# GENERAL APTITUDE

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For GATE, DRDO & PSU's

Managing Director
Y. V. Gogada Krishna Murthy
**SYLLABUS**

**GENERAL APTITUDE**

**GATE**

**Verbal Ability:**

**Numerical Ability:**

**CHAPTER I**

**NUMERICAL ESTIMATION**

Numerical estimation questions test your ability to make quick estimates of the answer to fairly straightforward numerical questions. To score well on these questions you will need to make quick approximations of the answer. You must avoid the trap of working out the answer exactly, which will take up too much time and prevent you from answering enough questions to get a good score.

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Numerical estimation is key in many craft and technical jobs where the ability to quickly and accurately estimate material quantities is essential. The speed at which you can answer these questions is the critical measure, as most people could achieve a very high score given unlimited time in which to answer.

Even though numerical estimation questions appear straightforward, it can take some time to develop the optimum compromise between speed and accuracy. Before you attempt to answer each question, look at the range of answers available and ask yourself how accurate your estimate needs to be. For example, is an order of magnitude sufficient or does the answer need to be worked out to the nearest whole number?

If you are out of practice with arithmetic, then try re-learning the times tables up to 12 and practice rough and ready multiplication, division and percentage calculations. Practice can improve your test scores for all types of aptitude tests but numerical estimation in one area where it can really make a difference, so try as many examples as you can.

There are no numerical estimation questions directed specifically to test your ability to make quick estimates of the answer. However, the ability to make quick estimates is a useful skill to have even if you are sitting a graduate or professions level test as it will enable you to roughly check your answers to data interpretation questions.
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In this type of questions, generally you are given along series of numbers. The candidate is required to find out how many times a number satisfying the conditions, specified in the question, occurs.

Ex: 1
How many 5’s are there in the following sequence which are immediately followed by 3 but not immediately preceded by 7?
89532585807357753653578
(a) One
(b) Two
(c) Three
(d) Four
(e) More than four

Sub: As you know, a number which comes after a given number is said to follow 1 while the one which comes before the given number precedes it.
Thus, the numbers satisfying the given conditions, can be shown as follows.
9532585807357753653578

Ex: 2
In the series, 64122874215386271413286 how many pairs of consecutive numbers have a difference of 2 each?
(a) 4
(b) 5
(c) 6
(d) 7

Sub: Clearly, the pairs of consecutive numbers having a difference of 2 can be shown as follows:
64 1 2 2 8 7 2 2 1 5 3 8 6 1 7 1 4 1 3 2 0 4
Thus, there are six such pairs. Hence, the answer is (c).

Ex: 3
How many even number are there in the following sequence of numbers which are immediately followed by an odd number as well as immediately preceded by an even number?
867689327348235228119
(a) One
(b) Two
(c) Three
(d) Six
(e) None of these

Sub: As you know, numbers divisible by 2 are called even while those not divisible by 2 are called odd numbers. Thus, the numbers satisfying the given conditions, can be shown as follows:
867689327348235228119
early, there are for such numbers. Hence the answer is (c).

EXERCISE:

01. How many 7’s are there in the following sequence which are neither preceded by 6 nor immediately followed by 9?
956395917891429639
(a) One
(b) Two
(c) Three
(d) Four
(e) None of these

NUMERICAL ESTIMATION

02. How many 7’s are there in the following series which are preceded by 6 which is not preceded by 8?
8767897697601677689787
(a) Nil
(b) One
(c) Two
(d) Three
(e) None of these

03. In the following list of numerical, how many 2’s are followed by 1’s but not preceded by 4?
4212124212441221214212421242146
(a) Two
(b) Three
(c) Four
(d) Five
Directions (Questions 4-5):
Study the number series given below and answer the questions that follow:
78956543976092479167487

04. How many 7’s are preceded by 9 and followed by 6?
(a) 2
(b) 3
(c) 4
(d) 5
(e) None of these

05. Which figure has equal frequency?
(a) 233 (b) 245 (c) 375 (d) 865 (e) None of these

06. How many 6’s are there in the following number sequence which are immediately preceded by 5 but not immediately followed by 4?
5643296316496215967214749642
(a) One
(b) Two
(c) Three
(d) Four
(e) More than four

07. In the following series of numbers, find out how many times, 1, 3 and 7 have appeared together, 7 being in the middle and 1 and 3 on either side of 7?
2973172771531738353177173906
(a) 3
(b) 4
(c) 5
(d) More than 5
(e) None of the above

08. In the series, 64122874215386271413286 how many pairs of alternate numbers have a difference of 2?
(a) One
(b) Two
(c) Three
(d) Four
(e) None

09. How many even numbers are there in the following sequence of numbers which are immediately followed by an odd number as well as immediately preceded by an even number?
867689327348235228119
(a) One
(b) Two
(c) Three
(d) Five
(e) None of these

Directions (Questions 10 to 12):
Study the following number sequence and answer the questions given below it
514793872503563835234396

10. How many odd numbers are there in the sequence which are immediately followed by an odd number?
(a) 1
(b) 2
(c) 3
(d) 4
(e) More than 4
11. How many even numbers are there in the sequence which are immediately preceded by an odd number but immediately followed by an even number?  
   (a) 1  
   (b) 2  
   (c) 3  
   (d) 4  
   (e) More than 4

12. How many odd numbers are there in the sequence which are immediately preceded and also immediately followed by an even number?  
   (a) 1  
   (b) 2  
   (c) 3  
   (d) 4  
   (e) None

13. In the following number series how many times an odd number is followed by two even numbers?  
   (a) 5  
   (b) 2  
   (c) 3  
   (d) 4  
   (e) None

14. In the following series 66696706976607979667. How many 9’s are sandwiched between 6 and 7?  
   (a) 2  
   (b) 3  
   (c) 4  
   (d) None

15. How many 6’s are sandwiched between 9?  
   (a) 1  
   (b) 2  
   (c) 3  
   (d) 4  
   (e) None

16. How many 7’s have a 6 before and after?  
   (a) 1  
   (b) 2  
   (c) 3  
   (d) 4  
   (e) None

Directions (Questions 17 to 21) are based on the following set of figures.  

17. How many 7’s are preceded by 9 and following?  
   (a) 3  
   (b) 2  
   (c) 4  
   (d) 5  
   (e) All

18. Which figure is missing?  
   (a) 6  
   (b) 9  
   (c) 1  
   (d) 2  
   (e) None

19. Which figure has equal frequency?  
   (a) 7  
   (b) 9  
   (c) 6  
   (d) 8  
   (e) All except 0

20. Which figures have equal frequency?  
   (a) 253  
   (b) 685  
   (c) 245  
   (d) 375  
   (e) None

21. Which figure has the lowest frequency?  
   (a) 2  
   (b) 8  
   (c) 3  
   (d) 4  
   (e) 9

22. If the first and second digits in the sequence 398132743 are interchanged, also the third and fourth digits, the fifth and sixth digits and so on, which digit would be the seventh counting your left?  
   (a) 1  
   (b) 4  
   (c) 7  
   (d) 8  
   (e) None

23. If the position of the first and the sixth digits of the sequence of numbers 8970132146753 are interchanged the second and the seventh and so on, which number would be seventh from the right end?  
   (a) 7  
   (b) 6  
   (c) 7  
   (d) 8  
   (e) 9

KEY:
0 1 2 3 4 5 6 7 8 9 0
1 3 2 4 6 5 7 8 9 0 4

24. In the following sequence of instructions, 1 stands for Run, 2 stands for stop, 3 stands for GO, 4 stands for sit and 5 stands for wait. If the sequence were continued, which instruction would it be next?  
   (a) wait  
   (b) 4  
   (c) 00  
   (d) stop  
   (e) Run

25. In a school, the following codes were used during physical exercise. 'V1' means start working, 'V2' means keeping standing, 3 means start running at the same spot, 4 means sit down. How many times will a student who performs the following sequence without error from the beginning to the end have to sit down?  
   (a) 2  
   (b) 3  
   (c) 4  
   (d) 5  
   (e) None

26. The letter L, M, N, O, P, Q, R, S and T in their order are substituted by nine integers 1 to 9 but not in the order. 4 is assigned to T. The difference between P and T is 5. The difference between N and T is 4. What is the integer assigned to L?  
   (a) 4  
   (b) 5  
   (c) 6  
   (d) 7  
   (e) None

27. If the numbers from 1 to 47 which are exactly divisible by 3 are arranged in ascending order, minimum number being on the top, which would come at the ninth place from the top?  
   (a) 1  
   (b) 21  
   (c) 50  
   (d) 8  
   (e) None

28. If the numbers from 5 to 85 which are exactly divisible by 5 are arranged in descending order from bottom. Which would come at the eighth place from the bottom?  
   (a) 35  
   (b) 45  
   (c) 50  
   (d) 65  
   (e) None

29. How many numbers from 1 to 100 are there which is not only exactly divisible by 4 but also has 4 as a digit?  
   (a) 7  
   (b) 10  
   (c) 20  
   (d) 21  
   (e) More than 21

30. How many numbers amongst the numbers 9 to 50 are there which are exactly divisible by 9 but not by 27?  
   (a) 8  
   (b) 5  
   (c) 35  
   (d) 5  
   (e) None

31. How many numbers from 11 to 50 are there which are exactly divisible by 7 but not by 5?  
   (a) 12  
   (b) 13  
   (c) 5  
   (d) 6  
   (e) None

32. A number is greater than 3 but less than 8. Also, it is greater than 6 but less than 10. The number is ______.  
   (a) 5  
   (b) 6  
   (c) 7  
   (d) 8  
   (e) 9
11. In a row of children, Shibu is fifth from the left and Ravi is sixth from the right. When they exchange positions, Shibu will be thirteenth from the left. What will be Ravi’s position from the right?
   (a) Fourth  (b) Fifth  (c) Thirteenth  (d) Fourteenth  (e) Fifteenth

12. Madhu ranks thirteenth in a class of thirty-one. What is his rank from the last?
   (a) 15  (b) 17  (c) 18  (d) 20  (e) None of these

13. Sandeep and Sunny are ranked 13th and 14th respectively in a class of 23. What is their respective ranks from the last?
   (a) 10 th to 11th  (b) 11th & 12th  (c) 11th & 10th  (d) 9th & 10th  (e) None of these

14. Lokesh remembers that his brother Laxman’s birthday falls after 20th of August but before 28th of August, while Ritu remembers that Loornam’s birthday falls before 22nd of August but after 12th of August. On what date does Laxman’s birthday fall?
   (a) 22nd August  (b) 21st August  (c) 22nd August  (d) Cannot be determined  (e) None of these

15. Pariksher remembers that his father’s birthday is between thirteen and sixteen of May whereas his sister remembers that their father’s birthday is between fourteenth and eighteenth of May. On which day of May is their father’s birthday?
   (a) 14th  (b) 16th  (c) 14th  (d) Seventeenth  (e) None of these

16. Prakash remembers that his father’s birthday is between thirteen and sixteen of May, whereas his sister remembers that their father’s birthday is after fourteenth but before seventeenth April. Which day in April is their father’s birthday?
   (a) 14th  (b) 16th  (c) 14th or 15th  (d) 15th  (e) 15th or 16th

17. The coach arrived at the playground at 8:35. Rakshak arrived 45 minutes late and was 15 minutes late for the training. By how much time did the coach come early than the scheduled time?
   (a) 35 minutes  (b) 45 minutes  (c) 15 minutes  (d) 10 minutes  (e) None of these

18. Alok remembers that his sister Uma’s birthday is after nineteen but before twenty second of April. Whereas his mother remembers that Uma’s birthday is after twentieth but before twenty-fourth of April. Which day is Uma’s birthday?
   (a) 21st April  (b) 23rd April  (c) 20th April  (d) 22nd April  (e) None of these

19. Among five friends, A is heavier than B, C is lighter than D. B is lighter than D but heavier than E. Who among them is the heaviest?
   (a) B  (b) C  (c) A  (d) D  (e) None of these

20. Moheen, the younger brother of Bibhu, is older than Rehat, Prema, who is younger to Sonam than Bibhu. Who among them is the oldest?
   (a) Rehat  (b) Moheen  (c) Sonam  (d) Bibhu  (e) Lalu

21. Lalu is taller than Munna but shorter than Mishra. Vani is taller than Raja. Munn is taller than Vani. Who is the shortest?
   (a) Raja  (b) Munna  (c) Mishra  (d) Vani  (e) Lalu
22. Shishir is taller than Samir but not as tall as Prakash. Ashok is taller than Prabodh but not as tall as Ramesh. Who among them is the tallest?
(a) Ashok  (b) Shishir  (c) Prabodh  (d) Samir  (e) Prakash

23. Ramesh is taller than Vinay who is not as tall as Karan. Sanjay is taller than Anupam but shorter than Vinay. Who among them is the tallest?
(a) Ramesh  (b) Karan  (c) Vinay  (d) Cannot be determined  (e) None of these

24. Five persons were playing card game sitting in a circle all facing the centre. Mukund was to the left of Rajesh, Vijay was to the right of Anil and between Anil and Nageh. Who was to the right of Nageh?
(a) Vijay  (b) Rajesh  (c) Anil  (d) Mukund  (e) Cannot be determined

25. Prakash is taller than Geeta. Amit is taller than Prabhut but not as tall as Geeta. Prabodh is taller than Prakash. Who among them is the shortest?
(a) Prakash  (b) Geeta  (c) Amit  (d) Prabodh  (e) Prabhut

26. Roshan is taller than Hardik, who is shorter than Sunheel. Mitra is taller than Harry but shorter than Hardik. Sunheel is shorter than Roshan. Who is the tallest?
(a) Roshan  (b) Sunheel  (c) Hardik  (d) Harry  (e) Mitra

27. Jayesh is taller than Ramesh who is shorter than Nandu. Satish is taller than Vinod but shorter than Subodh, who is not as tall as Prabodh. Who is the tallest in the group?
(a) Prabodh  (b) Subodh  (c) Kavita  (d) Ashok  (e) Jayesh

28. Ashok is taller than Kavin but not as tall as Jayesh. Jayesh is shorter than Subodh, who is not as tall as Prabodh. Who is the tallest in the group?
(a) Prabodh  (b) Subodh  (c) Kavita  (d) Ashok  (e) Jayesh

29. Kiran is taller than Sameer but shorter than Pramod. John is taller than Umila. Sameer is taller than John. Who is the tallest in the group?
(a) Kiran  (b) Sameer  (c) Pramod  (d) John  (e) Umila

30. Anam is taller than Samir, Pranath is taller than Umesh but not as tall as Samir, Ashok is shorter than Umesh. Who is the shortest?
(a) Anam  (b) Samir  (c) Pranath  (d) Ashok  (e) None of these

31. Virin is taller than Ramkal, who is shorter than Ahmed. Mohinder is taller than Sheikh but shorter than Ramkal. Ahmed is shorter than Virin. Who is the shortest?
(a) Virin  (b) Ahmed  (c) Ramkal  (d) Sheikh  (e) Mohinder

32. Among five friends, Dina is older than Souamma, Mona is younger than Sanjay. Jaya is older than Dina but not as old as Mona. Who is the youngest?
(a) Dina  (b) Souamma  (c) Mona  (d) Sanjay  (e) Jaya

33. Sofia is taller than Pushpa but shorter than Malini. Geeta is shorter than Vijay and Vijay is not as tall as Pushpa. Who should be the middle if they stand in a row according to height?
(a) Sofia  (b) Pushpa  (c) Mahi  (d) Geeta  (e) Vijay

34. Five boys are so standing that they form a circle. Ajay is between Ramesh and Toon. Soloman is to the left of Babu and Ramesh is to the left of Soloman. Who is to the right of Ajay?
(a) Babu  (b) Ramesh  (c) Rom  (d) Soloman  (e) Either Soloman or Toon

Directions (Questions 35 to 36):
Read the following information and answer the questions given below:
I. C is taller than B. 
II. D is taller than A, but taller than E. 
One of the following statements will enable you to list the five persons in the order of their heights (in descending):
A. Taller than A.
B. Tall than B.
C. Taller than B. 
D. Taller than C. 
E. Taller than D.

35. Which one of the above statements enables you to list all the five persons in order of their heights (in descending)?
(a) I (b) II (c) III (d) IV (e) Both II and III

36. Which of the above statements is false?
(a) I (b) II (c) III (d) IV (e) None

Directions (Questions 37):
Read the following information and answer the question given below:
Dhawal, Gunjan, Navin, Prince and Sanjay got the first five ranks (but not necessarily in this order), with each getting a different rank. The ranks were based on the aggregate marks.

I. Neither Navin nor Sanjay got less than Dhawal in the aggregate.
II. Prince's aggregate was the exact average of their total aggregate.
III. Gunjan got more marks (in aggregate) than at least two of the other.
IV. Sanjay's aggregate was the average of those of Gunjan and Dhawal.
V. Comparing Gunjan, Sanjay and Navin, Gunjan was neither the best nor the worst among these three.
VI. Sanjay got a higher rank than prince.

37. Who got the fourth rank?
(a) Dhawal  (b) Gunjan  (c) Navin  (d) Prince  (e) Sanjay

Directions (Questions 38):
Read the following information and answer the question given below:
A, B, C, D, E, F sit around a table to play cards. Those in alternate seats are in one team (note that two teams are thus formed).
I. A does not sit next to either C or F.
II. B and D sit opposite to each other.
III. A is in B's team, but E is in F's team.
IV. The other players in A's team are (a) B&C  (b) B&E  (c) C&F  (d) E&F  (e) B&C
Directions (Questions 39 to 40):
Read the following information and answer the questions given below:
Seven students A, B, C, D, E, F, and G appeared for two papers, each carrying the same numbers of maximum marks. The ranks they got in the aggregate of the two papers tallied with above order (A first, B second and so on). There were no ties in either of the papers i.e. no students got the same rank in paper I, no two students got the same rank in paper II, either.

I. E was second in paper I, while F was second in paper II.
II. A was third in paper I and fourth in paper II.
III. G got the same rank in both the papers.
IV. D and F did not get adjacent ranks in either of the papers; but C and G got adjacent ranks in one of the papers. (Adjacent rank means one rank higher or one rank lower)
V. B was the fifth in paper I.
VI. E got lower rank than C in paper II.

39. What was B’s rank in paper I?
(a) first (b) third (c) fifth (d) sixth (e) seventh
40. What was G’s rank in paper II?
(a) third (b) fifth (c) sixth (d) seventh (e) first

Directions (Question 41):
Read the following information and answer the question given below:
A, B, C, D, and E all vary in their heights.
I. Any one lets tall than C is less tall than A too.
II. C is not the shortest among them.
III. Any one else taller than A is less tall than D too.
IV. E is taller than only two other persons.

41. The fourth tallest is
(a) A (b) B (c) C (d) D (e) E

Directions (Question 42):
Read the following information and answer the question given below:
I. A was 5 when B was born, and C was 8 when D was born.
II. A was 6 when D was born.
III. E was 4 when A was born.

42. Who is in the middle?
(a) A (b) B (c) C (d) D (e) E

Directions (Questions 43 to 46):
Read the following information and answer the questions given below:
Five persons P, Q, R, S, and T are arranged in decreasing order of age and of height and moved 1 to 5 in each arrangement.
I. T and R have the same rank in both arrangements.
II. S has a lower rank than R in both.
III. The ranks of P in age and in Q in height are the same.

IV. The ranks of Q in age and height differ by 3.
V. T is taller and older than Q.
VI. Q occupies the last rank in height.

43. The person who has the same rank in age and height, is
(a) P (b) Q (c) R (d) S (e) T
44. The rank that P occupies in height is
(a) 1 (b) 2 (c) 3 (d) 4 (e) 5

Directions (Questions 45 to 46):
Read the following information and answer the question given below:
I. A drank more at a party than B and left earlier than C.
II. D drank more than A and less than C and left later than A and earlier than G.
III. E drank less than F and more than C and left later than G.
IV. B drank more than H and left earlier than C.

45. Which of the following drank more than C?
(a) G, F (b) E, D (c) F, D (d) F, H (e) H, B
46. Which of the following drank less than A?
(a) B, D (b) C, H (c) D, J (d) C, H (e) C, E

Directions (Questions 47 to 48):
Read the following information and answer the questions given below:
Given below is the account of how six cars have been parked by their owners. Green car is in between blue and white. Red and Blue cars have two cars in between them. White car is not near black or grey and black and grey cars have no cars in between them. Red car is to the left of black car.

47. Which car is on the extreme left?
(a) Grey (b) Blue (c) Black (d) Red
48. Which car is on the extreme right?
(a) Grey (b) Red (c) White (d) Black

Directions (Question 49):
Read the following information and answer the questions given below:
Out of A, B, C, D, E, F, and G a team of four has to be selected.
I. A and F have to be together.
II. F cannot be paired with C.
III. F and G cannot be together.
IV. D and E must be together.
V. A and B will not be together.

49. The team will comprise of
(a) ABCF (b) BCEF (c) CEGF (d) ADEF
Directions (Questions 54 to 55):
Read the following information and answer the questions given below:

Madan is taller than Naryan but not as tall as Pavan. Amar is taller than Sarvan but not as tall as Naryan.

54. Who is the tallest?
(a) Pavan  (b) Madan  (c) Naryan  (d) Amar  (e) None

55. Who is the shortest?
(a) Attee  (b) Sarvan  (c) Pavan  (d) Madan

Directions (Questions 56 to 57):
Ahmed is taller than Saleem but not as tall as Akbar. John is taller than Joseph, but not as tall as Saleem.

56. Who is the tallest?
(a) Ahmed  (b) Akbar  (c) Saleem  (d) John  (e) Joseph

57. Who is exactly in the middle?
(a) Ahmed  (b) Akbar  (c) Saleem  (d) John  (e) Joseph

Directions (Questions 58 to 59):
There are seven persons in a ladder. Amar is higher than Edward but lower than Chendi. Ganesh is in between Amar and Bhasker. Bhasker is in between Amar and Edward. Farooq is in between Dwarkar and Edward.

58. Who is at the top?
(a) Amar  (b) Bhasker  (c) Chendi  (d) Dwarkar

59. Who is exactly in the middle?
(a) Bhasker  (b) Farooq  (c) Edward  (d) Dwarkar

ANSWER:

01. e 02. e 03. d 04. e 05. a 06. e 07. b 08. c 09. d 10. e 11. d 12. e
25. e 26. a 27. a 28. a 29. e 30. d 31. d 32. b 33. b 34. b 35. e 36. d
37. d 38. b 39. a 40. e 41. e 42. a 43. d 44. b 45. a 46. b 47. a 48. d
49. d 50. b 51. e 52. e 53. d 54. a 55. b 56. b 57. e 58. e 59. e
CHAPTER II

CRITICAL REASONING

LOGICAL REASONING QUESTIONS

Type 1: Logical Inference Questions and Syllogism

1.1 INTRODUCTION

The word ‘Logic’ is derived from the Greek word ‘Logos’ which means ‘Thoughts in Language’. We can say that ‘Logic’ is the ‘Science of Thought’ expressed in language.

The mental recognition of cause-and-effect relationship is called ‘reasoning’. It may be production of an event from an observed cause or the inference of a cause from an observed event.

Logical reasoning is a process of passing from the known to the unknown. It is the process of deriving a logical inference from a hypothesis through reasoning.

This type of reasoning involves three important attributes, viz. What? Why? and How?

Another important factor in logical reasoning is logical deduction. Deriving an inference from units of arguments which are called proposition in logic or deducing an inference from statements is called logical deduction. For example:

(a) Mammals are mortal.
(b) Raveeth is a mammal.

Therefore, Raveeth is mortal.

From statement (a) and (b) we derive a logical conclusion that Raveeth is mortal.

(a) Basic Concepts in Logic

Terms are the subject or predicate of a logical proposition. A proposition is the statement of a certain relation between two terms. All propositions either assert or deny something. The subject is that about which an assertion is made and whatever is asserted is called the predicate. The sign of relation between subject and predicate is called copula.

For example, “Mammals are mortal” is a proposition, the term “Mammals” is a subject and “Mortal” is a predicate and both terms are joined by the copula “are”.

Propositions may be classified as follows:

(a) Universal: What is asserted applies to the whole of a subject. Usually, “all” is prefixed to such propositions. “All religious men are good” is a universal proposition.

(b) Particular: Only part of the subject is covered. Usually, “some” is prefixed in such propositions. We can say that “some” is the ‘Science of Thought’ expressed in language.

Universal and particular propositions are based on quantity. They are further classified on the basis of quality, viz. affirmative (e.g. Raveeth is an Indian) and negatives (Raveeth is not Indian).

Based on quality and quantity, propositions are further classified into:

(a) Universal affirmative: “All tigers are short-lived” affirms something of the whole subject. This is represented by “A”.

(b) Universal negative: “No politician is harmless”. Something is denied of the whole subject. This is represented by “E”.

(c) Particular affirmative: “Some professors are hard-working”. Something is affirmed of a part of the subject. This is represented by “I”.

(d) Particular negative: “Some writers are not professionals”. This is represented by “O”.

Symbols A, E, I and O, above are adapted from first two vowels of “Affirmo” and “Nego”. A and I are therefore affirmative and E and O are negative.

(b) Distribution of Terms

- A term is distributed when reference is made to all. A term is undistributed when reference is made to an indefinite part of the whole
- In universal propositions, the subject term is always distributed while in a particular proposition, the subject is undistributed.
- The predicate in ‘A’ proposition is undistributed and the same is true for ‘I’ proposition. Hence affirmative propositions do not distribute their predicate.

In ‘E’ proposition the predicate is distributed and this also applies to ‘O’ proposition. The universal proposition distributes the subject while the particular proposition does not distribute the subject. On the other hand, the predicate is distributed in negative proposition but undistributed in affirmative ones. This can be diagrammatically described as follows:

'A' Proposition

- All Indians are religious-minded
- P-religious-minded
- S-Indians

'E' Proposition

- No birds are mammals
- S-1: Birds
- S-2: Mammals

'I' Proposition

- Some birds are well-footed
- S-1: Birds
- S-2: Well-footed

'O' Proposition

- Some birds are not able to fly
- A- Some birds (shaded area pinpoints some)
- B- Birds that fly

A

B

\[ F \]

\( S \)

\( S-1 \)

\( S-2 \)

\( S-1 \)

\( S-2 \)
12. TYPES OF LOGICAL RELATIONSHIPS

The relation between propositions which are logically relevant are those in which the possible truth or falsity of one or more propositions limits the possible truth or falsity of others. For instance:

(a) Art cannot be taught
(b) If art is knowledge, then art cannot be taught
(c) If art is knowledge, then it can be taught
(d) Art can be taught
(e) Art is knowledge
(f) Art is not knowledge

In (a) and (b) both cannot be true, since one affirms what the other denies and both cannot be false for the same reason. Some relation applied between (c) and (f), such propositions are contradictions. In (c) and (f) there is no contradiction because art can be taught under certain contingencies. There is no mutual limitation upon the possible truth/falsity of two propositions. They are called independent.

(a) and (f) are asserted jointly to form a contradictory proposition and ask for the relation with (c). This is, if both (h) and (f) are true, (a) must be true.

Propositions so related shall if the first is true, the second is also true, but if the second is true, the first is undetermined and not thereby limited in its truth value, are said to be in the relation of subaltern to subaltern, also called subalternation. The truth-value of a proposition in logic means either truth or falsity, for example:

\[ \text{IF P is true, q is true} \]

\[ \text{IF P is false, q is undetermined} \]

\[ \text{(hence, P signifies any proposition and q any other)} \]

\[ \text{CONTRARIERS} \]

\[ \text{A} \]
\[ \text{E} \]
\[ \text{SUBTRAVERS} \]

Contradictories of two propositions both cannot be true, but one of them must be true. Contraries are extreme opposites, and do not between them exhaust all possibilities. They cannot both be true but they may both be false. Sub-contraries are precisely reverse of each other.

ACE Academy

CRITICAL REASONING

1.5 LOGICAL INFERENCE QUESTIONS

Now, after learning the basics of Logical reasoning, we proceed ahead with the type of questions we come across in competitive examinations.

These questions depend upon deducting the logical inference from the statements.

Inference is a mental process of arriving at a conclusion from more than one proposition. Inferences are of two types. They are deductive. When we move from the general to the particular and inductive where the conclusion is wider in extent than the premises. In intelligence testing, mostly deductive inference ability is judged. Deductive inference may be further classified as:

1. Immediate inference
2. Mediate inference

(a) Immediate Inference

Here the conclusion is derived from one premise. It is a process of directly coming to a conclusion from one premise. For example,

Statement: Some students are not bright.
Conclusion: Some industrial workers are not bright.

Conclusion: Some well paid persons are industrial workers.

Questions on immediate inference can be set in two ways:

(a) A correct statement is given and then it is asked whether the inference can be derived from that or not.
(b) An incorrect (false) statement is given and then it is asked whether the inferences are correct or not.

The results obtained by immediate inference process are termed conversion: obversion; contraposition; and inversion.

(b) Conversion

From a given proposition we infer another proposition by interchanging or transforming the subject and predicate thereby:

(a) Subject and predicate interchange their places.
(b) Quantity does not change.
(c) Quality (the denial of the terms) also does not change.
(d) The converse of A is I, of E is E, I is I but O cannot be converted. For example:

1. All students are bright (A)
Therefore, some bright people are students. (I) - valid
2. No man is vicious (E)
Therefore, no virtuous being is a man. (E) - valid
3. Some men are intelligent (I)
Therefore, some intelligent beings are men, (I) - valid
But Proposition O cannot be converted as it will become an invalid inference, for example

4. Some men are not wise. (O)
Some who are wise are not men. (invalid)
4. **Statement:** All men are mortal.  
**Conclusion:** No man is non-mortal.  
Valid because observation of A is E. 
5. **Statement:** Some men are wise.  
**Conclusion:** Some men are not wise.  
Conclusion is valid as observation of I is O.  
As a short cut to draw the conclusions from statements, we can also follow the following table which could be helpful in arriving at the right choice in most of the questions you'll come across in any logical reasoning test.

<table>
<thead>
<tr>
<th>If the first proposition (statement) is of type</th>
<th>If the second proposition (statement) is of type</th>
<th>And conclusion / inference is of type</th>
<th>The conclusion must be</th>
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<tbody>
<tr>
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<td>O</td>
<td>INDEFINITE</td>
<td>INVALID</td>
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</tbody>
</table>

Now, we should make use of these aids to answer the following type of question.  

### 1.4 IMMEDIATE INFERENCE QUESTIONS

#### Illustrations

**Directions:** In each question below are given two statements followed by two conclusions numbered I and II. You have to take the two given statements to be true even if they seem to be absurd. Give your answer as:  
(A) Only 1 follows  
(B) Only 2 follows  
(C) Either 1 or 2 follows  
(D) Neither 1 nor 2 follows  
(E) Both 1 and 2 follows

#### 1. Statements

1. **All horses are dogs**
   2. **All mice are dogs**

**Conclusion:**  
1. **All horses are mice**
2. **All mice are dogs.**

**Answer:** A + A = A, therefore 1 follows, but for 2, this is not so.
2. Statement
No coin is a dollar
Red token is a coin
Conclusion
1. Red token is not a dollar
2. Red token may not be a dollar
Answer: If we change the order to align the propositions, it becomes A + E = E, thus making 1 to follow but for 2, this is not so

3. Statement
All fathers are sons
No some are educated
Conclusion
1. All sons are educated
2. No fathers are educated
Answer: B for conclusion 2, A + E = E, but not for 1

4. Statements
All cups are saucers
No saucers is a kettle
Conclusion
1. No cup is a kettle
2. No kettle is a cup
Answer: E Now A + E = E, therefore the conclusion should be "No cup is a kettle", which is the same as "No kettle is a cup". Thus, both 1 and 2 follow.

5. Statements
All books are magazines.
Some magazines are novels.
Conclusion
1. Some books are novels.
2. Some novels are magazines.
Answer: B; A + I leads to no conclusion, thus from both these two statements, no conclusions follow, but if we consider only statement 2, we will find that this is the same proposition as conclusion 2. Thus only 2 follow

PRACTICE QUESTIONS
1. Statements
Some books are magazines
Some magazines are novels
Conclusion
1. Some books are novels
2. Some foolish girls are smart

2. Statements
All beautiful girls are foolish
No foolish girls are smart
Conclusion
1. No girls is smart
2. No beautiful persons are smart

3. Statements
Some cows are deer
Some deer are fish
Conclusion
1. Some cows are fish
2. Some fish are cows.

4. Statements
Some shirts are stocks
No sock is red
Conclusion
1. Some stocks are shirts
2. No shirt is red

5. Statements
All bulbs are birds
Some birds are butterflies
Conclusion
1. All butterflies are bulbs
2. Some bulbs are butterflies

6. Statements
Some tins are round
Some cups are round
Conclusion
1. Some tins are cups
2. All round things are either tins or cups

7. Statements
All rivers are mountains
All forests are mountains
Conclusion
1. Some rivers are forests
2. No forest is a river

8. Statements
Ashok is a good sportsman
Sportsmen are usually handsome
Conclusion
1. All handsome persons are sportsmen
2. Ashok is handsome

9. Statements
Some person are educated
Educated persons prefer small families
Conclusion
1. All small families are educated.
2. Some persons prefer small families.

10. Statements
All men are captains
All captains are beys
Constitution
1. All men are boys
2. Some captains are men

11. Statements
All birds are boys
Rabbi is a pastor
Conclusion
1. Rabbi is a bird
2. All pacocks are birds

12. Statements
Some educated are cigarettes
Some uneducated are table
Conclusion
1. Some educated are tables
2. All educated are not cigarettes

13. Statements
All lamps are poles
Some poles are pipes
Conclusion
1. Some lamps are pipes
2. Some pipes are poles

14. Statements
Some tasks are ponds
Some ponds are buckets
Conclusion
1. Some buckets are ponds
2. Some tasks are buckets

15. Statements
All cars are houses
Some homes are cars
Conclusion
1. Some cars are homes
2. Some homes are cars

Answers:

1.6 MEDIMATE INFERENCE (SYLLOLOGISM)
Here two premises are given on the basis of which the inference has to be drawn. For example
1. All men are mortal
   All Teachers are men
   Therefore, all teachers are mortal
2. All men are good
   Raven is a man
   Therefore, Raven is good

(a) Categorical: The given proposition or the premise are categorical. The conclusions is also categorical for example
   All men are mortal
   Harry is a man
   Therefore, Harry is mortal

(b) Hypothetical-Categorical: The major premise is hypothetical (conditional assertion) and minor premise is categorical. Inference or conclusion in minor categorical. For example:
   If you come in time, you will meet him
   You come in time
   Therefore, you met him

(c) Disjunctive-Categorical: The major premise is disjunctive (conditional proposition) and the minor premise is categorical. Inference also remains categorical. For example:
   Either he is intelligent or you are teaching him
   He is intelligent
   You are teaching him

(d) Dilemma: The major premise is a compound hypothetical, the minor premise is disjunctive and the conclusion is either categorical or disjunctive. For example:
   1. If A is B
      C is D
      And E is F
      2. Either A is B or E is F
      3. C is D

(e) Fallacies/Illogic: In a logical reasoning question, validity of the conclusion is to be determined. Fallacies are misleading arguments (sophism) and their validity, depends upon certain rules and their violation amounts to committing fallacy. There are various kinds of fallacies:
   - Undistributed middle: Study the following example
     All fruits are good for health
     Iron tonic is good for health
     Therefore, iron tone is a fruit
     The middle term “good for health” is undistributed, and therefore, the conclusion is Fallacious
   - illicit process: When the term undistributed in its own premise is distributed in the conclusion, an illicit fallacy occurs. Some intelligent persons are lies
     Raven is a litter
     Therefore, a loaf of bread is better than wisdom
     No illicit process is involved in these examples
   - Fallacy of two middle terms: Study the following examples?
     Nothing is better than wisdom
     A loaf of bread is better than nothing
     Therefore, the sum of man’s life are apples
In this example, there are four items:

- "nothing", "better than nothing", "a loaf of bread".
- Fallacy of division: Here the use of ambiguous word in statements amounts to a fallacy. For example:
  
  Apple is good
  
  Good is the state of man's life

  Therefore, the state of man's life

- Use of ambiguous phrases: Also lead to fallacies, or when the construction of the sentence is misleading. These fallacies are called, "fallacy of amphiboly". For example, Gavaskar, Kapil will lead in this, it is not clear as to why will lead whether Gavaskar or Kapil.

- Fallacies of composition and division: An argument becomes erroneous in composition when what is true of certain things, each taken separately, is assumed to be true of them collectively in the conclusion. For example,
  
  Three and two are five,

  Therefore, five is odd and even.

  An argument becomes erroneous in division when what is true of certain things collectively is taken to be true of them separately in the conclusion. For example,

  Red Indians are disappearing

  He is a Red Indian,

  Hence, he is disappearing.

In addition, there are fallacies relating to wrong accent, false cause and arguing beside the point which can be easily made out from the given statement.

Illustrations

Directions: In each of the following questions, two statements are given followed by two conclusions numbered 1 and 2. You are to take the two statements to be true even if they seem to be at variance from commonly known facts and then decide which one of the conclusions logically follows from the two statements. You answer will be:

(A) if only conclusion 1 follows
(B) if only conclusion 2 follows
(C) if either 1 or 2 follows
(D) if neither 1 nor 2 follows
(E) if both 1 and 2 follows

1. Statement
   Smoking is dangerous. Each driving is dangerous
   Conclusion
   1. Both driving is smoking
   2. Smoking is each driving
   Answer: D

2. Statement
   Some boys are young. All boys are young
   Conclusion
   1. Some boys are youths
   2. Some youths are boys
   Answer: D

3. Statement
   Stories are interesting. All interesting incidents are rumors
   Conclusion
   1. Stories are rumors
   2. Rumors are stories
   Answer: A

4. Statement
   All girls are beautiful. Vandana is a girl
   Conclusion
   1. Vandana is a beautiful
   2. Vandana is not beautiful
   Answer: A

5. Statement
   Some dogs bite. All dogs bark
   Conclusion
   1. Dogs which bite also bark
   2. Dogs which bark do not necessarily bite
   Answer: A

6. Statement
   Doctors serve their country
   Conclusion
   1. Engineers do not serve their country
   2. Some engineers serve their country
   Answer: A

7. Statement
   All travelers are men. All men are graduates
   Conclusion
   1. All men are travelers
   2. All travelers are graduates
   Answer: B

8. Statement
   Dogs have four legs. Tables have four legs
   Conclusion
   1. Tables are dogs
   2. Dogs are tables
   Answer: D

9. Statement
   Rats are brown. Rats are Mats
   Conclusion
   1. Mats are brown
   2. Rats are Mats
   Answer: D

10. Statement
    Some men are wolves. All wolves are hungry
    Conclusion
    1. Mats are hungry wolves
    2. All those who are hungry are wolves
    Answer: D
11. Statement
Fats are nuts. Rats eat mats
Conclusions
1. Bats eat mats
2. Mats eat bats
Answer: D

12. Statement
Love is God. Faith is God
Conclusions
1. Love is Faith
2. Faith is Love
Answer: D

13. Statement
All radios are transistors. Some transistors are imported
Conclusions
1. All radios are imported
2. All transistors are not radios
Answer: B

PRACTICE QUESTIONS
1. Statement
Whales are fish. Fish are in the sea
Conclusions
1. Whales are in the sea
2. Whales are sea

2. Statement
The committee rewarded him. Kuldeep Jain is the member of a committee
Conclusions
1. Kuldeep Jain rewarded him
2. Kuldeep Jain did not reward him

3. Statement
Industrial cities are highly polluted. Pollution means more diseases
Conclusions
1. People who live in industrial cities become immune to diseases
2. People living in cities which are not industrial are healthier than those who live in industrial cities

4. Statement
Space has no gravitational pull or it has no atmosphere
Conclusions
1. Gravity is due to atmospheric pressure
2. It is not difficult to breathe in space

5. Statement
People live in wooden houses in Simla? Earthquakes are frequent in Simla
Conclusions

1. Shovel, Malka and Vandana are friends
2. Sheets is friend of Vandana

Answer: D

1.6 LOGICAL DEDUCTIONS

Here we use logical diagrams to deduce the logic in the given statements and find the conclusions.

Illustrations

1. Directions: Read the following statement and draw the correct conclusion: If all books are tables and no table is a chair, then definitely no chair is a book.
(a) True
(b) False
(c) Neither
(d) Cannot be inferred

Answer: (d) We can solve this question in one of two methods as shown below

(i) Take another example. If all dogs are animals and no animals are plants, then no plants are definitely dogs
(ii) Draw Venn’s diagram

It is therefore true that no chair is definitely a book.

Q.2 to 7: Directions: In each of the following questions, there are two statements (A) and (B) followed by four conclusions numbered I, II, III and IV. Though the statements are of variance from commonly known facts, you have to assume them to be true. Read the conclusions and, based on the information given in statements (A) and (B), decide which of the opinions follow from A and B.

2. Statement:

(A) All books are trees.
(B) All trees are lions.

Conclusions

I. All books are lions.
II. All lions are books.
III. All trees are books.
IV. Some lions are books.

(a) Only I and III follow
(b) Only I and IV follow
(c) None of the conclusions follow
(d) All conclusions follow

Answer: (b) From statement (A) (all books are trees) and statement (B) (all trees are lions), it is clear that all books are lions (conclusion I), but not that all lions are books or all trees are books (conclusion II and III). However, some lions can be books (conclusion IV). Hence, conclusions II and III are not applicable and only I and IV can be inferred. The Venn diagram will make the situation clear.

3. Statements

A. No cow is a chair.
B. All chairs are tables.

Conclusions

I. Some tables are chairs.
II. Some tables are cows.
III. Some chairs are cows.
IV. No table is a cow.
(a) Either II or III follow
(b) Either II or IV follow
(c) Only I follows
(d) All conclusions follow

Answer: (c) It is clear that a cow can never be a chair or a table. Since all chairs are tables, it is evident that some tables are chairs (conclusion I). Conclusion II, III and IV are not applicable. See the following diagram.

4. Statements

A. All pens are pencils.
B. No pencil is a monkey.

Conclusions

I. No pen is a monkey.
II. Some pens are monkeys.
III. All monkeys are pens.
IV. Some monkeys are pens.
(a) Only I and III follow
(b) Either II or III follow
(c) None of the conclusions follow
(d) Only I follows

Answer: (d) From the given statements, it is clear that a monkey is a separate class and has no relationship with pens or pencils. Therefore, only conclusion I can be inferred and conclusion II, III or IV are not applicable. See the following diagram.

5. Statements

A. All buses are trees.
B. All trees are windows.

Conclusions

I. All buses are windows.
II. All windows are buses.
III. All buses are trees.
IV. Some windows are buses.
(a) Only I and II follow
(b) None of the conclusions follow
(c) Only II and III follow
(d) Only I and IV follow

Answer: (b) When all buses are trees and all trees are window statements (A and B), it implies that all buses are windows (conclusion I), but all windows cannot be trees and all trees cannot be buses. However, some windows can be buses (conclusion IV). Study the following Venn diagram which will make the situation clear.
PRACTICE QUESTIONS

01. Statements
A. All goats are tigers.
B. All tigers are lions.

Conclusions
I. All tigers are goats.
II. All lions are tigers.
III. No goat is a lion.
(a) Only III and IV follow
(b) Only I and II follow
(c) None of the conclusions follow
(d) All conclusions follow

02. Statements
A. Some skirts are benches.
B. No bench is a table.

Conclusions
I. Some skirts are tables.
II. Some benches are skirts.
III. All benches are skirts.
(a) Only I follows
(b) Only II follows
(c) Only II and IV follow
(d) None of the conclusions follow

03. Statements
A. All chairs are tables.
B. Some table are sofa sets.

Conclusions
I. Some sofa sets are chairs.
II. All sofa sets are chairs.
III. Some chairs are sofa sets.
(a) All conclusions follow
(b) Only I and II follow
(c) None of the conclusion follow

04. Statements
A. No book is a pencil.
B. All pencils are erasers.

Conclusions
I. No pencil is a book.
II. Some erasers are books.
III. No eraser is a book.
(a) Only I and IV follow
(b) None of the conclusions follow
(c) Only I, II and IV follow
(d) All the conclusion follow

05. Statements
A. All men are women.
B. All women are crazy.

Conclusions
I. All men are crazy.
II. All the crazy are men.
III. Some of the crazy are women.
IV. Some of the crazy are women.
(a) None of the conclusions follow
(b) All the conclusions follow
(c) Only I, III & IV follow
(d) Only II and III follow

06. Statements
A. Some donkeys are elephants.
B. Some donkeys are cats.

Conclusions
II. Some donkeys are cats.
IV. Some cats are elephants.
(a) None of the conclusions follow
(b) Only II and III follow
(c) All the conclusions follow
(d) Only I, II and IV follow

Answers
01. c 02. b 03. b 04. c 05. c 06. c

EXERCISE
Directions (1-10): In each of the questions below are given three statements followed by four conclusions number I, II, III and IV. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. Read all the conclusions and then decide which of the given conclusions logically follows from the given statements disregarding commonly known facts.

01. Statements
Some buildings are telephones.
Some helicopters are telephones.

Conclusions
I. Some helicopters are buildings.
II. Some trees are buildings.
III. Some trees are telephones.
IV. No tree is building.

1. None follows
2. Only either II or IV and III follow
3. Only either II or IV follows
4. Only III follows
5. All follow

02. Statements
All books are skies.
Some skies are waters.
All inks are waters.

Conclusions
I. Some water are books.
II. Some inks are books.
III. Some skies are books.
IV. Some inks are skies.

1. None follows
2. Only IV follows
3. Only III or IV follows
4. Only III follows
5. All follow

03. Statements
No paper is pen.
No pen is pencil.
All erasers are papers.

Conclusions
I. Some papers are erasers.
II. No pencil is eraser.
III. No pen is eraser.
IV. All papers are erasers.

1. None follows
2. Only II follows
3. Only I follows
4. Only III follows
5. All follow
1. All follows.  
2. None follows.
3. Only I and II follow.
4. Only II and III follow.
5. None of these.

4. Statements
Some bats are flowers.
Some chairs are flowers.
Some tables are chairs.
Conclusions
I. Some tables are flowers.
II. Some tables are bats.
III. Some chairs are bats.
IV. All chairs are flowers.
1. None follows.
2. Only I follows.
3. Only II follows.
4. Only III follows.
5. All follow.

5. Statements
All men are lions.
All women are tigers.
All tigers are lions.
Conclusions
I. Some women are men.
II. All women are lions.
III. Some lions are tigers.
IV. Some tigers are women.
1. Only I and II follow.
2. Only I and III follow.
3. Only II and IV follow.
4. Only II, III and IV follow.
5. All follow.

6. Statements
All players are spectators.
Some spectators are actors.
Some theatres are drama.
Conclusions
I. Some drama are spectators.
II. Some players are drama.
III. Some theatres are drama.
IV. All spectators are players.
1. Only II follows.
2. None follows.
3. Only II and IV follow.
4. Only I and III follow
5. All follow.

7. Statements
Some buckets are waters.
All waters are papers.
Some papers are woods.
Conclusions
I. Some woods are waters.
II. Some buckets are woods.
III. Some papers are woods.
IV. Some woods are buckets.

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ACE Academy

CRITICAL REASONING

1. None follows
2. Only II follows
3. Only III follows
4. Only IV follows
5. Only II, III and IV follow

8. Statements
All needles are threads.
All threads are boxes.
All trees are boxes.
Conclusions
I. No needle is thread.
II. Some trees are threads.
III. Some boxes are needles.
IV. Some trees are needles.
1. Only either I or IV follows.
2. Only either I or IV and II follow.
3. Only III follows.
4. None follows
5. Only either I or IV and III follow

9. Statements
Some rings are phones.
Some phones are computers.
Some computers are stations.
Conclusions
I. Some stations are rings.
II. Some phones are stations.
III. Some computers are rings.
IV. All rings are stations.
1. None follows
2. Only I and II follow.
3. Only I, II and III follow
4. Only II and III follow
5. All follow

10. Statements
All leaves are links.
No ink is brush.
All cakes are brushes.
Conclusions
I. Some cakes are leaves.
II. Some cakes are links.
III. Some cakes are leaves.
IV. Some cakes are brushes.
1. All follow
2. Only I and II follow
3. Only II and III follow
4. Only II and IV follow
5. None of these

Directions (11-14): In each of the questions below are given three statements followed by three conclusions numbered I, II, and III. You have to decide which of the given conclusions logically follows from the given statements disregarding commonly known facts.

11. Statements
Some trees are lions.
Some lions are cows.
All cows are bats.
Conclusions
I. Some bats are trees.
II. Some cows are trees.
III. No bat is tree.
1. None follows
2. Only III follows
3. Only II follows
4. Only either I or III follows
5. None of these

12. Statements
All rings are birds.
Some birds are cages.
All cages are kites.
Conclusions
I. All kites are cages.
II. Some kites are rings.
III. Some birds are kites.
1. Only I follows.
2. Only II follows.
3. Only III follows.
4. Only I and II follow
5. None of these

13. Statements
All pens are grasshoppers.
Some grasshoppers are clouds.
All clouds are bottles.
Conclusions
I. Some bottles are grasshoppers.
II. Some clouds are pens.
III. No pen is cloud.
1. Only III follows
2. Only either II or III follows
3. Only II follows
4. Only either I or III follows
5. None of these

14. Statements
Some reds are crows.
All crows are yellow.
All yellow are rabbits.
Conclusions
I. All crows are rabbits.
II. Some yellow are reds.
III. Some reds are rabbits.
1. All follow
2. Only I follows
3. Only I and II follow
4. Either I or II follows
5. None follows

15. Statements
Some dogs are bags.
No bag is lion.
All rooms are lions.
Conclusions
I. Some rooms are bags.
II. Some dogs are lions.
III. Some rooms are dogs.

16. Statements
All cupboards are bears.
All diamonds are bears.
Some bears are chairs.
Conclusions
I. Some chairs are diamond.
II. Some cupboards are chairs.
III. All diamonds are chairs.
1. Only I follows
2. Only II follows
3. Only III follows
4. None follows
5. None of these

17. Statements
Some chocolates are sticks.
Some spoons are sticks.
All spoons are apples.
Conclusions
I. All apples are chocolate.
II. Some sticks are apples.
III. Some spoons are chocolates.
1. Only III follows
2. Only II follows
3. Only II and III follows
4. All follows
5. None of these

Directions (18-25): In each of the questions below are given three statements followed by four conclusions numbered I, II, III and IV. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. Read all the conclusions and then decide which of the given conclusions logically follows from the given statements disregarding commonly known facts.

18. Statements
All flowers are rooms.
Some rooms are windows.
All cards are windows.
Conclusions
I. Some cards are flowers.
II. Some cards are rooms.
III. Some windows are flowers.
IV. All cards are rooms.
1. None follows
2. Only I follows
3. Only I follows
4. Only III follows
5. Only IV follows

19. Statements
All men are wolves.
Some owls are men.
All penguins are owls.

Conclusions
1. All wolves are coyotes.
2. All owls are wolves.
3. All parrots are wolves.
4. All parents are men.
5. All follow.
6. Only II and III follow.
7. None of these.

23. Statements

Some leaves are skiers.

Some skis are clouds.

No cloud is a boat.

Conclusions
1. Some boats are leaves.
2. All skis are leaves.
3. Only I and II follow.
4. Only either I or II follow.
5. None of these.

24. Statements

Some tigers are lions.

Some lions are rabbits.

Some rabbits are horses.

Conclusions
1. Some tigers are horses.
2. Some horses are lions.
3. IV. Some rabbits are lions.
4. Only II follow.
5. Only III and IV follow.
6. None of these.

25. Statements

Some vehicles are windows.

Some windows are trains.

All trains are vans.

Conclusions
1. Some vans are windows.
2. Some vans are vehicles.
3. IV. Some windows are vans.
4. Only II follow.
5. Only III and IV follow.
6. All follow.

Answers:

01. 02. 03. 04. 05. 06. 07. 08. 09. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 3.

Analysis of Statement

Each question follows two (or more) statements numbered I and II. You have to decide which of the arguments is 'strong' argument and which a 'weak' argument in. In another form, of this type of question the test-taker may use terms 'Forceful' for 'Strong', and 'Irrelevant' when none of the arguments are 'strong'.

In making decisions about important questions, it is desirable to be able to distinguish between 'strong' arguments and 'weak' arguments. 'Strong' arguments are those which are both important and directly related to the question. 'Weak' arguments are those which are of minor importance and also may not be directly related to the question or may be related to a trivial aspect of the question.

Points to Ponder

In such questions, a problem is posed in an interrogative sentence followed by two (or more) arguments, one of which begins with YES, and other with NO. To arrive at a correct answer, the following points are to be borne in mind.

(a) The argument should be factual, i.e., based on facts and not on assumptions.
(b) The arguments should be specific and not generalized.
(c) The arguments should be in conformity with the prevailing ideas and not support the current thinking of the majority.
(d) There should be any kind of ambiguity in the arguments.
Illustrations

1. Statement

Centralization in offices is a must to provide efficient services to the citizens.

Arguments

(a) Only argument I is strong
(b) Only argument II is strong
(c) Either I or II is strong
(d) Neither I nor II is strong
(e) Both I and II are strong

Answer and Explanations: (A)
Both the arguments are equally strong. If there are adequate number of institutions, we don’t need to open up new ones. Keeping in view the future demand, necessary steps must be taken.

2. Statement

Should private organizations be allowed to carry out security related research activities?

Arguments

(i) No, private organizations are easily vulnerable to our enemies and therefore, they should not be permitted to carry on such researches.
(ii) Yes, the government has not sufficient resources to carry on such researches and the private organizations would manage necessary resources

Answer and Explanations: (B)
Only argument II is strong

3. Statement

Should there be recruitment in banks on the basis of past academic performance rather than through competitive examinations?

Arguments

(i) Yes, it will be beneficial for those candidates who are unable to bear the expenses of competitive examinations.
(ii) No, the past academic performance cannot be made the basis of recruitment because there is no uniformity in the assessment by the universities.

Answers and Explanations: (A)
Only argument I is strong

CRITICAL REASONING

EXERCISE I

Directions: Each question below is followed by two arguments numbered I and II. You have to decide which of the arguments is ‘strong’ argument and which is ‘weak’ argument.

Give answer (A) if only argument I is strong
Give answer (B) if only argument II is strong
Give answer (C) if either I or II is strong
Give answer (D) if neither I nor II is strong
Give answer (E) if both I and II are strong

1. Statement

Should individuals/institutions having treasures of national significance like Nobel prizes be handed over to central government for their safe custody?

Argument

(i) Yes, the individuals or institutions do not have enough resource to protect them
(ii) No, these are the properties of individuals/institutions who win them and should be in their custody.

2. Statement

Should ‘education’ be brought under the control of central government like defence?

Argument

(i) No, education is a state subject and it should remain with the state.
(ii) Yes, this is the only way to establish uniformity in growth of education across the states.

3. Statement

Should import duty on all the electronic goods be dispensed with?

Argument

(i) No, this will considerably reduce the income of government and will adversely affect the developmental activities.
(ii) No, the local manufacturers will not be able to compete with the foreign manufacturers who are technologically far superior.

4. Statement

Should there be reservation of jobs in the organisation in the private sector also as in the public sector undertakings in India?

Argument

(i) Yes, this will help reduce the gap between the affluent downtowns in India.
(ii) No, the private sector does not get any government assistance and therefore they should not be saddled with such policies.
5. Statement
Should opinion polls predicting outcome of elections be banned in India?
Argument
I. Yes, this may affect the voter's mind and may affect the outcome
II. No, such polls are conducted all over the world

6. Statement
Should there be only a public system in all the big cities in India?
Argument
I. Yes, this will avoid creating confusion in people's mind for selection of their mode of transport.
II. No, such people should be given enough choices for their mode of transport.

7. Statement
Should the fees of all the private professional colleges be made equal to those of the government professional colleges?
Arguments
I. No, the private colleges need additional funds to maintain quality of education.
II. Yes, otherwise a large number of meritorious students will not be able to study in these colleges for exorbitant high fees.

8. Statement
Should those who manufacture spurious life-saving drugs be given capital punishment?
Argument
I. No, nobody has the right to take people's life as we cannot give life anybody
II. Yes, these people are more dangerous than those who are convicted for homicide as the extent of damage to human life is incalculable.

9. Statement
Should there be a restriction on number of ministers in each cabinet in India?
Argument
I. Yes, so a result of this a lot of money will be saved and the same can be used in developmental programmes.
II. No, there should not be such restriction on democratically elected representatives and it should be left to the judgement of the leader of the council of ministers.

10. Statement
Should all the slum dwellers in the big cities in India be relocated in restricted places outside the city limits?
Argument
I. Yes, this is the only way to make our big cities neat and clean and of international standards.
II. No, this will put a lot of hardship to the slum dwellers as they will need to spend lot of time and money to come to the cities for earning their livelihood.

II. Statement
Should the press in India be given full freedom?
Argument
I. Yes, because only then people will become politically enlightened.
II. No, because full freedom to press will create problems.
20. Statement
Should there be a limited and judicious restriction on the freedom of press in our country?

Arguments
I. No, restrictions may lead to suppression of truth
II. Yes, press personnel have a tendency to lead public astray

21. Statement
Should physical fitness be kept as the only criteria for recruitment in the defence forces?

Arguments
I. No, person’s antecedents are very important for such sensitive jobs
II. No, other mental attributes are also very important

22. Statement
Should politicians against whom complaints are lodged with the police be disallowed to contest any elections?

Arguments
I. No, people having criminal background should not represent common public
II. No, baseless complaints should be kept under control against people

23. Statement
Should the country extent generous behavior and goodwill to its neighboring countries?

Arguments
I. No, goodwill always pays dividend
II. No, our generous behavior and goodwill will be considered as our weakness

24. Statement
Should the entire medical profession be nationalized in our country?

Arguments
I. No, how can any country do such an undemocratic thing?
II. Yes, it will certainly eradicate unethical medical practices.

25. Statement
Should all the school teachers be barred from giving private tuitions?

Arguments
I. No, the needy students will be deprived of the expertise of these teachers
II. Yes, this is an injustice to unemployeed and educated people who can earn their living by giving tuitions.

26. Statement
Should there be a maximum limit for the number of ministers in the Central Govt.?

Argument
I. No, the political party in power should have the freedom to decide the number of ministers to be appointed
II. Yes, the number of ministers should be restricted to a certain percentage of total number of seats in the Parliament to avoid unnecessary expenditure.

27. Statement
Should all annual examinations up to Std. V be abolished?

Argument
I. Yes, the students should not be burdened with such examination which hampers their natural growth.
II. Yes, the students should be allowed to study seriously as they will get automatic promotion to the next class.

28. Statement
Should the railways immediately stop issuing free pass to all its employees?

Arguments
I. No, the employees have right to travel free
II. Yes, this will help railways to provide better facility

29. Statement
Should the qualified engineers be denied from seeking admissions to post graduate management courses in India?

Arguments
I. Yes, the large number of students gets wasted as they do not have basic knowledge which can help their technical knowledge.
II. No, all the students should have the freedom to select their courses and no other country has such stipulation.

30. Statement
Should strong nations attack comparatively weaker ones who could prove to be a threat to world peace?

Arguments
I. Yes, with a view to establishing world peace, one can support war.
II. No, violence should never be resorted to.

KEY:
01. 2  02. 1  03. 2  04. 4  05. 1  06. 2  07. 3  08. 2  09. 1  10. 3  11. 1  12. 5  13. 2  14. 1  15. 2  16. 1  17. 4  18. 2  19. 5  20. 1  21. 2  22. 1  23. 5  24. 4  25. 2  26. 2  27. 2  28. 4  29. 4  30. 5

STATEMENT - ASSUMPTION TYPE

EXERCISE
Directions (1-25): In each question below is given a statement followed by two assumptions numbered I and II. An assumption is something supposed or taken for granted. You have to consider the statement and the following assumptions and decide which of the assumptions are implicit in the statement.

Give answer (1) if only Assumption I is implicit
Give answer (2) if only Assumption II is implicit
Give answer (3) if either Assumption I or II is implicit
Give answer (4) if neither Assumption I nor II is implicit
Give answer (5) if both Assumption I and II are implicit

01. Statements
A. 'All the employees are cordially invited to attend the cultural function to be held this weekend at the Institute's premises.'
B. All the staff are busy preparing for the cultural function.

Assumptions
I. Employees have not attended such program in the past
II. Employees of the staff may attend the cultural function

Give answer (5)
02. Statement
“Use of cell phones and pagers is not allowed inside the auditorium. Please switch off
such devices while you are inside the auditorium.” A notice.
Assumption
I. All those who have such devices will switch them off before they take their seat in the
auditorium.
II. Generally people do not bring such devices when they come to attend functions in the
auditorium.

03. Statement
Inspection of less than normal rainfall in the catchment areas during the first two months of
monsoon of the lakes supplying water to the city the authority has not yet affected any
cut in the water supply to the city
Assumption
I. The rainfall during the remaining part of the monsoon may be adequate for normal
water supply
II. The present water level of the lakes supplying water to the city may be adequate for
normal supply

04. Statement
“Fly X airways whenever you decide to go places. Our fares are less than train fares”.
An advertisement
Assumption
I. People prefer to travel by air when the fares are reasonable
II. The fares of other airlines are costlier than those of X airways

05. Statement
In view of the violent situation due to student’s agitation the state government has
decided to close down all the educational institutions in the state for two weeks with
immediate effect.
Assumption
I. The student’s agitation may subside after two weeks
II. The students may not find a place to come further and continue agitation after the
closure of the educational institutions.

06. Statement
The railway authority has decided to introduce two additional super-fast trains between
Cities “A” and “B” during the vacation time
Assumption
I. All the passengers who desire to travel during vacation do not will get a train ticket.
II. All other modes of transport between cities “A” and “B” are already overstretched

07. Statement
The district administration has issued a circular to all the farmers under its jurisdiction
advising them for not using pesticides indiscriminately as it may pollute the ground
water.
Assumption
I. People may stop using ground water if the farmers continue to use pesticide
indiscriminately
II. Farmers may refrain from using pesticides indiscriminately

08. Statement
The government has decided to divest large chunk of its equity in select public sector
undertaking for better fiscal management
23. Statement
Warning: "Do not smoke in public places as it is a cognizable offence in our country."
Assumption
I. People often neglect such warnings;
II. People do not understand the implications of committing a cognizable offence

24. Statement
An advertisement: "Our garments are only for the wealthy people."
Assumption
I. One cannot become rich unless one wears those particular garments
II. Many people like to be labeled as wealthy

Direction (25 - 40): In each question below is given a statement followed by two assumptions numbered I and II. An assumption is something supposed or taken for granted. You have to consider the statement and the following assumptions are decide, which of the assumptions is implicit in the statement.

Give answer (1) if only Assumption I is implicit
Give answer (2) if only Assumption II is implicit
Give answer (3) if only Assumption I and II are either implicit
Give answer (4) if only Assumption I and II are either implicit
Give answer (5) if both neither Assumption I and II are implicit

25. Statement
Weapon inspectors of country ‘X’ could not detect the presence of chemical weapons in the custody of country ‘Y’.
Assumption
I. Country ‘Y’ allowed the weapon inspectors of country ‘X’ to inspect weapons
II. Presence of chemical weapons cannot be detected

26. Statement
Because of the large number of potholes in the road, X reaching airport in time has become difficult
Assumption
I. Reaching airport in time may not be always necessary
II. There is no other convenient road to the airport

27. Statement
Government need not spend even a pie to provide water tankers to the drought-stricken localities in the state.
Assumption
I. There are certain drought-afflicted localities in the state
II. Providing water tankers incurs too much money

28. Statement
Government need not spend even a pie to provide water tankers to the drought-stricken localities in the state.
Assumption
I. Some non-government organization also need to spend money on providing water tankers
II. Water tankers cannot overcome the water shortage in the drought-stricken localities

29. Statement
Why don’t you go to the court if the employee does not pay you the Provident Fund contribution?
36. **Statement**
Ways must be discouraged vehemently even though majority of the victims might have been a nuisance to peace-loving people

**Assumption**
I. Some people create problems to peace-loving people
II. Wars kill majority of wicked people

37. **Statement**
Ways must be discouraged vehemently even though majority of the victims might have been a nuisance to peace-loving people

**Assumptions**
I. Innocent people are also killed in wars
II. Vehement opposition to wars may have some desirable impact

38. **Statement**
Nobody can predict as to how long our country would take to contain the unfortunate and disastrous terrorist activities

**Assumption**
I. It is impossible to put an end to terrorist activities
II. Efforts to control the terrorist activities are on

39. **Statement**
It is not true that the mightiest superpowers always win wars and gets accolades from other countries

**Assumption**
I. Winners are sometimes admired and appreciated
II. Winners are occasionally criticised.

40. **Statement**
"Our bank provides all your banking requirements in one location" — an advertisement of a bank

**Assumption**
I. Customers prefer to carry out all banking transactions at one place.
II. People may not attach the advertisement and carry out their transactions with this bank.

**KEY:**

```
91.2 02.1 03.5 04.2 05.5 06.2 07.2 08.1 09.1 10.2 11.3 12.2
12.4 14.5 15.1 16.5 17.2 18.4 19.1 20.1 21.1 22.5 23.3 24.2
25.1 26.2 27.1 28.4 29.5 30.1 31.4 32.1 33.2 34.5 35.4 36.1
37.2 38.2 39.1 40.5
```

"ALL THE BEST"
CHAPTER – III

NUMERICAL REASONING

Information is provided that requires you to interpret it and then apply the appropriate logic to answer the questions. In other words, you need to work out how to get the answer rather than what calculations to apply. Sometimes the questions are designed to approximate the type of reasoning required in the workplace.

<table>
<thead>
<tr>
<th>Numerical Reasoning</th>
<th>Operation</th>
<th>Supervisory</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Craft &amp; Technicol</td>
<td>Y</td>
<td></td>
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<tr>
<td>Clerical &amp; Administrative</td>
<td>Y</td>
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<td>Police, Fire, Military etc.</td>
<td>Y</td>
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<tr>
<td>Management Trainee</td>
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<tr>
<td>Graduate &amp; Professional</td>
<td>Y</td>
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</tbody>
</table>

The questions will often use number series questions which represent the most popular type of numerical reasoning questions. Numerical reasoning questions are very commonly used in graduate and management selection.

Numerical reasoning is an increasingly popular way of assessing candidates during the job selection process. Many people who have been out of the education system for a while or who don’t use maths on a day-to-day basis feel intimidated by these types of test. The important thing to remember is that you don’t need to have studied mathematics to a high level to do well in these tests. They are primarily tests of reasoning ability and the most needed is invariably straightforward. Although you may need to get back up to speed with percentages, ratios, proportions, fractions and decimals.

You will usually be allowed to use a calculator of these types of question and investing in one which can handle fractions and percentages is a good idea.

ACE Academy

NUMERICAL REASONING

(1) Directions & Distances

In this test, the questions consist of a sort of directions puzzle. A successive follow up of directions is formulated and the candidate is required to explain the final direction (in) the distance between two points. The test is meant to judge the candidate’s ability to trace and follow correctly and answer the directions correctly.

The following figure which help the candidate for finding the directions (NEWS).

While solving the question in this chapter the candidate should notice and draw a rough diagram keeping the above figure in mind. From this rough diagram, we can easily tell the answer to the questions as well as accuracy.

Ex. 1

Shyam travels 9 km to north, then again he turns to the right and walks 3 km. Then again he turns to his right and moves 7 km forward. How many kilometers away is he from the starting point?

(a) 10 km  
(b) 20 km  
(c) 13 km  
(d) 6 km  
(e) 3 km

Sol:

You have to keep in mind the directions and turns given in the question and the distances covered. The situation should be quickly sketched as follows.

```
A --------------------------- B
A = starting point
B = finishing point
Distance between A and B = 5 km
```

Ex. 2

Kalidas faces towards north. Turning to his right, he walks 25 meters. He then turns to his left and walks 30 meters. Next, he turns to his right again and walks 25 meters. Finally, he turns to the right and moves 4 meters. In which direction is he now from starting point?

(a) South – West  
(b) South  
(c) North – West  
(d) South – East
**Ex: 5**

A child is looking for his father. He went 90 meters to the east before turning to his right. He went 20 meters before turning to his right again to look for his father at his uncle’s place 30 meters from this point. His father was not there. From there, he went 100 meters to his north before meeting his father in a street. How far did the son meet his father from starting point?

**Sol:**
Clearly, the child moves from A 90 m eastwards upto B, then turns right and moves 20 m upto C, then turns right and moves 30 m upto D. Finally, he turns right and moves 100 m upto E.

Clearly, AB = 90 m, BF = CD = 30 m

Also DE = 100 m, DF = BC = 20 m

EF = DE - DF = 80 m

.His distance from starting point A = \( \sqrt{AF^2 + EF^2} \)

\[ = \sqrt{60^2 + 80^2} = \sqrt{3600 + 6400} = \sqrt{10000} = 100 \text{ m}. \]

**Ex: 4**
A man is facing west. He turns 45° in the clockwise direction and then another 135° in the same direction and then 270° in the antitockwise direction which direction is he facing now?
(a) South (b) north – West (c) West (d) South – West

Clearly, the man initially faces in the direction OA on moving 45° clockwise; he faces in the direction OB. On further moving 135° clockwise, he faces in the direction OC. Finally, on moving 270° anticlockwise, he faces in the direction OD, which is south–west. Hence, the answer is (D).

**Ex: 5**
Deeps moved a distance of 75 meters towards the north. She then turned to the left and walked for about 25 meters, turned left again and walked 80 meters. Finally, she turned to the right at an angle of 25°. In which direction was she moving finally?
(a) North – East (b) North – West (c) South – East (d) South – West

**Sol:**
Deeps started from A, moved 75 m upto B, turned left and walked 25 m upto C. She then turned left again and moved 80 m upto D. Turning to the right – at an angle of 25°, She was finally moving in the direction DE, i.e., South – West. Hence the answer is (E).
11. A man looking for his child be went 90 m in the East before turning to his right. He went 20 m before turning to his right again to look for his child at his uncle's place 30 m from this point. His child was not there. From there he went 100 m to his North before meeting his child in a street. How far did the father meet his son from the starting point?
(a) 80 m (b) 100 m (c) 140 m (d) 260 m

12. Facing the East Mr. L.V. Rao turned left and walked 10 m then turned to his left again and walked 10 m. He then turned 45° towards his right and went straight to cover 25 m. In which direction from his starting point is he?
(a) South - West (b) South - East (c) North - West (d) North - East

13. If South - East is called "East North" - West is called "West South". West in called South and so on what will north be called?
(a) East (b) North - East (c) North - West (d) South

14. If South - East becomes North, North - East becomes South and so on, what will West become?
(a) North - East (b) North - West (c) South - East (d) South - West

15. Pradip wants to go to the market. She starts from her house which is in the North and comes to the crossing, the road to her left ends in a park and straight ahead is the office complex. In which direct on is the market?
(a) East (b) West (c) North (d) South

16. If A is to the South of B and C is to the East of B. In what direction is A with respect to C?
(a) North - East (b) North - West (c) South - East (d) South - West

17. There are four towns P, Q, R and T. Q is to the South of South of P. R is to the East of Q and South of T, and T is the North of R. In which direction is P, located?
(a) South - East (b) North - East (c) North - East (d) East

18. I start from my home and go 1 km straight. Then turn to right and go 1 km. I turn again towards my right and go 1 km again. If I am North - West from my house, then in which direction did I go in beginning?
(a) North (b) South (c) East (d) West

19. P, Q, R and S are playing cards. P and Q are partners, S faces to west. If P faces to west, then who faces to west?
(a) Q (b) R (c) P (d) S

20. A watch reads 4:30. If the minute hand points East in what direction will the hour hand point?
(a) North (b) South (c) East (d) West

21. A, B, C and D are playing a game of carom. A, C and B, D are partners. D is to the right of C who is facing West. There is B is facing in
(a) North (b) South (c) East (d) West
22. Lokesh's school bus is facing North when it reaches his school. After starting from Lokesh's house, it took two turns and then left before reaching the school. What direction was the bus facing when it left the bus stop in front of Lokesh's house?  
(a) North  
(b) South  
(c) East  
(d) West

23. A walk towards North 4 Kms and turns right and walks 5 Kms. Then he turns towards South and walks 2 Kms. Again he turns towards West walks 1 Kms and stops a while. Then he further walks 3 Kms. What is the distance of A from his starting point?  
(a) 16 Kms  
(b) 12 Kms  
(c) 2 Kms  
(d) 4 Kms

24. If a man in the stop-plan starts from a point and rides 4 Kms North then turns left and rides 2 Kms. To turn again to the right to ride 4 Kms more. Towards which direction is he moving?  
(a) North  
(b) West  
(c) East  
(d) South

25. Alok went 8 Kms South and turned West and walked 3 Kms. Again he turned North and walked 5 Kms. He took a final turn to East and walked 3 Kms. In which direction was Alok from the starting point?  
(a) East  
(b) North  
(c) West  
(d) South

26. Rana drove to the North of her place of stay at A and after traveling 25 km, finds that she has driven in the wrong direction. She then turns to her right and travels 2 km and then she again turns to the right and drives straight another 25 km. How much distance has she now to cover to go back to the starting point?  
(a) 25 km  
(b) 3 km  
(c) 4 km  
(d) 40 km

27. Rana travels 10 km to the North, turns left and travels 4 km, and then again turns right and covers another 5 km. How far is he from the right starting point?  
(a) 15 km  
(b) 4 km  
(c) 5 km  
(d) 10 km

28. A taxi driver commenced his journey from a point, and drove 10 Kms towards North, and turned to his left and drove another 5 Kms. After waiting to meet a friend, he turned to his right and continued to drive another 10 Kms. He has covered a distance of 25 Kms so far, but in which direction would he be now?  
(a) North  
(b) East  
(c) South  
(d) West

29. A tourist driver 10 km eastwards and turns to the right hand drives 7 Kms. Then he turns to his right and drives 13 Kms. How far is he from his starting point?  
(a) 10 Kms  
(b) 9 Kms  
(c) 8 Kms  
(d) 5 Kms

30. Bhalwa's house is to the right of vatsal's house at a distance of 20 meters in the time now facing north, sheila's house is in the north east direction of vatsal's house at a distance of 25 m. Dinesh Rathi's house is in which direction with respect to Sheila's house?  
(a) East  
(b) South  
(c) North – East  
(d) West

31. How much far is her bank for her house?  
(a) 33 Kms  
(b) 49 Kms  
(c) 30 Kms  
(d) 39 Kms

32. In which direction is the bank from her house?  
(a) North  
(b) East  
(c) North – East  
(d) None of these

33. Swathi stands with her face pointing to the South – East direction. She walks 15 m and then turns Northwards and walks another 12 m. How far is she from the starting point?  
(a) 3 meters  
(b) 27 meters  
(c) 9 meters  
(d) None of these

34. Karan starts walking towards south. After walking 15 meters he turns towards north. After walking 20 meters, he turns towards east and walks 10 meters. He then turns towards south and walks 5 meters. How far is he from his original position in which direction?  
(a) 10 meters, East  
(b) 10 meters, South – East  
(c) 10 meters, West  
(d) 10 meters, North – East

35. Bhuvika and Susmita start simultaneously towards each other from two places 100 m apart. After walking 30 m, Bhuvika turns left and goes 20 m, then she turns right and goes and comes back to the road on which she had started walking. If both Bhuvika and Susmita walk the same speed, what is the distance between them at this point of time?  
(a) 70 meters  
(b) 40 meters  
(c) 10 meters  
(d) 20 meters

36. 'Babu' village is 20 kilometers to the north of village 'Klan' and village Babua is 18 kilometers to the east of village 'Kamal'. Village 'Pusli' is 12 kilometers to the west of 'Babua'. If Amrit exchanges from village Babua and goes to village Pusli in which direction is he from his starting point?  
(a) North – East  
(b) North – West  
(c) South – East  
(d) North

37. A man is facing north west. He turns 90° in the clockwise direction and then 115° in the anticlockwise direction. Which direction is he facing now?  
(a) East  
(b) West  
(c) North  
(d) South

38. A man is facing north west. He turns 90° in the clockwise direction, then 165° in the anticlockwise direction and then another 90° in the same direction. Which direction is he facing now?  
(a) South  
(b) South – West  
(c) West  
(d) South – East

39. I am facing east. I turn 100° in the clockwise direction and then 45° in the anticlockwise direction. Which direction am I facing now?  
(a) East  
(b) North – east  
(c) North  
(d) South – west
40. One morning after sunrise, Vikram and Shailash were standing in a line with their backs towards each other, Vikram’s shadow fell exactly left hand side. Which direction was Shailash facing?
(a) East  (b) West  (c) North  (d) South

41. One evening before sunset two friends sumit and mohit were talking to each other face to face. If mohit’s shadow was exactly to his right side, which direction was sumit facing.
(a) North  (b) South  (c) Data inadequate  (d) West

**ANSWERS**

01. d  02. d  03. d  04. b  05. e  06. e  07. e  08. d  09. a  10. b  11. b  12. e
25. b  26. b  27. a  28. a  29. d  30. b  31. a  32. e  33. e  34. a  35. d  36. b
37. b  38. d  39. b  40. d  41. b

**TYPE 3: SENSE OF DIRECTION**

These are questions pertaining to movements of a person or a vehicle in a given direction. Using sense of direction, you are required to determine the location of the person or vehicle, after the person or vehicle has covered a certain distance, taking turns towards right to left.

**Example**

A man starts from a point and moves 3 km north, then turns to west and goes 2 km. He then turns south and walks 1 km and then moves 5 km towards east. How far is he from his starting point?
(a) 11 km  (b) 5 km  (c) 10 km  (d) 8 km

**ANSWER:** (b)

**How to Tackle Such Questions?**

1. Keep in mind the directions as given in maps.

![Map diagram](image)

2. Keep in mind the change in direction when a person or vehicle takes a right or a left turn.

<table>
<thead>
<tr>
<th>Direction before taking the turn</th>
<th>Direction in which the person or vehicle will be moving after taking the turn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Right</strong></td>
<td><strong>Left</strong></td>
</tr>
<tr>
<td>North</td>
<td>East</td>
</tr>
<tr>
<td>South</td>
<td>East</td>
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<td>South</td>
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<tr>
<td>West</td>
<td>North</td>
</tr>
<tr>
<td>North</td>
<td>South</td>
</tr>
</tbody>
</table>

Now to solve the question given in the above example, the following picture emerges on visualizing the movement of the person.

![Visual diagram](image)

It may be seen that OAD forms a right angled triangle, whose dimensions can easily be determined. Thus the distance OD may be determined by applying Pythagoras theorem as follows:

\[(OD)^2 = (OA)^2 + (AD)^2 = (3+1)^2 + (5-2)^2 = 4^2 + 3^2 = 16 + 9 = 25\]

Therefore, \((OD)^2 = 25\) or \(OD = 5\ km\).

Let us now look at another example:

A vehicle starts from point A and runs 10 km towards north, turns to its right and runs 15 km. It then turns to its right again and runs another 10 km to reach point B.

01. After reaching point E, how far is the vehicle from the starting point A?
(a) 25 km  (b) 15 km  (c) 10 km  (d) 35 km

02. After taking the second turn, in which direction will the vehicle be moving?
(a) North  (b) East  (c) South  (d) West

**ANSWERS**

01. b  02. e

**Illustrations**

01. Sham travels 7 km North, then turns right and walks 3 km. He again turns to his right hand side and moves 7 km forward. How many km is Sham away from the place of his starting the journey?
(a) 7 km  (b) 3 km  (c) 6 km  (d) 14 km
02. Roeta drives to North of her place of stay at A and finds after travelling 25 km that she has driven in the wrong direction. She then turns to the right and travels 2 km and then again turns right and drives straight another 25 km. How much distance she has now to cover to get back to the point from where she started?
   (a) 25 km  
   (b) 2 km  
   (c) 4 km  
   (d) 10 km

03. Rana travels 10 km North turns left and travels 4 km and then again turns right and covers another 5 km. He then turns to right and travels 2 km and turns left again. He looks at the point of starting his journey?
   (a) 15 km  
   (b) 4 km  
   (c) 5 km  
   (d) 10 km

04. Seeta and Ram both start from a point towards North. Seeta turns left after walking 10 km. Ram turns to right after walking the same distance. Seeta waits for some time and then walks another 5 km, whereas Ram walks only 3 km. They both move to their respective South and walk 15 km forward. How far is Seeta from Ram?
   (a) 15 km  
   (b) 10 km  
   (c) 8 km  
   (d) 12 km

05. A taxi driver commenced his journey from a point and drove another 10 km towards North and turned to his left and drove another 5 km. After waiting to meet one of his friends, he turned to his right and continued to drive another 10 km. He has covered a distance of 25 km so far but in which direction he now may be?
   (a) North  
   (b) East  
   (c) West  
   (d) South

06. There is a ring road connecting points A, B, C and D. The road is in a compact circular form but having several approach roads leading to the centre. Exactly in the centre of the ringroad there is a tree which is 20 km from point A on the circular road. You have taken a round of circular road starting from point A and finish at the same point A and from there reach somewhere in between B and C on the ring road. How much distance you have to travel from the tree to reach the point between B and C on the ring road.
   (a) 20 km  
   (b) 15 km  
   (c) 8 km  
   (d) 40 km

07. A tourist drives 10 km towards East and turns to right-hand side and takes a drive of another 3 km. He then drives towards West (turning to his right) another 3 km. He then turns to his left and walks another 2 km. Afterwards, he turns to his right and arrives at point A. How far is he from his starting point and in which direction?
   (a) 10 km East  
   (b) 9 km North  
   (c) 8 km West  
   (d) 5 km South

08. Rahul walks 10 meters towards South. Then turns to his right and starts walking straight until he completes another 30 meters. Then again turning to his left he walks for 20 meters. He then turns to his left and walks another 30 meters. How far is he from his initial position?
   (a) 20 meters  
   (b) 30 meters  
   (c) 10 meters  
   (d) 60 meters

09. Vandana drove her car for 30 km due West. Then she turned left and drove for 40 km. She then turned left again and drove yet another 30 km. Again she turned left and drove another 30 km. How far do you think she actually drove her car from the initial position?
   (a) 10 km  
   (b) 50 km  
   (c) 30 km  
   (d) None

10. Shaloo and 20 m to the east, then he turned left and walked for 15 m, then turned right and went 25 m and then turned right again and went 15 m. How far was Shaloo from the starting point?
   (a) 40 m  
   (b) 35 m  
   (c) 25 m  
   (d) 15 m
08. Which of the following possibilities would make two roads coincide?
(a) L is 3 km north of A.
(b) C is 1 km west of D.
(c) D is 3 km east of A.
(d) B and E are 5 km apart.

09. If K is parallel to J and K is 1 km south of J and 1 km north of G, then which two roads would be ½ km apart?
(a) I and K
(b) J and K
(c) J and H
(d) G and J

Directions Q 10 – 12: Seven villages A, B, C, D, E, F, G are situated as follows:
E is 2 km to the west of B
F is 2 km to the north of A
C is 1 km to the west of A
D is 2 km to the south of G
Q is 2 km to the east of C
D is exactly in the middle of B and E

10. Which two villages are the farthest from one another?
(a) F and E
(b) G and E
(c) D and C
(d) F and B

11. How far is E and F (in km) as the crow flies?
(a) 5
(b) \(5\sqrt{2}\)
(c) 4
(d) \(\sqrt{50}\)

12. A is middle of
(a) E and G
(b) E and C
(c) G and C
(d) F and G

13. A school going student starts from his house every morning and first travels 3 km to his left, then turns right and travels 4 km. His school from his house is
(a) 1 km
(b) 5 km
(c) 4 km
(d) None of these

Direction Q 14 – 17: Answer the following questions on the basis of the information given below.

Four security guards, P, Q, R, and S have been posted at the four corners of a huge cashew plantations farm as shown in the above figure.

14. Given the condition that none of the corners should be unmanned and both P and R start moving towards diagonally opposite corners, in which direction should S start moving so that he occupies a corner by traveling the minimum possible distance?
(a) Clockwise
(c) Either clockwise or Anti-clockwise
(b) Anti-clockwise
(d) None of these

15. From the original position, P and Q are not on a straight line, clockwise and then moves over to the corner diagonally opposite, R and S move one arm length anti-clockwise and cross over the corner diagonally opposite. The original setting PQR has now changed to
(a) RS\(P\)
(b) SR\(P\)
(c) RQP\(S\)
(d) None of these

16. From the original position, P and R move diagonally to opposite corners and then one side each in the clockwise direction. Which of the corners is unmanned at the moment?
(a) South – West
(b) South – East
(c) North – East
(d) North – West

17. After the movement in 69, who is at the North – West corner?
(a) I
(b) Q
(c) I and Q
(d) None of these

18. Saiul was facing east. He turns 100\(^0\) in the clockwise direction and then 45\(^0\) in the anticlockwise direction. Which direction is he facing now?
(a) East
(b) North
(c) South – West
(d) South

19. San started walking from a point "P" towards south. After walking 40 meters, he took a left turn. He then walked 30 meters and reached a point "Q". What is the straight line distance between P and Q, and Q is towards which direction of P?
(a) 60 meters, south east
(b) 50 meters, south west
(c) 50 meters, south east
(d) None of these

20. Kastam was facing North. He walked 40 meters and turned left to cover 20 mts. He again turned left and walked 40 mts. How far is he from his original position?
(a) 20 mts
(b) 40 mts
(c) 60 mts
(d) 80 mts

21. Chasmit walked southwest for 30 mts. Then she walked east for 60 mts and turned left and walked straight for 60 mts. In which direction is he from one original point?
(a) South east
(b) North west
(c) North east
(d) South

22. Shally traveled 9 km to the west, then turned right and traveled 7 km, then turned left and traveled 8 km, then turned back and traveled 11 km, then turned right and traveled 7 km. How far is he from the starting point?
(a) 3 km
(b) 6 km
(c) 7 km
(d) 9 km

23. Inspector Latie traveled from his police station for 400 meters. He then turns left and traveled 500 meters straight after which he turned left again and traveled for 400 meters straight. He then turned right and walked for another 600 meters straight. How far is he from the Police post?
(a) 1.0 km
(b) 1.1 km
(c) 1.4 km
(d) 1.8 km

24. A puppy was trying to find its mother. It was facing east and walked for 10 mts. It turned south then and walked another 10 mts. Then it started walking Northwards it walked for 20 mts and turned west. It walked 10 mts and moved south for 2 mts. In which direction is it from the original position and how far?
(a) 60 mts
(b) 10 mts
(c) 60 mts north
(d) can't determined

25. Mr vivek walks 6 m North East and then 6 m South East. Then she moves 2 m South and 4 m West. What is the straight distance between the point she started and finally reached?
(a) 12 m
(b) 14 m
(c) 12 m
(d) 2 m

KEYS:
01. a
02. c
03. c
04. a
05. d
06. a
07. d
08. b
09. b
10. a
11. c
12. c
13. a
14. b
15. c
16. b
17. c
18. b
19. d
20. b
21. c
22. d
23. e
24. e
25. d
(2) Logical Venn Diagrams

In these tests a relationship is to be established between two or more items represented by diagrams. The items represented by the diagrams may be individuals, a particular group class of people (items) etc.

From these two types of problems:
1. Type 1: From statement (items) to Diagram
2. Type 2: From Diagrams to statements

Type 1

Example

You are required to choose from the five diagrams the one that best illustrates the relationship among the three given classes in the questions that follows. (The size of the circles does not indicate relative sizes of classes).

(a)  
(b)  
(c)  
(d)  
(e)  

Questions:
1. Criminals, Pick – Pocketers, Arsonists
2. Dogs, Friendly animals, can
3. Potato, Vegetables, Fruits
4. Liquids, milk, River water
5. Food, cutlery, spoons

Ans:
1) e  2) d  3) a  4) b  5) c

Explanations
1. Both arsonists and pick – pocketers come under the class of criminals. However, some pick – pocketers can be Arsonists and vice versa.

Type 2

Sample

The diagram below depicts BSC (Hons) students, studying chemistry, physics and mathematics, what does the shaded portion depict?

A = Students studying Chemistry
B = Students studying Physics
C = Students studying Mathematics

(a) Students who study chemistry and physics
(b) Students who study physics and mathematics
(c) Students who study chemistry, Physics and Mathematics
(d) Students who study chemistry and Mathematics.

Answer
c) The shaded portion is common to all the three circles. Therefore it represents those students who are studying all the three subjects.
1. Doctors, Engineers, lawyers (Ans: a)
2. Table, Chair, Furniture (Ans: b)
3. Men, Fathers, Brothers (Ans: c)
4. Females, Mothers, Daughters (Ans: g)
5. Elephants, Cats, Animals (Ans: b)
6. Carrot, Food, Vegetable (Ans: a)
7. Woman, Mother, Widows (Ans: g)
8. Authors, Teachers, Men (Ans: b)
9. Boys, Students, Athletes (Ans: b)
10. Tennis fans, Cricket players, students (Ans: b)
11. Mountains, Forests, Earth (Ans: e)
12. Doctors, Mothers, Fathers (Ans: d)
13. Fathers, Mothers, Books (Ans: e)
15. Primates, Elephants, Ape (Ans: b)
16. Blackmen, Indians, Americans (Ans: a)
17. Match fixing, cricket players, Indian (Ans: b)

Ven diagrams – II
(Diagrams to statements)

1. Which of the following statements is true?
(a) All urban are graduates
(b) All graduates are urban
(c) All the urban government employees are graduates.
(d) All teachers are urban people

2. Choose the correct statements?
(a) There are some urban teachers who are government employees as well as graduates.
(b) No teacher is a government employee.
(c) All government employees are urban people.
(d) All government employees are graduates.

3. Mark the correct statement?
(a) All nonurban teachers are government employees.
(b) All non-urban government employees are teachers.
(c) There are some non-urban graduates who are neither teachers nor government employees.
(d) All non-urban government employees are graduates.

4. Which of the following statements is not true?
(a) Some government employees are rural.
(b) All teachers are urban.
(c) Teachers who are government employees are urban.
(d) All govt. Employees are urban people.
05. Indians who are Artists but not singers are represented by
   (a) a                           (b) b                           (c) c                           (d) d
06. Artists who are neither Indians nor singers are represented by
   (a) b                           (b) c                           (c) f                           (d) g
07. Indians who are singers but not Artists represented by
   (a) d                           (b) f                           (c) e                           (d) b
08. Indians who are Artists as well as singers are represented by
   (a) d                           (b) b                           (c) e                           (d) c

Directions:
Read the following diagram carefully and the questions that follows.

09. Who among the following are teachers graduates (or) teachers but not politicians
   (a) B, G                           (b) G, H                           (c) A, E                           (d) E, F
10. Who among the following politicians are graduates but not the numbers of parliament?
    (a) B, C                           (b) L, B                           (c) D, L                           (d) A, H, L
11. Who among the following politicians are neither teachers nor graduates?
    (a) E, F                           (b) D, E                           (c) C, D                           (d) L, H
12. Who among the following members of parliament is a graduate as well as a teacher?
    (a) G                           (b) F                           (c) C                           (d) H

The following questions are based on the diagram given below

13. Who among the following is an educated male who is not an urban resident?
    (a) 2                           (b) 3                           (c) 6                           (d) 10
14. Who among the following is neither a civil servant nor educated but is urban and not a male?
    (a) 2                           (b) 5                           (c) 9                           (d) 11
15. Who among the following is a female, urban resident and also a civil servant?
    (a) 6                           (b) 7                           (c) 10                           (d) 13
16. Who among the following is an educated male who hails from urban area?
    (a) 4                           (b) 2                           (c) 11                           (d) 5
17. Who among following is an educated and also an urban male?
    (a) 2                           (b) 3                           (c) 11                           (d) 12
18. Who among the following is only a civil servant but not a male nor urban oriented and un educated?
    (a) 7                           (b) 8                           (c) 9                           (d) 14
19. Who among the following is a male, urban oriented and also a civil servant but not educated?
    (a) 13                           (b) 12                           (c) 6                           (d) 10
20. Who among the following is a male civil servant, who is neither educated nor belongs to urban area?
    (a) 7                           (b) 13                           (c) 4                           (d) 1
LOGICAL VENN DIAGRAMS

From Diagrams to Statements

Read the following diagram carefully and answer the question that follows.

Graduate
Urban People
Government employees
Teachers

21. Which of the following statements is true?
(a) All urban peoples are graduates.
(b) All Graduates are urban peoples.
(c) All urban Government employees are graduates.
(d) All teachers are urban peoples.

22. Choose the correct statements:
(a) There are some urban teachers who are Govt. employees as well as graduates.
(b) No teacher is a govt. Employee.
(c) All Govt. employees are urban people.
(d) All Govt. employees are Graduates.

23. Mark the correct statement:
(a) All Urban teachers who are Govt. Employees.
(b) All Urban Govt. employees are teachers.
(c) There are some non urban Graduates who are neither teachers nor Government employees.
(d) All Urban are Teachers.

24. Which of the following statement is not true?
(a) Some Government employees are Rural.
(b) All teachers are Urban.
(c) Teachers who are Government employees are urban.
(d) All Govt. Employees are urban people.

II. Study the following diagram carefully answer the questions that follow.

Indians

Artists

Singers

25. Indians who are Artists but not singers represented by
(a) a
(b) b
(c) c
(d) d

26. Artists who are neither Indians nor singers represented by
(a) b
(b) c
(c) d
(d) e

27. Indians who are singers but not Artists represented by
(a) b
(b) c
(c) d
(d) e

28. Indians who are Artists as well as singers are represented by
(a) b
(b) c
(c) d
(d) e

III. Study the following diagram carefully and Answer the questions that follow.

Rural

Gradsutates

Hard Working

Honest

29. Graduates, Hard working and Honest rural people.
(a) 1
(b) 2
(c) 3
(d) 9

30. Rural people, who are hard working and Graduates but not Honest are by
(a) 1
(b) 2
(c) 3
(d) 9

31. Urban Graduates, who are Hard working but not Honest
(a) 7
(b) 11
(c) 5
(d) 12

32. Rural Graduates who are neither Hard working nor Honest
(a) 7
(b) 11
(c) 5
(d) 8

ANSWERS

01. b 02. a 03. c 04. d 05. b 06. e 07. a 08. d 09. c 10. a 11. d 12. b
25. b 26. c 27. a 28. d 29. a 30. b 31. a 32. c
In these tests, the success of a candidate depends upon the knowledge of the blood relations, some of which are summarized below to help solve these tests.

1. Mother's (or) father's son = Brother
2. Mother's (or) father's sister = Sister
3. Mother's (or) father's Brother = Uncle
4. Mother's (or) father's sister = Aunt
5. Mother's (or) father's father = Grand Father
6. Mother's (or) father's mother = Grand Mother
7. Son's wife = Daughter-in-law
8. Daughter's Husband = Son-in-law
9. Husband's (or) wife's Father = Father-in-law
10. Husband's (or) wife's Mother = Mother-in-law
11. Husband's (or) wife's sister = Sister-in-law
12. Husband's (or) wife's Brother = Brother-in-law
13. Sister's Husband = Brother-in-law
14. Brother's (or) Sister's Son = Brother-in-law
15. Brother's (or) Sister's Daughter = Nephew
16. Uncle's (or) Aunt's son (or) Daughter = Niece
17. Uncle's (or) Aunt's son (or) Daughter = Cousin
18. Uncle's (or) Aunt's Grand son = Nephew
19. Grand son’s (or) Grand daughter = Great Grand daughter

Type of problems

1. Single person Blood Relation
2. Mixed Blood Relations
3. Coded Blood Relations
MIXED BLOOD RELATIONS

In this type, mutual blood relations on either internation of more than two persons are mentioned and information about any two mentioned.

Ex. 1 A and B are brothers, C and D are sisters. A’s son is D’s brother. How is B related to C?
   a) Father   b) Brother   c) Grand father
   d) Uncle   e) None of these

SOL The above problem can be solved from following blood relation tree.

A ————- B
   (1)
D ————- C
   (3)

Clearly, A is C’s father, So, the Father’s Brother is uncle, Hence, the answer (D).

CODED BLOOD RELATIONS

In such questions, the relationships are represented by certain codes (or) symbols such as X, Y, Z, etc. The relationships between certain persons given in the form of these codes, are to be analysed.

Ex. 1 If A + B means A is the sister of B, A - B means A is the brother of B. A X B means A is the daughter of B which of the following shows the relation that E is the maternal uncle of D.
   a) D + F x E   b) D - F x E   c) F x E
   d) D x F - E   e) None of these

SOL Clearly, E is the maternal uncle of D means D is the daughter of the sister (Sey F) of E i.e., D x F Hence, the answer is (C).

BLOOD RELATIONS

1. Single Person R.R. (Direct)

1. Arul introduces raju as the son of the only brother of his father’s wife. How is Rohit related to Arul?
   a) Cousin   b) Son   c) Uncle
   d) Son-in-law e) Brother

2. Pointing towards a person in a photograph, Anjali said, “He is the only son of father of my sister’s brother”. How is that person related to Anjali?
   a) Mother   b) Father   c) Maternal uncle
   d) Cousin   e) None of these

3. Pointing out to a photograph a man tells his friend, “She is the daughter of the only son of my father’s wife”. How is the girl in the photograph related to the man?
   a) Daughter   b) Cousin   c) Mother
   d) Sister   e) None

4. Pointing out to a lady, Raja said, “She is the daughter of the woman who is the mother of my husband’s mother”. Who is the lady to Rajan?
   a) Aunt   b) Grand daughter   c) Daughter
   d) Sister   e) Sister-in-law

5. Pointing to a man on the stage, Rita said, “He is the brother of the daughter of the wife of my husband”. How is the man on the stage related to Rita?
   a) Son   b) Husband   c) Cousin
   d) Nephew   e) Brother-in-law

6. Showing the man receiving the prize, Sarvesh said, “He is the brother of my uncle’s daughter”. Who is the man to Sarvesh?
   a) Son   b) Brother-in-law   c) Nephew
   d) Uncle   e) Cousin

7. Pointing to a photograph, a person tells his friend, “She is the grand daughter of the elder brother of my father”. How is the girl in the photograph related to that man?
   a) Niece   b) Sister   c) Aunt
   d) Sister-in-law e) Maternal aunt

8. A woman introduces a man as the son of the brother of her mother. How is the man related to the woman?
   a) Nephew   b) Son   c) Cousin
   d) Uncle   e) Grandson

9. Pointing out to a lady, a girl said, she is the daughter-in-law of the grand mother of my father’s only son. How is the lady related to the girl?
   a) Sister-in-law   b) Mother   c) Aunt
   d) Mother-in-law   e) Cousin

10. Introducing a man, a woman said, “He is the only son of my mother’s mother”. How is the woman related to the man?
    a) Mother   b) Aunt   c) Sister   d) Niece

11. Deepak said to Nitin, “That boy playing football is the younger of the two brother of the daughter of my father’s wife”. How is the boy playing football related to Deepak?
    a) Son   b) Brother   c) Cousin   d) Nephew

12. Pointing to the lady on the platform Manju said, “She is the sister of the father of my mother’s son”. Who’s is the lady to Manju?
    a) Mother   b) Sister   c) Aunt
    d) Niece   e) None of these
b. Single person B.B. (In Direct)

13. Pointing to a man, a woman said, "His mother is the only daughter of my mother". How is the woman related to the man?
   a) Mother          b) Daughter          c) Sister          d) Grand mother          e) None of these

14. A man said to a lady "your mother's husband's sister is my aunt". How is the lady related to the man?
   a) Daughter          b) Grand daughter          c) Mother          d) Sister          e) Aunt

15. Pointing to a gentleman, Dorek said, "His only brother is the father of my daughter's father". How is the gentleman related to Deepak?
   a) Grand father          b) Father          c) Brother-in-law          d) Uncle          e) None of these

16. If Kamal says, Ravi's mother is the only daughter of my mother". How is Kamal related to Ravi?
   a) Grand father          b) Father          c) Brother          d) Cannot be determined          e) None of these

17. Pointing to a man in a photograph, Ahma said, "His mother's only daughter is my mother". How is Ahma related to that man?
   a) Nephew          b) Sister          c) Wife          d) niece          e) Grand daughter

18. Pointing to a photograph, a woman says, "This Man's son's sister is my mother-in-law". How is the woman's husband related to the man in the photograph?
   a) Grand son          b) Son          c) Son-in-law          d) Nephew          e) None of these

19. Introducing a man, a woman said, "His wife is the only daughter of my father". How is that man related to the woman?
   a) Brother          b) Father-in-law          c) Maternal Uncle          d) Husband          e) None of these

20. Pointing to a man in a photograph, a woman said, "His brother's father is the only son of my grand father". How is the woman related to the man in the photograph?
   a) Mother          b) Aunt          c) Sister          d) Daughter          e) Grand mother

21. Pointing to a boy a man said, "His only brother's mother is my father's wife". How is the boy related to the man?
   a) Brother          b) Nephew          c) Uncle          d) Father          e) None of these

22. Introducing Kiran, Manoj said, "Her father's the only son of my father". How is Manoj related to Kiran?
   a) Brother          b) Father          c) Son          d) Uncle

23. A man said to a woman: "Your mother's husband's sister is my aunt". How is the woman related to the man?
   a) Sister          b) Daughter          c) Grand daughter          d) Aunt

24. Navin says to Asha that "Namrata is the only daughter of my father's only daughter-in-law". How is Namrata related to Navin?
   a) Niece          b) Sister          c) Daughter          d) Cannot determine

**MIXED BLOOD RELATIONS**

25. A and B are brothers. C and D are sister's A's son is D's brother. How is B related to C?
   a) Father          b) Brother          c) Grand father          d) Uncle          e) None of these

26. A party consists of grandmother, Father, four sons and their wives and one son and two daughters of each of the sons. How many females are there in all?
   a) 14          b) 16          c) 18          d) 24          e) None of these

27. Days has a brother of Anil. Days in the son of Chandra. Bimal is Chandra's father. In terms of relationship, what is Anil of Bimal?
   a) Son          b) Grand son          c) Brother          d) Grand father

28. Rahul's mother is the only daughter of Mounika's father. How is mounika's husband related to Rahul?
   a) Uncle          b) Father          c) Grand father          d) Brother          e) Data inadequate

29. If (i) M is brother of N (ii) B is brother of N, and (iii) M is brother of D, then which of the following statements is definitely true?
   a) N is brother of B          b) N is brother of D          c) M is brother of B          d) D is brother of M          e) None of these

30. Deepak is brother of Ravi, Rekha is sister of Anil, Ravi is son of Rekha. How is Deepak related to Rekha?
   a) Son          b) Brother          c) Nephew          d) Father

31. A is B's sister, C is B's mother. D is C's Father E mother. Then, how is A related to D?
   a) Grand mother          b) Grand father          c) Daughter          d) Grand daughter

32. Given that:
   1. A is brother of B
   2. C is Father of A
   3. D is brother of E
   4. E is daughter of B
   Then uncle of D is
   a) A          b) B          c) C          d) E
33. Lakshmi and Mona are Jahan’s wife Shafali and Mona’s step-daughter. How is Lakshmi related to Shafali?
   a) Sister b) Mother-in-law c) Mother d) Step-mother e) None of these

Read the following information carefully and answer the questions given below.

There are six children playing. Foot ball namely A, B, C, D, E, and F are brother. F is the sister of E, C is the only son of X’s. Uncle B and D are the daughter of the brother of C’s father.

Questions:
34. How is C related to F?
   a) Cousin b) Brother c) Son d) Uncle e) None of these

35. How many male players are there?
   a) One b) Three c) Four d) Six e) Five

36. How many female players are there?
   a) Two b) Three c) Five d) Four e) None of these

37. How is D related to A?
   a) Uncle b) Sister c) Niece d) Cousin e) None of these

Read the information given below and answer the questions that follow.

1. In a family of six person A, B, C, D, E, and F there are two married couples.
2. D is grand mother of A and mentor B.
3. C is wife of B and mother of F.
4. F is the grand daughter of E.

Questions:
38. What is C to A?
   a) Daughter b) Grand mother c) Can not be determined d) None of these

39. How many male members are there in the family.
   a) Two b) Three c) Four d) Cannot be determined e) None of these

40. Which of the following is true?
   a) A is brother of F b) A is sister of F c) C is the father of F d) A has two daughters e) None of these

41. Who among the following is one of the couples?
   a) CD b) DE c) CB d) Cannot be determined e) None of these

Directions
Study the following information carefully and answer the questions given below.

All the six members of a family A, B, C, D, E, and F are travelling together. B is the sister of C but is not the mother of B. A and D are a married couple.

E is the brother of C, D is the daughter of A, F is the brother of B.

42. How many male members are there in the family?
   a) 1 b) 2 c) 3 d) 4

43. Who is the mother of B?
   a) D b) F c) E d) A

44. How many children does A have?
   a) One b) Two c) Three d) Four

45. Who is the wife of E?
   a) A b) F c) B d) Cannot be determined

46. Which of the following is a pair of females?
   a) AE b) BD c) DF d) AD

47. How is E related to D?
   a) Father b) Brother c) Uncle d) Cannot be determined

Directions
Read the following information carefully and answer the questions given below.

I, A, B, C, D, E, and F are six members of a family.
II. One couple has parents and their children in the family.
III. A is the son of C and E is the daughter of A.
IV. D is the daughter of F who is the mother of E.
V. B is mother of F.

Questions:
48. Who are the male members in the family
   a) A and C b) C and F c) A, B and D d) Cannot be determined e) None of these

49. Which of the following pairs is/are the parents of the children?
   a) BC b) CF c) BF d) Cannot be determined e) None of these

50. Which of the following pairs is/are the parents of the couple?
   a) AB b) BC c) AF d) CF e) None of these
51. How many female members are there in the family?
   a) Two  b) Three  c) Four  d) Cannot be determined  e) None of these

52. What relationship D and E bear to each other?
   a) Sister and Brother  b) Mother and Son  c) General mother and grand daughter
d) Sister  e) None of these

Directions
Study the following information carefully and answer the question given below it.

There are six persons; A, B, C, D, E and F. C is the sister of F, B is the brother of E's husband, D is the father of A and grandfather of F. There are two fathers, three brothers and a mother in the group.

Questions:
53. Who is the mother?
   a) A  b) B  c) C  d) D  e) E

54. Who is E's husband?
   a) B  b) C  c) A  d) F

55. How many male members are there in the group?
   a) One  b) Two  c) Three  d) Four

56. How is F related to E?
   a) Uncle  b) Husband  c) Son  d) Daughter

57. Which of the following is a group of brother?
   a) ABF  b) ABD  c) BCD  d) BDF

Direction:
Read the following information carefully and answer the questions given below it.

A family consisting of six persons, P, Q, R, X, Y and Z. Q is the son of R but R is not mother of Q. P and R are married couple. Y is the brother of R, X is the daughter of P. Z is the brother of P.

Questions:
58. Who is the brother-in-law of R?
   a) P  b) Z  c) Y  d) X

59. Who is the father of Q?
   a) R  b) P  c) Z  d) None of these

60. How many female members are there in the family?
   a) One  b) Two  c) Three  d) Four

ACE Academy

NUMERICAL REASONING

61. How is Q related to x?
   a) Husband  b) Father  c) Brother  d) Uncle

62. Which is a pair of brothers?
   a) P and X  b) P and Z  c) Q and X  d) R and Y

63. How many children does P have?
   a) One  b) Two  c) Three  d) Four

CODED BLOOD RELATIONS

64. P x Q means P is the sister of Q. Q x P means P is the father of Q. Which of the following means S is the mother of T?
   a) T x M x S  b) S x T x M  c) S x M x R x T  d) None of these

65. If A x B means A is the son of B, A x B means A is the sister of B. Which of the following is the father of A?
   a) P x B = B x R x Q  b) P x B = B x R x Q  c) P = B x R x Q  d) None of these

66. If P x Q means P is the brother of Q, P x Q means P is the father of Q, P x Q means P is the sister of Q. Which of the following represents S is the niece of T?
   a) T x M x S = K  b) K = S + M + T  c) T + M x S = K  d) None of these

67. If P x Q means P is the husband of Q, P x Q means P is the sister of Q on P x Q means P is the son of Q which of the following shows A is the daughter of Y?
   a) C x A  b) B x C x A  c) B x C + A  d) A = D x B  e) None of these

68. X−Z means X is the mother of Z, x y means Y is the son of X, x & y x means Y is the daughter of Z. Now, if M − N x T + Q then which of the following is not true?
   a) T is N's daughter  b) N is wife of Q  c) M is mother-in-law of Q  d) Q is wife of M  e) T is grand daughter of M

69. A x B means A is the father of B, A x B means A is the sister of B. Which of the following is true?
   a) P = R + S + Q  b) Q is the aunt of P  c) P is the aunt of Q  d) P is the mother of Q

70. If P x R + Q, which of the following statements is true?
   a) P is the mother of Q  b) Q is the daughter of P  c) P is the aunt of Q  d) P is the sister of Q

71. If P x R − Q which of the following statement is true?
   a) P is the uncle of Q  b) F is the father of Q  c) P is the brother of Q  d) P is the son of Q
1. Read the following information carefully and answer the questions that follow: A + B means A is the son of B, A – B means A is the wife of B, A x B means A is brother of B, A ÷ B means A is the mother of B and A = B means A is the sister of B.

2. Read the following information carefully and answer the questions given below. A + B means A is the daughter of B, A x B means A is the son of B and A – B means A is the wife of B.

ANSWERS

01. a
02. e
03. a
04. a
05. a
06. e

07. a
08. e
09. b
10. d
11. b
12. b

13. a
14. d
15. d
16. e
17. d
18. a

19. d
20. e
21. a
22. b
23. a
24. c

25. d
26. e
27. b
28. b
29. e
30. a

31. d
32. a
33. c
34. a
35. b
36. b

37. d
38. a
39. d
40. e
41. b
42. d

43. d
44. e
45. d
46. e
47. e
48. d

49. e
50. b
51. c
52. d
53. c
54. c

55. d
56. e
57. a
58. b
59. a
60. b

61. e
62. d
63. b
64. e
65. a
66. e

67. d
68. b
69. e
70. a
71. d
72. a

73. c
74. d
75. e
76. f
77. g
78. h

79. i
80. j
81. k
82. l
83. m
84. n

85. o

*** ALL THE BEST ***
ASSIGNMENTS

01. (a) A only  (b) B only  (c) C and D only  (d) A, B, C, and D

02. (a) A only  (b) B only  (c) C and D only  (d) A, B, C, and D

03. (a) 1  (b) 2  (c) 5  (d) 6

04. What number is opposite 4?

(a) 1  (b) 2  (c) 3  (d) 6

05. What number is opposite 3?

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

06. Which number is on the face opposite 4?

(a) 1  (b) 2  (c) 3  (d) 6
07. Which number is opposite 3?
(a) 1  (b) 2  (c) 4  (d) 6

08. What should be the number opposite 3?
(a) 1  (b) 6  (c) 5  (d) 4

09. Two positions of a dice are shown below. If 1 is at the bottom, which number will be on the top?
(a) 2  (b) 3  (c) 4  (d) 5

10. Two positions of a dice with 1 to 6 dots on its sides are shown below. If the dice is resting on the side with the dots what will be the number of dots on the side at the top?
(a) 1 or 5  (b) 2  (c) 3  (d) 5

11. What will be the number at the bottom if 5 is at the top, two positions of the dice being as given below?
(a) 1  (b) 2  (c) 3  (d) 6

12. How many cubes will have one face painted only in blue?
(a) 2  (b) 2  (c) 3  (d) 4

13. How many cubes will have one face painted only in green?
(a) 1  (b) 2  (c) 3  (d) 4

14. How many cubes are formed in all?
(a) 16  (b) 24  (c) 27  (d) 32

15. How many cubes will have at least three sides painted?
(a) 8  (b) 6  (c) 3  (d) 2

16. How many cubes will have no face painted at all?
(a) 1  (b) 2  (c) 3  (d) 4
A solid cube of each side 5 cm, has been painted red, blue and green on pairs of opposite faces. It is then cut into cubical blocks of each side 1 cm.

17. How many cubes have no face painted?
   (a) 14  (b) 21  (c) 27  (d) 35

18. How many cubes have only one face painted?
   (a) 27  (b) 49  (c) 54  (d) 84

19. How many cubes have only two faces painted?
   (a) 24  (b) 36  (c) 48  (d) 60

20. How many cubes have only three faces painted?
   (a) 8  (b) 12  (c) 16  (d) 20

21. How many cubes have three faces painted with different colours?
   (a) 6  (b) 6  (c) 8  (d) 10

22. How many cubes have two faces painted with red and green and all other faces un-painted?
   (a) 8  (b) 12  (c) 16  (d) 20

23. How many have only one face painted; red all other faces un-painted?
   (a) 9  (b) 12  (c) 15  (d) 18

24. How many cubes have two faces painted; Green?
   (a) 6  (b) 12  (c) 16  (d) None

25. How many cubes have one face painted red and one face painted blue and other faces may be painted or un-painted?
   (a) 8  (b) 12  (c) 16  (d) 20

A cube is coloured red on all faces. It is cut into 64 smaller cubes of equal size. Now answer the following questions based on this statement.

26. How many cubes are there in all?
   (a) 25  (b) 75  (c) 125  (d) 150

Directions

27. How many cubes have no face coloured?
   (a) 4  (b) 16  (c) 8  (d) 0

28. How many cubes have only one face coloured?
   (a) 4  (b) 8  (c) 16  (d) 24

29. How many cubes have two opposite faces?
   (a) 0  (b) 8  (c) 16  (d) 24

30. How many cubes have three faces coloured?
   (a) 24  (b) 16  (c) 8  (d) 14

Directions

A cube is painted red on two adjacent faces and black on the faces opposite to the red faces and green on the remaining faces. It is cut into 64 smaller cubes of equal size.
31. How many cubes are there which have no face painted?
   (a) 6  (b) 4  (c) 8  (d) 15
32. How many cubes have only one face painted?
   (a) 8  (b) 16  (c) 24  (d) 32
33. How many cubes have less than three faces painted?
   (a) 8  (b) 24  (c) 28  (d) 48
34. How many cubes are there with three faces painted?
   (a) 4  (b) 8  (c) 16  (d) 24
35. How many cubes have one face green and one of the adjacent faces black or red?
   (a) 8  (b) 16  (c) 24  (d) 28

Direction:
The length of each side of a cube is 5 cm. The outer border of the width of 1 cm is painted yellow on each side and the remaining space enclosed by this 1 cm. border is painted ink. This cube is cut into 127 smaller cubes of each side 1 cm. When these smaller cubes are separated...

36. How many cubes have all the faces unlabeled?
   (a) 0  (b) a  (c) 18  (d) 27
37. How many cubes have three faces colored yellow?
   (a) 2  (b) 4  (c) 8  (d) 10
38. How many cubes have at least two faces colored yellow?
   (a) 24  (b) 44  (c) 48  (d) 96
39. How many cubes have one face pink and an adjacent face yellow
   (a) 0  (b) 1  (c) 2  (d) 4
40. How many cubes have at least one face colored
   (a) 27  (b) 48  (c) 98  (d) 121

KEY:
0.6 0.2 0.3 0.6 0.4 0.5 0.6 0.7 0.8 0.9 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0
1. In figure 1, which symbol will appear opposite to the square □?
   (a) ○ (b) △ (c) (d) △

2. In figure 2, which symbol will appear on the face opposite to the face containing a circle ○?
   (a) △ (b) ○ (c) (d) △

3. In figure 3, which symbol will appear on the face opposite to the face containing a double square □:
   (a) △ (b) ○ (c) (d) △

4. In figure 4, which symbol will appear on the face opposite to the face containing a triangle △?
   (a) △ (b) △ (c) (d) △

ANSWER: The open view of the cube shown below explains the various views of the above questions.

The unfolded view of the cube is given below, to explain the answers.

Illustration II

In some reasoning questions on cubes and dices, various views of a cube/dice are given. On each face a number is given. In one cube, one face is blank. You have to decide which number should come in the blank face.

1. Directions: The following diagram depicts various views of a cube. Each face has some number, whereas in cube 4, one face is blank. From the answer choices, select the number that should come in the blank face.
By countoting the figures on various faces, the number on the blank face can be determined. The assigned view of the cube will also help in explaining the answer.

Illustration IV

Answer: C.

Another set of questions deals with cubes displaying various views. You have to answer questions based on the type of cube involved in the set.

Directions: The cubes shown here have different symbol-meanings on their faces. Each question has five views of cubes. You have to determine how many different cubes are involved in each case.

Answers have to be marked as follows:
(a) In case only one cube is involved.
(b) In case two cubes are involved.
(c) In case three cubes are involved.
(d) In case four cubes are involved.
(e) In case five or more cubes are involved.

Answers: A.

Answers: B.

Answers: B.
Select the correct one from the answer figures A, B, C and D.

![Diagram of cubes with numbers](image)

Explanation: The development of the block is shown below.

![Development of the block](image)

Only option B can have the development matching the above one. In the rest of the blocks, point 2 is linked to point 6 or 8. This is not so in the original cube.

CLASSWORK

Directions:
The cube (x) given on the left in each problem, is folded to form a box, choose from amongst the alternatives (a), (b), (c), and (d) the boxes that are similar to the box formed.

1. ![Cube with numbers](image)

   a) ![Box A](image)
   b) ![Box B](image)
   c) ![Box C](image)
   d) ![Box D](image)

2. ![Cube with numbers](image)

   a) ![Box A](image)
   b) ![Box B](image)
   c) ![Box C](image)
   d) ![Box D](image)
05. A die is thrown four times and its four different positions are given below. Find the number on the face opposite the face showing 2.

- (i) 5
- (ii) 3
- (iii) 4
- (iv) 6

(a) 3  (b) 4  (c) 5  (d) 6

06. Shown below are, four different positions of the dice. Find the number on the face opposite the face showing 6.

- (i) 6
- (ii) 1
- (iii) 4
- (iv) 3

(a) 1  (b) 2  (c) 4  (d) 5

07. What number is on the face opposite 6

- (i) 2
- (ii) 3
- (iii) 1
- (iv) 4

(a) 1  (b) 2  (c) 3  (d) 4

08. Find the alphabet opposite A

(a) B  (b) C  (c) D  (d) E

09. How many dots lie opposite 2 dots?

- (i) 3
- (ii) 5
- (iii) 6

(a) 1  (b) 3  (c) 5  (d) 6
Directions:
A solid cube of each side 2 cm has been painted red, blue and black on pairs of opposite faces. It is then cut into cubical blocks of each side 2 cm.

10. How many cubes have no face painted?
(a) 8  (b) 4  (c) 8  (d) 12

11. How many cubes have only one face painted?
(a) 8  (b) 16  (c) 24  (d) 25

12. How many cubes have only two faces painted?
(a) 8  (b) 16  (c) 20  (d) 24

13. How many cubes have three faces painted?
(a) 0  (b) 4  (c) 6  (d) 12

14. How many cubes have three faces painted with different colours?
(a) 0  (b) 4  (c) 8  (d) 8

15. How many cubes have two faces painted red and black and all other faces unpainted?
(a) 4  (b) 8  (c) 16  (d) 32

16. How many cubes have only one face painted red and all other faces unpainted?
(a) 4  (b) 8  (c) 12  (d) 16

17. How many cubes have two faces painted black?
(a) 2  (b) 4  (c) 8  (d) None

18. How many cubes are there in all?
(a) 64  (b) 56  (c) 40  (d) 32

19. How many cubes have one face painted red and one face painted blue? (The other faces may be painted unpainted?)
(a) 8  (b) 12  (c) 4  (d) 0

Key:
(a) 0  (b) 0  (c) 0  (d) 0

Illustration III:
In the questions given above, the cubes usually have numbers 1 to 6 on some distinguishing symbols on each face. These cubes are known as regular cubes. In some cases, questions are based on 'curious' types of cubes. An example is given below.

Directions: The illustration below shows three views of the same (but rather 'curious') cube. Find out how many spots there are on the face directly opposite to the face of the third cube having six spots.

(A) Three  (B) Two  (C) One  (D) Four

Answer: B

The face directly opposite to the face with six spots has two spots. The cube is not a regular cube but a curious one.

The answer is explained by unfolding the cube as shown above.
(5) CODING AND DECODING TESTS

Codes are used for conveying secret messages from one place to another, especially in the defense services. The codes are based on various principle/patterns, which are required to be deciphered by the receiver, so as to get the correct message.

Coding and decoding tests are becoming very popular in competitive examinations. They call for careful observation and analytical aptitude. These tests can be broadly classified into several categories.

1. Alphabetical coding (or) letter coding
2. Number coding
3. Substitution coding
4. Mixed coding

1. Alphabetical (or) letter coding

The letters of the alphabet may be used in the coding scheme, the letters to be coded are allotted other letters to stand for them. Questions on letter coding can be of different types.

Examples of the important ones are given below:

Ex 1:

If "SPIEA" stands for "BLADE", how will you code "SALE"

Ans: SPTA

Explanation:

"BLADE" has been coded as "SPIEA". You will see that all the letters in the word "BLADE", which have to be coded, are also there in the word "SPIEA". Hence all that needs to be done is to choose the relevant code letters from the code word "SPIEA". Thus, B becomes A, L becomes E, A becomes F, and D becomes A. Therefore "BALE" will be coded as "SPTA".

Ex 2:

If in a certain code, "TEACHER" is written as "VOCREGT", how would "DULLARD" be written in the same code?

(a) FWNNCTD (b) FWNBNCTF (c) FWNNCF (d) FWNCTF (e) None of these

In same way

D 4 2 E L A R D
U 4 2 L A R D
L 4 2 L A R D
A 4 2 L A R D
R 4 2 L A R D
D 4 2 L A R D

Ans: D

ACE Academy

NUMERICAL REASONING

NUMBER CODING

In this coding scheme, the letters of the alphabet are allotted a numerical value. There are several methods of allotting numerical values to letters of alphabet. These will be discussed in this section.

Ex 1:

If "DOES" is coded as "46521", how will you code the word "DOES"?

(a) 36215 (b) 5126 (c) 6231 (d) 6213 (e) 3265

Ex 2:

If "DATE" is coded as "23-24-7-22" how will you code "ZEAR"?

(a) 73-24-27-7 (b) 73-24-7-27 (c) 23-7-4-27 (d) 73-27-24-7 (e) 73-24-7-27

SUBSTITUTION

In this type of question, some particular objects are assigned code names. Then a question is asked that is to be answered in the code language.

Ex 1:

If cook is called Butter, butter is called manager, Manager is called teacher, teacher is called clerk and clerk is called principle, who will teach in a class?

(a) Cook (b) Butter (c) Manager (d) Teacher (e) Clerk

Sol: Cook, 'teacher' teacher in class and so given teacher is called 'clerk'. So, a clerk will teach in the class. Hence, the answer is (E).

MIXED LETTER CODING

In this type of questions, three (or) four complete messages are given in the coded language and the code for a particular word is asked. To analyze such codes, any two message bearing a common word are picked up. The common coded word will mean this word. Proceeding similarly by picking up all possible combinations of two, the entire message can be analyzed.

Ex 1:

If "nou nai cha'su" stands for "Sharma gets married gift, pt. leem wop cha'su" stands for "wife gives marriage gift". M= wop ni stands for "he gives nothing". What would mean "gives"?

(a) Chm (b) ha (c) R (d) wop

Sol: In the second and third sentences, the common word is "gives" and the common code word is "wop". So, wop means "gives".

Hence, the answer is (D)

Ex 2:

If in a certain language MYSTIFY is coded as N7TUKGZ, how is N5M5G5S coded in that code?

(a) OFKNITFT (b) M1L3RDR (c) OGNHTRD (d) POOKUOG

Ex 3:

If in a certain language, NATURE is coded as OCUWKG, how is FAMINE coded in that code?

(a) GCNKF (b) GCNDF (c) GCNKOG (d) HCNKOG
17. In a certain code, HANGER is written as TDIMCOG. How is KUREISH written in that code?
   (a) RQGRWJ  (b) LVSPTI  (c) MGSTUT  (d) MYPFUI

18. If people are coded as PLIPPOG, how is trend coded?
   (a) TREDIN  (b) DNEIR  (c) NDTE  (d) TREDN  (c) TNERD

19. In a certain code, HUMIDITY is written as UHMIYUD. How is politics written in that code?
   (a) OPLICTS  (b) OPLICTS  (c) OPTISI  (d) POLYSE

20. In a certain code, GIGANTIC is written as GIGTANCL. How is Miracles written in that code?
   (a) RMLASCHE  (b) RMLASC  (c) RMLASC  (d) RMLIASCE

DECODING

21. If in a certain language, CARRM4 is coded as BZQQLNL. Which word will be coded as HOUSE?
   (a) IVPTF  (b) GNTRD  (c) INVRF  (d) GPTID

22. If in a certain language, POPULAR is coded as QPQMBS, which word would be coded as GBIPVT?
   (a) YAMOUS  (b) FAMOUS  (c) SAPOSM  (d) FOUSAUM

23. If in a certain code, SWITCH is written as TVJSIGD, which word would be written as COQZE?
   (a) BARED  (b) BARED  (c) BREAD  (d) BRAIDE

24. In a certain code, REFIRGATOR is coded as ROTAREGIFER, which word would be coded as NONINUMAY?
   (a) ANMMRUIN  (b) ANMFROIG  (c) AMMNUITIO  (d) AMMUITIONA

25. If in a certain language, REMOTY is coded as ROTEME, which word would be coded as PNBPC?
   (a) NPPBC  (b) PBCIN  (c) PNCIC  (d) PNCIC

26. If in a certain language, SHIFT is coded as RFBO, which word would be coded as LKUMBY?
   (a) MNNQXG  (b) MLVNC  (c) KLVLA  (d) KVLMC

27. If in a certain language, TRIANGLE is coded as SQHQFMKD, which word would be coded as DOWLORD?
   (a) EXAMPL  (b) FROMENT  (c) DISMISS  (d) DISJOIN

28. If in a certain code, CALCUTTA is coded as GUPGYXZ, which word would be coded as FSQCTIE?
   (a) BOMBAY  (b) BOMBAY  (c) BOMYAB  (d) BOBAY

106 GENERAL APTITUDE

PRACuCE TESTS — LETTER CODING

29. If ‘TEACHER’ and ‘SLIGHT’ are written as ‘XWPHWWM’ and ‘QSNRDO’ respectively. How will you code the word ‘CHARITY’?
(a) BRNSBDZ (b) BRMDASZ (c) BRPSAZZ (d) BRPSMXZ

30. ‘SCHOOL’ = ‘FNIKBE’ and ‘ME’ = ‘ZY’, how will you write ‘COOL HOME’?
(a) NNXBKZXY (b) NNKLKJZ (c) NNXBKZ (d) NNXBKJZ

31. If ‘UJLPOR’ stands for ‘MIDFIEH’. How will you code POLICE?
(a) FTRDMFF (b) FTRTMME (c) FTRTMDF (d) FTRTMDF

32. ‘XYMOPQ’ is coded as ‘RHOUIQG’ and ‘OUTRIGHT’ is coded as ‘MNQNOQQ’.
(a) MNQNOQ (b) MNQNOXYQ (c) MNQNOXYQ (d) MNQNOXYQ

33. ‘LOAD’ is coded as ‘MPBE’ and ‘SHAVE’ as ‘ESIWF’. how will you code ‘MATTER’?
(a) MDEEFPS (b) MBEESP (c) NCFQGT (d) MBEEFP

34. ‘GO AT ONCE’ is a coded message received as ‘JB GM BOZY’ and you are required to relay the answer in a coded message ‘GO TO GATE’. Select the code you will be using based on the scheme applied in the example here.
(a) HP BI PDMDF (b) JB MK JSMY (c) IMCS QMBDF (d) JBMK JMSY

35. ‘START’ = ‘WALKA’ and ‘BUDON’ = ‘XZFMQR’, what would be ‘STUPID’ =
(a) BAZMOF (b) BANOOF (c) WAZMNF (d) BAZMQF (e) WAZMQF

Directions:
‘GO AHEAD’ is coded as ‘JRDJKHOQ and STOP’ is coded as ‘VWRS’ how will you code/decode the correct answer from the above choices.

36. FIRE
(a) UIRV (b) UQIO (c) LUEIH (d) ILUIH

37. SHOW
(a) VKRW (b) UMARK (c) TIPFR (d) VKSSE

38. RETURN
(a) UHWDXIQ (b) VDXQM (c) UHHWXR (d) JHWFYVR

39. VWDW
(a) STAION (b) STEPS (c) SPORT (d) START

40. HEAD
(a) OHHGD (b) NUBO (c) KHDD (d) KHDG

41. ORZO
(a) OWNOS (b) DOWN (c) DONE (d) COME (e) SHUT

42. If ‘HSM’ means ‘GIRL’, what does ‘RMS’ mean?
(a) BOYS (b) CWOS (c) TOYS (d) SOFT

43. If ‘BDMYV/LUB’ stands for ‘CALCUTTA’ how will you write ‘BOMBAY’?
(a) DQQODD (b) CINCNZ (c) DPNRDX (d) CPMNQR

44. If ‘OVER’ is coded as ‘QYUV’ and ‘UP’ as ‘WS’ then ‘START’ will be coded as
(a) UVEY (b) UMDY (c) UVBS (d) UWVE

45. In a certain code ‘DELIH’ is written as ‘CDKGRH’, ‘ADARAS’ as ‘IZCQZ’ how will ‘PATNA’ be coded?
(a) OZTXEI (b) OZSQZ (c) ORUMB (d) OZTZM

46. If ‘FIRE’ is coded for a secret message type teleprinted as ‘EZHKO’. How should the receiver answer?
(a) DMOE (b) CNMD (c) DMCN (d) DNPE

47. If A = E, B = F, C = G and D = H, how will you code GOAHEAD?
(a) KSFLFHI (b) HPSRHFE (c) CSOLGH (d) KSELEH

48. ‘NEW’ is a secret code for ‘MOVE’ you have to tell ‘DIFFICULT’ using the code based on the scheme used to code ‘MOVE’.
(a) EGGKJMU (b) FHIKTEXWY (c) EGGKJMU (d) EGCJDMU

49. ‘WIRE’ is coded as how will you code ‘HOTEL’?
(a) AYVGN (b) IFUTM (c) KRYHO (d) LSWIP

NUMBER CODING

50. If PAIN is coded as 74128 and EXCEL is coded as 953398, then how would you code ACCEPT?
(a) 455878 (b) 547908 (c) 545978 (d) 735961

51. If DELHI is coded as 73541 and CALCUTTA as 85289662, how can CALCUTA be coded?
(a) 5279431 (b) 5978213 (c) 8251896 (d) 8546491

52. In a certain code, RIPPLE is written as 613932 and LIFE is written as 8192. How is PILLER written in that code?
(a) 318226 (b) 318286 (c) 618226 (d) 33816

53. If ROSE is coded as 6821, CHAIR is coded as 73456 and PREACH in coded as 961473, What will be the code for SEARCH?
(a) 246173 (b) 241673 (c) 214763 (d) 216473

54. If PALE is coded as 2134, EARTH is coded as 41586, how is PEARL coded in that code?
(a) 29530 (b) 24153 (c) 25413 (d) 25430

55. In a certain code GIRLF is coded as 725302 and TINA as 6842. How is MARTINA written in that code?
(a) 32656482 (b) 3265482 (c) 3645862 (d) 3658426
Directions:
If in a certain language, ENTRY is coded as 12345 and "STEADY" is coded as 931785, then state which is the correct code for each of the given words.

56. TENANT
   (a) 956169  (b) 196247  (c) 352123  (d) 312723

57. NEATNESS
   (a) 25196577  (b) 21732199  (c) 21362199  (d) 21823498

58. SEDATE
   (a) 918731  (b) 954185  (c) 814195  (d) 6148781

59. ARREST
   (a) 744389  (b) 741193  (c) 166479  (d) 745194

60. ENDEAR
   (a) 535191  (b) 741189  (c) 128174  (d) 124179

61. IF I = 4 and COVER = 63, then BASIS = ?
   (a) 49  (b) 50  (c) 54  (d) 55

62. IF FAOD is coded as 52 and BELIEVED is 7, what is the code number for GOVERNMENT?
   (a) 6  (b) 8  (c) 9  (d) 10

63. If PALAM could be given the code number 43, what code number can be given to SANTACRUZ?
   (a) 75  (b) 85  (c) 120  (d) 123

64. If Z = 52 and ACT = 48, then BAT will be equal to
   (a) 89  (b) 41  (c) 44  (d) 46

65. If GO = 32, SHE = 46, then SOME will be equal to
   (a) 56  (b) 58  (c) 62  (d) 64

66. If AT = 20, BAT = 40, then CAT will be equal to
   (a) 30  (b) 50  (c) 60  (d) 70

67. If MACHINE is coded as 1974-14-15-20-11, how will you code DANGER?
   (a) 10-7-20-13-11-24  (b) 11-7-20-16-11-24  (c) 13-7-20-9-11-25  (d) 13-7-20-10-11-25

68. DRIVER = 8, PILOT = 7, CHARACTERS = ?
   (a) 3  (b) 8  (c) 9  (d) 11  (e) None

69. LUNCH = 6, DINNER = 8, SUPPER = 8, then BREAKFAST = ?
   (a) 8  (b) 13  (c) 14  (d) 16  (e) None

Ace Academy General Aptitude

Numerical Reasoning

70. BOOK + PEN = P, PEN + NIB = ?
   (a) 6  (b) 8  (c) 10  (d) 12  (e) None

71. CAT + DOG = 50, BAT + HEN = ?
   (a) 25  (b) 30  (c) 40  (d) 50  (e) None

72. AT x EAT = 5, SAT x SEAT = 5, GO x GOAT = 21, then EAR x HEAR = ?
   (a) 15  (b) 20  (c) 22  (d) 25  (e) None

73. AUID = 15, UKUSA = 15, ABDOU = 15, Then UAIEO = ?
   (a) 10  (b) 15  (c) 20  (d) 25  (e) None

74. EXCURSE
   (a) 53  (b) 44  (c) 11  (d) 25  (e) None

75. BOOK = 43 and PEN = 35, COPY = ?
   (a) 45  (b) 60  (c) 59  (d) 79  (e) None

76. PENCIL = 59 and PEN = 35, SCALE = ?
   (a) 80  (b) 65  (c) 40  (d) 35  (e) None

77. DRAMA is coded as 37 and STAGE as 52, how will you code ACTOR?
   (a) 50  (b) 50  (c) 57  (d) 67  (e) None

78. If AROMA = 24, ORAND = 22, KWALITY = ?
   (a) 40  (b) 42  (c) 55.5  (d) 50.5  (e) None

79. If DISTEMPER is coded as 32.5 and WALLS as 3.5.5, how will you code PLASTER using the same coding scheme?
   (a) 40.5  (b) 45.5  (c) 48.5  (d) 55.5  (e) None

80. SUPER = 79, SUPREME = 97, LABOUR = ?
   (a) 79  (b) 69  (c) 89  (d) None  (e) None

81. If ROTARY and ROTARIAN are coded as 97 and 96, how will you code ROTARAOTP?
   (a) 98  (b) 96  (c) 97  (d) 99  (e) 97.5

82. LIM = 39, WHITTY = ?
   (a) 66  (b) 56  (c) 65  (d) None  (e) None

83. If DRIVER = 76 and TRUCK = 73, what would be MOPAD?
   (a) 45  (b) 55  (c) 49  (d) None  (e) None

84. If OPTICAL and OPTICIAN are coded as 76 and 87 respectively, GLASSES will be coded as
   (a) 80  (b) 82  (c) 84  (d) 86  (e) None

85. If PLANT is coded as 12.60, what will be the code for LEAVES?
   (a) 11  (b) 10  (c) 10.5  (d) 10.66  (e) None

86. If in a certain code DEMOCRATIC is coded as 9.10 how will you code AGITATION?
   (a) 11.50  (b) 10.60  (c) 10.66  (d) 11.8  (e) None
87. If cook is called butler, butler is called manager, manager is called teacher, teacher is called clerk and clerk is called principal, who will teach in a class?
(a) cook (b) Butler (c) manager (d) Clerk

88. If white is called blue, blue is called red, red is called yellow, is called green, green is called black, black is called violet and violet is called orange, what would be the colour of human blood?
(a) Red (b) Green (c) Yellow (d) Violet

89. If room is called bed, bed is called window, window is called flower and flower is called cooler, on what would a man sleep?
(a) Window (b) Bed (c) Flower (d) Cooler

90. If Orange is called butler, butler is called soap, soap is called ink, ink is called hen and hen is called orange? Which of the following is used for washing others?
(a) Hen (b) Butter (c) Orange (d) Ink

91. If fixed is called air, air is called Rock, Rock is called well, well is called Drainage and Drainage is called sky, then from where will a woman draw water?
(a) Well (b) Drainage (c) Sky (d) Air

92. If bangle is called cassette, cassette is called table, table is called game and game is called cupboard, then which is played in the tape recorder?
(a) Bangle (b) Cassette (c) Table (d) Cupboard

93. If cloud is called white, white is called rain, rain is called green, green is called air, is called blue and blue is called water, where will the birds fly?
(a) Air (b) Cloud (c) White (d) Blue

94. If book is called watch, watch is called bag, bag is called dictionary and dictionary is called window, which is used to carry books?
(a) Dictionary (b) Bag (c) Watch (d) Book

95. If rain is water, water is road, road is cloud, cloud is sky, sky is sun and sun is path, where do aeroplanes fly?
(a) Road (b) Sun (c) Cloud (d) Water

96. If water is called food, food is called tree, tree is called ska, ska is called wall, on which of the following grows a fruit?
(a) Water (b) Food (c) Sky (d) Tree

97. If pen is table, table is fan, fan is chair and chair is roof, on which of the following will a person sit?
(a) Pen (b) Chair (c) Roof (d) Table

98. If ice is called green, green is called blue, blue is called sky, sky is called yellow, yellow is called water and water is called pink, then what is the colour of clear sky?
(a) Blue (b) Sky (c) Yellow (d) Water

99. If eraser is called box, box is called pencil, pencil is called sharpener and sharpener is called bag, what will a child write with?
(a) Eraser (b) Box (c) Pencil (d) Sharpener

100. If man is called girl, girl is called woman, woman is called boy, boy is called butler and butler is called dog who will serve in a restaurant?
(a) Butler (b) Girl (c) Man (d) Dog

101. If cook is called television, television is called radio, radio is called oven, oven is called carbet, Grinder and Grind is called iron, in what will a lady bake?
(a) Radio (b) Oven (c) Grinder (d) Iron

MIXED LETTER CODING

102. If 'nee pe kili che' stands for shamma gets marriage gift, 'pee from wop chni' stands for wife gives marriage gift, 'tii wop nii' stands for be, give a cutting what would mean 'gives'?
(a) Cni (b) nii (c) Pii (d) Wop

103. If see see pe means drink fruit juice, see kee lee means juice is sweet and lee ree see means. He is intelligent, which word in that language means sweet?
(a) see (b) lee (c) le (d) ree

104. In a certain code, see time see means how are you lee see see means where are you, what is the code for what?
(a) ree (b) time (c) see (d) Can't be determined

105. If 'ski ps tri' stands for nice Sunday morning, 'the ski ps' stands for every Tuesday morning and 'ski ps qn' stands for nice market piece, what would Sunday stand for?
(a) ski (b) tri (c) ps (d) qn

106. In a certain code 'kii' nie pie means 'some good Joke's' in nie but like meaning 'some real stories and pie like to means many good stories' which word in that code means jokes?
(a) kii (b) nie (c) pie (d) Can't be determined

107. In a certain language 'ska peni' means fine cloth 'meta fizer' means clear water 'dona liha peni' means the clear water which word in that language means 'weather'?
(a) peni (b) dona (c) meta (d) liha

108. In a certain code language 'Tom kum so' means Dogs are barking 'Kum jo mop ments dogs and horses, and 'mst Tom ko' means Donkeys are mad' which word in that language means barking?
(a) sof (b) kum (c) jo (d) tums

109. In a certain language 'pre not bil' means smoking is harmful 'vog doj soq' means avoid harmful habit and 'doj bi yel' means please avoid smoking. Which of the following means 'habit' in that language?
(a) Vog (b) net (c) der (d) bit
112. In a certain code language
(a) 'Pic vic nic' means winter is hot
(b) 'te nic re' means summer is cold
(c) 'te pic boo' means winter and summer
(d) 'vic the po' means highs are old
110. Which word in the language means 'summer'?
(a) nic (b) re (c) to (d) pic
111. Which of the given statements is superfluous?
(a) only A (b) only D (c) both A and D (d) Neither A nor D

Directions
In a certain code,
'll be pea' means 'meas are blue'
silk hoe means 'red flowers' and
'pee mit bee' means flowers are vegetables
112. How is 'red' written in that code?
(a) hoe (b) silk (c) te (d) cannot be determined
113. How is 'vegetables' written in that code?
(a) hoe silk mit hoe (b) silk pee hoe bee (c) ili silk mit thee (d) cannot be determined
114. How is 'red flowers' written in this code?
(a) pee silk mit hoe (b) silk pee hoe bee (c) ili silk mit thee (d) cannot be determined

MIXED NUMBER CODING

115. In a certain code, 786 means 'study very hard'; 546 means 'hard work pays' and 645 means 'study and work' which of the following is the code for 'very'?
(a) 8 (b) 6 (c) 7 (d) cannot be determined
116. In a certain code language '334' means 'Light is bright', '249' means 'Girl is beautiful' and 4758 means I prefer bright clothes, which digit means 'Light' in that language?
(a) 3 (b) 2 (c) 4 (d) cannot be determined
117. In a certain code '256' means you are good '637' means we are bad and '358' means 'good and bad'. Which of the following represents 'and' in that code?
(a) 2 (b) 5 (c) 7 (d) 3
118. In a certain code '53' means 'which class' and '583' means 'countryside class'. What is the code for canoe?
(a) 3 (b) 7 (c) 8 (d) Either 5 or 8

119. In a certain code language '479' means fruit is sweet '248' means 'very' sweet and '637' means 'eat fruit daily' which digit stands for 'in' in that code?
(a) 7 (b) 9 (c) 4 (d) Cannot be determined
120. In a certain code '233' means books are old; '546' means man is old and '178' means buy good books what stands for 'in' in that code?
(a) 2 (b) 4 (c) 5 (d) 6
121. In a certain code language '381' means 'Hari is honest' 162 means 'suji is intelligent' and 948 means 'Hari should go'. Which digit in that language means 'honest'?
(a) 3 (b) 9 (c) 1 (d) cannot be determined
122. In a certain code language '123' means 'hot filtered coffee' 356 means very hot day and 589 means 'day and night', which digit stands for 'very'?
(a) 9 (b) 5 (c) 8 (d) 6

Directions:
(A) '134' means 'you are well'
(B) '758' means 'they go home'
(C) '439' means 'we are home'
123. Which of the following represents 'they' in that code language?
(a) 5 (b) 7 (c) 3 (d) Dates inadequate
124. Which of the statements can be dispensed with while answering the above question?
(a) A only (b) B only (c) A or C only (d) B and C only

Key:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72
73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
97 98 99 100 101 102 103 104 105 106 107 108
109 110 111 112 113 114 115 116 117 118 119 120
121 122 123 124
Directions: In the following questions the mathematical numbers follow according to a pattern. Discover that pattern and tick the choice which gives the missing number.

1. 7 10 9 12 11 ?
   (a) 14, 13  
   (b) 13, 12  
   (c) 12, 11 
   (d) 5, 6

2. 6 9 18 21 42 45 ?
   (a) 90, 91 
   (b) 90, 92 
   (c) 90, 93 
   (d) 90, 94

3. 23 20 15 10 ?
   (a) 50 
   (b) 50 
   (c) 100 
   (d) 100

4. 3 7 16 35 ?
   (a) 70 
   (b) 70 
   (c) 71 
   (d) 73

5. 2 5 9 19 37 ?
   (a) 77 
   (b) 76 
   (c) 75 
   (d) 73

6. 3 7 15 31 ?
   (a) 63 
   (b) 63 
   (c) 63 
   (d) 63

7. 8 12 16 12 ?
   (a) 10 
   (b) 10 
   (c) 15 
   (d) 15

8. 7 13 18 281 ?
   (a) 65 
   (b) 65 
   (c) 66 
   (d) 66

9. 17 19 ? 20 15 ?
   (a) 7 
   (b) 7 
   (c) 15 
   (d) 15

10. 4 6 9 14 ?
    (a) 20 
    (b) 22 
    (c) 22 
    (d) 22

11. 28 33 31 36 34 ?
    (a) 39 
    (b) 39 
    (c) 29 
    (d) 29

12. 12 26 24 22 ?
    (a) 20 
    (b) 20 
    (c) 21 
    (d) 21

13. 5 4 3 2 1 14 ?
    (a) 13 
    (b) 13 
    (c) 15 
    (d) 16

(6) NUMBER SERIES
### GENERAL APTITUDE

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### NUMERICAL REASONING

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**ACE Academy**
(7) INSERTING THE MISSING CHARACTER

Directions: Find the missing character from among the given alternatives.

01. [Diagram of a circle with numbers 3, 2, 12, 11, 6, 6, 5, 7, 10, 10, 9, 8, 7, 6] (a) 625 (b) 25 (c) 125 (d) 136

02. [Diagram of a circle with numbers 9, 2, 3, 7, 5, 4] (a) 10 (b) 11 (c) 12 (d) 13

03. [Diagram of a circle with numbers 5, 3, 14, 4, 2, 30, 5, 8, 1] (a) 100 (b) 81 (c) 64 (d) 121

04. [Diagram of a circle with numbers 5, 4, 7, 3, 11, 8, 2] (a) 9 (b) 8 (c) 125 (d) 216

05. [Diagram of a circle with numbers 216, 27, 125, 64] (a) 0 (b) 8 (c) 305 (d) 729

06. [Diagram of circles with numbers 3, 33, 2, 4, 54, 2, 3, 5, 4, 7] (a) 78 (b) 82 (c) 94 (d) 86

07. [Diagram of circles with numbers 25, 17, 6, 38, 18, 8, 89, 16] (a) 13 (b) 15 (c) 17 (d) 19

08. [Diagram of circles with numbers 5, 4, 3, 8, 9, 4] (a) 117 (b) 36 (c) 32 (d) 26

09. [Diagram of a circle with numbers 651, 5, 4, 3, 8, 6] (a) 262 (b) 622 (c) 631 (d) 824

10. [Diagram of a circle with numbers 584, 2, 3, 4, 6, 7] (a) 937 (b) 824 (c) 769 (d) 678
37. In each of the following questions, the numbers have been arranged according to the pattern shown in the sample figure given below, find the missing number.

Sample Figure

(1)

(2)

(3)

(4)
ACE Academy  
NUMERICAL REASONING  

CLASS WORK

Directions: Questions No. 1 to 5
1. Read the following information carefully and answer the questions given below.
Six persons A, B, C, D, E and F are sitting in two rows, three in each. 
B is not at the end of any row.
D is not to the left of F.
C, the neighbour of E, is sitting diagonally opposite to D.
B is the neighbour of E.

61. Which of the following are sitting diagonally opposite to each other?
(a) F and C  
(b) D and A  
(c) A and C  
(d) A and F

62. Who is facing B?
(a) A  
(b) C  
(c) D  
(d) E  
(e) F

63. Which of the following are in the same row?
(a) A and E  
(b) E and D  
(c) C and B  
(d) A and B

64. Which of the following are in one of the two rows?
(a) FBC  
(b) CEB  
(c) DBF  
(d) AEF  
(e) ABF

65. After interchanging seat with E, who will be the neighbours of D in the new position?
(a) C and A  
(b) F and B  
(c) only B  
(d) only A

Directions: Questions No. 6 to 10
6. A, B, C, D, E, F and G are sitting on a wall and all of them are facing east.
7. C is on the immediate right of D.
8. B is not on extreme end and has E as his neighbour.
9. G is between E and F.
10. D is sitting third from the south end.

66. Who is sitting to the right of E?
(a) A  
(b) C  
(c) D  
(d) F  
(e) None of these

67. Which of the following pairs of people are sitting at the extreme ends?
(a) AB  
(b) AE  
(c) CB  
(d) FB  
(e) None

68. Name the person who should change places with C such that he gets the third place from
the north end?
(a) E  
(b) F  
(c) G  
(d) D  
(e) None

69. Immediately between which of the following pairs of people is D sitting?
(a) AC  
(b) AF  
(c) CE  
(d) CF  
(e) None
10. Which of the conditions (i) to (v) given is not required to find out the place in which A is sitting?
(a) (i) (b) (ii) (c) (iii) (d) All are required (e) None

Directions: Questions No. 11 to 15
A blacksmith has flat iron articles A, B, C, D and E, each having a different weight.
(i) A weighs twice as much as B
(ii) B weighs four and half times as much as C
(iii) C weighs half as much as D
(iv) D weighs half as much as E
(v) E weighs less than A but more than C.

11. Which of the following is the lightest in weight?
(a) A (b) B (c) C (d) D (e) E

12. E is lighter in weight than which of the other two articles?
(a) A, B (b) D, C (c) A, C (d) D, B (e) B, E

13. E is heavier than which of the following two articles?
(a) D, B (b) D, C (c) A, C (d) A, B (e) None

14. Which of the following articles is the heaviest in weight?
(a) A (b) B (c) C (d) D (e) E

15. Which of the following represents the descending order of weights of the articles?
(a) A, B, C, D, E (b) B, D, E, A, C (c) E, C, D, A, B (d) C, A, D, B, E (e) A, B, D, E, C

Directions: Questions No. 16 to 20
Six friends P, Q, R, S, T and U are members of a club and play a different game of football, Cricket, Tennis, Basketball, Badminton and Volleyball.
(i) T is older than P and S plays Tennis
(ii) The tallest among them plays Volleyball
(iii) Q and S neither plays Volleyball nor Basketball
(iv) R plays Volleyball.
(ivii) "T" is between Q who plays football and P in order of height.

16. Who among them is taller than P but shorter than T?
(a) Q (b) T (c) U (d) cannot be determined (e) None of these

17. Who will be at the third place if they are arranged in the descending order of height?
(a) Q (b) P (c) S (d) T (e) None of these

18. Which of the following statements is not true?
(a) P is shorter than R (b) Q is taller than S (c) S is taller than R (d) U is taller than Q (e) None of these

19. Who among them plays Basketball?
(a) C (b) R (c) S (d) U (e) None of these

20. What does S play?
(a) Cricket (b) Badminton (c) Foottball (d) Either Cricket or Badminton (e) None of these

Directions: Questions No. 21 to 25
A training college has to conduct a refresher course for teachers of seven different subject Mechanics, Psychology, Philosophy, Sociology, Economics, Science and Engineering from 22nd July to 25th July.
(i) Course should start with Psychology
(ii) 23rd July, being Sunday, should be holiday
(iii) Science subject should be on the previous day of the Engineering subject
(iv) Course should end with Mechanics subject
(v) Philosophy should be immediately after the holiday.
(vi) There should be a gap of one day between Economics and Engineering.

21. The refresher course will start with which one of the following subjects?
(a) Psychology (b) Mechanics (c) Philosophy (d) Economics (e) None of these

22. Which subject will be on Tuesday?
(a) Philosophy (b) Economics (c) Psychology (d) Engineering (e) None of these

23. Which subject precedes Mechanics?
(a) Economics (b) Engineering (c) Philosophy — (d) Psychology (e) None of these

24. How many days gap is there between Science and Philosophy?
(a) One (b) Two (c) Three (d) No gap (e) None of these

25. Which subject is followed by Science?
(a) Engineering (b) Philosophy (c) Psychology (d) Economics (e) None of these

Directions: Questions No. 26 to 30
Seven friends Kamal, Manish, Rohit, Amit, Gaurav, Prem and Priya are sitting at equal distance from each other. Rohit is sitting two places right of Prem who is sitting right of Amit but Rohit and Prem are not sitting opposite to each other. Kamal forms an angle of 90° from Gaurav and an angle of 120° from Manish. Manish is just opposite Priya and is sitting on the left of Gaurav.
26. Who is the only person sitting between Rohit and Manish?
(a) Prem (b) Amit (c) Guwah (d) Kamala

27. Guwah is not sitting at equal distances from any two people among Prem, Rohit, and Manish.
(a) Rohit and Prem (b) Amit and Kamala (c) Manish and Prem (d) All be above

28. Guwah is sitting ________ of Priya.
(a) to the left (b) to the right (c) two places right (d) None of these

29. The angle between Guwah and Manish in the clockwise direction is ________.
(a) 150° (b) 180° (c) 210° (d) None of these

30. Which of the following statements is NOT correct?
(a) Prem is between Manish and Kamala (b) Manish is two places away from Priya (c) Guwah is sitting opposite Prem (d) All of the above

Directions: Questions No. 31 to 35
There are six cities A, B, C, D, E and F. A is not a hill station. B and E are not historical places. D is not an industrial city. A and D are not historical cities. A and B are not alike.

31. Which two cities are industrial centres?
(a) A and B (b) E and F (c) C and D (d) B and F

32. Which two cities are historical places?
(a) A and C (b) B and F (c) C and F (d) B and E

33. Which two cities are hill stations?
(a) A and B (b) C and A (c) B and D (d) A and F

34. Which city is a hill station and an industrial but not a historical place?
(a) E (b) F (c) A (d) B (e) C

35. Which two cities are neither historical places nor industrial centres?
(a) A and B (b) D and E (c) F and C (d) B and D

Directions: Questions No. 36 to 40
There are six persons A, B, C, D, E and F in a school. Each of the teachers teaches two subjects: one compulsory subject and one other optional subject. D’s optional subject was History while three others have it as compulsory subject. E and F have physics as one of their subjects. F’s compulsory subject is Mathematics. Which is an optional subject of both C and E. History and English are A’s subjects but in terms of compulsory and optional subjects they are just reverse of those of D’s. Chemistry is an optional subject of only one of them. The only female teacher in the school has English as her compulsory subject.

36. What is C’s compulsory subject?
(a) History (b) Physics (c) Chemistry (d) English

37. Who is a female member in the group?
(a) A (b) B (c) C (d) D (e) E

38. Which of the following has same compulsory and optional subjects as those of F’s?
(a) D (b) B (c) A (d) C (e) None of these

39. Disregarding which is the compulsory and which is the optional subjects who has the same two subjects combinations as F’s?
(a) A (b) B (c) E (d) D (e) None

40. Which of the following groups has History as the compulsory subject?
(a) A, C and D (b) B, C and D (c) C and D (d) A, B and C (e) A and D

Directions: Questions 41 to 45
There is a family of six persons A, B, C, D, E, and F. They are lawyer, doctor, teacher, salesman, engineer, and accountant. There are two married couples in the family. D, the sales man, is married to the lady teacher. The doctor is married to the lawyer. F, the Accountant is the son of B and brother of E, C, the lawyer is the daughter-in-law of A. E is the unmarried Engineer. A is the grandmother of F.

41. How is F related to E?
(a) Brother (b) Sister (c) Cousin (d) Cannot be determined

42. What is the profession of B?
(a) Teacher (b) Doctor (c) Lawyer (d) Cannot be determined

43. What is the profession of A?
(a) Lawyer (b) Teacher (c) Doctor (d) Cannot be determined

44. Which of the following is one of the couples?
(a) F and D (b) D and B (c) E and A (d) A and C
45. How is D related to T?
   (a) Grandfather (b) Father (c) Uncle (d) Brother
   (e) None of these

Directions: Questions No. 46 to 51

(i) P, R, S, T and U are six members of a group of which there are male and there are females.
(ii) There are two engineers, two lawyers and one doctor in the group.
(iii) Q, T, P and R are two married couples and no person in this group has same profession.
(iv) T, a teacher with low stress, married a man lawyer with brown dress.
(v) Colour of the dresses of both the husbands and that of both the wives is the same.
(vi) Two persons have blue dress, two have brown and the remaining one each has black and green.
(vii) P is a male engineer whose sister S is also an engineer.
(viii) Q is a doctor.

What is the wife of P?
   (a) Q (b) R (c) S (d) T
   (e) None of these

47. Which of the following is a group of female members?
   (a) QSR (b) QST (c) QSU (d) QTU
   (e) None of these

48. Which of the following is a pair of married ladies?
   (a) PR (b) TS (c) QT (d) Data inadequate
   (e) None of these

49. What is the colour of U’s dress?
   (a) Black (b) Green (c) Black & Green (d) Data inadequate
   (e) None of these

Directions: Questions No. 52 to 54

All the roads in a city are either perpendicular or parallel to one another. The roads are all straight. Roads A, B, C, D and E are parallel to one another. Roads G, H, I, J, K, L and M are parallel to one another.
(i) Road A is 1km east of road B.
(ii) Road B is 1km west of road C.
(iii) Road D is 1km east of road E.
(iv) Road G is 1km south of road H.
(v) Road I is 1km north of road J.
(vi) Road K is 1km north of road L.
(vii) Road K is 1km north of road M.

50. Which is necessarily true?
   (a) B and E are intersecting
   (b) D is 2km west of B
   (c) D is at least 2km west of A
   (d) M is 1.5 km north of L
   (e) I is 1 km north of L.
ASSIGNMENT

Directions: Questions No. 1 to 5
Five persons are sitting in a row. One of the two persons at the extreme ends is intelligent and other one is fair. A fat person is sitting to the right of a weak person. A tall person is to the left of the fair person and weak person is sitting between the intelligent and fat person.

01. Tall person is at which place counting from right?
   (a) First  (b) Second  (c) Third  (d) Fourth  (e) None of these

02. Which of the following describes the person to the left of weak person?
   (a) Intelligent  (b) Fat  (c) Fair  (d) Tall  (e) None

03. Which of the following persons is sitting at the centre?
   (a) Fair  (b) Weak  (c) Intelligent  (d) Tall  (e) Fat

04. To whose left is the fat person sitting?
   (a) Fair  (b) Intelligent  (c) Tall  (d) Weak  (e) cannot be determined

05. If the fair and fat persons exchange their positions so also tall and weak, then who will be sitting to the left of the weak person?
   (a) Tall  (b) Fair  (c) None  (d) Intelligent  (e) cannot be determined

Directions: Questions No. 6 to 10
Five friends A, B, C, D and E are sitting on a bench.
(1). A is sitting next to B
(2). C is sitting next to D
(3). D is not sitting with E
(4). E is on the left end of the bench
(5). C is on second position from the right
(6). A is on the right side of B and to the right side of E
(7). A and C are sitting together

06. Where is A sitting?
   (a) Between B and D  (b) Between D and C  (c) Between B and C  (d) Between C and E  (e) Between B and C

07. Who is sitting in the centre?
   (a) A  (b) B  (c) C  (d) D  (e) E

08. C is sitting between:
   (a) B and D  (b) A and E  (c) D and E  (d) A and D

09. A and B
   (a) B and D  (b) A and E  (c) D and E  (d) A and D
69. What is the position of D?
   (a) Extreme left  (b) Extreme right  (c) Third from left  (d) Second from left

(c) None

10. What is the position of B?
   (a) Second from right  (b) Centre  (c) Extreme left  (d) Second from left

(c) None

Directions: Questions 11 to 15

In a car exhibition, seven cars of seven different companies viz. Cardiac, Ambassador, Fiat, Maruti, Mercedes, Bedford and Fargo were displayed in a row, facing east such that (i) Cardiac car was to the immediate right of Fargo.
(ii) Fargo was fourth to the right of Fiat.
(iii) Maruti car was between Ambassador and Bedford.
(iv) Fiat, which was third to the left of Ambassador car at one of the ends.

11. Which of the following was the correct position of the Mercedes?
   (a) Immediate right of Ambassador  (b) Immediate left of Bedford
   (c) Between Bedford and Fargo  (d) Fourth to the right of Maruti

(b) Immediate left of Bedford

12. Which of the following is definitely true?
   (a) Fargo car is between Ambassador and Fiat
   (b) Cardiac car is to the immediate left of Mercedes.
   (c) Fargo is to the immediate right of cardiacl.
   (d) Maruti is to the right of Mercedes
   (e) None of these

(b) Cardiac car is to the immediate left of Mercedes.

13. Which car is on the immediate other sides of the cardiacl car?
   (a) Ambassador and Maruti  (b) Maruti and Fiat  (c) Fiat and Mercedes  (d) Ambassador and Fargo

(c) Fiat and Mercedes

14. Which of the following is definitely true?
   (a) Maruti is to the immediate left of Ambassador
   (b) Bedford is to the immediate left of Fiat
   (c) Bedford is at one of the ends.
   (d) Fiat is second to the right of Maruti
   (e) None of these

(e) None of these

15. Which of the following groups of cars is to the right of the ambassador car?
   (a) Cardiac, Fargo and Maruti  (b) Maruti, Bedford and Fiat
   (c) Mercedes, Cardiac and Fargo  (d) Bedford, Cardiac and Fargo

(d) Bedford, Cardiac and Fargo

Directions: Questions 16 to 20
Six players A, B, C, D, E and F are to be staged one on each day from Monday to Saturday. The schedule of the plays is to be according to the following.
(i) A must be staged a day before E.
(ii) C must not be staged on Tuesday.
(iii) B must be staged on the day following the day on which F is staged.
(iv) D must be staged on Friday only and should not be immediately preceded by B.
(v) E must not be staged on the last day of the schedule.

16. Which of the following plays immediately follows B?
   (a) A  (b) C  (c) D  (d) E

(c) D

17. Which of the following plays is on Monday?
   (a) E  (b) F  (c) A  (d) B

(d) B

18. Play D is in between which of the following pairs of players?
   (a) B and E  (b) E and F  (c) A and E  (d) C and F

(b) E and F

19. Which of the following is the schedule of plays, with the order of their staging from Monday?
   (a) E, A, B, F, D, C  (b) A, F, B, E, D, C
   (c) A, F, B, C, D, E  (d) F, A, B, E, D, C

(c) A, F, B, C, D, E

20. Play C cannot definitely be staged on which of the following days in addition to Tuesday?
   (a) Monday  (b) Wednesday  (c) Friday  (d) Thursday

(b) Wednesday

Directions: Questions 21 to 25
(i) Five friends P, Q, R, S and T traveled to five different cities of Chennai, Calcutta, Delhi, Bangalore and Hyderabad by five different modes of transport: Bus, Train, Car and Boat from Mumbai.
(ii) The person who traveled to Delhi did not travel by boat.
(iii) R went to Bangalore by car and Q went to Calcutta by Aeroplane.
(iv) S traveled by boat where as T traveled by train.
(v) Mitsuhi is not connected by bus to Delhi and Chennai.

21. Which of the following combinations of person and mode is not correct?
   (a) P – Bus  (b) Q – Aeroplane  (c) R – Car  (d) S – Boat

(c) R – Car

22. Which of the following combinations is true for S?
   (a) Delhi – Bus  (b) Chennai – Bus  (c) Chennai – Boat  (d) Data inadequate

(d) Data inadequate

23. Which of the following combinations of place and mode is not correct?
   (a) Delhi – Bus  (b) Calcutta – Aeroplane  (c) Bangalore – Car  (d) Chennai – Boat

(b) Calcutta – Aeroplane

24. What is the position of the bus in the order of places?
   (a) 3rd  (b) 4th  (c) 2nd  (d) None of these

(a) 3rd
24. The person travelling to Delhi went by which of the following modes?
(a) Bus  (b) Train  (c) Airplane  (d) Car
(c) Boat

25. Who among the following traveled to Delhi?
(a) R  (b) S  (c) T  (d) Data inadequate  (e) None of these

Directions: Questions No. 26 to 31
Eight friends A, B, C, D, E, F, G and H are sitting in a circle facing the centre. B is sitting between G and D. H is third to the left of B and second to the right of A. C is sitting between A and G and B and E are not sitting opposite to each other.

26. Who is third to the left of D?
(a) A  (b) E  (c) F  (d) cannot be determined  (e) None

27. Which of the following statements is not correct?
(a) C is third to the right of D
(b) A is sitting between C and F
(c) D and A are sitting opposite to each other
(d) E is sitting between F and D
(e) E and C are sitting opposite to each other

28. Who is facing A?
(a) B  (b) C  (c) D  (d) E
(e) None

29. Who is between A and C?
(a) G  (b) F
(c) B  (d) H
(e) None

30. How many persons are there in between D and A?
(a) One  (b) Two  (c) Three  (d) None

31. Who is second to the right of F?
(a) E  (b) B  (c) G  (d) A  (e) None

Directions: Questions No. 32 to 36
In a group of five persons A, B, C, D and E (ii), A and C are intelligent in Mathematics and Geography (iii), B and D are intelligent in Political Science and Geography (iv), D and E are intelligent in Biology, History and Political Science.
A is intelligent in Political Science. Geography and Biology.

32. Who is intelligent in Political Science, Geography and Biology?
(a) E  (b) D  (c) C  (d) D  (e) A

33. Who is intelligent in Mathematics, Political Science and Geography?
(a) A  (b) B  (c) C  (d) D  (e) E

34. Who is intelligent in Mathematics and History but not in Geography?
(a) C  (b) E  (c) A  (d) B  (e) D

35. Who is intelligent in Mathematics, Geography and History?
(a) A  (b) B  (c) C  (d) D  (e) E

36. Who is intelligent in Political Science, History, and Biology?
(a) A  (b) B  (c) C  (d) D  (e) E

Directions: Questions No. 37 to 41
(i) F, G, R, S, T and U are six students pursuing their Masters degree in six different subjects - English, History, Philosophy, Physics, Statistics and Mathematics.
(ii) Two of them stay in Hostel, two stay as paying guest (PG) and the remaining two stay at their Home.
(iii) R does not stay as paying guest and studies Physics.
(iv) The students studying statistics and History do not stay as paying guest.
(v) T studies Mathematics and S studies Physics.
(vi) U and S stay in hostel. T stays as paying guest and Q stays at home.

37. Who studies English?
(a) T  (b) S  (c) R  (d) U  (e) None of them

38. Which of the following combinations of subject and place of stay is not correct?
(a) English – Hostel  (b) Mathematics - PG  (c) Philosophy – Home  (d) Physics – Hostel  (e) None

39. Which of the following pairs of students stay one each at hostel and at home?
(a) QR  (b) SR  (c) US  (d) Data inadequate  (e) None

40. Which subject does Q study?
(a) History  (b) Statistics  (c) History or Statistics  (d) Data inadequate  (e) None of these

41. Which of the following pairs of students stay at home?
(a) PQ  (b) QR  (c) RS  (d) ST  (e) None of these

Directions: Questions No. 42 to 46
(i) P, Q, R, S, T and U are six members in a family in which there are two married couples.
(ii) T, a teacher, is married to the doctor, who is mother of R and U.
(iii) Q, the lawyer, is married to P.
(iv) P has one son and one grandson.
(v) Of the two married ladies one is a housewife.
(vi) There is also one student and one male engineer in the family.
42. How is R related to R?
(a) Grand father (b) Mother (c) Sister (d) Grand mother (e) None of these

43. Who among the following is the house wife?
(a) P (b) Q (c) S (d) T

44. How is R related to U?
(a) Brother (b) Sister (c) Resbhour (or) Sister (d) Data inadequate (e) None of these

45. Which of the following represents the group of females in the family?
(a) PSR (b) PSU (c) QTR (d) Data inadequate (e) None of these

46. Which of the following is true about the grand-daughter in the family?
(a) She is a lawyer (b) She is a student (c) She is an engineer (d) Data inadequate (e) None of these

Directions: Questions No. 47 to 51

(i) P, Q, R, S, T and U are traveling in a train.
(ii) There are two reporter, two technicains, one photographer and one writer in the group.
(iii) The photographer ‘P’ is married to ‘S’ who is a reporter.
(iv) The writer is married to ‘Q’ who is of the same profession as that of ‘U’.
(v) P, Q, R, N are two married couple and nobody in the group has same profession.
(vi) U is brother of N.

47. Which of the following is a pair of technicians?
(a) RS (b) SU (c) FT (d) QU

48. Which of the following is a pair of reporters?
(a) PQ (b) RT (c) ST (d) SU

49. How is R related to U?
(a) Brother (b) Sister (c) Uncle (d) cannot be determined

50. Which of the following is a pair of reporters?
(a) PQ (b) QR (c) QT (d) PT

51. Which of the following is a pair of house?
(a) OP (b) PR (c) QR (d) cannot be determined

Directions: Questions No. 52 to 55

A team of five is to be selected from amongst five boys A, B, C, D and E and four girls P, Q, R and S. Some criteria for selection are:
A and S have to be together
P cannot be put with R
D and Q cannot go together

52. If two of the members have to be boys, the team will consist of:
(a) ABSPQ (b) ADBQR (c) BIDSRQ (d) CESPQ

53. If R be one of the members, the other members of the team are:
(a) PASD (b) QSAD (c) QSCB (d) SACE

54. If two of the members are girls and D is one of the members, the members of the team other than D are:
(a) PQBD (b) PQCBD (c) PSAB (d) PSCE

55. If including P at least three are girls the members of the team other than P are:
(a) QSAB (b) QSBD (c) QSCB (d) RSAB

KEY:


25. e  26. c  27. c  28. c  29. e  30. a  31. a  32. b  33. b  34. a  35. d  36. e

37. a  38. b  39. b  40. e  41. b  42. e  43. a  44. e  45. d  46. b  47. d  48. c

49. d  50. b  51. a  52. d  53. a  54. e  55. a
Numerical estimation questions test your ability

Numerical computation questions involve basic principles of arithmetic like addition, subtraction, multiplication and division. They also use mathematical terms and methods such as percentages, ratios, fractions and decimals. To score well on these questions you will simply need to make quick and accurate calculations.

This type of test can be categorized as a speed test and is used to determine your basic numeric. Obviously you will not be allowed to use a calculator.

If your are very busy with arithmetic, try re-learning the times tables up to 12 and practice multiplication, division and percentage calculations. Practice can improve your test scores for all types of aptitude tests, so try as many examples as you can.

These simple numerical computation questions are directly applicable to many administrative and clerical jobs but can also appear as a component of graduate and managerial tests. The speed at which you can answer these questions is the critical measure, as most people could achieve a very high score given unlimited time in which to answer.

**NUMBER SYSTEM**

Test of Divisibility:

1. **Divisibility By 2:** A number is divisible by 2, if its units digit is even: 0, 2, 4, 6, 8.
   - E.g.: 84932

2. **Divisibility By 3:** A number is divisible by 3, if the sum of its digits is divisible by 3.
   - E.g.: 592482

3. **Divisibility By 4:** A number is divisible by 4, if the number formed by the two right-hand digits is divisible by 4.
   - E.g.: 892648

4. **Divisibility By 5:** A number is divisible by 5, if its units digit is either 0 or 5.
   - E.g.: 20820

5. **Divisibility By 6:** A number is divisible by 6, if it is divisible by both 2 and 3.
   - E.g.: 53256

**BASIC FORMULAE**

1. \((a + b)^2 = a^2 + b^2 + 2ab\)
2. \((a - b)^2 = a^2 + b^2 - 2ab\)
3. \((a + b)^3 = a^3 + b^3 + 3ab(a + b)\)
4. \((a + b)(a - b) = 2(a^2 + b^2)\)
5. \((a - b)^3 = a^3 - b^3 - 3ab(a - b)\)
6. \((a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)\)
7. \((a^2 + b^2) = (a + b)(a^2 - ab + b^2)\)
8. \((a - b)^3 = (a - b)(a^2 + ab + b^2)\)
9. \((a^2 + b^2 + c^2 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)\)

10. If \(a + b + c = 0\), then \(a^2 + b^2 + c^2 = 3abc\).

**Some Important Results**

(i) \((1 + 2 + 3 + \ldots + n) = \frac{n(n+1)}{2}\)

(ii) \((1^2 + 2^2 + 3^2 + \ldots + n^2) = \frac{n(n+1)(2n+1)}{6}\)

(iii) \((1^3 + 2^3 + 3^3 + \ldots + n^3) = \frac{n^2(n+1)^2}{4}\)

**CLASSWORK**

01. \((51 + 52 + 53 + \ldots + 100)\) is equal to \(-?\)

(a) 2525  (b) 2975  (c) 3225  (d) 3775

02. If the number 357 + 25x is divisible by both 3 and 5, then the missing digits in the units place and the thousands place respectively are?

(a) 5, 6  (b) 3, 5  (c) 5, 4  (d) None

03. 5 + 2 is a three digit number with + as the missing digit. If the number is divisible by 6, the missing digit is \(-?\)

(a) 2  (b) 3  (c) 6  (d) 0

04. Which one of the following numbers is exactly divisible by 11?

(a) 23641  (b) 24562  (c) 315624  (d) 415624

05. What least value must be given to + so that the number 451 * 603 is exactly divisible by 99?

(a) 2  (b) 5  (c) 7  (d) 8

06. The number 31131131131131 is \(-?\)

(a) divisible by 7 but not by 11  (b) divisible by 11 but not by 3  (c) divisible by both 3 and 11  (d) neither divisible by 3 nor 11

**KEY:** 01.d  02.b  03.a  04.d  05.d  06.d

**ASSIGNMENT**

1. Evaluate: \(986 \times 117 + 986 \times 863\)

(a) 986000  (b) 896000

2. 983 x 207 – 983 x 107

3. 1602 x 1605 – (14 x 15)^2

4. 1398 x 1398 – (14 x 15)^2

5. Evaluate: \((113 x 311 + 287 x 287) - a^2 + b^2\)

**NUMERICAL COMPUTATION**

11. \((856 + 167)^2 + (856 - 167)^2\) is equal to \(-?\)

(a) 856  (b) 257  (c) 689  (d) 1023

12. \((469 + 174)^2 - (469 - 174)^2\) is equal to \(-?\)

(a) 2  (b) 4  (c) 295  (d) 643

15. The sum of first 45 natural numbers is \(-?\)

(a) 1035  (b) 1280  (c) 2070  (d) 2140

16. The sum of even numbers between 1 and 31 is \(-?\)

(a) 16  (b) 12  (c) 240  (d) 512

17. If \(x + 568\) is divisible by 3, which of the following digits can replace \(x\)?

(a) 0  (b) 12  (c) 7  (d) 9

18. What least value must be assigned to * so that the number 63576 + 7 44\text{d} divisible by 47?

(a) 1  (b) 2  (c) 3  (d) 4

19. What least value must be given to * so that the number 451 * 603 is exactly divisible by 99?

(a) 2  (b) 5  (c) 7  (d) 8

20. Which of the following number is exactly divisible by 24?

(a) 37578  (b) 63810  (c) 537804  (d) 3125736

21. Which of the following number is exactly divisible by 99?

(a) 114345  (b) 135792  (c) 913464  (d) 3572404

22. The digits indicated by * and $ in 342221* $ so that this number is divisible by 99 are respectively?

(a) 19  (b) 3  (c) 4  (d) 55
23. If x and y are the two digits of the number 653xy such that this number is divisible by 86, then x + y is equal to ————?
   (a) 2    (b) 3    (c) 4    (d) 6

24. Which of the following numbers is exactly divisible by all prime numbers between 1 and 17?
   (a) 342342  (b) 440440  (c) 510510  (d) 515513

25. There is one number which is formed by writing one digit 6 times (e.g., 111111, 444444 etc.) such a number is always divisible by ————?
   (a) 7    (b) 11    (c) 13    (d) All the above

26. A 4-digit number is formed by repeating a 2-digits number such as 2525, 3232 etc. Any number of this form is exactly divisible by ————?
   (a) 7    (b) 11    (c) 13    (d) smallest 3-digit prime number

27. A six digit number is formed by repeating a three number: for example, 256256, 678678 etc. Any number 9 this form is always exactly divisible by ————?
   (a) 7 only    (b) 11 only    (c) 13 only    (d) 1001

28. The largest natural number which exactly divides the product of any four consecutive natural numbers is ————?
   (a) 6    (b) 12    (c) 24    (d) 120

29. The largest natural number by which the product of three consecutive even natural numbers is always divisible is ————?
   (a) 12    (b) 24    (c) 48    (d) 96

30. The sum of three consecutive odd numbers is always divisible by ————?
   (a) 1    (b) 2    (c) 3    (d) IV

31. The difference between the squares of two consecutive odd integers is always divisible by ————?
   (a) 3    (b) 6    (c) 7    (d) 8

32. The sum of the digits of a 3-digit number is subtracted from the number the result obtained number is ————?
   (a) divisible by 6    (b) divisible by 9
   (c) divisible neither by 6 nor by 9    (d) divisible by both 6 and 9

33. A 3-digit number 4 a 3 is added to another 3-digit number 984 to give the four digit number 336, which is divisible by 11, then, (a + b) is ————?
   (a) 10    (b) 11    (c) 12    (d) 15

34. The smallest number to be added to 1000 so that 45 divides the sum exactly is ————?
   (a) 10    (b) 20    (c) 35    (d) 80

35. The smallest number that must be added to 803642 in order to obtain a multiple of 11 is ————?
   (a) 1    (b) 4    (c) 7    (d) 9

36. The least number which must be subtracted from 6709 to make it exactly divisible by 9 is ————?
   (a) 2    (b) 3    (c) 4    (d) 5

37. What least number must be subtracted from 427398 so that the remaining number is divisible by 13?
   (a) 3    (b) 6    (c) 11    (d) 16

38. When the sum of two numbers is multiplied by 5, the product is divisible by 15. Which one of the following pairs of numbers satisfies the above condition?
   (a) 240, 335    (b) 250, 341    (c) 245, 342    (d) None

39. Find the number which is nearest to 457 and is exactly divisible by 11
   (a) 450    (b) 461    (c) 460    (d) 462

40. What largest number of five digits is divisible by 99? ————?
   (a) 99909    (b) 99981    (c) 99990    (d) 99999

**KEY:**
23.a 24.e 25.d 26.d 27.d 28.e 29.c 30.b 31.d 32.b 33.a 34.e
35.c 36.c 37.a 38.b 39.b 40.e

**2 DECIMAL FRACTIONS**

**Decimal Fractions:** Fractions in which denominators are powers of 10 are known as decimal fractions.

\[ \frac{1}{10} = 1 \text{ tenth} = 0.1, \quad \frac{1}{100} = 1 \text{ hundredth} = 0.01 \]

\[ \frac{99}{100} = 99 \text{ hundredths} = 0.99, \quad \frac{7}{1000} = 7 \text{ thousandths} = 0.007 \text{ etc.} \]

II. **Conversion of a Decimal Into Vulgar Fraction:** Put 1 in the denominator under the decimal point and annex with it as many zeros as is the number of digits after the decimal point. Now, remove the decimal point and reduce the fraction to its lowest terms.

E.g: \[ 0.25 = \frac{25}{100} = \frac{1}{4}, \quad 2.008 = \frac{2008}{1000} = \frac{251}{125} \]
III. Operations of Decimal fractions:
1. Addition and subtraction of Decimal Fraction
2. Multiplication of Decimal fractions
3. Dividing or Decimal fractions By a counting Number.

IV. Recurring Decimal: If in a decimal fraction, a figure or a set of figures is repeated continuously, then such a number is called recurring decimal.

In a recurring decimal, if a single figure is repeated then it is expressed by putting a dot over it. If a set of figures is repeated, it is expressed by putting a bar over the set.

\[ \frac{1}{3} = 0.333\ldots = 0.\overline{3} \]

\[ \frac{21}{7} = 3.142857142857\ldots = 3.\overline{142857} \]

Pure Recurring Decimal: A decimal fraction in which all the figures after the decimal point are repeated, is called a pure recurring decimal.

Converting a Pure Recurring Decimal into Vulgar Fraction:

1. Let \( 0.3 = \frac{x}{10} \)
2. Let \( 0.33 = \frac{x}{\overline{10}} \)
3. Subtract (1) from (2), the difference is \( \frac{x}{\overline{9}} = 0.03 \), so \( x = 0.27 \)

Mixed Recurring Decimal: A decimal fraction in which some figures do not repeat and some of them are repeated, is called a mixed recurring decimal.

\[ \frac{0.173333}{10} = 0.175 \]

Converting a Mixed Recurring Decimal into Vulgar Fraction: In the numerator, take the difference between the number formed by all the digits after decimal point (taking repeated digits only once), and that formed by the digits which are not repeated.

In the denominator, take the number formed by as many nines as there are repeating digits following by as many zeros as is the number of non-repeating digits.

\[ \frac{0.16 - 0.1}{90} = \frac{0.06}{90} \]

CLASSWORK:

01. Which of the following is equal to \( 3.14 \times 10^3 \)?
(a) 3140 (b) 314 (c) 3140000 (d) None

02. If \( 1.125 \times 10^3 = 0.00125 \), then the value of \( x \) is \( \ldots \ldots \)?
(a) 3 (b) -3 (c) -2 (d) -1

03. A tailor has 37.5 meters of cloth and he has to make \( 6 \) pieces out of a meter of cloth. How many pieces can he make out of this cloth?
(a) 320 (b) 360 (c) 400 (d) None

04. When \( \frac{0.212333}{10} \) is converted into a fraction, then the result is \( \ldots \ldots \)?
(a) \( \frac{1}{2} \) (b) \( \frac{3}{9} \) (c) \( \frac{23}{90} \) (d) None

ACE Academy NUMERICAL COMPUTATION

05. The rational number for the recurring decimal \( 0.125125 \ldots \ldots \) is?
(a) \( \frac{125}{999} \) (b) \( \frac{119}{99} \) (c) \( \frac{125}{99} \) (d) None

06. 0.76 expressed in the form of \( \frac{a}{b} \) equals:
(a) \( \frac{17}{20} \) (b) \( \frac{4}{9} \) (c) \( \frac{72}{99} \) (d) \( \frac{16}{21} \)

07. The correct expression of \( 0.36 \) in the fractional form is \( \ldots \ldots \)?
(a) \( \frac{64}{99} \) (b) \( \frac{146}{103} \) (c) \( \frac{64}{99} \) (d) \( \frac{64}{99} \)

08. If \( 547.527 = x \), then the value of \( \frac{547.527}{x} \) is \( \ldots \ldots \)?
(a) \( \frac{1}{10} \) (b) \( \frac{1}{10x} \) (c) \( \frac{1}{10} \) (d) None

09. If \( \frac{1}{2} = 0.16134 \), then the value of \( \frac{1}{0.0006198} \) is \( \ldots \ldots \)?
(a) \( \frac{0.16134}{10} \) (b) 0.16134 (c) \( \frac{16134}{10} \) (d) \( \frac{1}{0.0006198} \)

KEY:
01. c 02. b 03. d 04. c 05. c 06. c 07. e 08. a 09. a

ASSIGNMENT

1. The fraction \( \frac{101}{100000} \) in decimal form is \( \ldots \ldots \)?
(a) 0.01027 (b) 0.01027 (c) 0.100007 (d) 0.100007

2. What is 0.36 when written in simplest fraction form, the sum of the numerator and the denominator is \( \ldots \ldots \)?
(a) 15 (b) 15 (c) 114 (d) 135 (e) 34

3. If \( 7.25 = 4 \times A + 2B + 2C + 4 \times D + 3E \), then the value of \( 3A + 3B + 4C + D + 3E \) is \( \ldots \ldots \)?
(a) 53 (b) 53, 500 (c) 53, 560 (d) 155, 600 (e) 213, 000

4. Which of the following has fractions in ascending order?
(a) \( \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6} \) (b) \( \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6} \)
(c) \( \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6} \) (d) \( \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6} \)

\[ \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6} \]
5. What is the difference between the biggest and smallest fraction among $\frac{1}{3}$, $\frac{3}{4}$, $\frac{5}{6}$ and $\frac{7}{8}$?
(a) $\frac{1}{6}$ (b) $\frac{1}{12}$ (c) $\frac{1}{20}$ (d) $\frac{1}{30}$

6. The value of $34.95 + 240.016 + 23.98 = ?$
(a) 298.9046 (b) 298.111 (c) 298.946 (d) 299.09

7. $138.009 + 341.941 - 146.305 = 123.68 = ?$
(a) 120.085 (b) 120.85 (c) 220.85 (d) None

8. $0.002 \times 0.5 = ?$
(a) 0.001 (b) 0.0001 (c) 0.01 (d) 0.1

9. $40 \div 1.2 = ?$
(a) 41.666 (b) 42.47933 (c) 49.92932 (d) 54.7952

10. How many digits will be there to the right of the decimal point in the product of 96.75 and 0.02547?
(a) 5 (b) 6 (c) 7 (d) None

11. What is the square root of $\frac{2}{3}$, when expressed as a vulgar fraction, equals - - - - -?
(a) $\frac{2}{3}$ (b) $\frac{2}{8}$ (c) $\frac{3}{8}$ (d) None

12. Which is the closest approximation to the product $0.3333 \times 0.027 \times 0.499 \times 0.125 
\times 0.25$?
(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

13. 4.036 divided by 0.84 gives - - - - -?
(a) 1.009 (b) 10.09 (c) 100.9 (d) None

14. $0.95 + 0.25 = 0.05 = ?$
(a) 1394 (b) 140 (c) 140.6 (d) 143.9

15. $\frac{144}{1.44} = \frac{144}{x}$ Then the value of $x$ is - - - - -?
(a) 0.0144 (b) 1.44 (c) 14.4 (d) 144

16. The value of $\sqrt{6.37}$ is - - - - -?
(a) $\frac{51}{10}$ (b) $\frac{56}{9}$ (c) 26.45 (d) None

17. Let $F = 0.84111$. When $F$ is written as a fraction in lowest terms, the denominator exceeds the numerator by - - - -?
(a) 13 (b) 14 (c) 29 (d) 87

18. The value of $(0.85 + 0.3 + 0.1 + 0.9 + 0.39)$ is - - - -?
(a) 1.57 (b) 1.53 (c) 2.57 (d) 2.53

19. $3.87 - 2.59 = ?$
(a) 1.20 (b) 1.37 (c) 1.57 (d) None

20. The simplification of $3.36 - 2.65 + 1.33$ equals
(a) 2.60 (b) 2.64 (c) 2.81 (d) 2.84

21. $(0.05 \times 7.3)$ is equal to - - - -?
(a) 0.5 (b) 0.657 (c) 0.675 (d) None

22. $(0.3467 + 0.1335)$ is equal to - - - -?
(a) 0.48 (b) 0.48 (c) None (d) None

23. $\frac{3472 \times 324.23}{3.489 \times 5.42}$ is the same as - - - -?
(a) $\frac{53472 \times 3.2423}{3.489 \times 5.42}$ (b) $\frac{53472 \times 32423}{3.489 \times 5.42}$ (c) $\frac{53472 \times 324.23}{3.489 \times 5.42}$ (d) None

24. If $12 + 2 = 3 + 2 + 9 = 2025$, then the value of $(0.11)^2 + (0.22)^2 + (0.09)^2$ is close to - - - -?
(a) 0.2695 (b) 0.3695 (c) 2.695 (d) 2.695

25. The value of $\frac{1}{4} + \frac{1}{4x} + \frac{1}{4x^2}$ correct to 4 decimal places is - - - -?
(a) 0.3075 (b) 0.3082 (c) 0.3083 (d) 0.3085

26. If $1.5x = 0.04y$, then the value of $\frac{x - 2}{y + 4}$ is - - - -?
(a) $\frac{79}{77}$ (b) $\frac{77}{77}$ (c) $\frac{77}{77}$ (d) None

27. The value of $\left[ \frac{32.7 + 3 + 1}{3} \right] - \left[ \frac{2 + 1}{2 + 2} \right]$ is - - - -?
(a) 30 (b) 34.8 (c) 36.6 (d) 41.4
28. The value of \( \frac{3.6 \times 0.48 \times 2.50}{0.12 \times 0.09 \times 1.5} \) is --- ?
   (a) 8000
   (b) 600
   (c) 000
   (d) 80,000

29. The value of \((68.37)^2 - (31.73)^2\) is --- ?
   (a) 3,6474
   (b) 36,474
   (c) 36,744
   (d) 3647.4

30. Evaluate: \(\sqrt{0.39^2 - 0.61^2}\)
   (a) 2
   (b) 4
   (c) 6
   (d) 5

31. The value of \(\frac{(75.45 + 12.48)^2}{75.45 - 12.48}\) is --- ?
   (a) 1
   (b) 10
   (c) 100
   (d) None of the above

32. \(\frac{0.64^2 - 0.46^2}{0.7}\) is --- ?
   (a) 3.308
   (b) 4
   (c) 33.08
   (d) 330.8

33. \(\frac{4.7 \times 4.2 - 1.9 \times 1.9}{2.3 \times 6.1}\) is --- ?
   (a) 0.5
   (b) 1
   (c) 1.9
   (d) 4.2

34. Simplify: \(\frac{5.52 \times 56 + 5.32 \times 64}{(7.60)^2 - (2.24)^2}\)
   (a) 0.5
   (b) 1
   (c) 10
   (d) 12

35. \(0.6^2 - 0.5^2 \div (0.6^2 + 0.5^2)\) is equal to --- ?
   (a) 1
   (b) 0.11
   (c) 1.1
   (d) 11

36. The value of \(\frac{2.697 - 0.498}{2.697 \times 0.498}\) is --- ?
   (a) 0.5
   (b) 2
   (c) 2.199
   (d) 3.195

37. The value of \(\frac{0.137 - 0.098}{0.137 + 0.098}\) is --- ?
   (a) 0.039
   (b) 0.235
   (c) 0.25
   (d) 0.4

38. The value of \(0.951 \times 0.951 \times 0.951 + 0.041 \times 0.041 \times 0.041\) is --- ?
   (a) 0.039
   (b) 0.092
   (c) 0.92
   (d) 0.92

39. The value of \(0.953 \times 0.953 - 0.953 \times 0.047 \times 0.047\) is --- ?
   (a) 0.32
   (b) 0.886
   (c) 1.1288
   (d) None of the above

40. \(10.3 \times 10.3 + 1\) is equal to --- ?
   (a) 9.3
   (b) 10.3
   (c) 11.3
   (d) 12.3

41. The value of \(8.94 \times 8.94 \times 8.94 - 3.56 \times 3.56 \times 3.56\) is --- ?
   (a) 0.538
   (b) 2.38
   (c) 10.538
   (d) 53.8

KEY:
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

(3) H.C.F. AND L.C.M.

1. FACTORS AND MULTIPLES:
If a number 'a' divides another number 'b' exactly we say that 'a' is a factor of 'b'. In this case, 'b' is called a multiple of 'a'.

2. Highest common factor (H.C.F.) or Greatest Common Measure (G.C.M.) or Greatest Common Divisor (G.C.D.):
The H.C.F. of two or more than two numbers is the greatest number that divides each of them exactly.

There are two methods of finding the H.C.F. of a given set of numbers.

1. FACTORIZATION METHODS
Express each one of the given numbers as the product of prime factors. The product of least powers of common prime factors gives H.C.F.
1. Find the H.C.F. of 108, 288 and 360
   108 = 2^3 x 3^2
   288 = 2^5 x 3
   360 = 2^3 x 3^2 x 5
   H.C.F. = 2^3 x 3 = 8 x 3 = 24

2. **Division Method:**
   Suppose we have to find the H.C.F. of two given numbers. Divide the larger number by the smaller one. Now, divide the divisor by the remainder. Repeat the process of dividing the proceeding number by the remainder last obtained till zero is obtained as remainder.
   
   The last divisor is the required H.C.F.
   
   **Example:** Find the H.C.F. of 513, 1134 and 1215
   
   \[
   \begin{array}{c|cccc}
   \text{Dividend} & \text{Divisor} & \text{Quotient} & \text{Remainder} \\
   \hline
   1134 & 1215 & 1 & 81 \\
   81 & 1134 & 14 & 224 \\
   324 & 81 & 3 & 0 \\
   \hline
   \end{array}
   \]
   
   H.C.F. of 1134 and 1215 is 81

   H.C.F. of 513, 81
   
   \[
   \begin{array}{c|cccc}
   \text{Dividend} & \text{Divisor} & \text{Quotient} & \text{Remainder} \\
   \hline
   513 & 81 & 6 & 48 \\
   48 & 81 & 0 & 0 \\
   \hline
   \end{array}
   \]
   
   H.C.F. = 81

**Problems:**

1. Find the H.C.F. of 2^3 x 3^2 x 5, 2^3 x 5^2 x 7 x 11, 2^2 x 9 x 7^2
2. Find the greatest number which will divide 1356 and 1755 leaving no remainder
3. A trader has two varieties of sugar 204 kg and 1190 kg by weight. Find the number of minimum bags of equal size in which he can store the sugar without mixing
4. A worker was engaged for a certain number of days and was promised to be paid Rs. 1189. He remained absent for some days and was paid Rs. 1076 only. What were his daily wages?
5. What is the greatest number that will divide 2930 and 3246 that will leave as remainder 7 in each case
6. Find the greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively

**IV. H.C.F. AND L.C.M. OF FRACTIONS**

1. **I. H.C.F. = H.C.F. of Numerators**
   
   H.C.F. of Denominators
   
   **Example:** Find the H.C.F. and L.C.M. of 6, 24, 36 and 54
   
   **H.C.F. = 18**
   
   **L.C.M. = 54**

   **CLASSWORK**

   1. **The H.C.F. of 2^2 x 3^1 x 5^2 x 7 x 11 and 2^2 x 3^1 x 5^1 x 7^1 x 11 is**
   
   a) 2^2 x 3 x 5^1
   
   b) 2^2 x 3^1 x 5^1
   
   c) 2^2 x 3^1 x 5^1 x 7 x 11
   
   2. **The L.C.M. = 2^2 x 3^2 x 5 x 7 x 11, 2^3 x 3^2 x 7 and 2^3 x 3^2 x 5 x 7 x 11 is**
   
   a) 2^2 x 3^2 x 5 x 7 x 11
   
   b) 2^2 x 3^2 x 5 x 7 x 11
   
   c) 2^3 x 3^2 x 5 x 7 x 11

   **Product of two numbers = Product of their H.C.F. and I.C.M.**

   **(ii) The Ratio of two numbers = H.C.F. of that numbers**
03. The ratio of two numbers is 3 : 4 and their H.C.F. is 4. Their L.C.M. is
(a) 12
(b) 16
(c) 24
(d) 48

04. The H.C.F. of two numbers is 11 and their L.C.M. is 7700. If one of the numbers is 275, then the other is
(a) 680
(b) 308
(c) 2960
(d) 3700

05. Three different containers contain 496 liters, 403 liters and 713 liters of mixtures of milk and water respectively when biggest measure can measure all the different quantities exactly?
(a) 7 liters
(b) 7 litres
(c) 31 litres
(d) 41 liters

06. The maximum number of students among them 1001 pens and 910 pencils can be distributed in such a way that each student gets the same number of pens and same number of pencils is
(a) 91
(b) 910
(c) 1001
(d) 1911

07. A rectangular courtyard 37.8 meters long and 5.25 meters wide is to be paved exactly with square tiles, all the same size. What is the largest size of the tile which could be used for the purpose?
(a) 14 cm
(b) 21 cm
(c) 42 cm
(d) None

KEY: 01.a 02.d 03.d 04.b 05.e 06.a 07.b

ASSIGNMENT
01. The H.C.F. of $2^4 \times 3^3 \times 5^2 \times 7^2 \times 11^3 \times 17$ and $3 \times 5 \times 7 \times 11 \times 13$ is
(a) 105
(b) 1215
(c) 2310
(d) 27720

02. H.C.F. of $4 \times 27 \times 3125$, $8 \times 9 \times 25 \times 7$ and $16 \times 81 \times 5 \times 11 \times 49$ is
(a) 180
(b) 360
(c) 540
(d) 1260

03. Find the highest common factor of 36 and 84?
(a) 4
(b) 6
(c) 12
(d) 18

04. The H.C.F. of 2041190 and 1445 is
(a) 17
(b) 47
(c) 19
(d) 21

05. The H.C.F. of 2923 and 3239 is
(a) 37
(b) 47
(c) 73
(d) 75

06. Find the lowest common multiple of 24, 36, 48?
(a) 120
(b) 240
(c) 360
(d) 480

07. The L.C.M. of 22, 54, 108, 135 and 198 is
(a) 330
(b) 19980
(c) 5940
(d) 11880

08. The L.C.M. of 148 and 185 is
(a) 680
(b) 740
(c) 2960
(d) 3700

09. The H.C.F. of $\frac{2}{3} \times \frac{3}{9} \times \frac{8}{11}$ and $\frac{10}{27}$ is
(a) $\frac{2}{3}$
(b) $\frac{2}{81}$
(c) 160
(d) $\frac{160}{81}$

10. The H.C.F. of $\frac{9}{10} \times \frac{12}{25} \times \frac{18}{35}$ and $\frac{21}{40}$ is
(a) $\frac{3}{5}$
(b) $\frac{252}{5}$
(c) $\frac{3}{2800}$
(d) $\frac{3}{700}$

11. The L.C.M. of $\frac{2}{3} \times 2 \times 3 \times 5$ is
(a) $\frac{1}{36}$
(b) $\frac{10}{27}$
(c) $\frac{1}{1365}$
(d) None

12. The L.C.M. of $\frac{1}{5} \times \frac{2}{3} \times \frac{4}{5}$ is
(a) $\frac{1}{54}$
(b) $\frac{10}{27}$
(c) $\frac{20}{3}$
(d) None

13. The H.C.F. of $\frac{1}{75}$, $\frac{5}{6}$ and $\frac{1}{27}$ is
(a) 0.07
(b) 0.7
(c) 3.5
(d) 0.35

14. The G. C. D. of 1.08, 0.36 and 0.9 is
(a) 0.11
(b) 0.9
(c) 0.18
(d) 0.108

15. The L.C.M. of $\frac{1}{2}$ and 1.09 is
(a) 2.7
(b) 0.27
(c) 0.027
(d) None

16. The H.C.F. of two numbers is 11 and their L.C.M. is 693. If one of the numbers is 77, find the other
(a) 89
(b) 99
(c) 98
(d) 79

17. Two numbers are in the ratio of 15 : 11. If their H.C.F. is 13. Find the numbers
(a) 193 and 143
(b) 135 and 195
(c) 154 and 159
(d) None

18. Three numbers are in the ratio 1 : 2 : 3 and their H.C.F. is 12. The numbers are
(a) 2, 8, 12
(b) 5, 10, 15
(c) 5, 10, 15
(d) None

19. The sum of two numbers is 216 and their H.C.F. is 27. The numbers are
(a) 27, 189
(b) 81, 135
(c) 108, 168
(d) 154, 162

20. The sum of two numbers is 528 and their H.C.F. is 33. The numbers of pairs of numbers satisfying the above conditions is
(a) 4
(b) 6
(c) 8
(d) 12
21. The product of two numbers is 4107. If the H.C.F. of these numbers is 37, then the greater
number is
(a) 101 (b) 107 (c) 111 (d) 185

22. The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is
(a) 1 (b) 2 (c) 3 (d) 4

23. The L.C.M. of two number is 48. The numbers are in the ratio 2 : 3. The sum of the numbers is
(a) 28 (b) 32 (c) 40 (d) 64

24. Three numbers are in the ratio of 3 : 4 : 5 and their L.C.M. is 2400. Their H.C.F. is
(a) 40 (b) 80 (c) 120 (d) 200

25. The H.C.F. and L.C.M. of two numbers are 84 and 21 respectively. If the ratio of the two
numbers is 1 : 4, then the larger of the two numbers is
(a) 48 (b) 36 (c) 84 (d) 108

26. The L.C.M. of two numbers of 495 and their H.C.F. is 5. If the sum of the numbers is
100, then their difference is
(a) 10 (b) 46 (c) 70 (d) 90

27. If the sum of two numbers is 35 and the H.C.F. and L.C.M. of these numbers are 5 and
120 respectively, then the sum of the reciprocals of the numbers is equal to
(a) 55 (b) 60 (c) 11 (d) 120

28. The L.C.M. of two numbers is 45 times their H.C.F. If one of the numbers is 125 and the
sum of H.C.F. and L.C.M. is 1150, the other number is
(a) 215 (b) 220 (c) 225 (d) 235

29. The H.C.F. and L.C.M. of two numbers are 50 and 250 respectively. If the first number is
divided by 2, the quotient is 50. The second number is
(a) 50 (b) 100 (c) 125 (d) 250

30. The product of two numbers is 1320 and their H.C.F. is 6. The L.C.M. of the numbers is
(a) 220 (b) 1314 (c) 1326 (d) 7920

31. The H.C.F. and L.C.M. of two numbers 11 and 385 respectively. If one number lies
between 75 and 125, then that number is
(a) 77 (b) 88 (c) 99 (d) 1110

32. The greatest number that exactly divides 105, 1001 and 2436 is
(a) 3 (b) 7 (c) 11 (d) 121

33. The greatest possible length which can be used to measure exactly the length 7m, 3m 85
cm, 12 m 95cm is
(a) 15 cm (b) 25 cm (c) 35 cm (d) 42 cm

34. Find the greatest number that will divide 43, 91 and 183 so as to leave the same
remainder in each case
(a) 4 (b) 7 (c) 9 (d) 13

35. Let N be the greatest number that will divide, 1305, 4665 and 6905, leaving the same
remainder in each case. The sum of the digits in N is
(a) 9 (b) 5 (c) 6 (d) 8

36. The greatest number which can divide 1356, 1869 and 2764 leaving the same remainder
in each case is
(a) 64 (b) 124 (c) 156 (d) 260

37. The greatest number of four digits which is divisible by 15, 25, 40 and 75 is
(a) 9000 (b) 9400 (c) 9600 (d) 9800

38. The least number of five digits which is exactly divisible by 12, 15, and 18 is
(a) 10010 (b) 10015 (c) 10020 (d) 10080

39. The least number which should be added to 2497 so that the sum is exactly divisible
by 5, 6, 4 and 3 is
(a) 3 (b) 13 (c) 23 (d) 33

40. The smallest number which when diminished by 7, is divisible by 12, 16, 18, 21 and
28 is
(a) 1008 (b) 1015 (c) 1022 (d) 1032

41. The least number, which when increased by 5 is divisible by each one of 24, 32, 36, and
54 is
(a) 427 (b) 859 (c) 869 (d) 4320

42. The least number, which when divided by 12, 15, 20 and 54 leaves in each case a
remainder of 8 is
(a) 504 (b) 536 (c) 544 (d) 548

43. The greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5
respectively is
(a) 123 (b) 127 (c) 235 (d) 305

KEY:
01. a 02.a 03.e 04.a 05.d 06.e 07.e 08.b 09.a 10.e 11.a 12.e
25.e 26.e 27.e 28.e 29.a 30.a 31.a 32.b 33.e 34. 35.a 36.a
37.e 38.d 39.e 40.b 41.b 42.d 43.h
(4) SQUARE ROOTS AND CUBE ROOTS

1. FACTORS AND MULTIPLES:

Square root: If \( x^2 = y \) we say that the square root of \( y \) is \( x \) and we write \( \sqrt{y} = x \)

Eg: \( \sqrt{4} = 2 \), \( \sqrt{144} = 12 \)

Cube root: The cube root of a given number is \( x \) if the number whose cube is \( x \), we denote it as \( \sqrt[3]{x} \)

Eg: \( \sqrt[3]{27} = 2 \), \( \sqrt[3]{64} = 4 \)

Important notes:

1. \( \sqrt{x \times y} = \sqrt{x} \times \sqrt{y} \)
2. \( \sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}} \)
3. \( \sqrt{x^2} = x \)
4. \( \sqrt{x^3 \times y} = \sqrt{x^3} \times \sqrt{y} \)
5. \( \sqrt{x^5} = x^2 \times \sqrt{x} \)
6. \( \sqrt{x^7} = x^2 \times \sqrt{x^3} \)

Properties of a perfect square Number:

(a) A number ending with 2, 3, 7 or 8 cannot be a perfect square.
(b) The last digit of a perfect square must be 0, 1, 4, 5, 6, or 9.
(c) A number ending with odd number of zeros cannot be a perfect square. Eg. 9,000,000 is not a perfect square.
(d) A perfect square number is either divisible by 3 or \( -1 \) or -4 leaves a remainder of 1, when divided by 9.
(e) 64 is exactly divisible by 3.
(f) A perfect square number is either exactly divisible by 4, (or) leaves a remainder of 1, when divided by 4.

Eg: 81 \( \rightarrow \) remainder 1.
100 \( \rightarrow \) 4 remainder

ACE Academy

NUMERICAL COMPUTATION

165

For finding square root two methods:
1. By Factored method,
2. By division method,

CLASSWORK

01. If \( 10 \times 10 = 100 \), then \( P \) equals --- ?
(a) 0.01  (b) 0.1  (c) 10  (d) 100

02. If \( \sqrt{8} \times \sqrt{4} \times \sqrt{4} \times \sqrt{4} \), then \( x \) equals --- ?
(a) 22  (b) 24  (c) 28  (d) 32

03. A man plants 15376 apple trees in his garden and arranges them so that there are as many rows as there are apple trees in each row. The number of rows is --- ?
(a) 124  (b) 126  (c) 134  (d) 144

04. A General wishes to draw up his 36581 soldiers in 64 form of a solid square. After arranging them, he found that some of them were left over. How many are left?
(a) 65  (b) 81  (c) 100  (d) None of these

KEY: (b) (a) (c) (c)

ASSIGNMENT

01. Find the value of \( \sqrt[3]{684} \times 124 \). Ans: 78.14

02. Find the value of \( \sqrt{1671369} \). Ans: 1213

03. Find the value of \( \sqrt{75.2976} \). Ans: 8.68

04. Evaluate: \( \sqrt{48 + \sqrt{35 + \sqrt{69}} \). Ans: 16

05. Find the value of \( \sqrt{2} \). Ans: 1.4

06. What is the square root of 0.00009? Ans: 0.03

07. Find the value of \( \sqrt{14} \times 14 \). Ans: 23

08. Evaluate: \( \sqrt[3]{\frac{4}{9}} \). Ans: 2

09. What will come in place of question mark in each of the following questions.
(i) \( \frac{224}{7} \times 2 \). Ans: 8.1

(ii) \( \sqrt[3]{9.5 \times 0.0085 \times 18.9} \). Ans: 2

10. Evaluate: \( 0.0017 \times 1.9 \times 0.021 \). Ans: 150
11. If \( a \times b \times c = \frac{(a+2)(b+3)}{(c+1)} \), then find the value of \( 6 \times 15 \times 3 \).

12. Evaluate \( \sqrt{36} \times 0.3 \), up to 3 places of decimals.

13. Find the values of \( \sqrt{2} \) up to three places of decimal.

14. Find the smallest number that must be added to 1780 to make it a perfect square. (Ans: 66)

15. The smallest number added to 600621 to make the sum a perfect square is - - - ?
   (a) 4     (b) 6     (c) 8     (d) 10

16. What is the smallest number to be subtracted from 549162 in order to make it a perfect square?
   (a) 28     (b) 36     (c) 63     (d) 81

17. What is the least number which should be subtracted from 0.000326 to make it a perfect square?
   (a) 0.000002     (b) 0.000004     (c) 0.02     (d) 0.04

18. The least number by which 294 must be multiplied to make it a perfect square, is - - - ?
   (a) 2     (b) 3     (c) 6     (d) 24

19. Find the smallest number by which 5808 should be multiplied so that the product becomes a perfect square.
   (a) 2     (b) 3     (c) 7     (d) 11

20. The least number by which 1470 must be divided to get a number which is a perfect square.
    (a) 5     (b) 6     (c) 15     (d) 30

21. The greatest four-digit perfect square number is - - - ?
    (a) 19000     (b) 9801     (c) 9900     (d) 19981

22. The least number of 4 digits which is a perfect square is - - - ?
    (a) 1000     (b) 1016     (c) 1024     (d) 1036

Key:
15a. 16d 17a 18c 19b 20d 21b 22c

EXERCISE 1

01. \( \sqrt{3.0524} \) = ?
   (a) 202     (b) 232     (c) 242     (d) 352

02. The square root of 64009 is - - - ?
   (a) 253     (b) 347     (c) 363     (d) 303
14. \( \sqrt{0.01} + \sqrt{0.0064} = ? \)
   (a) 0.05  
   (b) 0.3  
   (c) 0.42  
   (d) 0.0064
   (e) None of these

15. The value of \( \sqrt{0.01} + \sqrt{0.81} + \sqrt{2.21} + \sqrt{0.0009} \) is: 
   (a) 2.01  
   (b) 2.1  
   (c) 2.11  
   (d) 2.13

16. \( \sqrt[3]{0.00025} \times \sqrt[3]{0.25} \times \sqrt[3]{0.0001} = ? \)
   (a) 0.000075  
   (b) 0.0075  
   (c) 0.075  
   (d) None of these

17. \( \sqrt[3]{5625} = ? \)
   (a) 1.05  
   (b) 1.25  
   (c) 1.45  
   (d) 1.55

18. If \( \sqrt[3]{2.25} = 1.35 \), then the value of \( (\sqrt[3]{2.25})^3 \) is: 
   (a) 1.40985  
   (b) 1.49985  
   (c) 149.985  
   (d) 1499.85

19. If \( \frac{52}{x} = \frac{169}{289} \), the value of \( x \) is: 
   (a) 52  
   (b) 58  
   (c) 32  
   (d) 68

20. \( \sqrt{\frac{3}{169}} = \frac{56}{39} \)
   (a) 108  
   (b) 524  
   (c) 2916  
   (d) 4800

21. If \( \sqrt{44} = 0.2 \), then the value of \( x \) is: 
   (a) 0.1764  
   (b) 1.764  
   (c) 1.64  
   (d) 2.64

22. \( \frac{0.0186}{0.2} = ? \)
   (a) 0.49  
   (b) 0.7  
   (c) 4.9  
   (d) None of these

23. \( \sqrt[3]{0.00169} = ? \)
   (a) \( \sqrt[3]{0.01} \)  
   (b) \( \sqrt[3]{1} \)  
   (c) \( \sqrt[3]{3} \)  
   (d) \( \frac{150}{13} \)

24. If \( \sqrt{1 + \frac{55}{729}} = \frac{1 + x}{27} \), then the value of \( x \) is: 
   (a) 1  
   (b) 3  
   (c) 5  
   (d) 7

25. The value of \( \sqrt{9 - \sqrt{12}} = ? \)
   (a) \( \frac{3}{2} \)  
   (b) \( \frac{1}{5} \)  
   (c) \( \frac{\sqrt{2}}{2} \)  
   (d) \( \frac{3}{4} \)

26. Given \( \sqrt{2} = 1.414 \), the value of \( \sqrt{8} + 3 \sqrt{2} - 3 \sqrt{28} + 41 \) is: 
   (a) 8.426  
   (b) 8.484  
   (c) 8.226  
   (d) 8.876

27. \( \sqrt{0.0064} \times 6.25 \) is equal to: 
   (a) 0.9  
   (b) 0.99  
   (c) 9  
   (d) None of these

28. \( \sqrt{0.204 \times 42} = ? \)
   (a) 0.07  
   (b) 0.6  
   (c) 6  
   (d) 6.6

29. Given \( \sqrt{5} = 2.236 \) is equal to: 
   (a) \( \frac{1}{6} \)  
   (b) 0.06  
   (c) 0.6  
   (d) None of these

30. \( \sqrt{3.5} = 1.85 \) is equal to: 
   (a) 0.05  
   (b) 5  
   (c) 0.5  
   (d) 500

31. The value of \( \sqrt[3]{(0.001)^{2} + (0.02)^{2} - (0.0065)^{2}} \) is: 
   (a) 0.1  
   (b) 10  
   (c) 10^{0}  
   (d) None of these

32. The square root of \( 7 + 3 \sqrt{5} \) is: 
   (a) \( \sqrt{7} \)  
   (b) 2  
   (c) 4  
   (d) None of these

33. \( \sqrt{5} - 1 \) simplifies to: 
   (a) \( \frac{3}{4} \)  
   (b) \( \frac{2}{3} \)  
   (c) \( \frac{4}{5} \)  
   (d) None of these

34. The square root of \( 0.5 \) is: 
   (a) 0.5  
   (b) 0.7  
   (c) None of these  
   (d) 0.8

35. \( \frac{1}{(y - x)^{2}} + \frac{1}{(y - z)^{2}} + \frac{1}{(x - y)^{2}} + \frac{1}{(x - z)^{2}} + \frac{1}{(z - y)^{2}} + \frac{1}{(z - x)^{2}} \) is equal to: 
   (a) \( \frac{1}{3} \)  
   (b) 1  
   (c) 5  
   (d) None of these
36. If \( \frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = \frac{n + b}{n + b} \), then find the value of \( \frac{a + 1}{b} \).
   (a) \( a = -1, b = 4 \)  
   (b) \( a = -1, b = 6 \)  
   (c) \( a = 11, b = -4 \)  
   (d) \( a = 6, b = 11 \)

37. If \( x = 2 - 4\sqrt{3} \) then find the value of \( \frac{x + 1}{2} \).
   (a) \( 3\sqrt{3} \)  
   (b) \( 5\sqrt{3} \)  
   (c) 14  
   (d) \( 14 + 8\sqrt{3} \)

**KEY:**

**EXERCISE II**

01. The cube root of 0.0000216 is -?
   (a) 0.6  
   (b) 0.6  
   (c) 0.06  
   (d) None of these

02. \( \sqrt[3]{125} = ? \)
   (a) \( \frac{5}{2} \)  
   (b) \( \frac{7}{5} \)  
   (c) \( \frac{1}{5} \)  
   (d) \( 2 \frac{2}{5} \)

03. \( \sqrt[3]{0.000064} = ? \)
   (a) 0.02  
   (b) 0.2  
   (c) 0.2  
   (d) None of these

04. By what least number \( 6720 \) be multiplied to obtain a number which is a perfect cube?
   (a) \( 5 \)  
   (b) \( 7 \)  
   (c) \( 4 \)  
   (d) None of these

05. What is the smallest number by which \( 6500 \) be divided to make it a perfect cube?
   (a) 9  
   (b) 50  
   (c) 300  
   (d) None of these

06. A General wishes to draw up his 3581 soldiers in the form of a solid square. After arranging them, he found that some of them are left over. How many are left?
   (a) 65  
   (b) 81  
   (c) 100  
   (d) None of these

07. A group of students decided to collect as many notes as possible from each member of the group as is the number of members. If the total collection amounted to Rs. 59.29, the number of members in the group is -?
   (a) 57  
   (b) 67  
   (c) 77  
   (d) 87

**KEY:** 01.b 02.b 03.b 04.a 05.d 06.c 07.c

**Solutions:**

1. Simplify: \( 18 - \frac{1}{5} - 3 + (7 - 8 - 3) \)
   - (a) 13  
   - (b) 15  
   - (c) 27  
   - (d) 32

2. What is the value of \( \frac{f + g}{f - g} \) if \( f = 2 \)?
   - (a) \( \frac{1}{3} \)  
   - (b) \( \frac{2}{3} \)  
   - (c) \( \frac{4}{3} \)  
   - (d) \( \frac{7}{3} \)

3. Income of a company double after every one year. If the initial income was Rs. 4 lakh, what would be the income after 5 years?
   - (a) Rs. 1,24 lakhs  
   - (b) Rs. 1,28 lakhs  
   - (c) Rs. 2.36 lakhs  
   - (d) None of these

4. The number of students in each section of a school is 24. After admitting new students, three new sections were started. Now, the total number of sections is 16 and there are 21 students in each section. How many new students were admitted?
   - (a) 14  
   - (b) 24  
   - (c) 48  
   - (d) 114

5. A new train Rs. 20 on the first day and Rs. 1 on the next day. He again earns Rs. 20 on the third day and spends Rs. 15 on the fourth day. If he continues to earn like this, how soon will he have Rs. 60 in hand?
   - (a) on 17th day  
   - (b) on 27th day  
   - (c) on 30th day  
   - (d) on 40th day?

6. A boy was asked to multiply a number by 25. Instead multiplied the number by 52 and got the answer 324 more than the correct answer. The number to be multiplied was -?
   - (a) 12  
   - (b) 15  
   - (c) 25  
   - (d) 32
01. \[ \frac{1}{2} \times \frac{3}{4} = \frac{3}{8} \]
(a) $\frac{1}{2}$  
(b) $\frac{3}{4}$  
(c) $\frac{5}{8}$  
(d) $\frac{3}{8}$  
(e) None of these

02. \[ \frac{2}{3} \times \frac{5}{6} = \frac{5}{9} \]
(a) $\frac{2}{3}$  
(b) $\frac{5}{6}$  
(c) $\frac{5}{9}$  
(d) $\frac{2}{9}$  
(e) None of these

03. \[ \frac{3}{4} \times \frac{1}{2} = \frac{3}{8} \]
(a) $\frac{3}{4}$  
(b) $\frac{1}{2}$  
(c) $\frac{3}{8}$  
(d) $\frac{1}{8}$  
(e) None of these

04. \[ \frac{5}{6} \times \frac{2}{3} = \frac{10}{9} \]
(a) $\frac{5}{6}$  
(b) $\frac{2}{3}$  
(c) $\frac{10}{9}$  
(d) $\frac{1}{9}$  
(e) None of these

05. \[ \frac{1}{3} \times \frac{2}{4} = \frac{1}{6} \]
(a) $\frac{1}{3}$  
(b) $\frac{2}{4}$  
(c) $\frac{1}{6}$  
(d) $\frac{1}{12}$  
(e) None of these

06. \[ \frac{1}{2} \times \frac{3}{4} = \frac{3}{8} \]
(a) $\frac{1}{2}$  
(b) $\frac{3}{4}$  
(c) $\frac{1}{8}$  
(d) $\frac{3}{8}$  
(e) None of these

07. \[ \frac{1}{3} \times \frac{2}{3} = \frac{1}{9} \]
(a) $\frac{1}{3}$  
(b) $\frac{2}{3}$  
(c) $\frac{1}{9}$  
(d) $\frac{1}{27}$  
(e) None of these

08. The total monthly salary of 4 men and 2 women is Rs. 46,000. If a man earns Rs. 500 more than a woman, what is the monthly salary of a woman?
(a) Rs. 6000  
(b) Rs. 7500  
(c) Rs. 8000  
(d) Rs. 9000  
(e) Rs. 10000

KEY: 01.c 02.c 03.b 04.b 05.a 06.b 07.a 08.c

ASSIGNMENT

02. \[ \frac{3}{5} \times \frac{2}{3} \]
(a) $\frac{3}{5}$  
(b) $\frac{2}{3}$  
(c) $\frac{1}{2}$  
(d) $\frac{1}{3}$  
(e) None of these

03. \[ \frac{5}{7} \times \frac{1}{2} \]
(a) $\frac{5}{7}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{14}$  
(d) $\frac{1}{7}$  
(e) None of these

04. \[ \frac{2}{3} \times \frac{1}{2} \]
(a) $\frac{2}{3}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{6}$  
(d) $\frac{1}{6}$  
(e) None of these

05. \[ \frac{1}{4} \times \frac{3}{8} \]
(a) $\frac{1}{4}$  
(b) $\frac{3}{8}$  
(c) $\frac{3}{32}$  
(d) $\frac{1}{32}$  
(e) None of these

06. \[ \frac{1}{2} \times \frac{3}{4} \]
(a) $\frac{1}{2}$  
(b) $\frac{3}{4}$  
(c) $\frac{3}{8}$  
(d) $\frac{1}{8}$  
(e) None of these

07. \[ \frac{3}{5} \times \frac{2}{3} \]
(a) $\frac{3}{5}$  
(b) $\frac{2}{3}$  
(c) $\frac{1}{3}$  
(d) $\frac{1}{15}$  
(e) None of these

08. \[ \frac{5}{6} \times \frac{1}{2} \]
(a) $\frac{5}{6}$  
(b) $\frac{1}{2}$  
(c) $\frac{5}{12}$  
(d) None of these

09. \[ \frac{2}{3} \times \frac{1}{2} \]
(a) $\frac{2}{3}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{6}$  
(d) None of these

10. \[ \frac{3}{4} \times \frac{1}{2} \]
(a) $\frac{3}{4}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{3}$  
(d) None of these

11. \[ \frac{5}{6} \times \frac{2}{3} \]
(a) $\frac{5}{6}$  
(b) $\frac{2}{3}$  
(c) $\frac{2}{3}$  
(d) None of these

12. \[ \frac{3}{4} \times \frac{1}{2} \]
(a) $\frac{3}{4}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{6}$  
(d) None of these

13. \[ \frac{1}{2} \times \frac{3}{4} \]
(a) $\frac{1}{2}$  
(b) $\frac{3}{4}$  
(c) $\frac{3}{8}$  
(d) None of these

14. \[ \frac{5}{6} \times \frac{1}{2} \]
(a) $\frac{5}{6}$  
(b) $\frac{1}{2}$  
(c) $\frac{5}{12}$  
(d) None of these

15. \[ \frac{2}{3} \times \frac{1}{2} \]
(a) $\frac{2}{3}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{3}$  
(d) None of these

16. \[ \frac{3}{4} \times \frac{1}{2} \]
(a) $\frac{3}{4}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{6}$  
(d) None of these

17. \[ \frac{5}{6} \times \frac{1}{2} \]
(a) $\frac{5}{6}$  
(b) $\frac{1}{2}$  
(c) $\frac{5}{12}$  
(d) None of these

18. \[ \frac{2}{3} \times \frac{1}{2} \]
(a) $\frac{2}{3}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{3}$  
(d) None of these

19. \[ \frac{3}{4} \times \frac{1}{2} \]
(a) $\frac{3}{4}$  
(b) $\frac{1}{2}$  
(c) $\frac{1}{6}$  
(d) None of these

20. \[ \frac{5}{6} \times \frac{1}{2} \]
(a) $\frac{5}{6}$  
(b) $\frac{1}{2}$  
(c) $\frac{5}{12}$  
(d) None of these
22. On a tricky day, if 30 children were made to stand in a column, then 16 columns could be formed. If 24 children were made to stand in a column, then how many columns could be formed?
(a) 20
(b) 29
(c) 20
(d) 43

23. A class starts at 10 a.m. and lasts till 1:27 p.m. Four periods are held during this interval. After every period, 5 minutes are given to the students. The exact duration of each period is
(a) 42 minutes
(b) 48 minutes
(c) 51 minutes
(d) 53 minutes

24. A light was seen at intervals of 13 seconds. It was seen for the first time at 1 hr, 24 min 50 seconds a.m. and the last time at 17.58 hours. How many times was the light seen?
(a) 56
(b) 375
(c) 376
(d) 384

25. A boy multiplied 423 by a number and obtained 65589 as his answer. If both the figures in the answer are wrong and all other figures are correct, the correct answer is
(a) 65489
(b) 61189
(c) 62189
(d) 62389

26. David got two and a half times as many marks in English as in History. If his total marks in the two subjects are 460, the marks scored by him in English are
(a) 220
(b) 250
(c) 90
(d) 100

27. $\frac{565 + 167}{7} + \frac{856 - 167}{7}$ = ...
(a) 1
(b) 2
(c) 689
(d) 1023

28. $\frac{(69 + 179)^2 - (440 - 176)^2}{2}$ = ?
(a) 2
(b) 469 x 714
(c) 4
(d) 295

29. If $a = 3$ and $b = 5$, find the value of $ab^2$
(a) 10
(b) 12
(c) 15
(d) 18

30. If $x = 7$, $y = 5$
(a) $\frac{10}{y}$
(b) 1
(c) 5
(d) cannot be determined

31. How many pieces of 85 cm length can be cut from a rod 42.5 meters long?
(a) 30
(b) 40
(c) 60
(d) None of these

32. If $x = 7$, $y = 5$
(a) $\frac{10}{y}$
(b) 1
(c) 5
(d) cannot be determined

33. How many pieces of 85 cm length can be cut from a rod 42.5 meters long?
(a) 30
(b) 40
(c) 60
(d) None of these
32. The simplified value of \[\begin{array}{c|c|c|c|c}
1 + \frac{1}{100} & 1 + \frac{1}{100} & 1 + \frac{1}{100} & 1 + \frac{1}{100} \\
100 & 109 & 100 & 109 \\
\end{array}\]

\(\begin{array}{c}
100 \\
101 \\
200 \\
202 \\
100 \\
\end{array}\)

33. If \(a = b + c - 13\), \(a^2 + b^2 = 69\), then find \(ab + be + ca\) - ?

\(\begin{array}{c}
(a) -50 \\
(b) 50 \\
(c) 69 \\
(d) 75 \\
\end{array}\)

34. \(785 \times 785 \times 785 \times 453 \times 453 \times 453\) simplifies to

\(\begin{array}{c}
(a) 350 \\
(b) 785 \\
(c) 1220 \\
(d) 1320 \\
\end{array}\)

35. \(\frac{147 \times 147 + 147 \times 143 - 143 \times 143}{147 \times 147 - 147 \times 143 + 143 \times 143}\)

\(\begin{array}{c}
(a) \frac{1}{4} \\
(b) 290 \\
(c) \frac{1}{290} \\
(d) 4 \\
\end{array}\)

36. \(\frac{3}{4} \times \left(\frac{3}{4}\right) = 20\)

\(\begin{array}{c}
(a) 6 \\
(b) 20 \\
(c) 91 \\
(d) None of these \\
\end{array}\)

37. The value of \(\frac{\left(\frac{2}{3}\right)^3 - \left(\frac{2}{3}\right)^2}{\left(\frac{2}{3}\right)^2 - \left(\frac{2}{3}\right)^3}\)

\(\begin{array}{c}
(a) \frac{1}{5} \\
(b) \frac{19}{25} \\
(c) \frac{21}{25} \\
(d) 1 \end{array}\)

**KEY:**

01.e 02.e 03.a 04.e 05. 06.d 07.a 08.e 09.a 10.b 11.e 12.d


25.a 26.d 27.b 28.e 29.a 30.e 31.b 32.b 33.b 34.e 35.a 36.e

37.b

### (6) RATIO AND PROPORTION

**RATIO:**

The ratio of two quantities \(a\) and \(b\) in the same units, is the fraction \(\frac{a}{b}\), and we write it as \(a:b\).

In the ratio \(a:b\), we call \(a\) the first term (or) antecedent and \(b\), the second term (or) consequent.

**RULE:** The multiplication (or) division of each term of a ratio by the same non-zero number does not affect the ratio.

**PROPORTION:**

The equality of two ratios is called proportion. If \(a:b = c:d\), we write \(a:b::c:d\) and we say that \(a,b,c,d\) are in proportion. Here \(a\) and \(d\) are called "extremes", while \(b\) and \(c\) are called mean terms.

\[\frac{\text{product of means}}{\text{product of extremes}} = \frac{bc}{ad} = \frac{a \times d}{b \times c}\]

(i) **Fourth proportional:**

If \(a:b = c:d\), then \(d\) is called the fourth proportional to \(a,b,c\).

(ii) **Third proportional:**

\(x:b\cdot a\), then \(c\) is called the third proportional to \(a\) and \(b\).

(iii) **Mean proportional:**

Mean proportional between \(a\) and \(b\) is \(\sqrt{ab}\)

**COMPOUNDED RATIO:**

The compounded ratio of the ratios \((a:b),(c:d),(e:f)\) is \((ae-bf)\)

(i) **Duplicate ratio of \((a:b)\) is \(a^2:b^2\)**

(ii) **Sub-duplicate ratio of \((a:b)\) is \(\sqrt{a}:\sqrt{b}\)**

(iii) **Triplicate ratio of \((a:b)\) is \(a^3:b^3\)**

(iv) **Sub-triplicate ratio of \((a:b)\) is \(a^{3/2}:b^{3/2}\)**

**Componendo and dividendo rule:**

\[\frac{a + b}{a - b} = \frac{c + d}{c - d}\]

then \(\frac{a + b}{b} = \frac{c + d}{d}\)
CLASSWORK

01. If the ratio of A to B is 9 times the ratio of B to A, then A:B is ______.

02. A and B together have Rs.12060 with them. If $\frac{4}{15}$ of A's amount is equal to $\frac{2}{5}$ of B's amount, how much does 'B' have ______.

03. Five bananas and four apples cost as much as three bananas and seven apples. The ratio of the cost of one banana to that of one apple is ______.

04. The average age of three boys is 25 years and their ages are in the proportion 3:5:7. The age of the youngest boy is ______.

05. An amount of money is to be distributed to P, Q, and R in the ratio 3:5:7. If Q’s share is Rs.1500, what is the difference between P’s and R’s share is ______.

06. A sum of money is to be divided among P, Q, and R in the ratio of 2:3:5. If the total share of P and R together is Rs. 4000 more than that of Q, what is R’s share is in ______.

07. The prices of scooter and TV are in the ratio of 5:4. If scooter cost Rs. 4000 more than TV. The price of TV set is ______.

08. Two numbers are in the ratio of 1:3 and the sum of their squares is 560. The small number is ______.

09. The two numbers are in the ratio of 4:7 and their product is 252. The big number is ______.

10. A present the sum of ages are Rahim and Kamal are 63 years, the ratio of their ages after 7 years will be 7:4. What is present age of Rahim? ______.

11. An amount of Rs. 2,430/- is divided among A,B,C such that if their shares being reduced by Rs.5/-, Rs.10/- and Rs.15/- respectively, the remainders shall be in the ratio 3:4:5. The share of B is ______.

12. An amount of Rs. 735/- was divided between A, B & C. If each of them had received by 25% less, the shares would have been in the ratio of 1:3:2. The money received by c was ______.

13. Rs.1,555/- are distributed to three men A,B and C in such a way, if 15%, 20% and 10% be added to their shares respectively then ratio becomes 2:5:9. Find the share of c? ______.

14. Rs. 1870/- is divided in to three parts, $\frac{1}{2}$ of the first part $\frac{1}{3}$ of second part, $\frac{1}{6}$ of third part are equal, what is second part? ______.

15. Rs. 2160/- are divided among A,B,C such that 50% of A's amount, $\frac{3}{2}$ % of B's amount and 25% of C's amount is equal. What is C's amount ______.

16. Rs. 1540/- was divided among A, B and C, such that B's amount is equal to $\frac{3}{11}$ of A and C together receive, then B's amount ______.
11. The ratio of \(a^{1/2} : b^{1/2}\) is same as:
   (a) 2:1
   (b) 4:1
   (c) 7:3
   (d) 7:10

12. If \(x = y\), then \((x + 9y)(x + 2y)\) is:
   (a) 22:20
   (b) 26:61
   (c) 29:22
   (d) 61:26

13. If \(15\%\) of \(a = 20\%\) of \(y\), then \(x = y\) is:
   (a) \(x = y\)
   (b) \(2x = 3y\)
   (c) \(5x = 3y\)
   (d) \(3x = 5y\)

14. If \(x = 2:1\), then \((x^2 + y^2) : (x^2 + y^2)\) is:
   (a) 3:3
   (b) 5:3
   (c) 1:3
   (d) 3:1

15. If \(x = 3:1\), then \((x + 5) : (y + 6)\) is equal to:
   (a) 2:1
   (b) 13:8
   (c) \(\frac{13}{8}\)
   (d) \(\frac{8}{13}\)

16. If \(x = 3\) and \(y = 7\), then \(x + y = c\) is equal to:
   (a) \(c\) = 2
   (b) \(c\) = 1
   (c) \(c\) = \(\frac{1}{2}\)
   (d) \(c\) = 7

17. If \(x + y = 6:7\), \(x + a = 8\) and \((a + b + c) = 14\), then the value of \(c\) is:
   (a) \(c\) = 1
   (b) \(c\) = \(\frac{1}{2}\)
   (c) \(c\) = 2
   (d) \(c\) = 7

18. The salaries of A, B, and C are in the ratio 2:3:5. If the increments of 15%, 10%, and 20% are allowed respectively in their salaries, then what will be the new ratio of their salaries?
   (a) 3:4:5
   (b) 10:11:20
   (c) 23:39:60
   (d) None of these

19. If \(A = 12\) and \(B = 5\) were divided among A, B, and C so that \(A : B = 5:4\) and \(B : C = 9:10\), then C gets:
   (a) Rs. 340
   (b) Rs. 360
   (c) Rs. 450
   (d) Rs. 475

20. If \(A = 5\) and \(B = 6\) were divided among A, B, and C in such a way that A gets \(\frac{1}{2}\) of what B gets and C gets \(\frac{1}{4}\) of what C gets, then their shares are respectively:
   (a) Rs. 120, Rs. 240, Rs. 150
   (b) Rs. 60, Rs. 90, Rs. 150
   (c) Rs. 150, Rs. 300, Rs. 60
   (d) None of these

21. If \(A = 36\) and \(B = 48\), then A may get \(\frac{1}{2}\) as much as \(A + B\) together, \(B\) may get \(\frac{1}{2}\) as much as \(A + B\) together, then the share of \(A\) is:
   (a) Rs. 122
   (b) Rs. 120.60
   (c) Rs. 146.60
   (d) Rs. 183

22. A sum of Rs. 1300 is divided amongst P, Q, R, and S such that P's share : Q's share : R's share : S's share = \(\frac{1}{2}\) : 2 : 3 : 4. Then P's share is:
   (a) Rs. 140
   (b) Rs. 160
   (c) Rs. 240
   (d) Rs. 320

23. The sum of three numbers is 98. If the ratio of the first to the second is 2:3 and that of the second to the third is 5:8, then the second number is:
   (a) 20
   (b) 30
   (c) 40
   (d) 58

24. A and B together have Rs. 1210. If \(\frac{5}{9}\) of A's amount is equal to \(\frac{2}{7}\) of B's amount, how much money does B have?
   (a) Rs. 460
   (b) Rs. 484
   (c) Rs. 550
   (d) Rs. 664

25. A sum of money is to be distributed among A, B, C, D, and E in proportion of 5:2:4:3:6. If C gets Rs. 1000 more than D, who is B's share?
   (a) Rs. 500
   (b) Rs. 1500
   (c) Rs. 2000
   (d) None

26. Salaries of Ravi and Rishi are in the ratio 2:3. If the salary of each is increased by Rs. 1000, the new ratio becomes 40:27. What is Ravi's present salary?
   (a) Rs. 17,000
   (b) Rs. 20,006
   (c) Rs. 25,500
   (d) None of these

27. Ratio of the earnings of A and B is 4:7. If the earnings of A increase by 50% and those of B decrease by 25%, the new ratio of their earnings becomes 8:7. What are A's earnings?
   (a) Rs. 21,000
   (b) Rs. 26,000
   (c) Rs. 28,000
   (d) Rs. 32,000

28. The prices of a scooter and a TV are in the ratio 7:5. If the scooter costs Rs. 10,000 more than a TV set, then the price of a TV set is:
   (a) Rs. 20,000
   (b) Rs. 24,000
   (c) Rs. 28,000
   (d) Rs. 32,000
29. An amount of Rs. 735 was divided between A, B, and C. If each of them had received Rs. 25 less, their shares would have been in the ratio of 1:2:3. The money received by C was: 
(a) Rs. 195  
(b) Rs. 200  
(c) Rs. 225  
(d) Rs. 245

30. An amount of Rs. 2430 is divided among A, B, and C such that if their shares be reduced by Rs. 5, Rs. 10, and Rs. 15 respectively, the remainders shall be in the ratio of 3:4:5. Then, B's share was: 
(a) Rs. 605  
(b) Rs. 790  
(c) Rs. 800  
(d) Rs. 810

31. Two numbers are in the ratio 3:5. If 9 is subtracted from each, the new numbers are in the ratio 12:23. The smaller number is: 
(a) 27  
(b) 32  
(c) 49  
(d) 55

32. The ratio of three numbers is 3:4:7 and their product is 18144. The numbers are: 
(a) 9, 12, 21  
(b) 15, 20, 25  
(c) 18, 24, 42  
(d) None of these

33. Seats for Mathematics, Physics, and Biology in a school are in the ratio 5:7:8. There is a proposal to increase these seats by 40%, 50%, and 35% respectively. What will be the ratio of increased seats? 
(a) 2:3:4  
(b) 4:7:8  
(c) 6:8:9  
(d) None of these

34. The ratio of the number of boys and girls in a college is 7:8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio? 
(a) 8:9  
(b) 9:10  
(c) 21:22  
(d) cannot be determined

35. In a mixture of 60 litres, the ratio of milk and water is 2:1. If the ratio is to be 1:2, then the quantity of water to be further added is: 
(a) 20 litres  
(b) 30 litres  
(c) 40 litres  
(d) 60 litres

36. In a school, 10% of the boys are some in number as 4 th of the girls. What is the ratio of boys to girls in that school? 
(a) 5:2  
(b) 5:2  
(c) 2:1  
(d) 4:3

37. A sum of Rs. 53 is divided among A, B, and C in such a way that A gets Rs. 7 more than what B gets and B gets Rs. 8 more than what C gets. The ratio of their shares is: 
(a) 16:9:18  
(b) 25:18:10  
(c) 18:15:10  
(d) 15:8:30

KEY: 

ACE Academy  
NUMERICAL COMputation  

the average of a number is a measure of the central tendency of a set of numbers. in other words, it is an estimate of where the center point of a set of numbers lies.

the basic formula for the average of n numbers x₁, x₂, xₙ .... xₙ is

\[ A_n = \frac{\sum_{i=1}^{n} x_i}{n} \]

also means \( A_n = \text{total of all set of numbers.} \)

the average is always calculated for a set of numbers.

concept of weighted average:
when we have two or more groups whose individual averages are known, then to find the combined average of all the elements of all the groups we use weighted average. Thus, if we have \( K \) groups with averages \( A_1, A_2, ..., A_k \) and having \( n_1, n_2, ..., n_k \) elements then the weighted average is given by the formula

\[ A_w = \frac{n_1 A_1 + n_2 A_2 + ... + n_k A_k}{n_1 + n_2 + ... + n_k} \]

another meaning of average:
the average (also known as arithmetic mean AM) of a set of numbers can also be defined as the number by which we can replace each and every number of the set without changing the total of the set of numbers.

properties of average (AM):
the properties of averages can be elucidated by the following examples:

01. the average of 4 numbers 12, 13, 17 and 18 is

\[ \frac{12 + 13 + 17 + 18}{4} = 15 \]

solution: required average is 4

02. this means that if each of the 4 numbers of the set were replaced by 15 each, there would be no change in the total.

this is an important way to look at averages. this can be visualized as:

| 12 | + | 3 | = | 15 |
| 13 | + | 2 | = | 15 |
| 17 | + | -2 | = | 15 |
| 18 | + | -3 | = | 15 |

\[ \frac{40 + 0}{4} = 60 \]
22. In a school, visualizes adition of a fifth number, which increases the average by 1.
\[ 15 + 1 = 16 \]
\[ 15 + 1 = 16 \]
\[ 15 + 1 = 16 \]
\[ 15 + 1 = 16 \]

The +1 appearing at time is due to the fifth number, which is able to maintain the average of
16 first and then 'given one' to each of the first 4.
Hence, the fifth number is this case is 20

03. The average always lies above the lowest number of the set and below the highest number of
the set.
04. The net deficit due to the numbers below the average always equals the net surplus due to
the numbers above the average.

05. Ages and averages:
If the average age of a group of persons if x years today then after n years their averages
age will be \((x + n)\) years.
Also, n years ago their average age would have been \((x-n)\). This happens due to the fact
that for a group of people, 1 year is added to each person's age every year.

EXERCISE:
01. Davis obtained 76, 65, 82, 67 and 85 marks (out of 100) in English, Mathematics, Physics,
Chemistry and Biology. What is his average mark?
(a) 65
(b) 69
(c) 72
(d) 76
(e) None of these

02. In Arun's opinion, his weight is greater than 65 kg but less than 72 kg. His brother does
not agree with Arun and he thinks that Arun's weight is greater than 60 kg but less than
70 kg. His mother's view is that his weight cannot be greater than 58 kg. If all of them are
correct in their estimation, what is the average of different weight estimates of Arun?
(a) 67 kg
(b) 68 kg
(c) 69 kg
(d) Cannot be determined
(e) None of these

03. Find the average of all the numbers from 6 to 34 which are divisible by 5.
(a) 18
(b) 20
(c) 24
(d) 30

04. A student was asked to find the arithmetic mean of the numbers 3, 11, 7, 9, 15, 13, 8, 19,
17, 21, 14 and x. He found the mean to be 12. What should be the number in place of x?
(a) 3
(b) 7
(c) 17
(d) 11

05. The average of 2, 7, 6 and \(x\) is 5 and the average of 18, 1, 6x and y is 10. What is the
value of y?
(a) 5
(b) 10
(c) 20
(d) 30

06. If the mean of 7 observation \(x, y = 2, x + 4, y + 6, x + 3, y + 7, y + 8, z + 9 = 11,\) then the mean of the last
three observations is:
(a) 11
(b) 13
(c) 15
(d) 17

07. The average of first 30 natural numbers is:
(a) 15
(b) 21
(c) 25
(d) 25.5

08. The mean of \(x, y, z, x^2, y^2, z^2, x^3, y^3, \) is:
(a) 10
(b) 20
(c) 30
(d) 40

09. The average of all odd numbers up to 100 is:
(a) 49
(b) 49.5
(c) 50
(d) 51

10. If \(a, b, c, d, e\) are five consecutive odd numbers, their average is:
(a) \(5a + 4\)
(b) \(a + b + c + d + e\)
(c) None of these

11. The square of a non-zero number and its square is 5 times the number. The number is:
(a) 5
(b) 17
(c) 29
(d) 295

12. The average of 7 consecutive numbers is 20. The largest of these numbers is:
(a) 20
(b) 22
(c) 23
(d) 26

13. The average of five consecutive odd numbers is 61. What is the different between the
highest and lowest numbers?
(a) 5
(b) 5
(c) 6
(d) Cannot be determined
(e) None of these

14. The sum of three consecutive odd numbers is 38 more than the average of these numbers.
What is the first of these numbers?
(a) 13
(b) 17
(c) 19
(d) Cannot be determined
(e) None of these

15. The average annual income (in Rs.) of certain agricultural workers is S and that of other
workers is T. The number of agricultural workers is 11 times that of other workers. Then
the average monthly income (in Rs.) of all the workers is:
(a) \(\frac{S + T}{2}\)
(b) \(\frac{S + 21T}{2}\)
(c) \(\frac{11S + T}{12}\)
(d) None of these

16. A library has an average of 510 visitors on Sundays and 240 on other days. The average
number of visitors per day in a month of 31 days beginning with a Sunday is:
(a) 250
(b) 276
(c) 280
(d) 285

17. The average weight of 16 boys in a class is 50.25 kg and that of the remaining 8 boys is
45.15 kg. Find the average weight of all the boys in the class.
(a) 47.53 kg
(b) 48 kg
(c) 48.55 kg
(d) 49.25 kg

18. A car owner buys petrol at Rs.7.50, Rs. 8 and Rs. 4.50 per litre for three successive years.
What approximately is the average cost per litre of petrol if he spends Rs. 4000 each year?
(a) Rs.7.98
(b) Rs. 8
(c) Rs. 7.50
(d) Rs. 9

19. The average of six numbers \(x, y = z\) and the average of three of these \(y, z\). If the average of
the remaining three \(x, y, z\), then:
(a) \(x = y + z\)
(b) \(2x = y + z\)
(c) \(x = 2y + 2z\)
(d) None of these
PERCENTAGE

Percent literally means for every 100' and is derived from the French word 'cent' which is French for 100.

The basic utility of the percentage arises from the fact that it is one of the most powerful tools for comparison of numerical data and information. It is also one of the simplest tools for comparison of data.

In the context of business and economic performance, it is specifically useful for comparing data such as profits, growth rates, performance, magnitude and so on.

Mathematical definition of percentage:

The concept of percentage mainly applies to ratios, and the percentage value of a ratio is arrived at by multiplying by 100 the decimal value of the ratio.

For example, a student scores 20 marks out of a maximum possible 30 marks. His marks can then be denoted as 20 out of 30 = (20/30) * 100 = 66.66%

The process for getting this is perfectly illustrated through the unitary method.

Marks got = Out of
20 = 30
X = 100

Then the value of X x 30 = 20 x 100

X = (20/30) x 100 = the percentage equivalent of a ratio.

Now, let us consider a classic example of the application of percentage.

CLASSWORK

01. It costs Rs. 1 to photocopy a sheet of paper. However, 25% discount is allowed on all photocopies done after first 1000 sheets. How much will it cost to copy 5000 sheets of paper?

(a) Rs. 3500
(b) Rs. 3950
(c) Rs. 4000
(d) Rs. 4900

02. A household saved Rs. 2.50 in buying an item on sale. If she spent Rs. 25 for the item, approximately how much percent she saved in the transaction?

(a) 8% 
(b) 9% 
(c) 11% 
(d) 12%

03. When 15% is lost in grinding wheat, a country can export 30 lakh tons of wheat. On the other hand, if 10% is lost in grinding, it can export 40 lakh tons of wheat. The production of wheat in the country is:

(a) 20 lakh tons
(b) 30 lakh tons
(c) 40 lakh tons
(d) 80 lakh tons

04. In a market survey 20% opted for product A, whereas 60% opted for product B. The remaining individuals were not certain. If the difference between those who opted for product B and those who were uncertain was 720, how many individuals were covered in the survey?

(a) 1440
(b) 1800
(c) 3600
(d) Data insufficent

05. In an election, 30% of the voters voted for candidate A whereas 60% of the remaining voted for candidate B. The remaining voters did not vote. If the difference between those who voted for candidate A and those who did not vote was 320, how many individuals were eligible for casting vote in that election?

(a) 10000
(b) 45000
(c) 60000
(d) 72000

06. In an examination, 5% of the applicants were found ineligible and 85% of the eligible candidates belonged to the general category. If 4275 eligible candidates belonged to other categories, then how many candidates applied for the examination?

(a) 30000
(b) 35000
(c) 37000
(d) None of these

07. 33 1/3% of a man's daily output is equal to 50% of a second man's daily output. If the second man turns out 1500 acres daily, then the first man's output in terms of making screws is:

(a) 500
(b) 1000
(c) 21000
(d) 2250

08. Samson spends 24% of his monthly income on food and 15% on the education of his children. Of the remaining income, he spends 25% on entertainment and 20% on conveyances. He is now left with Rs.10,736. What is the monthly salary of Samson?

(a) Rs.27,600
(b) Rs.28,000
(c) Rs.31,200
(d) Rs.32,000

09. 405 sweets were distributed equally among children in such a way that the number of sweets received by each child is 20% of the total number of children. How many sweets did each child receive?

(a) 9
(b) 15
(c) 18
(d) 45
10. A man bought a house for Rs.16000 and rents it. He puts 12 1/2 % of each month's rent aside for repairs, pays Rs. 1600 as annual taxes and realizes 10% on his investments there after. The monthly rent of the house is:
(a) Rs.2460
(b) Rs.2500
(c) Rs.4920
(d) Rs.5000
11. Mr. X a businessman had the income in the year 2000, such that he earned a profit of Rs.5000 but still had the same income (Income = Investment + Profit) as that in 2001. Thus the percentage profit earned in 2001 increased by 4%. What was his investment in 2000?
(a) Rs.1,02,000
(b) Rs.1,05,000
(c) Rs.1,50,000
(d) Data Inadequate
(e) None of these

**KEY:**
01.d 02.b 03.c 04.b 05.c 06.a 07.d 08.d 09.a 10.c 11.b

**ASSIGNMENT**
01. The ratio 5 : 4 expressed as a percent equals:
(a) 12.5%
(b) 40%
(c) 80%
(d) 125%
02. 65% of 7 is:
(a) 2.25
(b) 2.45
(c) 2.50
(d) 2.75
03. 88% of 270 + 24% of 210 = 118
(a) 256
(b) 258
(c) 268
(d) 383
04. 60% of 264 is the same as:
(a) 10% of 44
(b) 15% of 1056
(c) 39% of 132
(d) None of these
05. 270 candidates appeared for an examination, of which 252 passed. The percent age is:
(a) 10%
(b) 35.33%
(c) 90.33%
(d) 93.3%
06. Rajesh buys goods worth Rs. 6650. He gets a rebate of 6% on it, after getting the rebate, he pays sales tax @ 10%. Find the amount he will have to pay for the goods.
(a) Rs. 6876.10
(b) Rs. 6999.20
(c) Rs. 6654
(d) Rs. 7000
07. An agent gets a commission of 2.5% on the sales of cloth. If no agent's day, he gets Rs.12.50 as commission, the cloth sold through him on that day is worth:
(a) Rs. 250
(b) Rs. 500
(c) Rs. 750
(d) Rs. 1250
08. Two-fifth of one-third of three-sevenths of a number is 15. What is 40% of that number?
(a) 72
(b) 84
(c) 136
(d) 140

**ACE Academy**

**NUMERICAL COMPUTATION**

09. The difference between a number and its two-fifth is 310. What is 10% of that number?
(a) 12.75
(b) 85
(c) 204
(d) None of these
10. If 25% of a number is subtracted from a second number, the second number reduces to 1/5 of itself. What is the ratio of the first number to the second number?
(a) 1 : 3
(b) 2 : 3
(c) 3 : 2
(d) Data Inadequate
11. When any number is divided by 12, then, dividend becomes 1/4th of the other number, by how much percent first number is greater than the second number?
(a) 150
(b) 200
(c) 300
(d) Data Inadequate
12. Two numbers A and B are sum that sum of 5% of A and 4% of B is two-thirds of the sum of 6% of A and 8% of B. Find the ratio of A : B.
(a) 2 : 3
(b) 1 : 1
(c) 3 : 4
(d) 4 : 3
13. In a competitive examination in State A, 6% candidates got selected from the total appeared candidates. State B had an equal number of candidates appeared and 7% candidates got selected with 80 more candidates got selected than A. What was the number of candidates appeared from each State?
(a) 7600
(b) 8000
(c) 8400
(d) Data Inadequate
14. The price of a car is Rs.2,25,000. It was increased to 85% of its price. The car was damaged completely in an accident and the insurant company paid 90% of the insurance. What was the difference between the price of the car and the amount received?
(a) Rs.32,500
(b) Rs.48,750
(c) Rs.76,375
(d) Rs.81,250
15. 10% of the voters did not cast their vote in an election between two candidates. 10% of the votes polled were found invalid. The successful candidate got 54% of the valid votes and won by a majority of 1620 votes. The number of votes enrolled on the voter list was:
(a) 22690
(b) 31000
(c) 35000
(d) 40080
16. If $x = \frac{4}{7}$ of $y$ and $y = \frac{3}{4}$ of $x$, then which of the following is true? 
(a) $x$ is smaller than $y$ 
(b) $x$ is greater than $y$ 
(c) Relationship between $x$ and $y$ cannot be determined 
(d) $y$ is smaller than $x$, that is $x$ is greater than $y$.
(e) None of these

Directions: Questions 18 to 20:
A survey of magazine readership habits of the people residing in five cities P, Q, R, S, and T is summarized in a table below. The Column I in the table gives percentage of magazine readers in each city who read only one magazine a week. The Column II gives the total number of magazine readers who read two or more magazines in a week. Read the table and then answer these questions:

<table>
<thead>
<tr>
<th>City</th>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>75</td>
<td>6000</td>
</tr>
<tr>
<td>Q</td>
<td>80</td>
<td>3500</td>
</tr>
<tr>
<td>R</td>
<td>60</td>
<td>2000</td>
</tr>
<tr>
<td>S</td>
<td>55</td>
<td>2700</td>
</tr>
<tr>
<td>T</td>
<td>25</td>
<td>4200</td>
</tr>
</tbody>
</table>
17. The city with the lowest number of magazine-readers is:
   (a) Q  (b) R  (c) S  (d) T

18. Which city has the highest number of magazine-readers who read only one magazine a week?
   (a) P  (b) Q  (c) R  (d) S

19. The highest number of magazine-readers in any given city is:
   (a) 17500  (b) 18000  (c) 24000  (d) 30000

20. How many magazine-readers in city Q read only one magazine a week?
   (a) 14000  (b) 18000  (c) 12500  (d) 16500

21. The total number of all the magazine-readers in the five cities who read only one magazine a week is:
   (a) 19400  (b) 24000  (c) 41200  (d) 42000

22. Rohan spends 40% of his salary on food, 20% on house rent, 10% on entertainment and 10% on conveyance. If his savings at the end of a month are Rs. 1500, then his monthly salary is:
   (a) Rs.6000  (b) Rs.7500  (c) Rs.8000  (d) Rs.10,000

23. Kunal spent Rs.35,000 in buying raw materials, Rs.40,000 in buying machinery and 20% of the total amount he had as cash money; how much does he save every month?
   (a) Rs.40,000  (b) Rs.65,750  (c) Rs.90,000  (d) Rs.95,750

24. A man gave 40% of the amount he had to Rohan. Rohan in turn gave one-fourth of what he received from A man to Sahil. After paying Rs. 200 to the taxi driver out of the amount he got from Rohan, Sahil now has Rs.600 left with him. How much amount did A man have?
   (a) Rs.4000  (b) Rs.8000  (c) Rs.12,000  (d) Data inadequate

25. In an examination, there are three papers and a candidate has to get 35% of the total to pass. In one paper, he gets 62 out of 150 and in the second 52 out of 150. How much must be got, out of 180, in the third paper to just qualify for a pass?
   (a) 60.5  (b) 68  (c) 70  (d) 71

26. In a History examination, the average of the entire class was 60 marks. If 10% of the students scored 95 marks and 20% scored 90 marks. What was the average marks of the remaining students of the class?
   (a) 65.5  (b) 68  (c) 75  (d) 85

27. In a recent survey 40% houses contained two or more people. Of these houses containing only one person, 25% were having only a male. What is the percentage of all houses, which contains exactly one female and no males?
   (a) 15  (b) 40  (c) 75  (d) Can't be determined  (e) None of these

28. In a city, 35% of the population is composed of migrants, 20% of whom are from rural areas. Of the local population, 48% is female while this figure for rural and urban migrants is 30% and 40% respectively. If the total population of the city is 728400, what is its female population?
   (a) 324135  (b) 349680  (c) 509940  (d) None of these

29. The price of a T.V. set is decreased by 25% as a result of which the sale increased by 20%. What will be the effect on the total revenue of the shop?
   (a) No effect  (b) 5% decrease  (c) 5% increase  (d) 10% increase

30. The price of tea being increased by 20%, a man reduces his weekly consumption by 50%, by how much percent will his expenses for tea be decreased?
   (a) 2%  (b) 4%  (c) 6%  (d) 8%

31. Prakash earns an income of 10% on food grains and 15% on other items of expenditure. If the ratio of an employee's expenditure on food grains and other items be 2 : 3 by how much should his salary be increased in order that he may maintain the same level of consumption as before, his present salary being Rs.2250?
   (a) Rs.323.75  (b) Rs.350  (c) Rs.365.50  (d) None of these

32. In the month of January, the Railway Police caught 4000 ticket less travelers. In February, the number rose by 5%. However, due to constant vigil by the Police and the Railway staff, the number reduced by 5% and in April it further reduced by 10%. The total number of ticket less travelers caught in the month of April was:
   (a) 3125  (b) 3255  (c) 3575  (d) 3591

33. The population of a variety of tiny bees in an experimental field increased by 10% in the first year, increased by 8% in the second year but decreased by 10% in the third year. If the present number of bees in the experimental field is 26730, then the number of bees in the beginning was:
   (a) 25000  (b) 27000  (c) 24000  (d) 24600

34. The population of a company has up and down every year. The production increases for two consecutive by 15% and in the third year it decreases by 10%. Again in the next two years in increases by 15% each year and decrease by 10% in the third year. If we start counting from the year 1998, approximately what will be the effect on production of the company in 2002?
   (a) 27% increase  (b) 32% increase  (c) 37% increase  (d) 42% increase  (e) 52% increase

35. A building worth Rs.135,100 is constructed on land worth Rs.72,900. How many years will the value of both be the same if land depreciates at 10% p.a and building depreciates at 10% p.a ?
   (a) 1 ½  (b) 2  (c) 2 ½  (d) 3

36. The real population of a village is 5000. The number of males and females increases by 10% and 15% respectively and consequently the population of the village becomes 5600. What was the number of males in the village?
   (a) 2000  (b) 2500  (c) 3000  (d) 4000
GENERAL APTITUDE 193

37. % of income of A = equal to 15% of income of B and 10% of income of C. If C’s income is Rs 20,000, then the total income of A, B and C is:
(a) Rs.60,000
(b) Rs.40,000
(c) Rs.18,000
(d) Rs.20,000

38. Ash’s monthly income is 20% more than that of Ravi’s. Ravi’s monthly income is 20% less than that of Deepak’s. If the difference between the monthly incomes of Amit and Deepak is Rs.800, what is the monthly income of Ravi?
(a) Rs.13,000
(b) Rs.16,000
(c) Rs.20,000

(9) QUANTITATIVE APTITUDE

KEV:
01.6 02.4 03.2 04.0 06.4 06.6 07.6 08.0 09.0 10.0 11.0 12.0 12.2
13.4 13.4 13.4 13.4 13.4 19.6 20.0 21.6 22.8 24.6
25.0 26.0 21.0 28.0 28.6 30.0 30.4 32.0 33.0 34.0 35.0 36.0 38.0

1. The ratio of number of males to number of females in a club is 7 : 4. If there are 84 males in the club, the total numbers in the club are:
(a) 126
(b) 132
(c) 136
(d) 148
(e) 168

2. The prices of scooter and TV are in the ratio of 3 : 4. If scooter cost 4,000 less than TV, the price of TV is:
(a) 20,000
(b) 16,000
(c) 8,000
(d) 10,000
(e) None

3. The sum of money is divided among P, Q & R, in the ratio of 2 : 3 : 5. If the amount of P and R together is Rs. 4000 more than that of Q. What is R’s Amount?
(a) Rs. 206
(b) Rs. 300
(c) Rs. 500
(d) Rs. 400

4. An amount of 7500 was divided between A, B, C, in the ratio which they had received Rs. 2500 less the shares would have been in the ratio of 3 : 2. The money received by C was:
(a) 355
(b) 245
(c) 253
(d) None

PARTNERSHIP

5. A, B and C are partners in a business. A puts Rs.45,000/-, B puts Rs.54,000/- and C puts Rs.36,000/-. What is the share of C in a total profit of Rs.37,300/-
(a) Rs.12500
(b) Rs.15000
(c) Rs.19000
(d) Rs.5500
(e) None

6. Yogesh started a business, investing Rs.45,000. After 3 months, Pranab joined him with a capital of Rs.60,000. After another 6 months, Ashok joined with a capital of Rs.20,000. What would be Ashok’s share in it:
(a) Rs.8000
(b) Rs.4000
(c) Rs.3000
(d) Rs.2000
(e) None

ACE Academy NUMERICAL COMPUTATION

07. A and B started a business with initial investments in the ratio 14 : 15 and their profits were in the ratio 7 : 6. If A invested the money for 10 months, how many months did B invest his money
(a) 8 months
(b) 4 months
(c) 6 months
(d) 12 months
(e) None

08. ‘A’ is a working partner and ‘B’ is a sleeping partner in a business. A invests Rs.12,000/-
and B invests Rs.20,000/-. A receives 10% of the profit for managing and rent being divided in proportion to their capitals earn a total profit of Rs.9,600/-. The money received by A is:
(a) Rs. 4,000/-
(b) Rs. 6,000/-
(c) Rs. 5,100/-
(d) Rs. 4,800/-

TIME & WORK

9. Tuhin and Rausgari can do a job alone in 20 days and 30 days respectively. In how many days the job will be finished if they work together?
(a) 12 days
(b) 14 days
(c) 15 days
(d) 16 days
(e) None

10. Ram, Scram and Mohan can do a piece of work in 12, 15 and 20 days respectively. How long will they take to finish it together?
(a) 10 days
(b) 12 days
(c) 14 days
(d) 8 days
(e) 5 days

11. A Tailor is able to finish a consignment of Garments fabrication in 80 days less than second Tailor. If the first tailor is three times as fast as the second tailor, in how many days both of them can finish this consignment together?
(a) 120 days
(b) 40 days
(c) 30 days
(d) 20 days
(e) None

12. A alone can do a work in 10 days, which B alone can do it 15 days. If they work together and finish it, then out of total wages of Rs.2,250/-, the amount ‘A’ will get is
(a) Rs.135
(b) Rs.90
(c) Rs.150
(d) Rs.120
(e) None

TIME AND DISTANCE

\[ \text{mph} = \text{kmph} \times \frac{5}{18} \]
\[ \text{kmph} = \text{mph} \times \frac{18}{5} \]

01. Speed (V) = \[ \frac{\text{Total distance travelled}(d)}{\text{Total time taken}(t)} \]

02. Average Speed for whole journey \[ V = \frac{d_1 + d_2 + \ldots + d_n}{t_1 + t_2 + \ldots + t_n} \]

13. A car can finish a certain journey in 10 hours, at a speed of 48 kmph. In order to cover the same distance in 8 hours, the speed of the car must be
(a) 60 kmph
(b) 30 kmph
(c) 45 kmph
(d) 15 kmph
(e) None

14. A man travelled at certain distance by train at the rate of 50 kmph and came back by bus at an average speed of 30 kmph. The journey took 8 hours. What distance did he travel by train
(a) 150 km
(b) 200 km
(c) 125 km
(d) 175 km
(e) None

15. Two buses start from stations A and B and travelled towards each other a speed of 50 kmph and 60 kmph respectively. At the time of meeting the second bus has covered 120 km more than the first. The distance between A and B is
(a) 1320 km
(b) 1350 km
(c) 1310 km
(d) 1300 km
(e) None
16. A train is moving at a speed of 132 kmph, if length of the train is 110 m, how long will it take to cross a railway pivot point of 165 m long is ....
(a) 7.5 sec (b) 7 sec (c) 7.2 sec (d) 8.6 sec (e) None

17. A train takes 35 sec to pass completely through a station of 272 m long and 19 sec to another station is 200 m long. The length of the train is ....
(a) 140 m (b) 142 m (c) 154 m (d) 145 m (e) None

18. Two trains travel in opposite directions at 66 kmph at 45 kmph, a man sitting in lower train crosses the faster train in 8 sec. The length of faster train is ....
(a) 350 m (b) 160 m (c) 380 m (d) 170 m (e) None

PIPPES AND CISTERN

19. A tap can fill a tank in 20 minutes and another can empty it in 30 min. Find whether the tank will be filled up (a) emptied and in how many minutes?
(a) 60 min empty (b) 60 min filled up (c) 40 min. (d) 30 min. (e) None

20. A leak in the bottom if a tank can empty the full tank in 10 hours. An inlet pipe fills water at the rate of 6 ltr a minute. When the tank is full, the inlet is opened and due to the leak it will take to empty 5 hours more. The capacity of the tank is ....
(a) 11,000 ltr (b) 10,800 ltr (c) 10,600 ltr (d) 10,000 ltr (e) None

21. A cistern has two taps which fill it 12 min and 15 min respectively. There is also a waste pipe to the cistern. When all the three are opened, the empty cistern is full in 20 min. How long will waste pipe take to empty the full cistern.
(a) 5 min (b) 8 min (c) 10 min (d) 12 min (e) None

CHAIN RULE

\[
N_1 \times D_1 \times R_1 \times W_1 \quad \text{and} \quad N_2 \times D_2 \times R_2 \times W_2
\]

Where:

\[
N_1, N_2 = \text{No. of workers} \\
D_1, D_2 = \text{time of work} \\
R_1, R_2 = \text{Work rate of worker (or) machine} \\
E_1, E_2 = \text{Efficiency of worker (or) machine} \\
W_1, W_2 = \text{Amount of work done (of same nature)}
\]

22. A contract is to be completed in 56 days and 104 men were set to work, each working 8 hours a day. After 30 days, 25 of the works is finished. How many additional men may be employed so that work may be completed on time each man now working a hours per day?
(a) 46 men (b) 48 men (c) 52 men (d) 54 men (e) None

23. A can do a piece of work in \( \frac{1}{2} \) days with 'B' can do in \( \frac{1}{3} \) days. If A’s wages are Rs.45.50 per week and B’s wages are Rs.42.50 per week, What ‘A’ would have been earning doing a piece of work for which B received Rs.140?
(a) Rs.200 (b) Rs.300 (c) Rs.400 (d) Rs.500 (e) None

24. Two coal loading machines each working 12 hours per day for 8 days handles 9000 tons of coal with an efficiency of 99%. While 3 other coal loading machines at an efficiency of 80% set to handle 12,000 tons of coal in 6 days. Find how many hours per day \( x \) should work.
(a) 16 hr/day (b) 14 hr/day (c) 15 hr/day (d) None

AVERAGES

(1) Average = \( \frac{\text{Sum of all the terms}}{\text{Number of Items}} \)

(2) Average of combined group = \( \frac{m \times n}{m + n} \)

(3) Average of numbers 1 to \( n \) = \( \frac{\text{First No.} + \text{Last No.}}{2} \)

25. The average age of students in section A of 40 students in 10 years and the average age of students in section B of 30 students is 12 years. Find the average age of students in both sections taken together.
(a) 10.86 yrs (b) 11.86 yrs (c) 12.86 yrs (d) None

26. The average age of husband and wife who are married 5 years ago was 26 years, the average age including a child which was born during the interval is 21 years at present child age was .......
(a) 1 year (b) 2 years (c) 3 years (d) 4 years (e) None

27. The average age of class of 36 students is 17 years. When the age of the teacher also included, the average will be increased by 1 year. What is the age of the teacher is .......
(a) 50 years (b) 52 years (c) 54 years (d) 56 years (e) None

28. The average salary of 35 workers is Rs.1800/- When the salary of the manager is also included, the average will be increased by Rs.125/- What is salary of the manager?
(a) Rs.6200 (b) Rs.6300 (c) Rs.6400 (d) Rs.6500 (e) None

AGES

29. The ratio of the ages of Shresh and his father is 2 : 7. The difference of their ages is 40 years, the ratio of the ages 6 years ago = \( \frac{x}{y} \). What is the value of \( x \)?
(a) 1 : 4 (b) 1 : 5 (c) 1 : 6 (d) 1 : 8 (e) None

30. The ages of Ram and Mukta are in the ratio of 3 : 5. After 9 years the ratio of their ages will be 13 : 4. The present age of Mukta is .......
(a) 9 years (b) 12 years (c) 15 years (d) 18 years (e) None

31. The age of a man is 4 times that of his son. 5 years ago, the man was 9 times as well as his son was at that time. What was man’s age 5 years ago....
(a) 3 years (b) 9 years (c) 27 years (d) 29 days (e) None

PERCENTAGE

32. A student has to secure 40% of marks to pass. He gets 178 marks and falls by 22 marks. The maximum marks are .......
(a) 250 marks (b) 350 marks (c) 500 marks (d) 550 marks (e) None
33. A got 50% of maximum marks and failed by 12 marks. B got 42% of maximum marks, which are 6 marks above the pass marks. Find the pass marks.
(a) 110 marks  (b) 100 marks  (c) 120 marks  (d) 140 marks  (e) None

34. Of the total amount received by Rajash 25% was spent on purchase, 20% of the remaining on house rent and 10% of the remaining transportation. It is left with Rs. 2700/-. The initial amount is .......
(a) Rs.10,000  (b) Rs.7500  (c) Rs.5000  (d) Rs.2500  (e) None

35. The population of a town is 10,000. It increases by 10% during the first year. During the second year it decreases by 20% and increased by 30%, during the third year. What is the population of 3 years will be.
(a) 14,400  (b) 12,440  (c) 11,440  (d) 11,240  (e) None

PROFIT AND LOSS
36. A man purchased an old scooter for Rs.6400/- and spent Rs.1600/- in its repairing. If he sold the scooter for Rs.8,400/-, the gain % is
(a) 2%  (b) 10%  (c) 15%  (d) 20%  (e) None

37. A bought radio set and spent Rs.110/- on its repairs, he then sold it to "B" at 20% profit, "B" sold it to "C" at a loss of 10% and "C" sold it for Rs.180/- to a profit of 10%. What is the amount for which "A" bought the radio set?
(a) Rs.870  (b) Rs.890  (c) Rs.880  (d) Rs.820  (e) None

38. A machine is sold for Rs.5,500/- at a gain of 10%, What would have been the gain or loss percent, if it was sold for Rs.4,750/-
(a) 5% gain  (b) 5% loss  (c) 10% gain  (d) 10% loss  (e) None

39. B bought a house for Rs.12,000/- each. The house was sold at 20% and the gain is 20% of the given. The entire transaction, the gain / loss in amount is .......
(a) Rs.1000 gain  (b) Rs.1000 loss  (c) Rs.500 gain  (d) Rs.500 loss  (e) None

KEY:
01.b  02.b  03.c  04.c  05.e  06.b  07.a  08.a  09.a  10.c  11.c  12.b  13.a  14.a  15.a  16.a  17.b  18.c  19.a  20.b  21.c  22.d  23.b  24.a  25.a  26.a  27.a  28.b  29.b  30.c  31.e  32.e  33.c  34.e  35.e  36.a  37.b  38.a  39.b

CHAPTER - V

DATA INTERPRETATION

The interpretation of data is the process through which inferences are drawn about the data available for analysis. In other words, the process of drawing inferences and conclusions through the interpretation of data is what does Interpretation is all about.

ORGANISATION AND PRESENTATION OF DATA

Normally, data is generated in such volumes and in such great proportions that it becomes impossible to make any useful judgments through the volume of data. Unless organized in a condensed form that will highlight the main characteristics, facilitate comparisons and render it suitable for further processing and interpretation, raw data will have little meaning. To manage/assess people really need time to go through the existing details of any report, be it daily production or the sales forecast. An effective presentation of data enables them to draw upon the information with the least effort and time. Chart/table or graph gives at least 10 times more information than one page of words.

There is thus a need to organize the data into meaningful presentations. Data is organized and presented through one of the several forms of presentations available. The most commonly used amongst these are tables, pie charts, bar graphs, the line charts, and so on.

Data can be represented by using any one or more than one of these. Normally data is represented through a graphical representation or a set of graphical representations linked to each other.

Effective presentation of data is broadly classified in the following categories:
1. Tabular presentation
2. Bar Diagram
3. X - Y charts
4. Pie charts
5. Case lets
6. Miscellaneous charts

We will now go on and analyze each of the types of charts briefly.

Types of Problems

1. Tabular form
2. Bar Diagram
3. Histogram
4. Line graph
5. Pie Diagram
6. Other Diagrammatic Representation
7. Caselet form

Basic Tools of Analysis:
1. Ratio
2. Percentage
3. Important Measures in statistics:
   One of the most widely used set of summary figures is known as measures of central tendency (or) Averages. The following are the five measures of central (or) measures of location which are commonly used in practice.
(i) Arithmetic mean (A.M) is given by:

\[ x = \frac{X_1 + X_2 + \ldots + X_n}{n} \]

Where, \( X_1, X_2, \ldots, X_n \) are the given 'n' observations
\( x \) = arithmetic mean of the given 'n' observations

(ii) Median:

If data are arranged in ascending (or) descending order, then the middle – most term is taken as the median.

Median may be defined as the value of that item which divides an arranged series in two equal parts.

Thus when there are 'n' terms, the median would be the value of \( \frac{n+1}{2} \) item

\[ \text{Median} = L_i + \frac{f_i C}{N} \]

\( l_i \) = the lower limit of the median class
\( f_i \) = frequency of the median class
\( C \) = cumulative frequency of the class preceding the median class
\( i \) = the class interval of the median class

### CLASSWORK

**Directions (81 to 86):** Study the following table carefully and answer the questions given below it:

<table>
<thead>
<tr>
<th>Year</th>
<th>Heavy Commercial Vehicles</th>
<th>Cars</th>
<th>Jeeps</th>
<th>Two-Wheelers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>25</td>
<td>64</td>
<td>222</td>
<td>153</td>
</tr>
<tr>
<td>1991</td>
<td>45</td>
<td>60</td>
<td>242</td>
<td>172</td>
</tr>
<tr>
<td>1992</td>
<td>72</td>
<td>79</td>
<td>248</td>
<td>210</td>
</tr>
<tr>
<td>1993</td>
<td>81</td>
<td>93</td>
<td>280</td>
<td>241</td>
</tr>
<tr>
<td>1994</td>
<td>107</td>
<td>112</td>
<td>366</td>
<td>235</td>
</tr>
<tr>
<td>Total</td>
<td>331</td>
<td>468</td>
<td>1,266</td>
<td>1,011</td>
</tr>
</tbody>
</table>

### DATA INTERPRETATION

01. The percentage increase in the sales in 1993 over the previous year was maximum for which of the following categories of vehicles?
   (a) Cars  (b) Heavy Vehicles  (c) Jeeps  (d) Light commercial vehicles  (e) None of these

02. In which year was the number of 3-wheelers sold as a percentage of the total number of vehicles sold during that year, the highest?
   (a) 1994  (b) 1991  (c) 1990  (d) 1992  (e) 1993

03. The number of Heavy Vehicles sold in 1993 was approximately what percent of the total number of Vehicles sold in 1992?
   (a) 8  (b) 10  (c) 7  (d) 9  (e) 11

04. If the same percentage increase in the number of Heavy Vehicles as in 1994 over 1993 is expected in 1995, approximately how many heavy vehicles will be sold in 1995?
   (a) 139  (b) 141  (c) 144  (d) 133  (e) 131

05. In which of the following years was the number of light commercial vehicles sold approximately 25% of the number of 2-wheelers sold?
   (a) 1993  (b) 1991  (c) 1990  (d) 1994  (e) 1992

### Directions (86 to 89): Study the following table and answer the questions given below:

<table>
<thead>
<tr>
<th>Product</th>
<th>U.S.A</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal computer</td>
<td>1,600</td>
<td>1,800</td>
</tr>
<tr>
<td>Advanced</td>
<td>2,000</td>
<td>2,600</td>
</tr>
<tr>
<td>Dot matrix printers</td>
<td>300</td>
<td>270</td>
</tr>
<tr>
<td>Colour Monitor</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Key board</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

06. Which of the following is correct?
   (a) The total price of two colour monitors and two dot matrix printers in U.S.A is equal to the price of one basic PC in India.
   (b) The total price of four colour monitors and two dot matrix printers in U.S.A is equal to the price of one basic PC in India.
   (c) The total price of four colour monitors and two dot matrix printers in U.S.A is equal to the price of one basic PC in India.
   (d) The total price of four colour monitors in India is equal to the price of one Advanced PC in India.
   (e) All are correct.

07. Which of the following statements is false with reference to the table?
   (a) The personal computers are costlier in India than U.S.A.
   (b) The Dot matrix printers are cheaper in India than U.S.A.
   (c) If a person buys equal number of basic computers and dot matrix printers from U.S.A. and India, he will have to pay different prices.
   (d) The price of the colour monitors and key boards are same in U.S.A and India.
   (e) all the above statements are false.
08. If a person purchases 20 Advanced PCs in U.S.A and sells them in India, what will be the percentage profit?  
(a) 30  
(b) 15  
(c) 20  
(d) 25  
None of these  

09. The sale price of Dot matrix printers in India is lesser than that in U.S.A. What is the percentage difference with respect to the price in U.S.A?  
(a) 10%  
(b) 11%  
(c) 30%  
(d) 5%  
(e) None of these  

Directions (10 to 12): Study the following table carefully and answer the questions given below it:  

<table>
<thead>
<tr>
<th>Ratio of PC's to Telephones</th>
<th>World Basic</th>
<th>% of GDP spent on IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed base of PC's per 1000 Population</td>
<td>Installed base of Telephones per 1000 Population</td>
<td>India</td>
</tr>
<tr>
<td>1995-96 1.1</td>
<td>12</td>
<td>1:11</td>
</tr>
<tr>
<td>2001-02 8</td>
<td>60</td>
<td>1:4</td>
</tr>
</tbody>
</table>

10. Approximately what is the ratio of percentage of GDP spent on IT in India to that of world in 1995-96?  
(a) 0.28  
(b) 0.18  
(c) 0.24  
(d) 0.32  
(e) 0.14  

11. Approximately what is the expected percentage growth in installations of PCs per thousand population by 2001-02 from 1995-96?  
(a) 523  
(b) 625  
(c) 500  
(d) 475  
(e) 500  

12. What is the estimated percentage growth in installation of telephone lines from 1995-96 to 2001-02 per thousand population?  
(a) 200  
(b) 300  
(c) 600  
(d) 500  
(e) 400  

KEY:  
01-d 02-c 03-a 04-b 05-d 06-c 07-e 08-a 09-a 10-c  
11-b 12-c  

ASSIGNMENT  
Directions (1 to 6): Given below is the general as well as subject-wise result of a school for the secondary Examination. Study the chart carefully and answer the questions that follow:  

<table>
<thead>
<tr>
<th>Total Number of candidates</th>
<th>English</th>
<th>Hindi</th>
<th>Maths</th>
<th>Science</th>
<th>Social Studies</th>
<th>1 Div</th>
<th>II Div</th>
<th>III Div</th>
</tr>
</thead>
<tbody>
<tr>
<td>760</td>
<td>748</td>
<td>752</td>
<td>748</td>
<td>745</td>
<td>750</td>
<td>247</td>
<td>291</td>
<td>165</td>
</tr>
</tbody>
</table>

Note: No student failed in more than two subjects  
01. How many students failed in two subjects?  
(a) 8  
(b) 16  
(c) 13  
(d) 19  
(e) 15  

02. The pass percentage of the institution is:  
(a) 93.2%  
(b) 94.4%  
(c) 93.6%  
(d) 92.5%  
(e) 94.8%  

03. If half the students who failed in two subjects in science and maths and the remaining half in maths and one of the languages, how many failed in science alone?  
(a) 16  
(b) 12  
(c) 7  
(d) 11  
(e) 13  

04. What is the percentage of the students who secured I Division?  
(a) 39.6%  
(b) 32.5%  
(c) 30.4%  
(d) 33.3%  
(e) 35.5%  

05. If after re - evaluation, three more students were declared passed, the pass percentage of the school went up by approximately:  
(a) 0.2%  
(b) 0.4%  
(c) 0.5%  
(d) 0.6%  
(e) 0.7%  

06. Which is the highest pass — percentage approximately subject — wise?  
(a) 98.25%  
(b) 95.98%  
(c) 90.68%  
(d) 98.95%  
(e) 99.5%  

Direction (7 to 11): Study the following table carefully and answer the question below it:  

<table>
<thead>
<tr>
<th>Source of income</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>400</td>
<td>200</td>
<td>700</td>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td>Bonus</td>
<td>80</td>
<td>40</td>
<td>150</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Overtime</td>
<td>180</td>
<td>70</td>
<td>200</td>
<td>270</td>
<td>200</td>
</tr>
<tr>
<td>Arrears</td>
<td>200</td>
<td>150</td>
<td>400</td>
<td>140</td>
<td>250</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>40</td>
<td>10</td>
<td>50</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>900</td>
<td>500</td>
<td>1500</td>
<td>700</td>
<td>1000</td>
</tr>
</tbody>
</table>

07. Who among the following employees earns maximum bonus in comparison to his total income?  
(a) A  
(b) B  
(c) C  
(d) D  
(e) E  

08. The income from overtime is what percent of the income from arrears in the case of employee B?  
(a) 90  
(b) 80  
(c) 75  
(d) 40  
(e) None
9. How many employees have their salary less than 3 times the income from bonus?
(a) 1  
(b) 2  
(c) 3  
(d) 4  
(e) None

10. Who among the following employees has maximum percentage of his salary out of total income?
(a) A  
(b) B  
(c) C  
(d) D  
(e) E

11. Who among the following employees has minimum ratio of income from bonus to the income from salary?
(a) A  
(b) B  
(c) C  
(d) D  
(e) E

Direction (12 to 16): Study the table and answer the questions given below it.
Number of employees working in various departments of a factory

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Sales</th>
<th>Purchase</th>
<th>Admin. And Accts</th>
<th>R &amp; D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>175</td>
<td>50</td>
<td>75</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>1981</td>
<td>125</td>
<td>85</td>
<td>70</td>
<td>87</td>
<td>65</td>
</tr>
<tr>
<td>1982</td>
<td>450</td>
<td>90</td>
<td>55</td>
<td>115</td>
<td>98</td>
</tr>
<tr>
<td>1983</td>
<td>440</td>
<td>98</td>
<td>57</td>
<td>130</td>
<td>94</td>
</tr>
<tr>
<td>1984</td>
<td>525</td>
<td>125</td>
<td>60</td>
<td>157</td>
<td>99</td>
</tr>
<tr>
<td>1985</td>
<td>503</td>
<td>108</td>
<td>61</td>
<td>155</td>
<td>100</td>
</tr>
</tbody>
</table>

12. In which department the number of employees is maintained the same during the years 1980 and 1985?
(a) Production  
(b) Sales  
(c) R & D  
(d) Purchase  
(e) Admin. And Accts

13. In which of the following years, each department had more number of employees than it had in the immediately preceding year?
(a) 1982  
(b) 1984  
(c) 1985  
(d) 1982  
(e) None

14. In which year the number of employees in the production department was three times the number of employees in 1980 of the same department?
(a) 1984  
(b) 1985  
(c) 1986  
(d) 1981  
(e) None

15. Which two departments have the same total number of employees all through the years 1980 to 1985?
(a) Sales and R & D  
(b) Sales and Purchase  
(c) Production and Sales  
(d) Purchase and (R & D)  
(e) None

16. The total no. of employees of which department is four times the total no. of employees in R & D the time 1980 to 1985? Approximately
(a) Production  
(b) Sales  
(c) Purchase  
(d) Admin. And Accts  
(e) None

---

Direction (17 to 21): The food values and the unit price of a number of food items are given below:

<table>
<thead>
<tr>
<th></th>
<th>% of protein</th>
<th>% of carbohydrate</th>
<th>% of fat</th>
<th>Cost per 100 gm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>Rs. 1.80</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>Rs. 3.00</td>
</tr>
<tr>
<td>C</td>
<td>20</td>
<td>10</td>
<td>40</td>
<td>Rs. 2.75</td>
</tr>
</tbody>
</table>

17. If you purchased x grams of food A, y grams of food B and Z grams of food C, the cost will be:
(a) $(1.8x + 3y + 11z)$  
(b) Rs. $(9x/5 + 3y + 11/4 z)$  
(c) Rs. $(x + y + z)$  
(d) $(3x + 1.8y + 2.75z)$  
(e) All of the above

18. Which of the following diets would supply the maximum grams of protein?
(a) 150 grams of A and 200 grams of B  
(b) 200 grams of B and 200 grams of C  
(c) 500 grams of A  
(d) 350 grams of C

19. All of the following diets would supply at least 75 grams of fat. Which of these diets would cost the least?
(a) 200 grams of A and 150 grams of B  
(b) 200 grams of A and 100 grams of A  
(c) 300 grams of A  
(d) 200 grams of C

20. All of the following diets would supply at least 100 grams of carbohydrates. Which of them would cost the least?
(a) 500 grams of A  
(b) 250 grams of A and 125 grams of B  
(c) 1 kilogram of C  
(d) 700 grams of B

21. If one's diet has 100 grams each of A, B and C, what is the approximate cost of that is included in the diet?
(a) 50 grams  
(b) 80 grams  
(c) 65 grams  
(d) 45 grams

Directions (22 to 26): Study the following table carefully and answer the questions given below it.

<table>
<thead>
<tr>
<th>Months</th>
<th>V</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>April</td>
<td>200</td>
<td>70</td>
<td>30</td>
<td>290</td>
<td>10</td>
<td>600</td>
</tr>
<tr>
<td>October</td>
<td>120</td>
<td>120</td>
<td>70</td>
<td>150</td>
<td>290</td>
<td>760</td>
</tr>
<tr>
<td>November</td>
<td>45</td>
<td>35</td>
<td>25</td>
<td>125</td>
<td>160</td>
<td>390</td>
</tr>
<tr>
<td>December</td>
<td>160</td>
<td>110</td>
<td>40</td>
<td>115</td>
<td>130</td>
<td>555</td>
</tr>
<tr>
<td>January</td>
<td>80</td>
<td>90</td>
<td>70</td>
<td>100</td>
<td>140</td>
<td>480</td>
</tr>
<tr>
<td>February</td>
<td>130</td>
<td>150</td>
<td>50</td>
<td>40</td>
<td>390</td>
<td>740</td>
</tr>
</tbody>
</table>

Subscriptions to different schemes of a mutual fund company over the months (in crores).

22. What is the difference in the subscription of V scheme between December and January?
(a) 80 crores  
(b) 240 crores  
(c) 10 crores  
(d) 260 crores  
(e) None of these
23. If the subscription to a scheme is the criterion of popularity which of the schemes can be termed as the most popular over the months?
(a) V (b) W (c) X (d) Y (e) Z

24. In which of the following months, the total subscription to W and X schemes was equal to the subscription to W scheme in February?
(a) September (b) October (c) November (d) December (e) January

25. For which of the following types of schemes was there continuous decrease over the months?
(a) V (b) W (c) X (d) Y (e) None of these

26. What is the percentage increase in the subscription to Z scheme from January to February?
(a) 130% (b) 250% (c) 200% (d) 100% (e) None of these

Directions (27 to 31): Read the following table and answer the questions given below it:

<table>
<thead>
<tr>
<th>Year</th>
<th>Yearly commission earned by five salesmen in Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>27,500</td>
</tr>
<tr>
<td>B</td>
<td>26,500</td>
</tr>
<tr>
<td>C</td>
<td>26,200</td>
</tr>
<tr>
<td>D</td>
<td>27,450</td>
</tr>
<tr>
<td>E</td>
<td>28,640</td>
</tr>
</tbody>
</table>

27. In the year 1992 commission earned by salesman “D” was greater than that earned by A by what per cent (approximately)?
(a) 18% (b) 21% (c) 17% (d) 19% (e) None of these

28. In which year did the commission earned by the salesman “C” show the highest increase over that of the preceding year?
(a) 1990 (b) 1995 (c) 1991 (d) 1992 (e) None

29. In which of the following years was the difference between the highest and lowest commission earned by any salesman maximum?
(a) 1990 (b) 1991 (c) 1992 (d) 1993 (e) None of these

30. Which salesman commissioned in 1991 shows the highest increase over that in 1990?
(a) A (b) B (c) E (d) D (e) None of these

31. In the year 1992, the commission of B was approximately what percent of the total commission earned by five salesmen in that year?
(a) 20% (b) 98% (c) 80% (d) 90% (e) 2%

32. How much total interest is earned on a 7% investment for a 5-years period with monthly investments Rs. 1007?
(a) Rs. 7,201 (b) Rs. 6,701 (c) Rs. 6,000 (d) Rs. 201 (e) Rs. 207

33. How much more is earned on a Rs. 50 monthly investment for 10 years, than on a Rs. 100 monthly investment for 5 years?
(a) Rs. 150 (b) Rs. 701 (c) Rs. 870 (d) 1,504 (e) None of these

34. How much less is earned on a Rs. 500 monthly investment for 10 years, than on a Rs. 250 monthly investment for 20 years?
(a) Rs. 43,944 (b) Rs. 18,003 (c) Rs. 36,005 (d) Rs. 7,701 (e) None of these

35. How much total interest is earned on a 7% investment for a 10-years period with monthly investments of Rs. 1007?
(a) Rs. 5,209 (b) Rs. 4,209 (c) Rs. 1,705 (d) Rs. 3,705 (e) None of these

36. What is the approximate ratio of the interest earned on a 10-years period to the interest earned over a 5-years period with monthly investment of Rs. 1007?
(a) 2 : 1 (b) 4 : 1 (c) 8 : 1 (d) 9 : 2 (e) None of these

Directions (37 to 41): The following table represents the export of wheat and import of sugar in various years. Read the table and answer the questions given below it.

<table>
<thead>
<tr>
<th>Year</th>
<th>Export of Wheat (in crore of Rs.)</th>
<th>Import of Sugar (in crore of Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979-80</td>
<td>44</td>
<td>28</td>
</tr>
<tr>
<td>1981-82</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>1983-84</td>
<td>60</td>
<td>54</td>
</tr>
<tr>
<td>1985-86</td>
<td>56</td>
<td>60</td>
</tr>
<tr>
<td>1987-88</td>
<td>90</td>
<td>58</td>
</tr>
<tr>
<td>1989-90</td>
<td>100</td>
<td>78</td>
</tr>
<tr>
<td>1991-92</td>
<td>68</td>
<td>60</td>
</tr>
</tbody>
</table>
37. During which period was there maximum fall in exports?
(a) 1985-86
(b) 1987-88
(c) 1989-90
(d) 1991-90

38. The percentage of increase of imports in 1989-90 over 1987-88 is ——?
(a) 1.47%
(b) 14.7%
(c) 17.4%
(d) 20.0%

39. In 1981-82 the ratio of export to the import is ——?
(a) 9 : 10
(b) 10 : 9
(c) 14 : 15
(d) 15 : 14

40. During which period was maximum increase in import over its preceding year?
(a) 1983-84
(b) 1985-86
(c) 1987-88
(d) 1989-90

41. During which period was minimum increase in import over its preceding year?
(a) 1985-86
(b) 1987-88
(c) 1989-90
(d) None

Directions (42 to 49): The following five questions are to be answered on the basis of the table given below.

### Weight Distribution in the Average Adult

<table>
<thead>
<tr>
<th>Organ</th>
<th>Weight (in grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscles</td>
<td>30,000</td>
</tr>
<tr>
<td>Skeleton</td>
<td>10,000</td>
</tr>
<tr>
<td>Blood</td>
<td>5,000</td>
</tr>
<tr>
<td>Gastrointestinal Tract</td>
<td>2,000</td>
</tr>
<tr>
<td>Lung</td>
<td>1,000</td>
</tr>
<tr>
<td>Liver</td>
<td>1,700</td>
</tr>
<tr>
<td>Brain</td>
<td>1,500</td>
</tr>
</tbody>
</table>

42. The total body weight of the average adult is
(a) 70,000 grams
(b) More than 51 kg
(c) 50,000 grams
(d) Less than 50 kg

43. If the weight of the skeleton is represented as 8 grams, then the weight of the liver can be represented as
(a) 1.75
(b) 0.175
(c) 175
(d) 715

44. The ratio expressed in decimals of the weight of the blood to the weight of the gastrointestinal tract is ——?
(a) 0.4
(b) 4.0
(c) 2.5
(d) 0.25

45. The ratio expressed in decimals of the weight of the brain to the weight of the muscles is ——?
(a) 0.5
(b) 0.15
(c) 0.20
(d) 0.05

46. The ratio expressed in decimals of the weight of the brain to the weight of the liver is ——?
(a) 1.5
(b) 0.15
(c) 15.0
(d) 5.1

47. The difference in the index of which of the following commodities was the maximum between sept-96 and Oct-96?
(a) Wheat
(b) Sugar
(c) Gur
(d) Groundnut
(e) Name of these

48. In how many commodities was there increase in the index from the position of “month age” on Oct-11:1996?
(a) 1
(b) 2
(c) 3
(d) 4
(e) None of these

49. With reference to the base price of 1996-70, the price of which of the following commodities has undergone maximum increase over the years?
(a) Rice
(b) Gur
(c) Cotton
(d) Wheat
(e) Sugar

50. The price of which of the following commodities has remained same from sept,1996 to oct-1997?
(a) Raw Jute
(b) Cotton
(c) Rawjute and Cotton
(d) Groundnut
(e) Name of these

51. In the case of which of the following commodities the percentage increase in the index from Oct-7 to Oct-11 was maximum?
(a) Wheat
(b) Groundnut
(c) Gur
(d) Metals
(e) None of these

**KEY:**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Oct-11</th>
<th>Oct 10</th>
<th>Oct 9</th>
<th>Oct 8</th>
<th>Oct 7</th>
<th>Week ago</th>
<th>Month ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>857.2</td>
<td>857.2</td>
<td>857.2</td>
<td>857.2</td>
<td>857.2</td>
<td>857.2</td>
<td>857.2</td>
</tr>
<tr>
<td>Wheat</td>
<td>494.4</td>
<td>491.0</td>
<td>489.0</td>
<td>486.1</td>
<td>484.5</td>
<td>484.5</td>
<td>479.0</td>
</tr>
<tr>
<td>Groundnut</td>
<td>787.4</td>
<td>789.3</td>
<td>789.3</td>
<td>786.3</td>
<td>778.7</td>
<td>790.0</td>
<td>807.1</td>
</tr>
<tr>
<td>Sugar</td>
<td>331.1</td>
<td>333.3</td>
<td>333.3</td>
<td>333.3</td>
<td>333.3</td>
<td>334.0</td>
<td>542.7</td>
</tr>
<tr>
<td>Gur</td>
<td>1457.9</td>
<td>1457.9</td>
<td>1457.9</td>
<td>1443.2</td>
<td>1443.7</td>
<td>1443.7</td>
<td>1340.4</td>
</tr>
<tr>
<td>Raw Jute</td>
<td>179.0</td>
<td>179.0</td>
<td>179.0</td>
<td>179.0</td>
<td>179.0</td>
<td>179.0</td>
<td>179.0</td>
</tr>
<tr>
<td>Cotton</td>
<td>1105.4</td>
<td>1105.4</td>
<td>1105.4</td>
<td>1105.4</td>
<td>1105.4</td>
<td>1105.4</td>
<td>1105.4</td>
</tr>
<tr>
<td>Groundnut</td>
<td>814.7</td>
<td>814.7</td>
<td>814.7</td>
<td>825.4</td>
<td>830.7</td>
<td>820.7</td>
<td>819.4</td>
</tr>
<tr>
<td>Metals</td>
<td>955.9</td>
<td>955.9</td>
<td>955.3</td>
<td>954.0</td>
<td>957.1</td>
<td>957.1</td>
<td>974.2</td>
</tr>
</tbody>
</table>
Bar charts are one of the easiest, graphically attractive and hence most commonly used methods of presenting all types of data. They are especially useful for representing various data series (normally 1 to 4). The chart consists of bars which are equidistant from each other. The values of the bars are read by the measurement of the length (or) the height of the bars. The width of the bars is largely inessential and is used only for the clarity of the presentation.

Points noteworthy with respect to bar charts:
1. Bar diagrams are visual aids for presenting statistical data very often in bar charts, different colours, shades, dots, dashes, etc. are used in the bars to distinguish between different continuous variables being represented. There will always be an explanatory index indicating the meanings of the different colours, shades and markings.
2. Each bar chart has a title (which is displayed either at the top (or) at the bottom of the diagram) indicating the subject matter depicted in the diagram. Besides, at times, there may be foot notes at the bottom of the diagram to explain facts that are not covered in the title. The student is advised to be very-careful about readings these footnotes and not to overlook these facts while interpreting bar diagrams.
3. One axis (normally the x-axis) of every bar diagram will represent a discrete variable while the other axis represents the scale for one (or) more continuous variables.

CLASSWORK
Directions (Question 01 to 03): The following is a multiple bar chart showing men’s and women’s average daily earnings in certain industries. Study the chart and answer the questions given below.

Multiple Bar chart showing men’s and women’s average daily earnings (in Rs.)

- Men (21 years and above)
- Women (18 years and above)

Average daily Earnings (Rs.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Daily Earnings (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>35.80</td>
</tr>
<tr>
<td>2001</td>
<td>38.30</td>
</tr>
<tr>
<td>2002</td>
<td>40.90</td>
</tr>
<tr>
<td>2003</td>
<td>48.60</td>
</tr>
<tr>
<td>2004</td>
<td>59.50</td>
</tr>
</tbody>
</table>

01. In which year is the ratio of men’s average daily earnings and women’s average daily earnings, the highest?
(a) 2000  (b) 2002  (c) 2001  (d) 2004  (e) 2003

02. In which year is the percentage increase in the average daily earnings of men over the preceding year, the maximum?
(a) 2001  (b) 2004  (c) 2002  (d) 2003

03. The difference between the average daily earnings of men and women over successive years
(a) increase  (b) decrease  (c) remains the same  (d) None of these
Assignment

Direction for Questions 1 to 4: Study the following bar chart to answer the questions.

1. The percentage increase in sales from 2001 to 2002 was:
   (a) 115%
   (b) 120%
   (c) 122%
   (d) 118%

2. The sum of sales of cellular phones in the year 1999 and 2001 is equal to that of:
   (a) 1997
   (b) 1998
   (c) 2000
   (d) 2002

3. The two years between which the rate of change of cellular phones is minimum are:
   (a) 1997 and 1998
   (b) 1999 and 2000
   (c) Both, 1997 and 2002
   (d) 2001 and 2002

4. The difference in the sales of cellular phones for the years 1997 and 1999 is:
   (a) 500 units
   (b) 1,000 units
   (c) 5,000 units
   (d) 18,000 units

Direction for Questions 5 to 9: Study the following bar chart carefully and answer the questions given.

Key:
01-2 02-d 03-a 04-a 05-d 06-b 07-b 08-c
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GENERAL APTITUDE

ACE Academy

5. What is the approximate difference between the average sales turnover of all the companies put together between the years 2001 – 02 and 2002 – 2003?
   (a) 133.43
   (b) 142.48
   (c) 177.4
   (d) None

6. What should have been the sales turnover of GM in 2002 – 03 to have shown an excess of the same quantum over 2002 – 02 as shown by the sales turnover of Maruti?
   (a) 953.76
   (b) 963.76
   (c) 952.76
   (d) 963.76

7. Which of the companies shows the maximum percentage difference in sales turnover between the two years?
   (a) Honda
   (b) GM
   (c) Hyundai
   (d) Maruti

8. What is the percentage change in the overall sales turnover of the five companies together between 2001 – 02 to 2002 – 03?
   (a) 17.21%
   (b) 14.68%
   (c) 12.67%
   (d) 21.24%

9. What is the absolute change in the overall sales turnover of the five companies together between 2001 – 02 to 2002 – 2003?
   (a) 772.43
   (b) 142.48
   (c) 683.33
   (d) None of these

Directions (Questions 10 to 14): Study the graph carefully and answer the following questions:

<table>
<thead>
<tr>
<th>Trade Deficit of a Country (Roupas in crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>97-98</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>2200</td>
</tr>
</tbody>
</table>

10. The deficit in 2002-03 was roughly how many times the deficit in 1999-2000?
   (a) 1.7
   (b) 1.95
   (c) 2.1
   (d) 4.4

11. In which of the following years, the percent increase of deficit was highest to that in the preceding year?
   (a) 2002–2003
   (b) 1998–1999
   (c) 2000–2001
   (d) 2003–2004

12. The increase in deficit in 2003–2000 was what percent of the deficit in 1999–2000?
   (a) 150
   (b) 200
   (c) 100
   (d) None of these

13. The deficit in 2004–2005 was approximately what percent of the average deficit?
   (a) 140
   (b) 135
   (c) 90
   (d) 125

14. The ratio of the number of years in which the trade deficit is above the average deficit to those in which the trade deficit is below the average deficit is:
   (a) 4 : 3
   (b) 3 : 5
   (c) 3 : 4
   (d) 5 : 3

Directions (Questions 15 to 18): These questions refer to the following data:

Five coins were tossed 1000 times and at each toss the number of heads was observed. The number of times each of 0, 1, 2, 3, 4 and 5 heads were obtained separately is shown in the figure below.

<table>
<thead>
<tr>
<th>Number of Tosses</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>250</td>
<td>150</td>
<td>50</td>
</tr>
</tbody>
</table>

15. The total number of tosses resulting in number of heads greater than 1 is
   (a) 950
   (b) 800
   (c) 500
   (d) 250

16. The total number of tosses resulting in a number of heads greater than 3 is
   (a) 250
   (b) 300
   (c) 500
   (d) 400

17. Two heads were obtained in
   (a) 5 tosses
   (b) 150 tosses
   (c) 250 tosses
   (d) 300 tosses

18. The total number of tosses resulting in a number of heads greater than 2 but less than 4 is
   (a) 200
   (b) 250
   (c) 275
   (d) 300

KEY:
0.0, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0
1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8
**Pie Charts**

Pie charts are specific types of data presentation where the data is represented in the form of a circle. In a pie chart, a circle is divided into various sections or segments such that each sector (or) segment represents a certain proportion or percentage of the total. In such a diagram, the total of all the given items is equal to 360 degrees and the degree of angles, representing different items, are calculated proportionately. The entire diagram looks like a pie and its components resemble slices cut from a pie. The pie chart is used to show the break-up of one continuous variable into its component parts.

A single pie diagram can represent only one continuous variable. Hence, in terms of versatility of data representation, pie charts are less versatile than either of bar charts, graphs (or) tables. However, their utility is in the fact that the representation of data is cleaner and it gives an immediate idea of the relative distribution of the continuous variable amongst different sectors.

**CLASSWORK**

Direction (Questions 01 to 04): The following pie chart shows how the revenue accrued out from the national kitty in 1997 – 98 budget proposals. Study the chart carefully and answer the questions given below it.

- Central Plan: 13 P
- Interest: 25 P
- Education: 13 P
- Subsidies: 7 P
- Other Non-plan expenditure: 11 P
- States share of taxes & duties: 15 P
- Non-plan assistance to state & UT Govt: 8 P
- States & UT plan assistance: 10 P

01. The states share of taxes and duties as a percentage of total divisible pool is ______
   - (a) 13%
   - (b) 14%
   - (c) 15%
   - (d) 10%

02. What should be the central angle for state and UT plan assistance?
   - (a) 18°
   - (b) 36°
   - (c) 24°
   - (d) 6°

03. If non-plan assistance to state and UT Govt is Rs. 16440 crore, the defence expenditure is ______
   - (a) 30,500 Crore
   - (b) 30,000 Crore
   - (c) 35,620 Crore
   - (d) 31,500 Crore

04. If Rs. 29,498 Crore was allocated for defence in 1996 – 97, what is the approximate percentage increase in the allocation for defence in 1997 – 98?
   - (a) 31%
   - (b) 15%
   - (c) 25%
   - (d) None of these

**DATA INTERPRETATION**

Direction (Question No. 05 to 09): Study the following pie – chart and the table and answer the questions based on them.

**Proportion of Population of Seven Villages in 2007**

<table>
<thead>
<tr>
<th>Village</th>
<th>% Population below poverty line</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>18</td>
</tr>
<tr>
<td>Y</td>
<td>52</td>
</tr>
<tr>
<td>Z</td>
<td>42</td>
</tr>
<tr>
<td>R</td>
<td>51</td>
</tr>
<tr>
<td>S</td>
<td>49</td>
</tr>
<tr>
<td>T</td>
<td>46</td>
</tr>
<tr>
<td>V</td>
<td>58</td>
</tr>
</tbody>
</table>

05. Find the population of village "S" if the population of village X below poverty line in 2007 is 12160?
   - (a) 18500
   - (b) 20500
   - (c) 22000
   - (d) 26000

06. The ratio of population of village T below poverty line to that of village Z below poverty line in 2007 is ______
   - (a) 11 : 12
   - (b) 13 : 11
   - (c) 23 : 11
   - (d) 11 : 13

07. If the population of village R in 2007 is 32000, what will be the population of village Y below poverty line in that year?
   - (a) 14100
   - (b) 16500
   - (c) 16500
   - (d) 170000

08. If in 2008, the population of village Y and V increase by 10% each and the percentage of population below poverty line remains unchanged for all the villages, then find the population of village V below poverty line in 2008, given that the population of village Y in 2007 was 30,000?
   - (a) 11250
   - (b) 12760
   - (c) 13140
   - (d) 13780
ASSIGNMENT

Problem (Question 1 to 4): The total population of a city is 5000. The various sections are indicated in the pie diagram.

1. What percentage of the employed persons is self employed?
   (a) 4%  (b) 19%  (c) 19%  (d) 20%

2. Number of persons employed in the corporate sector is
   (a) 250  (b) 500  (c) 750  (d) 1500

3. The number of unemployed person is
   (a) 250  (b) 150  (c) 100  (d) 50

4. The number of persons employed in both the public sector and corporate sector is
   (a) 3750  (b) 3000  (c) 2250  (d) 2200

KEY:
01.c  02.b  03.c  04.a  05.c  06.c  07.b  08.b  09.a

05. If the miscellaneous charges are Rs. 6,000, the advertisement charges are
   (a) Rs. 90,000  (b) Rs. 1,333.33  (c) Rs. 27,000  (d) Rs. 12,000

06. If the cost of printing is Rs. 17,500, the royalty is
   (a) Rs. 8,750  (b) Rs. 7,500  (c) Rs. 5,150  (d) Rs. 4,300

07. The central angle of cost of printing is more than that of advertisement charges by
   (a) 72°  (b) 61.2°  (c) 60°  (d) 54.8°

08. What should be the central angle of the sector for the cost of the paper?
   (a) 22.5°  (b) 15°  (c) 54.8°  (d) 36°

Directions (Questions 9 to 12): The following pie diagrams show the monthly expenditure of Rakesh and Sohan. Rakesh earns Rs. 15,000 per month and Sohan Rs. 18,000 per month. Study the diagrams and answer the question given below!

(1) House 19%  (2) Children’s education 12%  (3) Miscellaneous 27%
(4) Food 36%  (5) Miscellaneous 22%  (6) Food 33%  (7) House 27%  (8) Children’s education 8%

09. How much more (or) less does Sohan spend on education than Rakesh?
   (a) Rs. 900 more  (b) Rs. 360 less  (c) Rs. 900 less  (d) Rs. 360 more  (e) None of these

10. Who spends more on food and how much more?
    (a) Sohan, Rs. 240 more  (b) Rakesh, Rs. 240 more  (c) Sohan, Rs. 140 more  (d) Rakesh, Rs. 140 more  (e) Sohan, Rs. 200 more

11. What is the ratio of the expenditure on children’s education by Rakesh and Sohan?
    (a) 5 : 4  (b) 4 : 5  (c) 6 : 7  (d) 8 : 7  (e) None of these
12. What is the measure of the angle used to represent the expenditure on house by Rakesh?
(a) 60° (approx)
(b) 60° (approx)
(c) 60° (approx)
(d) None of these

Directions (Questions 13 to 17):
The following pie–charts show the distribution of students of graduate and post-graduate levels in seven different institutes – M, N, P, Q, R, S and T in a town.

Distribution of students at Graduate and Post - Graduate levels in seven Institutes – M, N, P, Q, R, S and T.

**Total Number of students of Graduate Level = 27,300**

**Total Number of students of Post - Graduate Level = 24,700**

13. How many students of institutes M and S are studying at graduate level?
(a) 7,516
(b) 8,463
(c) 9,127
(d) 9,040

14. Total number of students studying at post-graduate level from institutes N and P is
(a) 5,401
(b) 5,944
(c) 6,649
(d) 7,004

15. What is the total number of Graduate and Post-Graduate level students in Institute R?
(a) 8,320
(b) 9,116
(c) 9,116
(d) 8,372

16. What is the ratio between the number of students at Post-Graduate and Graduate levels respectively from institute S?
(a) 14 : 19
(b) 19 : 21
(c) 17 : 21
(d) 19 : 14

17. What is the ratio between the number of students studying at Post - Graduate level from Institute S and the number of students studying at graduate level from Institute Q?
(a) 13 : 19
(b) 21 : 13
(c) 13 : 8
(d) 19 : 13

KEY:
01.a 02.c 03.a 04.b 05.c 06.b 07.b 08.d 09.d 10.a 11.a 12.a

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**(4) LINE GRAPHS / X – Y CHARTS**

In this chapter, we shall concentrate on X – Y graphs as a mode of data presentation. While bar charts are useful for visual presentation of categorical and geographical data, data related to time – series and frequency distribution is best represented through X – Y (or) line graphs. This representation is widely used by news paper, television, government reports, magazines and research papers.

Besides, X – Y graphs are also very useful for determining trends, rate of change and for illustrating comparisons with respect to some time series.

The typical data shown on an X – Y chart involves a time series:

A time series is an arrangement of data on the basis of time, i.e., in chronological order. The time period may be a year, quarter, month, week, days, hours etc. Time series are extremely essential for the measurement of economic and business performance. Hence, most data relating to economics and business are in the form of time series.

In time – series data, time (the independent variable) is seen as a discrete variable while the continuous variable being measured defines the other dependent variable.

Thus we have continuous variable like the population of a country, GDP of a country, data on exports and imports in an economy, data of production, sales, profit, etc. of a company and so forth which are measured against time.

Normally, time is taken along the x – axis and the dependent continuous variable is taken along the y – axis.

As you go through the exercise below you will see examples of various presentation of data possible through X – Y charts. These are listed below for your quick reference. As you go through the exercise, familiarise your self with the following representations.

Examples of various types of data presentation possible through X – Y charts:

1. Single dependent (Continuous) variable graph:
   These graphs show changes in a single variable over a certain period of time.

2. More than one dependent (Continuous) variable graph:
   In this type of graph, two (or) more lines are drawn to represent two (or) more dependent variables.

3. Graphs with two scales:
   When two continuous variables having different units of measurement have to be shown on the same graph, use two scales on the graph.

4. Range Graph:
   For some specific types of data (Such as temperatures, run rates, etc.) It is essential to depict the range of the variation of the variable over a period of time. This is depicted using a range graph, which shows the deviation between different values of the variable under consideration.
5. Stack graph:
Like a stacked bar chart, the stack graph is a line graph used to display the total value of a continuous variable broken up into its different components for each period.

6. Speed-time graph:
This is a special case of an X-Y chart where the respective axes show the speed of a moving body against time.

CLASSWORK

Directions (Questions 01 to 05): Study the following graph carefully and answer the question given below it:

![Graph showing consumption of metal A and metal B over years]

01. In how many years, the consumption of metal A was less than the average consumption of metal B in the given years?
(a) One  
(b) Two  
(c) Three  
(d) Four  
(e) None of these

02. What was the difference in the consumption of metal A and metal B in 1992?
(a) 500 tonnes  
(b) 50 tonnes  
(c) 5000 tonnes  
(d) 5 tonnes  
(e) None of these

03. In which of the following pairs of year, the consumption of metal B in 1993 was equivalent to the consumption of metal A?
(a) 1988 and 1989  
(b) 1989 and 1993  
(c) 1988 and 1993  
(d) 1990 and 1992  
(e) None of these

04. In which of the following years, the consumption of both the metals together was maximum?
(a) 1988  
(b) 1990  
(c) 1993  
(d) 1991  
(e) None of these

05. What is the percentage decrease in the consumption of metal A in 1992 in comparison to 1991?
(a) 40  
(b) 20  
(c) 40  
(d) 35  
(e) None of these

Directions (Questions 07 to 10): Study the following graph carefully and answer the question given below it:

![Graph showing sale of hardware by the Computer industry]

07. What was the difference in sale of hardware between domestic and exports in 1993 – 94?
(a) Rs. 1,000 crore  
(b) Rs. 500 crore  
(c) Rs. 1,200 crore  
(d) Rs. 700 crore  
(e) Rs. 200 crore

08. In which of the following years was the percentage increase in sale of hardware in domestic sector maximum over the previous year?
(a) 1992 – 93  
(b) 1993 – 94  
(c) 1994 – 95  
(d) 1992 – 93 and 1993 – 94  
(e) None of these

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DATA INTERPRETATION

06. Direction: The following charts depict the price variation in a stock market during a year. Movement of industry – its average price is plotted for the sectors of iron and steel and petro – products. Price movements of five companies A, B (iron and steel), C and D (petro – products) are also plotted. Study the charts and answer the question given below.

From the curve a significant feature that can be deduced is
(a) Company C made a large profit around June
(b) All share prices will increase steadily in the next year
(c) Company B seems to be performing better than the market average
(d) petro – products are performing better than iron and steel
09. What was the difference between the total hardware sale in exports sector in 1992–93 and 1991–92? (a) Rs. 300 crore (b) Rs. 200 crore (c) Rs. 400 crore (d) Rs. 100 crore (e) None of these

10. Approximately, what was the percentage increase in the sale of hardware in domestic sector from 1994 – 95 to 1993 – 94? (a) 35% (b) 25% (c) 40% (d) 30% (e) 20%

KEY:
01. a 02. c 03. b 04. d 05. c 06. c 07. d 08. c 09. a 10. d

ASSIGNMENT
Directions (Questions 01 to 10): Study the following graph carefully and answer the question given below it.

Number of Candidates (Boys and Girls) Appeared and Qualified in an Exam. Over the years

01. What was the approximate percentage of boys who qualified to those who appeared in 1992?
(a) 8% (b) 7% (c) 35% (d) 65% (e) 90%

02. The total number of girls who qualified in 1991 and 1992 together was exactly equal to the number of girls who appeared in which of the following years?
(a) 1995 (b) 1994 (c) 1991 (d) 1992 (e) 1990

03. What was the percentage increase in the number of boys qualified from 1993 to 1994?
(a) 5 (b) 30 (c) 100 (d) 200 (e) None of these

04. What was the difference between the total number of boys and girls who appeared in 1993 and the total number of boys and girls who appeared in 1991?
(a) 7000 (b) 2500 (c) 3000 (d) 10000 (e) None of these

05. In which of the following years was the percentage of girls who qualified to those who appeared the highest among the given years?
(a) 1994 (b) 1993 (c) 1991 (d) 1992 (e) None of these

Directions (Questions 06 to 10): Study the following graph carefully and answer the question given below it.

Re-requirement and Production of Rubber over the years (in Thousand Tons)

06. In which of the following years, was it likely that the quantity of rubber imported to bridge the gap between demand and supply, was minimum?
(a) 1996 (b) 1992 (c) 1994 (d) 1999 (e) None of these

07. During which year was the percentage drop in the requirement of rubber over the previous year, the maximum?
(a) 1995 (b) 1997 (c) 1999 (d) Data inadequate (e) None of these

08. In 1990, the production of rubber was what per cent of the requirement?
(a) 50 (b) 67 (c) 45 (d) 300 (e) 150

09. For which of the two years was the average yearly production of rubber equal to the average yearly requirement?

10. In 1991, the quantity of requirement of rubber was what per cent of the quantity of production?
(a) 28 (b) 72 (c) 65 (d) 56 (e) 70
11. What was the average import from August to March?
(a) Rs. 78.8 lacs  
(b) Rs. 71.5 lacs  
(c) Rs. 84 lacs  
(d) Rs. 73 lacs
(e) None of these

12. What was the difference between import and export from August to March?
(a) Rs. 10 lacs  
(b) Rs. 3.5 lacs  
(c) Rs. 45,000  
(d) Rs. 4.5 lacs  
(e) None of these

13. In which of the following pairs of months was the increase in the imports from the previous month exactly the same?
(a) September, October  
(b) October, November  
(c) December, January  
(d) November, December  
(e) None of these

14. What was the percentage increase in export from February to March?
(a) 16%  
(b) 20%  
(c) 25%  
(d) 40%  
(e) None of these

15. What was the difference in the value of export between December and January?
(a) Rs. 9 lacs  
(b) Rs. 90 lacs  
(c) Rs. 90,000  
(d) Rs. 90,000  
(e) None of these

16. Which month has the highest index of industrial production both in 1988-89 and 1989-90?
(a) March 1990  
(b) March 1989  
(c) March 1988  
(d) both (a) and (b)

17. What is the percentage change in the index of industrial production in the year 1988-90?
(a) 27.78%  
(b) 26.74%  
(c) 27.74%  
(d) 26.65%

18. In which year, 1988-89 or 1989-90, has the percentage change in the index of industrial production been higher?
(a) 1988-89  
(b) 1989-90  
(c) 1988-89  
(d) 1989-90

19. Which of the following statement(s) is/are true?
(i) The percentage change in the index of industrial production of 1988-89 is 10%.
(ii) The index of industrial production is exceptionally high in March of each year.
(a) (i) only  
(b) (ii) only  
(c) None of these

KEY:
1. 1b  2a  3d  4b  5b  6b  7b  8b  9b  10b
2. 1b  2b  3e  4e  5d  6b  7b  8  9  19

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