

39. Finding the roots of a continuous function f of one real variable x with iterative methods.
The function values for the first two elements of the iterative sequence x_0 and x_1 satisfy the inequality $f(x_0)f(x_1) < 0$.

The iterative sequence will converge to zero for any function satisfying the above conditions for

   a.   bisection method.

40. We are solving a system of linear equations $Ax = b$ with any real, non-singular matrix $A_{n \times n}, n \gg 1$.
The computational complexity of the algorithm used to solve this system is lower than the computational complexity of the Gaussian elimination method if the matrix A has the form (select correct statement(s)):

   a. $A = LU$. In this case, we have to solve two systems of equations, but both are systems with triangular matrices ($Ly = b$ and $Ux = y$), so they can be solved by forward and backward substitution.

41. Singular values decomposition exists

   a.   for any real value matrix.

42. Select correct statement(s)

   a.   In the Gaussian elimination algorithm for solving a system of equations, pivoting is performed $n - 1$ times

43. Select correct statement(s)

   a.   Rectangular matrices do not have eigenvalues. Their equivalents are the singular values, which can be obtained from the decomposition $A = U\Sigma V^T$.

44. Select correct statement(s)

   a.   Regardless of the orthogonalization method (e.g. Gram-Schmidt, Householder reflections, Givens rotations), the result of the orthogonalization of matrix A is a product $A = QR$, where Q is an orthogonal matrix and R is a triangular matrix.

45. Finding the minimum of a multivariable function

Let's assume that the function is a 'quadratic function', or more precisely that it can be expressed as a quadratic form $F(x) = x^T A x + b^T x + c$, $x \in R^n$ with a positive definite matrix A (i.e. the function is convex).

k - the number of iterations necessary to go from any starting point to the point where the function F has a minimum.

Select correct statement(s)

    a.   For the steepest descent method: $k < n$.

46. Let us consider the following example of a linear least squares approximation

Data:

20 measurements of the position s_i of a vehicle in rectilinear motion at times t_i, $i = 1, 2, \ldots, 20$.

Function approximating the position-time dependencies:

$s(t) = a_0 + a_1 t + a_2 t^2$.

Select correct statement(s)

    a.   The parameters of the approximating function are the solution (in the least squares sense) to the overdetermined system of 20 linear equations with 3 unknowns.

47. According to the two-point formula with step h, the error related to approximating the value of the derivative of the analytic function f at the point x, $x \in R$ using the difference quotient method can be written as
$\varepsilon(h) = \left| \frac{f(x+h) - f(x)}{h} - f'(x) \right|$.

    a.   The difference quotient methods require us to know the formula for the derivative.

48. Select correct statement(s)

    a.   In automatic differentiation, calculations are performed on numbers and the result is a number.

49. We are approximating the mass-height relationship with the affine function $m = a_0 + a_1 h$ based on measurements containing masses and heights of 100 people. The set of conditions ensuring the consistency of the data with the approximating function can be written as

    A.   a system of 100 equations with one unknown.

50. Which of the following sentences is one of the Kolmogorow axioms of probability for the tuple (Ω, F, P) :

    a. $\forall \{A_i\}_{i=1}^{\infty} \subset F$: $P(\bigcup_{i=1}^{\infty} A_i) \leq \sum_{i=1}^{\infty} P(A_i)$

51. As a statistical population we define

    a.   the set of all possible entities about which information is being gathered

52. In statistics an estimator we call

    a.   any statistic that allows to verify a hypothesis about the parameters of the tested population

53. In statistics an I type error is when

    a.   we accept the null hypothesis when it is false

54. The amount of all k-length sequences created from a set of n elements is given by the formula:

    a. $n!k!$

55. In probability theory the formula for total probability is used to:

    a.   to find alternative representations of events in conditional probability

56. In probability theory events that are independent of any other event:

    a.   exist, but must be only an empty set or the whole probability space

57. σ-algebra of Borel sets on R is:

    a.   any σ-algebra on R, which contains all sets of the form $(-\infty, a]$, where $a \in R$

58. A random variable $X: \Omega \rightarrow R$ is a function for which

    a.   the image of any event in the probability space is in the form $(-\infty, a]$ where $a \in R$

59. Which of the below are properties of the cumulative distribution function F_X of the random variable X:

    a. F_X is right-continuous

60. The variance of a random variable is used to

   a.   counting the number of possible k-length sequences created from the values of the random variable

61. If we know that the random variables X and Y are independent then:

    a.   the expected value of their multiplication is the multiplication of the expected values of X and Y

62. Given a graph **G** created from an n-vertex clique ($n > 5$), by removing 3 edges. Indicate the true statements:

    a.   **G** is Eulerian only for one specific value of n

63. Is the graph below a bipartite graph?
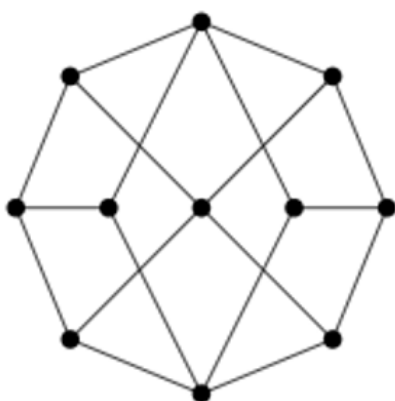
    a.   Yes, because it is Eulerian

64. Given a graph **G** with six vertices, having degrees 2,2,3,4,4,5. Can **G** be a planar graph?

    a.   No

65. Given is a dodecahedron with 11 vertices, seven of whose faces are triangles and four are quadrilaterals. The last face is:

    a.   None of the other answers are correct

66. The graph **G** is constructed from Hamiltonian graphs, $G_1=(V_1,E_1)$ and $G_2=(V_2,E_2)$, in the following way. From V_1, a subset W_1 (W_1 different from V_1) of vertices is selected, constituting successive nodes of the Hamiltonian cycle in G_1, and from V_2, a subset W_2 (W_2 different from V_2) of vertices, constituting successive nodes of the Hamiltonian cycle in G_2, and then nodes W_1 and W_2 are connected by **additional** edges, so that each node W1 is adjacent to each node W_2. Indicate the true statements:

    a.   **G** is a Hamiltonian graph

67. The chromatic index of a complete n-ary tree (n>1) of height h>3*n, T=(V,E), is:

    a. |E|

68. Given any connected graph G=(V,E), having |E| bridges. Which of the following statements are true:

    a. |E| = |V|-1

69. Give the smallest non-zero number of edges that should be removed from a complete bipartite graph $K_{n,n}$ (n>=3) to obtain a regular graph:

    a.   2n

70. Given a clique K_8 with vertices $v_1, v_2,..., v_8$. The number of subgraphs of K_8 that are isomorphic to K_5 is:

    a.   8!/5!

71. Given a clique K_8 with vertices $v_1, v_2,..., v_8$.. The number of simple paths in this graph from v_1 to v_2 having at most 3 edges is:

   a.   56

72. The number of simple paths in a K_8 clique having at most 3 edges is:

   a.   3! + 2! + 1!

73. Given a graph **G** with 21 edges, having 7 vertices of degree 1, 3 vertices of degree 2, 7 vertices of degree 3 and the remaining vertices of degree 4. **G** has:

   a.   21 vertices

74.
The following language is given $L_{ne} = \{\langle M \rangle : L(M) \neq \varnothing\}$. It codes the decision problem:

   a.   Whether for each Turing machine, a language it accepts is nonempty?

75.
Język $L_{nr} = \{\langle M \rangle : L(M)$ is not recursive $\}$ is:

   a.   Not recursively enumerable

76. Language $L_{eq} = \{\langle M \rangle \cdot \langle N \rangle : L(M) = L(N)\}$ is:

   a.   Accepted by a certain Turing machine not necessarily with the halt property

77. The decision problem „whether given Turing Machines **M** and **N** accept the same language?" is:

   a.   Semi-decidable for multi-tape Turing machines

78. Let S be some property (class) of recursively enumerable sets. If S is non-trivial then:

   a.   Language L = {<M>: L(M) ÎS} is finite

79. Let S be a certain property (class) of recursively enumerable sets. If S is not monotonic then:

   a.   S is enumerable

80. Ackermann function can be represented as:

   a.   Recursive function

81. The following language is given $L_e = \{w \in \Sigma^* : w = \langle M \rangle \implies L(M) = \varnothing\}$. It codes the decision problem:

   a.   Whether for each Turing machine, a language it accepts is empty?

82. Language $L_e = \{w \in \Sigma^* : w = \langle M \rangle \implies L(M) = \varnothing\}$

   a.   Is not recursively enumerable

83. Language $L_{ne} = \{\langle M \rangle : L(M) \neq \varnothing\}$

   a.   Is recursively enumerable

84. The decision problem whether a language accepted by a given Turing machine is empty, is:

   a.   Semi-decidable

85. The decision problem whether a language accepted by a given Turing machine is nonempty, is

   a.   Is not even a semi-decidable problem

86. The language $L_r = \{\langle M \rangle : L(M) \text{ is recursive}\}$ is given. It codes the following decision problem:

    a.   Whether a transition function of a given Turing machine **M** is recursive?

87. The language $L_{nr} = \{\langle M \rangle : L(M) \text{ is not recursive}\}$ is given. It codes the following decision problem:

    a.   Whether the language accepted by a given Turing machine **M** is infinite but enumerable?

88. Language $L_r = \{\langle M \rangle : L(M) \text{ is recursive}\}$

    a.   Is not recursively enumerable

89. The ALU arithmetic-logical unit

    a.   can be a combinational circuit

90. A sequential circuit is

    a.   it is a logical circuit with memory of previous states

91. Dual-port RAM

    a.   we can make it using FPGA

92. Processor

    a.   addressing modes of the processor executed using FPGA must be consistent with the modes provided by the FPGA manufacturer

93. The processor instruction set

    a.   in a processor executed using FPGA it must be consistent with the instruction set provided by the FPGA manufacturer

94. Graphics card

    a.   can be a combinational circuit

95. Program counter

    a.   we can make it with jk flip-flops together with NAND gates

96. The processor's conditional jump command

    a.   causes the address of the command to be executed after the jump to be entered into the instruction counter, but only if the jump condition is met

97. A processor instruction that performs the addition of two numbers

    a.   uses the ALU

98. In a processor using pipelined processing

    a.   the same step of two consecutive instructions can be executed at the same time

99. A single-bit adder

    a.   must be a sequential circuit

100. The instruction register

    a.   its contents are used by the control unit

101. Indicate which of the following statements describes the true properties of relational database systems.

    a.   A database is a set of relations.

102. Indicate which of the following statements about foreign keys in relational database systems are true.

    a.   A foreign key may be a composite key that refers to a simple key.

103. Given the relation R, its schema H={A,B,C,D} and a set of functional dependencies F={{A,B} -> C, {A,C} -> D}. The only key of this relation is the pair {A,B}. Which is the highest normal form of the relation R assuming it is in 1NF?

    a.   BCNF

104. Given the relation R, its schema H={A,B,C,D} and a set of functional dependencies F={A -> B, C -> D}. The only key of this relation is the pair {A,C}. How should the relation R be decomposed to obtain a set of relations in 3NF?

    a.   {A,B,C}, {A,C,D}

105. Indicate which of the following statements about keys in relational database systems are true.

    a.   The set of all attributes included in the header of a relation is a key.

106. Indicate which of the following statements about normalisation are true in a relational data model.

    a.   Any relation can be transformed into 3NF with lossless decomposition that preserves functional dependencies

107. Indicate which of the following statements about relationships between tables in relational database systems are true.

    a.   In case of a key - foreign key connection, there may be records in the parent table without corresponding records in the child table.

108. Indicate which of the following statements about subqueries are true in PostgreSQL.

    a.   Only scalar subqueries may be used inside an INSERT statement.

109. Indicate which of the following statements about join types in relational database systems are true.

    a.   An outer union join contains only unmatched records from both tables.

110. Indicate which of the properties of transactional processing is denoted by the acronym ACID.

    a.   Atomicity, consistency, isolation and durability.

111. Indicate which of the following statements about the use of aggregate functions are true in PostgreSQL.

    a.   An aggregate function cannot be used inside of a WHERE clause unless it is placed in a subquery.

112. Indicate which of the following statements about the relationship between relational database systems and mathematical theory of relations are true.

    a.   A number of operations on tables are specified, which are derived from relation algebra.

113. A formal grammar is ambiguous if:

    a.   there exists a sentence for which there are two different leftmost derivations

114. In the context of formal languages, (notation: ^ denotes exponentiation, with arguments potentially enclosed in curly brackets), the following statements are true:

    a. $L1 = \{f^{2^{n}}: n > 0\}$ is not regular and $L2 = \{f^{2n} : n > 0\}$ is not regular

115. We have a grammar (uppercase letters are non-terminal symbols, lowercase letters are terminal symbols, and S is the start symbol) with the following productions: S→AB, A→Aa I bB, A→AaIbB, B→a I Sb, B→aISb, and the sentence form baaABb. Which statement is true?

    a.   This sentence form is leftmost derivable

116. In reference to regular expressions and the generated strings, which statements are true?

    a.   The regular expression (x+y)∗y(a+ab)∗(x+y)∗y(a+ab)∗ contains 12 strings of length less than 4

117. In reference to the pumping lemma, which statements are true?

    a.   The pumping length for a string of length x is equal to x-1

118. In reference to regular languages, the following statements are true:

    a.   If L1 is regular and L2 is unknown, but L1−L2 is regular, then L2 must be: all of the given options

119. Which of the following statements regarding formal grammars are true:

    a.   Every left-recursive grammar can be converted into a right-recursive grammar, and vice versa - this statement is true

120. Regarding the Myhill-Nerode theorem, the following statements are true:

    a. The theorem is significant in the context of converting a DFA (Deterministic Finite Automaton) to an NFA (Non-deterministic Finite Automaton)

121. In the context of formal languages, the following statements are true:

    a. A context-sensitive language is accepted by an NFA (Non-deterministic Finite Automaton)

122. In reference to formal languages, the following statements are true:

    a. A pushdown automaton can accept an input string through final state only

123. If the color of a point is stored on 16 bits, it can take:

    a. one of 16777216 different colors.

124. In Phong's illumination model, the calculated intensity of specular reflection is:

    a. dependent on the angle between the normal vector to the surface and the vector in the direction of the light source and the angle between the vector in the direction of the reflection and the vector in the direction of the observer.

125. In recursive Ray-tracing, the secondary rays are:

    a. diffuse and specular rays.

126. Radiosity (energy balance):

    a. simulates diffuse reflections well.

127. Which of the following color models, are subtractive color models:

    a. CMYK

128. Image interlacing is:

    a. a video technique that interleaves video data with audio data to achieve better compression.

129. The abbreviation RLE stands for:

    a. a hardware-supported library for 3D graphics.

130. Fundamental transformations in 3D graphics are:

    a. scaling, rotation, translation.

131. In 3D graphics, Ray-Tracing is:

    a. a technique for drawing fractals.

132. Z-buffer is:

    a. a method of applying a texture to an object.

133. In 3D computer graphics, tessellation:

    a. is an algorithm for selecting the appropriate size of areas in the radiosity algorithm.

134. Phong shading is:

    a. an illumination model used in computer graphics to represent specular reflections from non-ideal objects.

135. After receiving interrupt information from an input/output device:

    a. passes control of the address and data bus to the interrupting device

136. File buffering is performed in order to:

    a. to increase the efficiency of access to secondary storage

137. If a virtual address in a program is 16-bit and the page size is 0.5K, we can address up to the following number of pages:

    a. 16

138. If the operating system wants to run more than one program at a given moment in time:

    a.   it must meet requirements a), b), and c)

139. Synchronous message exchange between processes is:

    a.   required for all processes

140. The initial value of a generalized semaphore implementing a critical section is:

    a.   -1

141. The privileged state is:

    a.   allows the execution of operating system instructions

142. The producer-consumer problem can be solved using:

    a.   only Monitors

143. To avoid timing-dependent errors, the maximum number of processes that can be inside the critical section is:

    a.   0

144. Which problem does Dijkstra's Banker's algorithm solve?

    a.   mutual exclusion

145. Which scheduling algorithm allows a process that can be executed to be temporarily suspended:

    a.   FIFO

146. Which statement refers to associative memory:

    a.   it is necessary for the efficient implementation of paging

147. LR parser:

    a.   reads input symbols from right to left

148. If grammar G is contex-free, the question whether G belongs to LL(k) for a given k

    a.   is decidable

149. Comparing LL grammars and LR grammars, it can be said that:

    a.   LL grammars describe a broader class than LR grammars

150. LL and LR parsers have the following complexities:

    a.   time Theta(n*n) and space Theta(n*n)

151.
For a context-free grammar with the productions:
$E \rightarrow E + E$
$E \rightarrow E * E$
$E \rightarrow id$
the following derivations are rightmost derivations:

    a.   E => E*E => E+E*E => E+E*id => E+id*id => id+id*id

152. The following statements are true:

    a.   Not for every deterministic language L there exist k>=0 and such grammar G which belongs to the R(k) class that L = L(G)

153. For a context-free grammar with the productions:

E' → E
E → E + T | T
T → T * F | F
F → (E) | id

the closure of a set of items I= {E' →•E} contains the items:

    a.   F→ id•

154. An (augmented) grammar with the following productions is given:

E' → E
E → E + T | T
T → T * F | F
F → (E) | id

Which of the symbols belong to the FOLLOW(F) set:

    a.   *

155. Which of the following statements are true:

    a.   In an operator grammar, the right-hand side of a production cannot have a single non-terminal symbol

156. Lexical analysis involves, among others:

    a.   removing tokens and identifying lexemes

157. Regarding LL and LR parsers, it is true that:

    a.   LR is not a directional parser

158. The following statements are true about parsers belonging to the LL(k) class:

    a.   parameter k represents the number of errors after which a parser terminates

159. Which of the following options best describes Chomsky's classification of formal grammars?

    a.   Chomsky's classification includes four levels of grammars: regular, context-free, context-sensitive, and grammars with context-free dependency

160. Which of the following statements best describes the role of a metalanguage in the context of semantic antinomies?

    a.   A metalanguage is a language used to formulate paradoxes, such as the liar paradox

161. Which of the following statements best describes the difference between the selected programming language paradigms?

    a.   The imperative paradigm focuses on defining functions and avoiding state, while the declarative paradigm focuses on state mutation through instructions

162. In the context of programming language paradigms, which of the following statements best characterize their properties?

    a.   The functional paradigm uses first-order logic to define problems, while the logical paradigm relies on recursion and the elimination of global variables

163. Which of the following statements best describes the difference between certain types of algorithms?

    a.   A deterministic algorithm requires a large amount of memory, while a nondeterministic algorithm requires a minimal amount of memory

164. Which statements about Shannon entropy are true:

    a.   If two systems are independent, the entropy of the sum of the systems is equal to the sum of the entropies of those systems

165. Which of the following statements about Hamming code are true:

    a.   Hamming code allows correcting errors involving the alteration of two bits

166. Which of the following statements about coding are true:

    a.   Huffman coding creates a prefix code

167. Which statements about JPEG compression are true:

    a.   Generally, the first step of compression is converting from the RGB color model to YCbCr

168. Mark correct results if you run the following command while working with the BASH shell in the Unix or Linux environment: rm / && echo ok

    a.   there will be the following message on the standard output: ok

169. While working with the BASH shell in the Unix or Linux environment the file name pattern: data.{txt,sql,iq} will match the following files:

    a.   data.

170. Mark correct statements. In a Linux or Unix operating system:

    a.   a user can remove a file if he owns it only

171. While working with the BASH shell in the Unix or Linux environment a question mark (?) in a file name means:

    a.   a string of at least one character

172. A Linux or UNIX operating system:

    a.   can handle multiple users

173. While working with the BASH shell in the Unix or Linux environment a variable $? holds a value of:

    a.   the first character of the recently opened file

174. While working with the BASH shell in the Unix or Linux environment the following commend: ls | less will result in:

    a.   forwarding the standard output of less to the standard input of ls

175. While working with the BASH shell in the Unix or Linux environment setting 700 access permissions on a file means that:

    a.   no permissions for the group owner

176. While working with the BASH shell in the Unix or Linux environment using a keyboard shortcut: Control-c results in:

    a.   putting currently running process on hold

177. While working with the BASH shell in the Unix or Linux environment using a keyboard shortcut: Control-z results in:

    a.   putting the currently running process on hold

178. While working with the BASH shell in the Unix or Linux environment an asterisk (*) in a file name means:

    a.   any string of characters

179. While working in the Unix or Linux environment if a file name starts with a dot (.) it is:

    a.   write protected

180. While working with the BASH shell in the Unix or Linux environment the pattern: [123]data will match the following files:

    a.   data

181. What is the significance of the extension relationship in the context of UML use case diagrams?

    a.   Indicates that one use case can operate independently of others

182. What is the purpose of using the "include" («include») relationship in UML use case diagrams?

    a.   It specifies that one use case is entirely dependent on the functionality of another use case

183. What are the key features of Yourdon's structured approach to systems analysis?

    a.   Division of the system into functions that are independently analyzed and developed

184. What is the main characteristic of the spiral model in the software development lifecycle?

    a.   All requirements and design must be finalized before starting the first iteration

185. What are the main objectives of using the Scrum methodology?

    a.   Ensuring that the final product precisely matches the specifications defined at the beginning of the project

186. What are the maturity levels in the CMM model?

    a.   Initial, Developed, Mature, Advanced

187. Maintainability is a characteristic of software that means:

    a.   the ability to evolve according to customer needs (program expansion)

188. Reliability is a characteristic of software that means:

    a.   the minimal complexity of the software system

189. The requirements engineering process is a process:

    a.   of elicitation, documentation, and deployment

190. System requirements:

    a.   describe the properties and constraints of the system, e.g., reliability, response time, disk space requirements

191. Unit tests:

    a.   test the behavior of individual components that make up the system

192. To limit the scope of changes in the system when modifying a part of the system, it is necessary to apply:

    a.   the dependency inversion principle

193. In the context of the model-driven approach to software development, it is not true that:

    a.   quality attributes do not affect the system architecture

194. An example of an activity resulting from the DevOps methodology:

    a.   automatic monitoring of the running application's parameters

195. In reference to UML sequence diagrams, the following can be stated:

    a.   A lifeline represents the flow of data between components

196. In reference to UML state diagrams, the following can be stated:

    a.   A history state automatically updates the object's state in response to external changes

197. In reference to UML activity diagrams, the following can be stated:

    a.   The use of a "token" in different flow paths represents an individual case of usage within the activity and is passed independently through each path

198. In reference to UML implementation diagrams, the following can be stated:

    a.   They visualize algorithms and their execution at the machine code level

199. In reference to sequence diagrams, the following can be stated:

    a.   Messages in sequence diagrams represent synchronous, asynchronous, return, and creation messages, which account for various forms of interaction between objects

200. In reference to UML state diagrams, the following can be stated:

    a.   Nested states allow modeling simple behaviors without the possibility of returning to previous states

201. In reference to and in the context of UML (Unified Modeling Language), the following can be stated:

    a.   Forward engineering involves analyzing an existing system and manually creating UML diagrams that reflect its structure and behavior

202. In reference to and in the context of UML (Unified Modeling Language), the following can be stated:

    a.   Backward engineering is the process of generating source code based on existing UML diagrams and design models

203. After executing a code fragment written in C:
int a,b=1;
a=b++ + b;

    a.   a will take on the value 4

204. The double type in C:

    a.   in a variable of this type we can store, among other things, any number that can be stored in the char type

205. Let's assume that the pointer variables t and s are of type char, additionally s points to a non-empty text string, and t to the memory address starting the area allocated to our process. After executing the code fragment written in C:
while(*t++=*s++);

    a.   the pointers will increase their values accordingly without changing the contents of memory

206. After executing the code fragment denoting the declaration in C:
int tab[10], *ws=tab;

    a.   the pointer ws differs from the name of the table tab in that it is a pointer variable, and the name of the table is a constant pointer

207. A fragment of code in C:
double (*fun1)(double, double);

    a.   the above declaration means the same as: double *fun1(double, double);

208. A fragment of C code:
int fib(int n){
 if(n<3) return n;
 return fib(n-1) + fib(n-2);
}

    a.   you can write a function that returns the same values as the above function without using recursion with linear time complexity and constant memory complexity

209. The minimax algorithm:

    a.   traverses the move tree with exponential time complexity regardless of whether you use recursion or not

210. If we have n numbers sorted and placed in an array, then:

    a.   in order to search for an element with a given value we have to perform exactly n steps in the worst case

211. If we have n numbers sorted and placed in a dynamic singly linked list, then:

    a.   to search for an element with a given value we have to look through half of all the elements of the list on average

212. When we have a dynamic data structure of the type unidirectional list, then:

    a.   you cannot remove any element from the list, because you can only remove the last element of the list

213. When we have a dynamic structure of the tree type, then:

    a.   in order to list all the elements of the tree we must traverse all the elements of the tree

214. If we have a dynamic structure of the binary search tree (BST) type, where this is a tree that satisfies the property that for each node containing value x and having a left child containing value l and a right child containing value p, we have: l<=x and x<=p, then:

    a.   in a balanced tree, in which the length of any two branches differs by at most 1, finding a node containing the value we are looking for has logarithmic time complexity

215. Analyze fragments of C++ code containing variables, pointers, and references. Which of them have correct syntax?

    a.
```
int x;
int*ptr=&x;
int&r=*ptr;
```

216. Which statements regarding the restrictions imposed by C++ syntax on constructors and destructors are true?

    a.   A class can define at most one constructor and at most one destructor.

217. Which statements regarding class methods in C++ are true?

    a.   The `this` pointer is the default argument for every class method (both non-static and static).

218.

Two C++ classes were declared

```
class A{
    int value;
public:
    A(int _v):value(_v){}
    int getValue(){return value;}
    const char*getName(){return "AAA";}
};
```

and

```
class B:public A {
public:
    // place for constructor

    const char*getName(){return "B";}
};
```

An object of class B was created with the following instruction:

```
A*pa=new B();
```

Which implementation of class B constructor is correct?

    a.   `B::B(){value=0;}`

219. The following C++ classes were declared

```
class A{
public:
    A(){std::cout<<"A";}
};

class B{
public:
    B(){std::cout<<"B";}
};

class C{
    A a;
public:
    C(){std::cout<<"C";}
};

class D : public C{
public:
    B b;
    D(){std::cout<<"D";}
};
```

What is the order of constructor calls when creating an object of class D?

    a.   Constructor `B` will be called before constructor `C`.

220.

The following three C++ classes were declared.

```
class A {
public:
    virtual ~A(){f();}
    virtual void f(){std::cout<<"A";}
};

class B:public A {
public:
    ~B(){f();}
};

class C:public B {
public:
    ~C(){f();}
    void f(){std::cout<<"C";}
};
```

Zaimplementowano następującą funkcję main()

```
int main(){
    A* ptr = new C();
    delete ptr;
    return 0;
}
```

When an object is deleted, its destructor is called. Which statements regarding the invoked destructors are true?

    a.   The destructor of class `A` will be invoked, and the virtual function called within it will print `C`.

221.

Which statements regarding operator overloading are true?

    a.   The operator is declared as:

```
TYPE  operator+(std::string s, double v)
```

       Assuming the operator does not cause side effects, the return type `TYPE` could be a reference type `std::string&`.

222. Select the correct statements regarding function objects in C++.

    a.   The function call operator is formally a binary operator, but the function implementing it can accept any number of arguments.

223. Which statements regarding the exception handling mechanism in C++ are true?

    a.   If an exception occurs in a constructor, the destructor of the object is not called.

224. Select the correct statements regarding C++ containers.

    a.   Kontener std::vector przechowuje dane elementów w tablicy. Jeżeli n jest równa liczbie elementów wektora zwracanej przez metodę std::vector<E>::size(), a m to rozmiar elementu zwracany przez operator sizeof(E), to rozmiar pamięci przydzielonej dla tej tablicy jest zawsze równy $n \cdot m$

       The `std::vector` container stores the data of its elements in an array. If n is the number of elements in the vector returned by the method `std::vector<E>::size()`, and m is the size of an element returned by the operator `sizeof(E)`, the memory size allocated for this array is exactly $n \cdot m$.

225. Assume that `A` is a class in C++. What conditions must be met in order to store objects of this class in a `std::set` container or use them as keys in a `std::map`?

    a.   If a specific comparator class is not provided when defining the container, a `bool` operator `<` must be defined to allow comparison of objects of class `A`.

226. Which statements regarding iterators in C++ are true?

    a. The iterator of the `std::list` container allows unrestricted access, meaning the iterator can be moved by any number of positions forward or backward.

227. Which statements related to lambda expressions in C++ are true

    a. Compilation of identical lambda expressions repeated in the code yields a single shared function object

228. Point out the semantic tags found in HTML5

    a. meters

229. What HTML5 tag should be use to display the video file content?

    a. mp4

230. Which element can be used in HTML5 to specify a navigation link

    a. links

231. What is the goal of using the for attribute in the <label> tag in HTML5?

    a. to specify the form element associated to the label

232. What is the purpose of using the defer attribute in the <script> tag in HTML5?

    a. to delay the execution of a script until the page has finished parsing

233. The characteristic feature of SPA class applications is:

    a. data between backend and frontend is transferred only in JSON format

234. Which http operation should be use to update some data of an existing user

    a. PUT

235.
Which of the following API addresses (according to the REST API convention) should be used to return information about all user's cars with id = 4

    a. /users?id=4/cars/all

236.
indicate valid JSON format

    a.
```
{
    user : "Jan Kowalski",
    age: "100"
}
```

237. Responsiveness in Web application

    a. wymaga użycia właściwości Flex lub Grid

238. Modern JS frameworks such as Angular, React or Vue

    a. are representatives of imperative programming

239. Point out the correct statements about Node JS

    a. it is a runtime environment that allows you to write Java Script code for the backend

240.

The following source code was written in Java:

```
Class C {
public static void main(String[] args) {
int[]a1[]=new int[3][3]; //3
int a2[4]={3,4,5,6}; //4
int a2[5]; //5
}}
```

What is the result of compiling and running the program (line numbers are given in comments)?

    a. Exception during program execution

241.

The following source code was written in Java:

```
public class A extends Thread {
public int i;
public void run() { i = 1; }
public static void main(String[] args) throws Exception {
A a = new A();
a.start();
System.out.print(a.i);
Thread.sleep(1000);
System.out.print(a.i);
}}
```

What is the outcome of compilatiomn and execution of the above program?

    a. Will print: "00"

242.

The following source code was written in Java:

```
class C{
public static void main(String[] args) {
 try {
   try {
     try {}
     catch(RuntimeException e){}
   }
   catch(Exception e) {}
 }
 catch(NullPointerException e) {}
 finally {
   System.out.println("finally");
 }
}}
```

What is the result of compiling and running the program?

    a. None of the above

243.

The following source code was written in Java:

```
public class C {
    public static void main ( String a[]) {
        Thread t = Thread.currentThread ( ) ;
        t.setPriority(-1);
        System.out.println("Done!");
    }
}
```

What will be the result of compiling and running the program?

    a.   Runtime Exception

244.

The following source code was written in Java:

interface I{

void f1(); // 1

public void f2(); // 2

protected void f3(); // 3

private void f4(); // 4

}

Which lines are responsible for compilation errors? (line no in comments)

    a.   Compilation error in lines 3, 4

245.

The following source code was written in Java:

```
class C {
static int s;
public static void main(String a[]){
  C obj=new C();
 obj.m1();
  System.out.println(s);
}
void m1() {
  int x=1;
 m2(x);
  System.out.println(x+"");
}
void m2(int x){
  x=x*2;
  s=x;
}
}
```

What is the result of compiling and running the program?

    a.   Will print: "2,0"

246.

The following source code was written in Java:

```
class C {
public static void main(String[] args) {
int i1=1;
switch(i1){
case 1:
System.out.println("one ");
case 2:
System.out.println("two ");
case 3:
System.out.println("three ");
}}}
```

What is the result of compilation and execution of the program?

    a.   Compilation error

247.

The following source code was written in Java:

```java
class C1 {
static interface I {
static class C2 {}
}
public static void main(String a[]) {
C1.I.C2 ob1=new C1.I.C2();
System.out.println("obj created");
}
}
```

What is the result of compiling and running the program?

a. Compilation error

248. The following source code was written in Java:
```java
class C1 {
static class C2 {
static int i1;
}
public static void main(String a[]) {
System.out.println(C1.C2.i1);
}
}
```

What is the result of compiling and running the program?

a. Will print: "0"

249.

How many objects (instances of class StringBuffer) will be created while executing the below program:

```java
StringBuffer s1 = new StringBuffer("abc");
StringBuffer s2 = s1;
StringBuffer s3 = new StringBuffer("abc");
```

a. 4

250.

Which of the following methods is a static method in the Thread class available in the standard API for Java?

a. sleep

251.

Given the following program in Java:

```java
class c1 {
  public void m1() {
    System.out.println("m1 in anonimous class");
  }
}

class c2 {
 public c1 m1() {
   return new c1(){
     public void m1() {
       System.out.println("m1 in anonimous class");
   }
 }
}

public static void main(String a[]) {
 c1 ob1 =new c2().m1();
 ob1.m1();
}}
```

What will be the result of compiling and running this code as a program?

    a. Program will print string: "m1 in anonimous class"

252.

Given the following program in Java:

```java
class C{
int i;
public static void main (String[] args) {
int i; //1
private int a = 1; //2
protected int b = 1; //3
public int c = 1; //4
System.out.println(a+b+c); //5
}}
```

What is the result of compilation and execution ot the program (line no in comments)?

    a. Compilation error in lines indicated by comments: //1, //2, //3, //4, //5

253.

Given the above code in Java:

public class Command {

public static void main (String[] a1) {

System.out.print(a1[1] + a1[2] + a1[3]);

}}

What is the result of trying to compile and run the above program using the following command?
 command: java Command A B C

    a.   Printing: BCD

254.
Given the above code in Java:

class C{
static String m(int i) {return "int";}
static String m(float i) {return "float";}
public static void main (String[] args) {
long a1 = 1; double b1 = 2;
System.out.print(m(a1)+","+ m(b1));
}}
What is the result of compilation and execution of the program?

    a.   Printing: double,float

255. The Model-View-Controller (MVC) architecture pattern in ASP .NET Core MVC technology includes:

    a.   Controllers layer - defines a set of remotely invoked methods executed by the HTTP protocol.

256. To store the state of a web application (ephemeral data that you don't want to persist in a database) in ASP.NET CORE MVC, you can use:

    a.   Application cache (IMemoryCache)

257. Registering an event (the method that will be called to handle the event) in the C# language is done using an operator:

    a.   ++

258. To define lambda expressions in C#, the following operator is used:

    a.   ->

259. In the .NET Core platform, LINQ stands for:

    a.   Linguistic interaction queries - a set of programming constructs that allow you to use natural language to interact with a computer.

260. Is it possible to create nested classes (declare a class inside the declaration of another class) in C#?

    a.   Yes.

261. In the C# language, you can:

    a.   Pass a variable to a method by reference using the out keyword.

262. In the C# language, you can use thread synchronization with the aid of:

    a.   Synchronization signals ("EventWaitHandle").

263. Top-level statements in the C# language are subject to certain rules. Among them are:

    a.   There can be only one top-level code file in the project.

264. Which of the following type conversions (type casts) in the C# language are allowed?

    a.   Casting a reference to an object of any class to a reference to the class "Object"

265. The IPv4 address pool for IP Multicast groups (class D IPv4 address pool) is:

    a.   0.0.0.0 – 127.255.255.255

266. Examples of the ISO OSI RM model layers (ISO Open Systems Interconnection Reference Model) used in computer networks are:

    a.   Presentation layer

267. A protocol used to avoid broadcast frame transmission loop in an Ethernet network (a so-called broadcast storm), is:

    a.   ARP (Address Resolution Protocol)

268. An IPv4 address belonging to 210.210.210.192/26 IP network is:

    a.   210.210.210.32

269. What technique will you use to connect the Internet when an IP network in the organization you work for have run out of IPv4 addresses for new devices and additionally these devices should not be directly addressable from the Internet?

    a.   RPF (Reverse Path Forwarding)

270. The so-called salt, i.e. random data added to the password when calculating the hash function stored in computer systems, is intended to:

    a.   making difficult for users to re-use some old passwords

271. A standard defining the format of public key certificates is:

    a.   Verikey

272. The UDP (User Datagram Protocol)

    a.   automatically confirms received data to the data sender

273. IPv4 mask for an IPv4 network 5.5.5.0/30 is

    a.   255.255.255.248

274. Does TCP protocol have a transmission data length limit for each connection?

    a.   No

275. The length of MAC (Media Access Control) address used for NIC (Network Interface Card) addressing in layer 2 ISO OSI is:

    a.   48 bits

276. An optical fiber in which a beam of light of the same wavelength can travel only in one path and several beams of the same wavelength cannot be sent through this optical fiber at the same time is identified as:

    a.   mono-optical

277. Digital serial communication bus examples are:

    a.   OSPF, RIP

278. Examples of communication protocol specifications for wireless networks or wireless communication systems are:

    a.   Dot1Q

279. An IPv6 address in IPv6 network 5::0/64 is:

    a.   5::5

280. The Big-M method finds an initial solution for the simplex algorithm. Select the true statements about this method:

    a.   Is sensitive to numerical errors.

281. The branch and bound method relies on comparing two values:

- the lower bound of the objective function
- the upper bound of the objective function

Assuming we are maximizing the objective, what are these values?

    a.   Lower bound is the value of the objective function for the best solution found so far.

282. Select true (proven) statements about the computational complexity of the decision version of the knapsack problem:

    a.   Belongs to class NP-Complete.

283. What is the purpose of the Critical Path Method:

    a.   To determine the number of employees needed to finish the project.

284. What characterizes the dual problem in linear programming:

    a.   The direction of the objective function (maximization/minimization) is reversed compared to the primal program.

285. What conditions must be met by the equality (canonical) form of linear programming:

    a.   The objective function must be maximized.

286. Select the true statements about the Hungarian Algorithm:

    a.   It guarantees finding an optimal solution for the classical assignment problem.

287. What characterizes the branch and bound method based on linear relaxation:

    a.   Allows solving problems with nonlinear constraints.

288. Select methods that can be used to solve the classical assignment problem:

    a.   Any algorithm that solves integer programming problems.

289. How many optimal solutions can exist for a linear programming problem:

    a.   Exactly two.

290. What does problem relaxation involve in the context of operations research:

    a.   Relaxation involves adding surplus variables to the linear program.

291. What characterizes the two-phase simplex algorithm:

    a.   Works in two phases, that is, it solves two models: first, it finds an initial solution, and then it solves the original problem.

292. One-hot encoding is:

    a.   a method of data representation where different values of a given parameter are split into separate fields/columns

293. Which of the following commands are correct, assuming that `df` is a `DataFrame` object of the Pandas library?

    a.   `df.agg({'one': 'mean', 'four': 'sum'})`

294. Which of the following statements are true regarding the Pandas library?

    a.   The `merge` command allows you to combine two DataFrame objects by matching values of selected columns (column-to-column), without making additional modifications to these objects.

295. Assuming that `s` is a Series object in the Pandas library, the command `s.map(x)` will:

    a.   if `x` is a string, filter only those values in the Series object that contain the string `x`

296. Spherical reference systems (spatial reference systems, coordinate reference systems), such as WGS-84:

    a.   use coordinates given in degrees

297. Flat (isometric, projected) reference systems (spatial reference systems, coordinate reference systems), such as PUWG 2000:

    a.   allow calculating distances in their base unit (e.g., meters) between two points using the Pythagorean theorem alone, without additional transformations

298. If data processing time is too long, one should:

    a. distribute computations across multiple nodes in a cluster.

299. If data does not fit into available RAM during analysis, one should:

    a. use a database.

300. Assuming that `df` is a `DataFrame` object in the Pandas library, the command `df.apply(my_function)` will:

    a. call the function `my_function` each time the `df` object is modified

301. Assuming that `df` is a `DataFrame` object in the Pandas library, the command `df.apply(my_function, axis=1)` will:

    a. execute the function `my_function` once

302. Which of the following data storage methods allow you to *explicitly* specify whether a value is an integer, a floating-point number, or text?

    a. a JSON file

303. A GeoDataFrame object of the GeoPandas library:

    a. has exactly one GeoSeries column designated as the one storing the geometry (shape/location) of the records

304. What are the standard methods used to evaluate models in supervised machine learning?

    a. Monte Carlo method.

305. The leave-one-out method:

    a. Is a validation method where the training set consists of a single sample.

306. An activation function is:

    a. A function according to which voting occurs in ensemble methods.

307. In the case of an unbalanced dataset for supervised learning:

    a. A clustering algorithm will indicate clusters of unequal sizes.

308. Data labeling is a process that:

    a. Requires human involvement at all times.

309. An epoch refers to:

    a. A single cycle in which we present all data from the test set to a neural network.

310. Which of the following methods are not typically used to evaluate models in supervised machine learning?

    a. Area under the ROC curve.

311. What can be said about a machine learning model in the context of overfitting?

    a. The machine learning model is too well-fitted to the training data.

312. What can cause overfitting in a machine learning model?

    a. Too much training data.

313. What can cause underfitting in a machine learning model?

    a. A model structure that is too simple.

314. What actions can be taken to avoid overfitting?

    a. Use a larger number of features.

315. What actions can be taken to avoid underfitting?

    a. Remove noise from the data.

316. What are examples of machine learning tasks used in supervised learning?

    a. Regression

317. What are examples of machine learning tasks used in unsupervised learning?

   a.   Classification

318. One of the fundamental architectures of agent systems is the BDI architecture. In the context of agent systems, the abbreviation BDI is explained as:

   a.   Belief-Desire-Intention

319. Select the true statements concerning the reversibility of cellular automata:

   a.   For reversible automata, the mapping realized by the transition function (transition rule) is a bijection.

320. The creators of the Cellular Automata (CA) paradigm are:

   a.   Richard Feynman and Paul Dirac

321. Select the true statements concerning Cellular Automata:

   a.   A classical cellular automaton is a discrete, dynamic system whose behavior is strictly defined by global relationships.

322. What is the concept of emergence in complex systems modeling based on?

   a.   The use of the Model-View-Controller scheme

323. The simplest agent that makes a basic adaptation of its actions depending on environmental changes (without memory or learning effects) is called:

   a.   A cognitive agent

324. The most important properties of complex systems in the domain of scale and time are:

   a.   Self-organization

325. Select which statements are true with respect to a homogeneous and synchronous Cellular Automaton (CA):

   a.   It is a discrete dynamic system whose behavior is strictly defined by local relationships.

326. List the basic properties of a homogeneous cellular automaton:

   a.   Different sets of states are allowed for different cells of the grid.

327. Select the true statements concerning non-homogeneous Cellular Automata:

   a.   Non-homogeneous cellular automata have significant practical importance in engineering applications.

328. Select the true statements concerning DES (Discrete Event Simulation) systems:

   a.   In the DES approach, the system is designed based on central control of processes and planning from the whole to the details (a top-down approach).

329. Periodic boundary conditions for a Cellular Automaton imply the following properties for an object moving on the grid:

   a.   The moving object bounces off the edge after reaching the boundary cells of the grid and returns back onto the grid according to defined reflection rules.

330. Algorithms that search for the extrema of functions include:

   a.   K-Means

331. Algorithms that are used for dimensionality reduction are:

   a.   K-Nearest Neighbors

332. Which algorithms are used to assess the effectiveness of a predictive model?

   a.   Calculating eigenvalues

333. Indicate the correct properties of semi-supervised learning.

   a.   Does not require labels.

334. Activation functions used in artificial neural network models include:

    a. Sigmoid

335. What is an outlier instance?

    a. An instance with a value significantly different from most other instances.

336. Indicate the correct properties of the K-Means algorithm.

    a. Is a supervised learning method

337. For features X and Y, a linear correlation coefficient of -0.95 was obtained. What does it mean?

    a. Features X and Y are not correlated.

338. Having a complete confusion matrix, which metrics can be calculated to assess model quality?

    a. Precision

339. Algorithms that are examples of supervised learning include:

    a. K-Nearest Neighbors

340. Algorithms that are examples of unsupervised learning include:

    a. PCA

341. Indicate the correct properties related to Principal Component Analysis (PCA).

    a. Subsequent principal components are uncorrelated with each other.

342. What objections did Turing foresee against the validity of his proposed test?

    a. The consequences of machine thinking will be too unpredictable, so let's hope they won't start doing it.

343. Choose the true statement regarding k in kNN:

    a. k is an integer value

344. In binary classification, the following results were obtained: TP = 90; TN = 30; FP = 10; FN = 70. What is the positive predictive value?

    a. 0.5

345. Predicting a person's one favorite color (out of 5 possible: {yellow, pink, blue, green, red}) is:

    a. Regularization

346. Select the true statements regarding the confusion matrix:

    a. The confusion matrix is used to calculate the reward in reinforcement learning.

347. What parameters need to be set in the DBSCAN algorithm for data clustering?

    a. Neighborhood radius around a point.

348. Which of the following features best describe the k-means algorithm?

    a. Requires specifying the number of clusters at the beginning.

349. Which diagrams, due to their visual properties, are most effective for presenting the results of clustering by the k-means algorithm?

    a. Scatter plot.

350. Which of the following options describe features or applications of the agglomerative clustering algorithm?

    a. Ability to gain insight into data through visualization in the form of a dendrogram.

351. Which of the following statements accurately describe the Principal Component Analysis (PCA) method?

    a. PCA creates components that are mutually orthogonal.

352. Which of the following applications are appropriate for the Apriori algorithm?

    a.   Data encryption.

353. Which of the following methods, algorithms, or techniques are used in unsupervised learning?

    a.   Decision Trees, Random Forests

354. What elements can be distinguished in reinforcement learning?

    a.   Environment