

## MULTIPLE CHOICE QUESTIONS ON MANAGEMENT SCIENCE

1. The term "Operation Research" was coined by :
  - a. Mc Closky and Trefthen
  - b. Arthur Clark
  - c. Churchman, Ackoff and Arnoff
  - d. George B Dantzig
2. Management Science came into existence in a ..... context.
  - a. Business
  - b. Academic
  - c. Military
  - d. Religious
3. By the beginning of ....., the industries in USA realised the importance of Management Science in solving business and management problems.
  - a. 1930s
  - b. 1940s
  - c. 1950s
  - d. 1960s
4. In India, Operations Research came into existence in the year .....
  - a. 1940
  - b. 1947
  - c. 1949
  - d. 1950
5. In India, first Operations Research unit was set up at .....
  - a. Regional Research Laboratory, Hyderabad
  - b. Indian Statistical Institute, Kolkotha
  - c. Indian Institute of Science and Technology, Bengaluru
  - d. Indian Institute of Science and Technology, Mohali
6. In India, first Operations Research application was made by .....
  - a. Pranab K Sen
  - b. Prof. Mahalonobis
  - c. Samarendra Nath Roy
  - d. Raghu Raj Bahadur
7. Operations Research Society of India was formed in the year .....
  - a. 1950
  - b. 1955
  - c. 1957
  - d. 1960
8. Who defined Operations Research as "the art of giving bad answers to problems which otherwise have worse answers"?
  - a. H M Wagner
  - b. H A Taha
  - c. T L Saaty

- d. Arthur Clark
9. .... defined Operations Research as “the art of winning wars without actually fighting.”
- a. H M Wagner
  - b. H A Taha
  - c. T L Saaty
  - d. Arthur Clark
10. Operations Research is a very powerful tool for .....
- a. Operations
  - b. Research
  - c. Decision making
  - d. None of these
11. Who defined Operations Research as scientific approach to problem solving for executive management.
- a. E L Arnoff
  - b. H M Wagner
  - c. Churchman
  - d. None of these
12. The term “Operations Research” was coined in the year .....
- a. 1930
  - b. 1940
  - c. 1950
  - d. 1960
13. The innovative science of Operations Research was discovered during .....
- a. Civil war
  - b. World war I
  - c. World war II
  - d. Industrial Revolution
14. Operations Research has the characteristic that it is done by a team of .....
- a. Scientists
  - b. Mathematicians
  - c. Academicians
  - d. Politicians
15. Operations Research emphasises on the overall approach to the system. This characteristic of Operations Research is often referred to as .....
- a. System orientation
  - b. System approach
  - c. Inter-disciplinary
  - d. Team approach
16. Operations Research cannot give perfect ..... to the problem.
- a. Answers
  - b. Solutions
  - c. Both a and b
  - d. Decisions

17. .... models involve the allocation of resources to activities in such a way that some measure of effectiveness is optimised.
  - a. Sequencing
  - b. Allocation
  - c. Queuing theory
  - d. Decision theory
18. In ..... models, everything is defined and the results are certain.
  - a. Probabilistic
  - b. Deterministic
  - c. Both a and b
  - d. None of these
19. .... models involve more risks and uncertainties.
  - a. Probabilistic
  - b. Deterministic
  - c. Both a and b
  - d. None of these
20. .... models are obtained by enlarging or reducing the size of the items.
  - a. Iconic models
  - b. Analogue models
  - c. Symbolic models
  - d. None of these
21. The word ..... may be defined as some actions that we apply to some problems or hypothesis.
  - a. Research
  - b. Operations
  - c. Both a and b
  - d. None of these
22. ....are representations of reality.
  - a. Phases
  - b. Models
  - c. Both a and b
  - d. None of these
23. ....are called mathematical models.
  - a. Iconic models
  - b. Symbolic models
  - c. Analogue models
  - d. None of these
24. Probabilistic models are also called .....
  - a. Deterministic models
  - b. Dynamic models
  - c. Stochastic models
  - d. None of these
25. .... models assume that the values of the variables do not change with time during a particular period.
  - a. Dynamic

- b. Static
  - c. Both a and b
  - d. None of these
26. ....models consider time as one of the important variable.
- a. Dynamic
  - b. Static
  - c. Both a and b
  - d. None of these
27. ....may be defined as a method of determining an optimal program of interdependent activities in view of available resources.
- a. Goal programming
  - b. Linear programming
  - c. Decision making
  - d. None of these
28. .... are expressed in the form of equations
- a. Objectives
  - b. Constraints
  - c. Both a and b
  - d. None of these
29. If there are more than one optimal solutions for the decision variables, the solution is .....
- a. Infeasible
  - b. Unbounded
  - c. Alternative
  - d. None of these
30. Dual of the dual s a .....
- a. Dual
  - b. Primal
  - c. Alternative
  - d. None of these
31. The quantitative approach to decision analysis is a .....
- a. Logical approach
  - b. Rational approach
  - c. Scientific approach
  - d. All of the above
32. A model is a .....
- a. An essence of reality
  - b. An approximation
  - c. An idealisation
  - d. All of the above
33. The dummy source/destination in a transportation problem is added to .....
- a. Satisfy rim constraints
  - b. Prevent solution from becoming degenerate
  - c. Ensure total cost does not exceed a limit
  - d. None of the above

34. The solution to a transportation problem with 'm' rows and 'n' columns is feasible if the number of positive allocations are:
- $m + n$
  - $m \times n$
  - $m + n - 1$
  - $m + n + 1$
35. The method used for solving an assignment problem is:
- Reduced matrix method
  - MODI method
  - Hungarian method
  - None of these
36. An assignment problem can be solved by .....
- Simplex method
  - Transportation method
  - Both a and b
  - None of these
37. For salesman who has to visit 'n' cities, which of the following are the ways of his tour plans:
- $n !$
  - $(n+1) !$
  - $(n-1) !$
  - $n$
38. The assignment problem is:
- Requires that only one activity be assigned to each resource
  - Is a special case of transportation problem
  - Can be used to maximise resource
  - All the above
39. The Hungarian method for solving an assignment problem can also be used to solve:
- A transportation problem
  - A travelling salesman problem
  - A linear programming problem
  - Both a and b
40. All the parameters in the linear programming model are assumed to be .....
- Variables
  - Constraints
  - Functions
  - None of these
41. Graphic method can be applied to solve a liner programming problem when there are only ..... variables
- A one
  - Two
  - Three
  - More than three
42. If the feasible region of a linear programming problem is empty, the solution is .....
- Unbounded
  - Infeasible

- c. Infeasible
  - d. Alternative
43. The variables whose coefficient vectors are unit vectors, are called .....
- a. Unit variables
  - b. Basic variables
  - c. Non-basic variables
  - d. None of these
44. Any column or row of a simplex table is known as .....
- a. Key column
  - b. Key row
  - c. Vector
  - d. None of these
45. .... is considered as the pioneer of Linear Programming Technique.
- a. churchman
  - b. D W Miller
  - c. James Lundy
  - d. George B Dantzig
46. A minimisation problem can be connected into maximisation problem by changing the signs of coefficients in the .....
- a. Constraints
  - b. Objectives
  - c. Both a and b
  - d. None of these
47. In an LPP, if the solution of a variable can be made infinitely large without violating the constraints, then the solution is .....
- a. Infeasible
  - b. Alternative
  - c. Unbounded
  - d. Unique
48. In maximisation cases, ..... are assigned to the artificial variables as their coefficients in the objective function.
- a. + m
  - b. - m
  - c. 0
  - d. None of these
49. In simplex method, we add ..... in the case of constraints with sign "="
- a. Surplus variable
  - b. Artificial variable
  - c. Slack variable
  - d. None of these
50. In simplex method, ..... should be selected when there is tie between slack/surplus variable and decision variable.
- a. Slack variable
  - b. Decision variable
  - c. Surplus variable

- d. None of these
51. When at least one of the basic variables is zero, then the basic feasible solution to a Linear Programming Problem is said to be .....
- a. Infeasible
  - b. Unbounded
  - c. Degenerate
  - d. Non-degenerate
52. In Linear Programming Problem, degeneracy occurs in ..... stages.
- a. One
  - b. Two
  - c. Three
  - d. Four
53. Every Linear Programming Problem is related to another Linear Programming Problem, called .....
- a. Primal
  - b. Dual
  - c. Non-linear Programming
  - d. None of these
54. In a maximisation assignment problem, the objective is to maximise .....
- a. Profit
  - b. Cost
  - c. Optimisation
  - d. None of these
55. Operations Research does not give perfect solution to a problem, but it helps to improve the ..... of the solution.
- a. Quality
  - b. Clarity
  - c. Look
  - d. None of these
56. Operations Research makes a ..... attack on complex problems to arrive at optimal solution.
- a. Scientific
  - b. Systematic
  - c. Both a and b
  - d. None of these
57. Operations Research uses models to help the management in determining its ..... scientifically.
- a. Policies
  - b. Actions
  - c. Both a and b
  - d. None of these
58. Operations Research is a .....
- a. Science
  - b. Art
  - c. Both a and b

- d. None of these
59. .... deals with making sound decisions under conditions of certainty, risk and uncertainty.
- a. Game theory
  - b. Network analysis
  - c. Decision theory
  - d. None of these
60. .... deals with the concepts such as critical path, float, events, etc.
- a. Game theory
  - b. Decision theory
  - c. Queuing theory
  - d. Network analysis
61. .... is used to imitate an operation prior to actual performance.
- a. Inventory control
  - b. Simulation
  - c. Game theory
  - d. Integrated Production Model
62. .... is concerned with determination of the most economic replacement policy.
- a. Probabilistic programming
  - b. Linear programming
  - c. Search theory
  - d. Replacement theory
63. The O R technique which helps in minimising total waiting and service cost is:
- a. Game theory
  - b. Queuing theory
  - c. Both a and b
  - d. Decision theory
64. Linear Programming technique is a:
- a. Constrained optimisation technique
  - b. Technique for economic allocation of resources
  - c. Mathematical technique
  - d. All of the above
65. A constraint in a Linear Programming Model restricts:
- a. Value of objective function
  - b. Value of decision variable
  - c. Use of available resources
  - d. All of the above
66. Before formulating a formal L P model, it is better to:
- a. Verbally identify decision variables
  - b. Express the objective function in words
  - c. Express each constraint in words
  - d. All of the above
67. Linear Programming Technique helps to find an optimal use of:
- a. Machine



- b. Money
  - c. Manpower
  - d. All of the above
68. Which of the followings is an assumption of Linear Programming Technique?
- a. Divisibility
  - b. Additivity
  - c. Proportionality
  - d. All of the above
69. Which of the following is true with regard to a Linear Programming Model?
- a. No guarantee to get integer valued solution
  - b. The relationship among decision variables is liner
  - c. Both a and b
  - d. None of the these
70. The graphical method if LPP uses:
- a. Linear equations
  - b. Constraint equations
  - c. Objective function
  - d. All of the above
71. Constraints in an LPP are treated as active, if they:
- a. Do not consume all the available resources at optimality
  - b. Represent optimal solution
  - c. Both a and b
  - d. None of these
72. While solving a LPP graphically, the area bounded by constraints is called .....
- a. Feasible region
  - b. Infeasible region
  - c. Unbounded region
  - d. None of these
73. While solving an LPP, infeasibility may be removed by:
- a. Removing a variable
  - b. Removing a constraint
  - c. Adding a variable
  - d. Adding a constraint
74. ....variables are fictitious and cannot have any physical meaning.
- a. Slack variables
  - b. Surplus variables
  - c. Artificial variables
  - d. Decision variables
75. An optimal solution is considered as the ..... among the feasible solutions.
- a. Worst
  - b. Best
  - c. Ineffective
  - d. None of these
76. .... method is used to solve an assignment problem.
- a. American method

- b. Hungarian method
  - c. German method
  - d. British method
77. The allocated cells in the transportation table are called .....
- a. Occupied cells
  - b. Empty cells
  - c. Unoccupied cells
  - d. None of these
78. In transportation Problems, VAM stands for .....
- a. Value Addition Method
  - b. Vogel's Approximation Method
  - c. Virgenean Approximation Method
  - d. None of these
79. Initial feasible solution to a transportation Problem can be found out by .....
- a. VAM
  - b. MODI Method
  - c. Both a and b
  - d. None of these
80. .... is applied to determine optimal solution.
- a. NWCR
  - b. VAM
  - c. MODI Method
  - d. None of these
81. A Transportation Problem is said to be unbalanced when total supply is not equal to .....
- a. Total cost
  - b. Total demand
  - c. Both a and b
  - d. None of these
82. For a minimisation Transportation Problem, the objective is to minimise:
- a. Profit
  - b. Cost
  - c. Solution
  - d. None of these
83. .... is an important Operations Research Technique to analyse the queuing behaviour.
- a. Game theory
  - b. Waiting line theory
  - c. Decision theory
  - d. Simulation
84. An organisation chart is an example of .....
- a. Iconic model
  - b. Mathematical model
  - c. Analogue model
  - d. None of these

85. .... model is a map which indicates roads, highways, towns and inter-relationships
- Iconic model
  - Analogue model
  - Mathematical model
  - None of these
86. Operations Research techniques help to find ..... solution.
- Feasible solution
  - Infeasible solution
  - Optimal solution
  - None of these
87. Operations Research Techniques involves ..... approach.
- Team approach
  - Critical approach
  - Individual approach
  - None of these
88. A LPP model doesnot contain:
- Decision
  - Constraints
  - Feasible solution
  - Spread Sheet
89. Straight lines shown in a linear programming graph indicates .....
- Objective function
  - Constraints
  - Points
  - All of the above
90. Non-negativity constraints are written as .....
- Equality
  - Non-equality
  - Greater than or equal to
  - Less than or equal to
91. PERT stand for:
- Performance Evaluation Review Technique
  - Programme Evaluation Review Technique
  - Programme Evaluation Research Technique
  - None of these
92. An activity which must be completed before commencement of one or more other activities is called.....
- Successor activity
  - Predecessor activity
  - Dummy activity
  - None of these
93. In network diagram, events are commonly represented by .....
- Arrows
  - Nodes

- c. Triangles
  - d. None of these
94. .... is activity oriented network diagram.
- a. CPM
  - b. PERT
  - c. Histogram
  - d. Ogive
95. .... is an event oriented network diagram.
- a. CPM
  - b. PERT
  - c. Histogram
  - d. Ogive
96. An activity which does not consume either resource or time is called .....
- a. Predecessor activity
  - b. Successor activity
  - c. Dummy activity
  - d. Terminal activity
97. .... is a series of activities related to a project.
- a. Network
  - b. Transportation Model
  - c. Assignment model
  - d. None of these
98. An event which represents the beginning of more than one activity is a :
- a. Merge event
  - b. Net event
  - c. Burst event
  - d. None of these
99. Activities lying on critical path are called .....
- a. Critical activities
  - b. Non-critical activities
  - c. Dummy activities
  - d. None of these
100. Activities that cannot be started until one or more of the other activities are completed, are called.....
- a. Dummy activities
  - b. Initial activities
  - c. Successor activities
  - d. Predecessor activities
101. .... is the sequence of activities which determines the total project duration.
- a. Critical path
  - b. Network
  - c. Non-critical activities
  - d. None of these
102. PERT emphasises on .....
- a. Activity

- b. Time
  - c. Cost
  - d. None of these
103. .... is the duration by which an activity can be delayed without delaying the completion of the project.
- a. Earliest Start Time
  - b. Earliest Finish Time
  - c. Latest Start Time
  - d. Latest Finish Time
104. The EST + activity duration = .....
- a. Earliest Finish Time
  - b. Latest Start Time
  - c. Latest Finish Time
  - d. None of these
105. .... is the latest time by which an activity can be finished without delaying the completion of the project.
- a. LST
  - b. LFT
  - c. EFT
  - d. EST
106. .... is a scheme or design of something intended to do.
- a. Network
  - b. Float
  - c. Project
  - d. Program
107. In a network diagram, activity is denoted by .....
- a. Node
  - b. Arrow
  - c. Triangle
  - d. None of these
108. .... is the duration by which an activity can be delayed without delaying the project.
- a. Slack
  - b. Total float
  - c. Both a and b
  - d. None of these
109. The maximise criteria is .....
- a. Optimistic
  - b. Pessimistic
  - c. Neutral
  - d. None of these
110. Decision making under certainty refers to ..... situation.
- a. Deterministic
  - b. Probabilistic
  - c. Competitive

- d. None of these
111. ....is known as father of game theory.
- a. Von Neumann
  - b. A K Erlang
  - c. George b Dantzig
  - d. Arnoff
112. Which of the following is an assumption of game theory?
- a. The players act rationally and intelligently
  - b. Each payer has a finite set of possible courses of action
  - c. The players attempt to maximise gains or minimises losses
  - d. All of the above
113. Each participant of the game is called.....
- a. Strategist
  - b. Winner
  - c. Player
  - d. Loser
114. The outcome of a game is known as.....
- a. Profit
  - b. Loss
  - c. Pay off
  - d. None of these
115. A matrix which shows the gains and losses resulting from moves and counter moves is called.....
- a. Cost matrix
  - b. Pay off matrix
  - c. Both a and b
  - d. None of these
116. When all the players of the game follow their optimal strategies, then the expected pay off of the game is called.....
- a. Gain of the game
  - b. Loss of the game
  - c. Value of the game
  - d. None of these
117. The position in the pay off matrix where the maximin coincides with the minimax.
- a. Saddle point
  - b. Break even point
  - c. Pivot point
  - d. None of the above
118. A game is said to be fair if the value of the game is.....
- a. One
  - b. Two
  - c. Three
  - d. Zero
119. In a .....game the amounts won by all winners together is equal to the sum of the amounts lost by all losers together.

- a. Non-zero sum game
  - b. Zero sum game
  - c. Rectangular game
  - d. None of these
120. Which of the following method is used to solve mixed strategy problems:
- a. Probability method
  - b. Graphic method
  - c. Linear Programming method
  - d. All of the above
121. A queue is formed when the demand for a service:
- a. Exceeds the capacity to provide that service
  - b. Is less than the capacity to provide that service
  - c. a or b
  - d. None of these
122. Queuing theory is also termed as .....
- a. Game theory
  - b. Replacement theory
  - c. Waiting line theory
  - d. None of these
123. In queuing theory, ..... refers to those waiting in a queue or receiving service.
- a. Service provider
  - b. Customer
  - c. Both a and b
  - d. None of these
124. In queuing theory, ..... is a person by whom service is rendered.
- a. Customer
  - b. Server
  - c. a or b
  - d. none of these
125. In waiting line theory, number of customers waiting in the queue is referred to as .....
- a. Traffic intensity
  - b. Queuing system
  - c. Service pattern
  - d. Queue length
126. Number of customers in the queue per unit of time is called .....
- a. Queuing system
  - b. Length of queue
  - c. Average length of queue
  - d. None of these
127. The ration between mean arrival rate and mean service rate is called .....
- a. Idle period
  - b. Average length of queue
  - c. Traffic intensity
  - d. None of these
128. Commonly assumed probability distribution of arrival pattern is .....

- a. Poisson distribution
  - b. Binomial distribution
  - c. Normal distribution
  - d. None of these
129. Commonly assumed probability distribution of service pattern are .....
- a. Poisson distribution
  - b. Exponential distribution
  - c. Erlang distribution
  - d. b and c
130. a customer's behaviour of leaving the queue when he does not like to wait in the queue due to lack of time or space is called .....
- a. Jockeying
  - b. Reneging
  - c. Collusion
  - d. Balking
131. A customer's behaviour of leaving the queue due to impatience is called .....
- a. Jockeying
  - b. Reneging
  - c. Collusion
  - d. Balking
132. A customer's behaviour of jumping from one queue to another is called .....
- a. Jockeying
  - b. Reneging
  - c. Collusion
  - d. Balking
133. In queuing theory, ..... stands for mean arrival rate of customers.
- a.  $\mu$
  - b.
  - c. t
  - d. none of these
134. In queuing theory, ..... stands for mean service rate.
- a.  $\mu$
  - b.
  - c. t
  - d. none of these
135. .... is a method of analysing the current movement of the some variable in an effort to predict the future movement of the same variable.
- a. Goal programming
  - b. Queuing theory
  - c. Markov Analysis
  - d. Replacement theory
136. In queuing theory, FCFS stand for .....
- a. First Cum First Served
  - b. First Customer Fist Served



- c. Fast Channel First Served
137. Initial feasible solution to a transportation problem arrived through which of the following method is very near to the optimal solution:
- a. NWCM
  - b. LCM
  - c. VAM
  - d. None of these
138. In Transportation Problem, NWCM stands for .....
- a. North West Cost Method
  - b. Net Worth Corner Method
  - c. North West Corner Method
  - d. None of these
139. In Transportation Problem, LCM stands for .....
- a. Lowest Common Multiplier
  - b. Least Cost Method
  - c. Lowest Cell Method
  - d. None of these
140. Matrix Minima Method to find initial feasible solution to a TP is also called .....
- a. NWCM
  - b. LCM
  - c. VAM
  - d. None of these
141. MODI Method to test the optimality of a feasible solution to TP is also called.....
- a. Stepping Stone Method
  - b. u. v. Method
  - c. both a and b
  - d. none of these
142. ....refers to the manner in which the customers behave while being in the queue.
- a. Service pattern
  - b. Service pattern
  - c. Queue discipline
  - d. None of these
143. Excess of service facilities over and above the number of customers results:
- a. Idleness of service capacity
  - b. Queues
  - c. Both a and b
  - d. None of these
144. ....was the first person who developed a viable queueing theory
- a. Von Neumann
  - b. Morgenstern
  - c. H M Wagner
  - d. Simeon Dennis Poisson
145. Traffic intensity in Queuing Theory is also called.....
- a. Service factor

- b. Arrival factor
  - c. Utilisation factor
  - d. None of these
146. Traffic intensity is computed by using the formula:
- a.  $\lambda/\mu$
  - b.  $\mu/\lambda$
  - c.  $1 - \lambda/\mu$
  - d.  $1 - \mu/\lambda$
147. Game theory became popular when the book "Theory of Games and Economic Behaviour" was published in 1944 by .....
- a. Von Neumann
  - b. Mc Closky
  - c. Von-Neumann and Mc Closky
  - d. Von-neumann and Morgenstern
148. Which of the following is a characteristic of a dual problem:
- a. Dual of a dual is primal
  - b. If dual has a finite optimal solution, then the primal also has finite optimal solution
  - c. If dual has no feasible solution, then the primal also has no feasible solution
  - d. All of the above
149. Shadow price is also called .....
- a. Dual price
  - b. Unit price
  - c. Total cost
  - d. None of these
150. ....is that element of the simplex table which lies both in the key row and key column.
- a. Key element
  - b. Pivot element
  - c. Both a and b
  - d. None of these
151. Transportation model was first introduced by ..... in the year 1941.
- a. T C Koopman
  - b. George B Dantzig
  - c. Von-neumann
  - d. F L Hitchcock
152. VAM is also called.....
- a. Matrix Minima Method
  - b. Penalty Method
  - c. MODI Method
  - d. None of these
153. Which of the following methods is used to solve an assignment problem:
- a. Enumeration Method
  - b. Hungarian Method
  - c. Simplex Method
  - d. All of the above

154. Hungarian method was developed by .....
- a. T C Koopman
  - b. F L Hitchcock
  - c. D Konig
  - d. George B Dantzig
155. .... is the popular method for solving an assignment problem.
- a. Hungarian Method
  - b. Enumeration Method
  - c. Simplex Method
  - d. None of the above
156. The outlet where the services are being provided to the customers is called.....
- a. Waiting line
  - b. Service facility
  - c. Idle facility
  - d. Traffic intensity
157. The variables which can be manipulated by the decision maker are called.....
- a. Controllable variables
  - b. Uncontrollable variables
  - c. Both a and b
  - d. None of these
158. The variables which cannot be manipulated by the decision maker are called.....
- a. Controllable variables
  - b. Uncontrollable variables
  - c. Both a and b
  - d. None of these
159. Controllable variables are also called.....
- a. Slack variables
  - b. Surplus variables
  - c. Artificial variable
  - d. Decision variables
160. If a simplex table shows the values 2, -3, 0 against " $\theta$ ", which should be taken as the replacement ratio.
- a. 2
  - b. -3
  - c. 0
  - d. None of these

\*\*\*

### ANSWERS:

1 : a	21 : b	41 : b	61 : b	81 : b	101 : a	121 : a	141 : b
2 : c	22 : b	42 : b	62 : d	82 : b	102 : b	122 : c	142 : c
3 : c	23 : b	43 : b	63 : b	83 : b	103 : c	123 : b	143 : a
4 : c	24 : c	44 : c	64 : d	84 : c	104 : a	124 : b	144 : d
5 : a	25 : b	45 : d	65 : d	85 : b	105 : b	125 : d	145 : c
6 : b	26 : a	46 : b	66 : d	86 : c	106 : a	126 : c	146 : a
7 : c	27 : b	47 : c	67 : d	87 : c	107 : b	127 : c	147 : d
8 : c	28 : b	48 : a	68 : d	88 : d	108 : b	128 : a	148 : d
9 : d	29 : c	49 : b	69 : d	89 : b	109 : b	129 : d	149 : a
10 : c	30 : b	50 : b	70 : d	90 : c	110 : a	130 : d	150 : c
11 : b	31 : c	51 : c	71 : b	91 : b	111 : a	131 : b	151 : d
12 : b	32 : d	52 : b	72 : a	92 : b	112 : d	132 : a	152 : b
13 : c	33 : a	53 : b	73 : b	93 : b	113 : c	133 : b	153 : d
14 : a	34 : c	54 : a	74 : c	94 : a	114 : c	134 : a	154 : c
15 : d	35 : c	55 : a	75 : b	95 : b	115 : b	135 : c	155 : a
16 : c	36 : c	56 : c	76 : b	96 : c	116 : c	136 : a	156 : b
17 : b	37 : c	57 : c	77 : a	97 : a	117 : a	137 : c	157 : a
18 : b	38 : d	58 : c	78 : b	98 : c	118 : d	138 : c	158 : b
19 : a	39 : b	59 : c	79 : a	99 : a	119 : b	139 : b	159 : d
20 : a	40 : b	60 : d	80 : c	100 : c	120 : d	140 : c	160 : c