

General Instructions

- All questions are compulsory.
- Each correct answer carry 3 marks, each incorrect answer carry -1 mark and unattempted questions carry no marks.

Section I

Quantitative Ability & Data Interpretation

Directions (Q. Nos. 1-10) *Select the correct alternative from the given choices.*

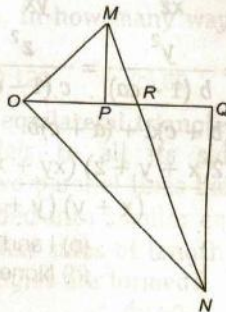
- Consider a sequence S whose n th term T_n is defined as $1 + 3/n$, where $n = 1, 2, \dots$. Find the product of all the consecutive terms of S starting from the 4th term to the 60th term.
 (a) 1980.55
 (b) 1985.55
 (c) 1990.55
 (d) 1975.55
- Let $P = \{2, 3, 4, \dots, 100\}$ and $Q = \{101, 102, 103, \dots, 200\}$. How many elements of Q are there such that they do not have any element of P as a factor?
 (a) 20
 (b) 24
 (c) 23
 (d) 21
- What is the sum of all the 2-digit numbers which leave a remainder of 6 when divided by 8?
 (a) 612
 (b) 594
 (c) 324
 (d) 872
- Which of the terms $2^{1/3}, 3^{1/4}, 4^{1/6}, 6^{1/8}$ and $10^{1/12}$ is the largest?
 (a) $2^{1/3}$
 (b) $3^{1/4}$
 (c) $4^{1/6}$
 (d) $10^{1/12}$

- If the roots of the equation $(a^2 + b^2)x^2 + 2(b^2 + c^2)x + (b^2 + c^2) = 0$ are real, which of the following must hold true?
 (a) $c^2 \geq a^2$
 (b) $c^4 \geq a^2(b^2 + c^2)$
 (c) $b^2 \geq a^2$
 (d) $a^4 \leq b^2(a^2 + c^2)$

- Find the remainder of 2^{1040} divided by 131.

- (a) 1
(b) 3
(c) 5
(d) 7

- In the figure below, $\angle MON = \angle MPO = \angle NQO = 90^\circ$ and OQ is the bisector of $\angle MON$ and $QN = 10$, $OR = 40/7$. Find OP .



- (a) 4.8
(c) 4

- (b) 4.5
(d) 5

8. If $(a^2 + b^2)$, $(b^2 + c^2)$ and $(a^2 + c^2)$ are in geometric progression, which of the following holds true?
- (a) $b^2 - c^2 = \frac{a^4 - c^4}{b^2 + a^2}$ (b) $b^2 - a^2 = \frac{a^4 - c^4}{b^2 + c^2}$
 (c) $b^2 - c^2 = \frac{b^4 - a^4}{b^2 + a^2}$ (d) $b^2 - a^2 = \frac{b^4 - c^4}{b^2 + a^2}$
9. p is a prime and m is a positive integer. How many solutions exist for the equation $p^6 - p = (m^2 + m + 6)(p - 1)$?
- (a) 0 (b) 1
 (c) 2 (d) Infinite
10. A certain number written in a certain base is 144. Which of the following is always true?
- I. Square root of the number written in the same base is 12.
 II. If base is increased by 2, the number becomes 100.
- (a) Only I (b) Only II
 (c) Neither I nor II (d) Both I and II
11. A rectangle is drawn such that none of its sides has length greater than 'a'. All lengths less than 'a' are equally likely. The chance that the rectangle has its diagonal greater than 'a' is (in terms of %)
- (a) 29.3% (b) 21.5%
 (c) 66.66% (d) 33.33%
12. If x is a real number, $[x]$ is greatest integer less than or equal to x , then $3[x] + 2 - [x] = 0$. Will the above equation have any real root?
- (a) Yes
 (b) No
 (c) Will have real roots for $x < 0$
 (d) Will have real roots for $x > 0$
13. If $a = \frac{x}{y+z}$, $b = \frac{y}{z+y}$, $c = \frac{z}{x+y}$, then which of the following statements is/are true?
- I. $\frac{b+c-1}{yz} + \frac{a+c-1}{xz} + \frac{a+b-1}{yx} = 1$
 II. $\frac{x^2}{a(1-bc)} = \frac{y^2}{b(1-ca)} = \frac{z^2}{c(1-ab)}$
 III. $(a+b)c + (b+c)a + (a+c)b = \frac{2(x+y+z)(xy+xz+yz) - 6xyz}{(x+y)(y+z)(z+x)}$
- (a) I and II (b) I and III
 (c) II and III (d) None of these

14. If α and β are the roots of the quadratic equation $x^2 - 10x + 15 = 0$, then find the quadratic equation whose roots are $\left(\alpha + \frac{\alpha}{\beta}\right)$ and $\left(\beta + \frac{\beta}{\alpha}\right)$
- (a) $15x^2 + 71x + 210 = 0$
 (b) $5x^2 - 22x + 56 = 0$
 (c) $3x^2 - 44x + 78 = 0$
 (d) Cannot be determined

Directions (Q. Nos. 15-17) Read the information carefully and answer the questions follow that.

A cricket tournament had three teams - India, Australia and Sri Lanka taking part in it. The format of the tournament was such that in the preliminary stage each of these teams, would play the other teams four times. Four points are awarded for a win and in case a team beats another team by a huge margin, it is given a bonus point in addition to the four points. At the end of the preliminary stage, the top two teams, in terms of the points scored, reaches the finals. No match in the tournament ends in a tie and if two teams end up with the same number of points at the end of the preliminary stage, the team with the better net run rate is placed higher.

15. If India reached the finals, then what is the minimum number of points it would have scored in the preliminary stage?
- (a) 8 (b) 10
 (c) 12 (d) 16
16. If Sri Lanka was eliminated in the preliminary stage, then what is the maximum number of points it could have scored?
- (a) 12 (b) 14
 (c) 16 (d) 20
17. If Australia had the highest number of points at the end of the preliminary stage, then atleast how many points did it have?
- (a) 16 (b) 17
 (c) 18 (d) 20
18. A vessel has a milk solution in which milk and water are in the ratio 4 : 1. By addition of water to it, milk solution with milk and water in the ratio 4 : 3 was formed. On replacing 14 L of this solution with pure milk the ratio of milk and water changed to 5 : 3. What is the volume of the water added?
- (a) 12 L (b) 60 L
 (c) 32 L (d) 24 L

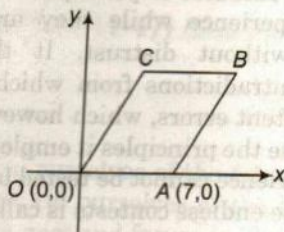
19. A car A starts from a point P towards another point Q. Another car B starts (also from P) 1 h after the first car and overtakes it after covering 30% of the distance PQ. After that, the cars continue. On reaching Q, car B reverses and meets car A, after covering $23\frac{1}{3}$ of the distance QP. Find the time taken by car B to cover the distance PQ (in hours).

(a) 3 (b) 4
(c) 5 (d) $3\frac{1}{3}$

20. A, B and C can independently do a work in 15 days, 20 days and 30 days, respectively. They work together for some time after which C leaves. A total of ₹ 18000 is paid for the work and B gets ₹ 6000 more than C. For how many days did A work?

(a) 2 (b) 4
(c) 6 (d) 8

21. In the figure given, OABC is a parallelogram. The area of the parallelogram is 21 sq units and the point C lies on the line $x = 3$. Find the coordinates of B.



(a) (3, 10) (b) (10, 3)
(c) (10, 10) (d) (8, 3)

22. Find the complete set of values that satisfy the relations $||x| - 3| < 2$ and $||x| - 2| < 3$.

(a) (-5, 5) (b) $(-5, -1) \cup (1, 5)$
(c) (1, 5) (d) (-1, 1)

23. If $ax^2 + bx + c = 0$ and $2a$, b and $2c$ are in arithmetic progression, which of the following are the roots of the equation?

(a) a, c (b) $-a, -c$
(c) $-\frac{a}{2}, -\frac{c}{2}$ (d) $-\frac{c}{a}, -1$

24. A solid sphere of radius 12 inches is melted and cast into a right circular cone whose base diameter is $\sqrt{2}$ times its slant height. If the radius of the sphere and the cone are the same, how many such cones can be made and how much material is left out?

(a) 4 and 1 cubic inch (b) 3 and 12 cubic inches
(c) 4 and 0 cubic inch (d) 3 and 6 cubic inches

25. If $\log_x (a - b) - \log_x (a + b) = \log_x (b/a)$, find $\frac{a^2}{b^2} + \frac{b^2}{a^2}$.

(a) 4 (b) 2 (c) 3 (d) 6

26. Letters of the word "ATTRACT" are written on cards and are kept on a table. Manish is asked to lift three cards at a time, write all possible combinations of the three letters on a piece of paper and then replace the three cards. The exercise ends when all possible combinations of letters are exhausted. Then, he is asked to strike out all words in his list, which look the same when seen in a mirror. How many words is he left with?

(a) 40 (b) 20
(c) 30 (d) None of these

27. S is a set given by $S = \{1, 2, 3, \dots, 4n\}$, where n is a natural number. S is partitioned into n disjoint subsets $A_1, A_2, A_3, \dots, A_n$ each containing four elements. It is given that in everyone of these subsets there is one element, which is the arithmetic mean of the other three elements of the subsets. Which of the following statements is then true?

(a) $n \neq 1$ and $n \neq 2$
(b) $n \neq 1$ but can be equal to 2
(c) $n \neq 2$ but can be equal to 1
(d) It is possible to satisfy the requirement for $n = 1$ as well as for $n = 2$

28. When asked for his taxi number, the driver replied, "If you divide the number of my taxi by 2, 3, 4, 5, 6 each time you will find a remainder of one. But, if you divide it by 11, the remainder is zero. You will also not find any other driver with a taxi having a lower number who can say the same". What is the taxi number?

(a) 121 (b) 1001 (c) 1881 (d) 781

29. A student is asked to form numbers between 3000 and 9000 with digits 2, 3, 5, 7 and 9. If no digit is to be repeated, in how many ways can the student do so?

(a) 24 (b) 120 (c) 60 (d) 72

30. The side of an equilateral triangle is 10 cm long. By drawing parallels to all its sides, the distance between any two parallel lines being the same. The triangle is divided into smaller equilateral triangle, each of which has sides of length 1 cm. How many such small triangles are formed?

(a) 60 (b) 90
(c) 120 (d) None of these

Section II

Verbal Ability, Reading Comprehension and Logical Reasoning

Directions (Q. Nos. 31-32) Each of the following questions has a paragraph from which a sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

31. RD Laing developed a broad range of thought on interpersonal psychology. This deals with interactions between people, which he considered important, for an ethical action always occurs between one person and another. In books such as *The Politics of Experience*, he deal with issues concerning how we should relate to persons labelled by the psychiatric establishment as "schizophrenic".

- (a) He came to be seen as a champion for the rights of those considered mentally ill
- (b) He spoke out against (and wrote about) practices of psychiatrists which he considered inhumane or barbaric, such as electric shock treatment
- (c) Laing also did work in establishing true asylums as places of refuge for those who feel disturbed and want a safe place to go through whatever it is they want to explore in themselves and with others
- (d) He suggested that the effects of psychiatric drugs (some of which are very deleterious, such as tardive diskensia) be called just that: "effects" and not be referred to by the preferred euphemisms of the drug companies, who prefer to call them "side effects"

32. Jurisprudence is the theory and philosophy of law. Students of jurisprudence aim to understand the fundamental nature of law and to analyse its purpose, structure and application. Jurisprudential scholars (sometimes confusingly referred to as "jurists") hope to obtain a deeper understanding of the law, the kind of power that it exercises and its role in human societies.

They seek a deeper understanding behind law's seemingly unpredictable and uncertain nature.

- (a) At a practical level, some jurists hope to improve society by studying what the Law is, what it ought to be, and how it actually operates
- (b) A common starting point in understanding jurisprudence is the objective of law to achieve justice
- (c) Hence, the arguable scientific nature of jurisprudence
- (d) Jurisprudence seeks to draw on unrestricted elements of life and the world to aid the critical study of law

Directions (Q. Nos. 33-35) Read the following passage carefully and answer the questions based on that.

Human reason, in one sphere of its cognition, is called upon to consider questions, which it cannot decline, as they are presented by its own nature but which it cannot answer, as they transcend every faculty of the mind.

It falls into this difficulty without any fault of its own. It begins with principles which cannot be dispensed within the field of experience and the truth and sufficiency of which are, at the same time insured by experience. With these principles it rises, in obedience to the laws of its own nature, to ever higher and more remote conditions. But it quickly discovers that in this way, its labours must remain ever incomplete because new questions never cease to present themselves and thus it finds itself compelled to have recourse to principles which transcend the region of experience while they are regarded by common sense without distrust. It thus falls into confusion and contradictions from which it conjectures the presence of latent errors, which however, it is unable to discover because the principles it employs transcending the limits of experience cannot be tested by that criterion. The arena of these endless contests is called Metaphysic.

Time, when she was the queen of all the sciences and if we take the will for the deed, she certainly deserves, so far as regards the high importance of her object-matter, this title of honour.

33. According to the author, 'Metaphysic' is best defined when human reason

- (a) becomes conscious of the presence of latent errors
- (b) solves pending old questions, tackles new ones that arise
- (c) employs principles that transcend the limits of experience
- (d) rises to higher and more remote conditions

34. If there were a paragraph succeeding the last, it would probably be about

- (a) the rise of Metaphysic into the realm of popular acclaim
- (b) Metaphysic as the final solution to human misery
- (c) the modern day contempt for metaphysical reasoning
- (d) the subjugation of science by a transcendental human consciousness

35. The passage provides an answer to which of the following questions?

- (a) How does experience limit the human mind's recourse to principles in combating new questions that present themselves?
- (b) Why does human reason restrain its forays to within its known limitations?
- (c) How does the human mind attempt to resolve problems beyond its scope?
- (d) None of the above

Directions (Q. Nos. 36-40) Find the incorrect usage of the word in the following questions

36. SLAM

- (a) I heard the door slam behind him
- (b) She slammed down the phone angrily
- (c) She slammed his face hard
- (d) The ear skidded and slammed into a tree

37. STOP

- (a) The car stopped at the traffic light
- (b) Shantaram immediately stopped what he was doing

Directions (Q. Nos. 41-47) Read the following passage carefully and answer the questions that follow.

Passage 1

It is essential to rid ourselves of the false impressions of time, which our human limitations seem to impose upon us. Above all, we must rid ourselves of the belief that the future is in some way less determined than the past, if the borderline between past and future is illusory, then so must be the distinction between the two regions of time which it is supposed to separate. The only reason we believe the future to be still undecided while the past is immutable is that we can remember the one and not the other. To avoid these prejudices we must picture the history of the universe not as a three-dimensional stage on which things change but as a static four-dimensional space time structure of which we are a part. We believe that events are not real until they "happen", whereas in reality past, present and future are all frozen in the four dimensions of space time. Unfortunately even if all this is accepted, we have to continue using the language of a "moving" time, for we have no other but we must try to interpret this language always as a description of the unchanging space time structure of the universe.

Contemplating the history of the universe in this way, it is attractive to believe that the periods of expansion and contraction could be related to each other by symmetry. Both points of view merit serious consideration and that we cannot say with any certainty that the contracting universe will or will not, differ fundamentally from the expanding phase that we observe today.

41. According to the author of the passage,

- (a) the time value called 'now' is most essential to the understanding of the universe
- (b) the impression of a moving time is not a false imposition of human limitation
- (c) there is nothing with respect to which time could move
- (d) the future is better determined than the past

- (c) We need more laws to stop pollution
- (d) He is stopped by law from holding a licence

38. TIME

- (a) I can remember very few times when we had to cancel due to ill health
- (b) This is the first time that I have been to London
- (c) The train arrived right on time
- (d) The changing seasons mark the passing of time

39. SOMBRE

- (a) He was dressed in sombre shades of grey and black
- (b) Paul was in a sombre mood
- (c) The year ended on a sombre note
- (d) He is in the sombre position of not having to worry about money

40. CALL

- (a) She payed him a call from the pay phone near her home
- (b) I will call on you tomorrow evening at 7 pm
- (c) Vikram decided to call a meeting to discuss the trade fair
- (d) She felt the call of religion early in her life

42. Which of the following best exemplifies the author's attitude to time?

- (a) The impression of a moving time is false
- (b) 'Now' is a purely subjective phenomenon existing only within the human mind
- (c) The future is not in any way less determined than the past
- (d) All of the above

Passage 2

Amidst the increasing clamour for a discourse on educational improvement, on budgetary allocations and retention rates, there is one crucial question which is insufficiently discussed. And the question is this: what is the purpose of education today? At various times, over the past 100 yr, that question has been answered differently - in colonial India, the official answer would have been, "to create a cadre of clerks and officials to run the colonial state", while in a newly decolonized India, the official answer could be, "to create a nationalist sensibility and the national citizen."

Today, I suspect the official answer to the question about the purpose of education would be, "to give people jobs." Increasingly, the emphasis in education is towards vocationalisation and skills development. In a recent private conversation, the Education Minister of a North Indian state said, "we have a lot of jobs. We just don't have the people skilled enough to do them. We need bio-technologists, fitters, crane operators, nurses and lab assistants. But our education does not prepare young people for what we need. We need to change that."

Similarly, we find that the Confederation of Indian Industry is showing increasing interest in school education. The CII recently commissioned a study to look at the challenges and opportunities which face the Indian industry and this is its thesis that in the year 2025, there will be about 40 million jobs worldwide, which need to be filled. India will be one of the few countries in the world to have a labour surplus of the right age group. It, therefore believes that we need to think about the kinds of education system necessary to develop skills whereby our children will be best equipped to function in this scenario.

Public consensus on the way to improve educational access is increasingly moving towards a public-private partnership. But we must be concerned about the terrible narrowness of the vision for educational improvement which characterizes our discourse. Education, in this picture, is about the implanting of useful skills - the assumption being that it will ultimately lead to both personal and national enrichment but as Martha Nussbaum writes, education is not simply a producer of wealth; it is a producer of citizens. Citizens in a democracy need, above all, freedom of mind - to learn to ask searching questions; to reject shoddy historical argument; to imagine alternative possibilities from a globalizing, service and market-driven economy, to think what it might be like to be in others' shoes. Recently, the Israeli novelist, Amos Oz, spoke about the importance of reading novels as what he calls an antidote to hate. He said, "I believe in literature as a bridge between peoples. I believe curiosity can be a moral quality. I believe imagining the other can be an antidote to fanaticism. Imagining the other will make you not only a better businessperson or a better lover but even a better person. Part of the tragedy between Jew and Arab is the inability of so many of us, Jews and Arabs, to imagine each other—really imagine each other; the loves, the terrible fears, the anger, the passion. There is too much hostility between us, too little curiosity."

The skills and thought processes which engender the curiosity, the imagining are associated with the humanities, the arts and literature and despite the splendid interventions in the NCERT's new textbooks for History and Political Science, these areas are terribly neglected. Our dominant conception of worthwhile education is increasingly technical and mechanistic. The thinking processes engendered by the social sciences are today seen as quaint, vaguely lefty-intellectual, a kind of quixotic idealism - which has very little to do with the real business of life. It is a strange irony that in the educational world of Gandhi, Tagore and Aurobindo, there are tragically few voices which assert a more holistic vision.

43. The true purpose of education in India as inferred from the passage

- (a) is to create a nationalist sensibility in every citizen
- (b) has been a topic of debate since independence
- (c) is a concept that has been changing from time to time
- (d) is to teach an individual the necessary skills to earn his livelihood

44. In the author's perception, our vision for educational improvement is narrow because our system

- (a) gives importance only to vocationalisation and skills development

- (b) believes in making people earn more so that they can stand up to the challenges of a globalizing economy
- (c) does not acknowledge the importance of humanist concepts
- (d) does not support a public-private partnership in improving educational access to everyone

45. Amos Oz believes that the world will become a peaceful place, if people

- (a) become less hostile
- (b) become less narrow minded
- (c) become less fanatic
- (d) empathise with each other

46. The Indian concept of worthwhile education is that which

- I. gives technical training.
- II. makes people think.
- III. has a measurable outcome.
- IV. kindles our curiosity and imagination.
- V. helps people become wealthy.

- (a) I and V
- (b) II and III
- (c) I, II and IV
- (d) I, III and IV

47. Which of the following is not an attribute of a good citizen in a democracy?

- (a) Learning to ask searching questions
- (b) Not accepting inadequate reasons from history
- (c) Thinking out of the box
- (d) Learning to negotiate with people

Directions (Q. Nos. 48-51) Read the following information carefully and answer the questions based on that.

Two teams of five each must be selected from a group of ten persons-A through J-of which A, E and G are doctors; D, H and J are lawyers; B and I are engineers; C and F are managers. It is also known that

- (i) every team must contain persons of each of the four professions.
- (ii) C and H cannot be selected together.
- (iii) I cannot be selected into a team with two lawyers.
- (iv) J cannot be in a team with two doctors.
- (v) A and D cannot be selected together.

48. If C and G are in different teams, then who are the other team members of A?

- (a) C, D, E and I
- (b) B, F, I and J
- (c) B, C, H and J
- (d) F, H, I and G

49. Who among the following cannot be in the same team as I?

- (a) H
- (b) J
- (c) C
- (d) F

50. Who among the following must always be in the same team as A?

- (a) D
- (b) B
- (c) H
- (d) J

51. If F and G are in the same team, which among the following statements is true?

- (a) B and H will in the other team
- (b) E and I must be in the same team

(c) H must be in the same team but B must in the other team

(d) C must be in the other team but D must be in the same team

Directions (Q. Nos. 52-55) Read the following information carefully and answer the questions based on that.

Two families are planning to go on a canoe trip together. The families consist of the following people: Robert and Mary Henderson and their three sons Tommy, Don and William, Jerome and Ellen Penick and their two daughters Kate and Susan.

There will be three canoes with three people in each canoe. Atleast one of the four parents must be in each canoe. Atleast one person from each family must be in each canoe.

52. If the two mothers ride together in the same canoe and the three brothers each ride in a different canoe, which of the following must be true?

- (a) Each canoe has both males and females in it
- (b) One of the canoes has only females in it
- (c) One of the canoes has only males in it
- (d) The sisters ride in the same canoe

53. If Ellen and Susan are together in one of the canoes, which of the following could be a list of the people together in another canoe?

- (a) Dan, Jerome, Kate
- (b) Dan, Jerome, William
- (c) Dan, Kate, Tommy
- (d) Jerome, Kate, Mary

54. If Jerome and Mary are together in one of the canoes, each of the following could be a list of the people together in another canoe except

- (a) Dan, Ellen, Susan
- (b) Ellen, Robert, Tommy
- (c) Ellen, Susan, William
- (d) Ellen, Tommy, William

55. If each of the Henderson children rides in a different canoe, which of the following must be true?

- I. The Penick children do not ride together.
 - II. The Penick parents do not ride together.
 - III. The Henderson parents do not ride together.
- (a) Only I
 - (b) Only II
 - (c) I and II
 - (d) I and III

Directions (Q. Nos. 56-57) Each question gives a sentence with a part of the sentence underlined that may contain an error. Four alternative substitutes are given for the underlined portion. Identify the choice that replaces the underlined part to form a logically and grammatically correct statement and mark its number as your answer.

56. Feminism is not simply a movement to ensure that women will have equal rights with men but that a commitment for eradicating the ideology of domination that permeates Indian culture at various levels

- (a) that is a commitment to eradicate the ideology to dominate that
- (b) it is a commitment to eradicating the ideology of domination that
- (c) whose commitment to eradicating the ideology of domination which
- (d) but that a commitment for eradicating the ideology of domination that

57. It is unfortunate that the lure of visiting foreign countries still draws a very large number of our people, who do not seem to be realizing what their own country is and how much can be seen and learnt from it?

- (a) Who do not seem to realize their country and see and learn from it
- (b) Who are not realizing what their own country is and how much there is in it to see and learn from

- (c) Who do not seem to realize what their own country is and how much there is in it to see and learn from it
- (d) Who do not seem to realize what their own country is and how much there is in it to see and learn from

Directions (Q. Nos. 58-60) Read the following information carefully and answer the questions based on that.

Each of five people—A, B, C, D and E owns a different car among Maruti, Mercedes, Sierra, Fiat and Audi and the colours of these cars are Black, Green, Blue, White and Red, not necessarily in that order. No two cars are of the same colour. It is also known that

- (i) A's car is not Black and it is not a Mercedes.
- (ii) B's car is Green and it is not a Sierra.
- (iii) E's car is not White and it is not an Audi.
- (iv) C's car is a Mercedes and it is not Blue.
- (v) D's car is not Red and it is a Fiat.

58. If A owns a Blue Sierra, then E's car can be a

- (a) Red Maruti
- (b) White Maruti
- (c) Black Audi
- (d) Red Audi

59. If A owns a White Audi, then E's car can be a

- (a) Red Maruti
- (b) Blue Maruti
- (c) Green Audi
- (d) Black Sierra

60. If A's car is a Red Maruti and D's car is White, then E owns a

- (a) Black Audi
- (b) Blue Sierra
- (c) Black Sierra
- (d) Blue Audi