CHAPTER – 5
INPUT AND OUTPUT

Introduction:

Some of the competitive examinations give questions on a pattern generally known as "Input and Output". In these questions, input data is converted into output through a few systematic steps. In the directions for these questions, an example (to show how a given input is transformed into a designed output) will be given. The input is a string of elements (these elements can be alphabets or numbers or words or any combination of these), which is processed through a few methodical steps and transformed into the designed (pre-defined order of elements) output.

From the given example, we have to understand the following,
(i) the method followed in the transformation; and
(ii) the desired arrangement of the elements in the final output.
The same method is to be employed to answer the subsequent questions.

Now, let us analyse the two important phrases used in the above paragraph, viz., desired order of output and methodical transformation.

I. Desired order of output:

The form in which the final output is required, is pre-defined. The following are the most commonly followed arrangements of elements in the output.

(a) If the elements are numbers:
  (i) Ascending order.
  (ii) Descending order.

(b) If the elements are letters:
  (i) Alphabetical order: The elements appear in the same order as in a dictionary, from A to Z.
  (ii) Reverse Alphabetical order: The elements appear in the reverse order, from Z to A.

(c) If the elements are words:
  (i) Alphabetical order: The words in the output are to be in the same order in which they appear in a dictionary, starting from A to Z.
  (ii) Reverse Alphabetical order: The words in the output are to be in the reverse order of the order given in a dictionary, starting from Z to A.

(d) If the elements are a combination of letters, numbers and words, several kinds of arrangements are possible. On a case-to-case basis, we have to find out the arrangement in the output.

II. Methodical transformation:

To achieve the pre-defined output, the input string of elements is processed through a few steps. These steps follow a specific pattern while rearranging the given elements. There are two most commonly followed methods. Let us name them as (A) Single element movement, and (B) Interchange of two elements. Students should note that there can be other methods of transformation. Now, let us discuss these two methods mentioned above with the help of a simple input "B D C A F E". Let the desired output be "A B C D E F".

1. **Single element movement:** In this method, only one element is rearranged in each step. The elements, which are to the left of the place vacated by the rearranged element, shift to their right to fill the vacant place. The positions of the other elements remain unchanged.

   Illustration of this method:
   Input : B D C A F E
   Step I : A B D C F E
   Step II : A B C D F E
   Step III : A B C D E F
   Step III is the final output.

   In step one, letter 'A' is removed from its position and arranged in the first position. The three letters to the left of the vacant place i.e., B, D and C shift to their right by one place. Similar method is followed in subsequent steps.

2. **Interchange of elements:** In each step, the element to be rearranged interchanges its position with the element in its designated position. In this case, A interchanges its position with B and the positions of the other elements remain unchanged. This is the first step. Each of the subsequent steps follow the same methods till the final output is obtained.

   Illustration of this method:
   Input : B D C A F E
   Step I : A D C B F E
   Step II : A B C D F E
   Step III : A B C D E F
   Step III is the final step.

METHOD OF ANSWERING A QUESTION:

Step I : Compare Input and Output in the example given in the question and observe the final arrangement.
Step II: Observe how each element is being rearranged and also the pattern followed by the remaining elements.
Step III: Whenever an element comes into its designated position without consuming any step, then leave such element untouched.

Let us understand the concepts discussed above more clearly by using the following examples.

I. Arranging the words given in the input in alphabetical order:

Example: A word arrangement machine, when given an input consisting of words, rearranges them following a particular pattern in each step.

The following is an illustration of input and the steps involved in the rearrangement.

Input : belt an area the state are tea
Step I : an belt area the state are tea
Step II : an are belt area the state tea
Step III : an are area belt the state tea
Step IV : an are area belt state the tea
Step V : an are area belt state tea the
Step V is the final output (last step) for the above input.

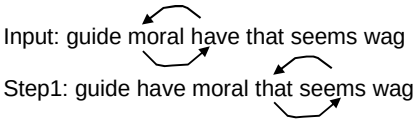
Now, let us solve three questions based on the above model.

5.01. Which of the following will be the last step for the following input?
Input : from food has made case wage
(A) has made from food case wage
(B) case food from has wage made
(C) case food from has made wage
(D) case food from made has wage

Sol. On comparing the input with the output, it is clear that the given words are arranged in alphabetical order. Hence, the output is 'case food from has made wage'. Choice (C)

5.02. Which step will be the last step for the following input?
Input : guide moral have that seems wag
(A) Step-I (B) Step-II
(C) Step-III (D) Step-IV

Sol. The method followed in rearrangement is as follows: The element to be rearranged, after reaching the designated position, pushes the other elements to its right. The given input goes through the following process to obtain the output. Arrows, as shown below, indicate the rearrangement that takes place in each step.



Step 2: guide have moral seems that wag
Step 2 is the final output. Choice (B)

II. Arranging the numbers in the given input in increasing order:

Example:
A number arrangement machine when given an input line of numbers, rearranges them following a particular pattern in each step. The following is an illustration of input and the steps involved in the rearrangement.

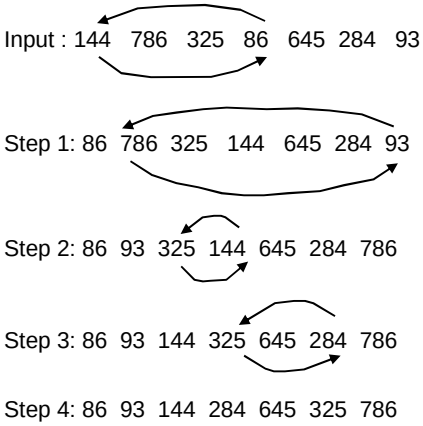
Input : 78 92 56 38 144 87
Step I : 38 92 56 78 144 87
Step II : 38 56 92 78 144 87
Step III : 38 56 78 92 144 87
Step IV : 38 56 78 87 144 92
Step V : 38 56 78 87 92 144

As all the numbers in the given input are arranged in the increasing order, Step V is the final output.

Explanation: The numbers are arranged in the ascending order in the output. During rearrangement, only two numbers i.e., the number to be rearranged and the number in its designated place, interchange positions and the positions of the remaining numbers remain unchanged.

5.03. Which will be Step-IV for the input following?
Input : 144 786 325 86 645 284 93
(A) 86 93 144 284 325 645 786
(B) 86 93 144 284 786 325 645
(C) 86 93 284 144 324 645 786
(D) 86 93 144 284 645 325 786

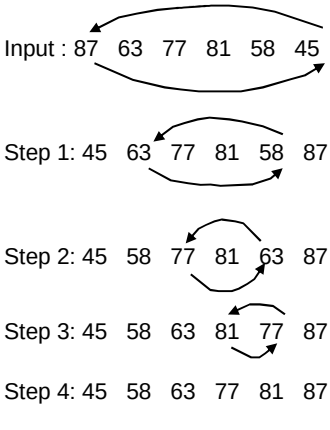
Sol.



Choice (D)

5.04. Which step will be the last step for the following input?
Input : 87 63 77 81 58 45
(A) Step VI (B) Step V
(C) Step III (D) Step II

Sol.



Choice (D)

5.05. Which of the following will be the first step, when the third step is 'fare gare hare tare mare pare'?
(A) gare hare fare tare mare pare
(B) gare hare tare mare pare fare
(C) mare hare gare pare tare fare
(D) None of these

Sol. The previous step cannot be found out because the initial arrangement of elements, as in the input, is not known. Choice (D)

Exercise – 5

Directions for questions 1 to 4: These questions are based on the following information.

A number arrangement machine, when given an input line of numerals, rearranges them following a particular rule in each step. The following is an illustration of the input and the steps of rearrangement.

Input: 32 339 24 51 74 86 45
Step I: 24 339 32 51 74 86 45
Step II: 24 32 339 51 74 86 45
Step III: 24 32 45 51 74 86 339
Step III is the final step for the given input.

Based on the rearrangement pattern given above and answer the following questions.

1. Input: 441 331 251 101 95 65
What is the output for the above input?
(A) 331 441 101 95 331 65
(B) 101 95 65 441 331 251
(C) 441 331 251 101 95 65
(D) 65 95 101 251 331 441

2. Input: 75 65 27 89 32 15 94
What is step V for the above input?
(A) 15 27 32 65 89 75 94
(B) 15 27 32 89 65 75 94
(C) 15 27 32 75 65 89 94
(D) 15 27 32 65 75 89 94

3. Input: 510 320 720 540 200 440
For the above input which step is the last step?
(A) II (B) IV (C) V (D) III

4. Arrangement: 15 25 36 57 61 70
If the above arrangement is the output, what is the input?
(A) 70 57 61 25 36 15
(B) 57 70 61 15 25 36
(C) 57 61 70 25 15 36
(D) Cannot be determined

Directions for questions 5 to 8: These questions are based on the information given below.

A machine, when given an input line of numbers, modifies them following a particular rule. An illustration of the input and the following steps is shown below.

Input:	64	16	169	4	9
Step I:	8	4	13	2	3
Step II:	514	66	2199	10	29
Step III:	1030	134	4400	22	60
Step IV:	4	8	8	4	6
Step V:	4	16	24	16	30

Here, step V is the output.

The following questions are to be answered based on the rule illustrated above.

5. What is the output for the given input ?
Input: 49 25 36 9 81
(A) 17 26 54 24 75
(B) 17 62 45 24 75
(C) 34 26 45 24 75
(D) 17 26 45 24 75

6. Which of the following is the 2nd element to the right of the 3rd element from the right end in step III of the above input?
(A) 1464 (B) 60 (C) 692 (D) 256

7. If the step II of a particular input is
127 66 29 127 345
then find the output.
(A) 13 16 18 52 85
(B) 10 16 18 52 87
(C) 1 7 9 7 13
(D) 1 49 81 49 169

8. Which of the following is step IV in the above question?
(A) 13 8 6 13 17
(B) 13 16 18 52 85
(C) 9 7 5 12 26
(D) 11 9 7 14 18

Directions for questions 9 to 12: These questions are based on the following information.

A number arrangement machine when given an input line of words and numbers applies certain operations following a particular rule. The following is an illustration of input and operation.

Input:	360	248	164	284	332	224	132
Step I:	92	65	46	78	94	69	50
Step II:	46	32	23	39	47	34	25
Step III:	56	37	28	51	58	41	32
Step IV:	28	32	37	41	51	56	58
Step V:	16	6	21	4	5	30	40
Step VI:	32	18	84	20	30	210	320

As per the rules followed in the steps given above, answer each of the following questions, by applying the above operations on the given input.

9. If the input is 84 96 104 128 136 184 196 then what is the smallest element in Step V?
(A) 0 (B) 3 (C) 7 (D) 12

10. If the input is 84 96 104 128 136 184 196 then how many elements remain in the same position between step III and step IV?
(A) 3 (B) 4 (C) 5 (D) 7

11. If the fourth element of new input is 432, what will be the fourth element of step III?
(A) 72 (B) 69
(C) 108 (D) Cannot be determined

12. If the fourth element of new input is 432, what will be the fourth element of step V?
(A) 6 (B) 4
(C) 0 (D) Cannot be determined

Directions for questions 13 to 16: Study the following input output flowchart and answer the questions below.

Input : Chocolate Vanilla Butterscotch Strawberry Mango

Step I :	9	7	12	10	5
Step II:	81	49	144	100	25
Step III:	9	13	9	1	7
Step IV:	10	15	12	5	12
Step V:	19	28	21	6	19
Step VI:	21	31	26	13	30

and step VI is the final output.

13. Which of the following is the output for the given input?

Input:	Gap	Puma	Reebok	Nike	Adidas
(A)	20	19	26	25	42
(B)	21	26	19	25	42
(C)	21	19	26	25	42
(D)	20	19	62	25	42

14. Which of the following would be step IV for the given input?

Input:	Goodday	Jaffa	Vities	Mc	ParleG	Creamfills
(A)	14	9	13	13	6	
(B)	14	13	9	13	6	
(C)	14	9	12	13	6	
(D)	14	9	13	14	6	

15. If 2529 14 105 62 is the Step V of a particular input, then which of the following is the input?

(A)	Ram	Shyam	Kiran	Daya	Varun
(B)	Vijay	Om	Vikas	Durga	Bhavani
(C)	Aakash	Rakesh	Deep	Meet	Prem
(D)	Cannot be determined				

16. In question 38 above, which of the following is the fourth element from the right in step II?
(A) 36 (B) 25 (C) 100 (D) 64

Directions for questions 17 to 20: These questions are based on the following information.

A word arrangement machine, when given a set of words applies certain operations on them following a particular rule through a step by step process. The following is an illustration of input and the steps of the process.

Input:	All	Indians	Are	My	Brothers	And	Sisters
Step I:	23	32	12	38	65	17	81
Step II:	30	70	41	156	328	104	568
Step III:	568	328	156	104	70	41	30
Step IV:	20	15	15	9	12	11	10
Step V:	41	32	33	22	29	28	27
Step VI:	Sisters	Brothers	My	And	Indians	Are	All

As per the rules followed in the steps given above, answer each of the following questions, by applying the above operations on the given input.
Input: Nothing Is Ever Lost Other Than Change

17. What is the third element of Step IV?
(1) 15 (2) 14 (3) 16 (4) 19

18. How many words in the step VI appear in the same position as they appear in the input?
(1) 0 (2) 1 (3) 2 (4) 3

19. How many elements are present to the left of 38 in step V?
(1) 0 (2) 1 (3) 2 (4) 3

20. What is the position of the element 15 in Step IV?
(1) 1st from the right
(2) 2nd from the left
(C) 1st from the left
(D) More than one of the above

Directions for questions 21 to 24: These questions are based on the following information.

A word arrangement machine, when given a set of words applies certain operations on them following a particular rule through a step by step process. The following is an illustration of input and the steps of the process.

Input:	Always	Feel	Great	Of	Whom	You	Love
Step I:	20	18	27	21	36	46	17
Step II:	2	17	23	5	27	34	15
Step III:	2	5	15	17	23	27	34
Step IV:	3	12	48	72	120	168	245
Step V:	3	2	32	14	0	48	40
Step VI:	Always	Of	Love	Feel	Great	Whom	You

As per the rules followed in the steps given above, answer each of the following questions, by applying the above operations on the given input.
Input: Sorry Sir Not Meant To Tell You

21. What is the first element in step V?
(A) 0 (B) 2 (C) 16 (D) 64

22. How many words in the step VI appear in the same position as they appear in the input?
(A) 0 (B) 1 (C) 2 (D) 3

23. How many elements are present between 88 and 245 in step IV?
(A) 0 (B) 1 (C) 2 (D) 3

24. What is the second element to the left of 24 in step III?
(A) 19 (B) 23 (C) 15 (D) 11

Directions for questions 25 to 28: These questions are based on the following information.

A word arrangement machine, when given an input line of words rearranges them following a particular rule in each step. The following is an illustration of the input and the steps of rearrangement.

Input : taking decision three clear expects happen next public
Step I : clear taking decision three expects happen next public
Step II : clear decision taking three expects happen next public
Step III: clear decision expects taking three happen next public
Step IV: clear decision expects happen taking three next public
Step V : clear decision expects happen next taking three public
Step VI: clear decision expects happen next public taking three
Step VI is the last step for this input.

In accordance with the rule followed in the above steps, answer the following questions.

25. Which of the following will be the last step for the following input?
Input : products retail growth share little option board base
(A) base board growth little products retail share option
(B) base board growth little option products retail share
(C) base board growth products retail share little option
(D) base board products retail growth share little option

26. Which step will be the last step for the following input?
Input : chosen efforts count painful difficult ended total orders
(A) Step IV (B) Step III
(C) Step V (D) Step VI

27. Which among the following will be the Step III for the following input?
Input : that there this provide many flows now years
(A) flows many now provide that there this years
(B) flows many now provide this that there years
(C) flows now many provide that there this years
(D) flows many now that there this provide years

28. Which among the following will be the input, if the output is "diving earn first flight learn sign while yourself"?
(A) flight first earn sign learn while diving yourself
(B) first flight sign earn learn while diving yourself
(C) diving first yourself earn flight learn while sign
(D) Cannot be determined

Directions for questions 29 to 32: These questions are based on the following information.

A word arrangement machine when given an input of a set of words rearranges them in a particular pattern through a step-by-step process. Study the sample arrangement provided below and answer the following questions.

Input : it has now become an ideal for its own sake
Step I : an has now become it ideal for its own sake
Step II : an it now become has ideal for its own sake
Step III : an it for become has ideal now its own sake
Step IV : an it for has become ideal now its own sake
Step V : an it for has its ideal now become own sake
Step VI : an it for has its now ideal become own sake
Step VII : an it for has its now own become ideal sake
Step VIII : an it for has its now own sake become ideal
Step IX : an it for has its now own sake ideal become.
Step IX is the final output.

29. What is the final output for the following input?
Input: our objective is to build a profitable business
(A) a is to our build objective business profitable
(B) a is to our build objective profitable business
(C) a build business is our objective profitable to
(D) a is to our build business objective profitable

30. What is the step IV of the output for the following input?
Input : not all of us want our bicycles insured
(A) of all not us want our bicycles insured
(B) of us all not our want bicycles insured
(C) of us all our not want bicycles insured
(D) step IV of output does not exist.

31. What is the final output for the following input? Input: first world quality at third rate prices
(A) quality prices world third first rate at
(B) at rate first third quality world prices
(C) at rate first third world prices quality
(D) at rate first third world quality prices

32. What is the input, if the step III of the output is "by his core design team hired from abroad"?
(A) his design team by core hired from abroad
(B) by his design core team hired from abroad
(C) abroad hired design team from his by core
(D) Cannot be determined

Directions for questions 33 to 37: These questions are based on the following information.

A word arrangement machine, when given an input line of words, rearranges them following a particular rule in each step.

The following is the illustration of the input and the steps of arrangement.

Input: crazy charan pranking pranav silly sakshi team
Step I: silly pranking team pranav charan crazy sakshi
Step II: charan team sakshi pranav pranking silly crazy
Step III: pranking sakshi crazy pranav team charan silly
Step IV: team crazy silly pranav sakshi pranking charan
and so on for subsequent steps. You have to find out the logic and answer the questions given below.

33. If Step V reads "old hari and his very young aunt", then, what would Step IV read?
(A) hari very young and his old aunt
(B) very old aunty and his young hari
(C) young very hari his old aunt and
(D) None of the above

34. If Step I reads "rest of the world will not forget", then what would be the arrangement for Step V?
(A) world the will of rest not forget
(B) the will world not forget of rest
(C) forget the will not rest of world
(D) None of the above

35. Which of the following steps would have the same output as that of the input?
(A) Step VI (B) Step VIII
(C) Step X (D) Not possible

36. If Step XI reads "tom must take a stand against jerry", then, what will be the last word of Step IV?
(A) must (B) stand
(C) against (D) take

37. If the given input is "he wanted to give you an opportunity", then, what will be Step VII?
(A) you to opportunity give wanted he an
(B) wanted opportunity an give to he you
(C) to opportunity you wanted he give an
(D) opportunity wanted give an you to he

Directions for questions 38 to 41: A word and number arrangement machine when given an input line of words and numbers rearranges them following a particular pattern in each step. The following is an illustration of the input and the steps of rearrangement.

Input: rit 56 71 fit hit 87 kit 94 dit bit 35 43
Step I: 94 rit 56 71 fit hit 87 kit dit bit 35 43
Step II: 94 bit rit 5671 fit hit 87 kit dit 35 43
Step III: 94 bit 35 rit 56 71 fit nit 87 kit dit 43
Step IV: 94 bit 35 rit 87 56 71 fit hit kit dit 43
Step V: 94 bit 35 rit 87 dit 56 71 fit hit kit 43
Step VI: 94 bit 35 rit 87 dit 43 56 71 fit hit kit
Step VII: 94 bit 35 rit 87 dit 43 kit 56 71 fit hit
Step VIII: 94 bit 35 rit 87 dit 43 kit 71 56 fit hit
Step IX: 94 bit 35 rit 87 dit 43 kit 71 fit 56 hit
Step IX is the last step and the output.

As per the rules followed in the above steps, answer the following given questions.

38. If step I of an input is "82 joint effect 76 27 bank 45 hike", then how many more steps are required to complete the final arrangement?
(A) Two (B) Three
(C) Four (D) Five

39. What will be the fourth step if the input is "73 24 51 18 twenty five months ago"?
(A) 73 five months 18 twenty ago 24 51
(B) 73 ago 18 twenty 24 51 months five
(C) 73 ago 18 twenty 51 24 five months
(D) 73 18 ago twenty 24 51 five months

40. What would be the final step if the input is "31 21 four over the 51 and 41 took 61 fox 71"?
(A) 71 fox 61 and 41 over 51 took 21 fox 31 four
(B) 71 and 21 took 61 fox 31 the 51 four 41 over
(C) 71 and 21 took 61 four 31 the 51 fox 41 over
(D) 71 and 21 took 61 four 31 the 51 over 41 fox

41. If the fifth step of an input is "65 care 28 cure 58 clue cold 32", then what will definitely be the input?
(A) 65 cure cold clue 28 32 58 care
(B) cure 65 cold clue 28 32 58 care
(C) 65 care 28 cold cure clue 32 58
(D) Cannot be determined

Directions for questions 42 to 45: These questions are based on the following information.

A word and number arrangement machine when given an input line of words and numbers rearranges them following a particular pattern in each step. The following is an illustration of the input and the steps of rearrangement.

Input: find 72 which 36 45 of the 89 logic 64 known 27
Step I: 27 find 72 36 45 of the 89 logic 64 known which
Step II: 36 27 find 72 45 of 89 logic 64 known which the
Step III: 45 36 27 find 72 89 logic 64 known which the of
Step IV: 64 45 36 27 find 72 89 logic which the of known
Step V: 72 64 45 36 27 find 89 which the of known logic
Step VI: 89 72 64 45 36 27 which the of known logic find
Step VI is the last step for given input and the output
Now, answer the questions based on the following input.
Input: "course 58 institute 78 97 will 68 reduce 12 number 21 student"

42. Which of the word/number would be fifth from the left end in step III for the input?
(A) 12 (B) course
(C) institute (D) 21

43. Which step will contain in the following pattern?
68 58 21 12 course institute 78 97 will student reduce number
(A) III (B) IV
(C) V (D) No such step exists

44. Which of the following would be Step V?
(A) 78 68 58 21 12 course 97 will student reduce number institute
(B) 78 58 68 21 12 97 course will student reduce number institute
(C) 78 68 58 21 12 97 course will student reduce number institute
(D) 68 58 21 12 course 78 97 will student reduce number institute

45. Which word/number would be at 7th position from the right in Step V?
(A) 12 (B) course (C) will (B) 97

Directions for questions 46 to 50: These questions are based on the following information.

When a number arrangement machine is given an input line of numbers, it rearranges them following a particular rule.

Following is an illustration of rearrangement.
(All the given numbers are two digit numbers)

Input: 26 64 47 95 63 17 36 51 80 72 12 33
Step 1: 13 26 64 47 63 17 36 51 80 72 33 94
Step 2: 79 13 26 64 47 63 36 51 72 33 94 18
Step 3: 27 79 13 64 47 63 36 51 33 94 18 71
Step 4: 63 27 79 13 47 63 36 51 94 18 71 34
Step 5: 37 63 27 79 13 47 51 94 18 71 34 62
Step 6: 50 37 63 27 79 13 94 18 71 34 62 48

Step 6 is the last step of the given input as intended output is obtained.

Now, following the same rules obtain the output for the given input.

Input: 27 64 48 95 60 20 41 57 73 68 14 30
(All the given numbers are two digits numbers)

46. Which number(s) appear between '57' and '67' in step 4 of the given input?
(A) Both '21' and '31' (B) Only '21'
(C) Only '94' (D) Both '94' and '21'

47. In which of the given steps the numbers 48, 57, 94 and 21 found consecutively in the same order?
(A) 4 (B) 5 (C) 6 (D) 3

48. Which is the tenth number from the left end in step 2 of the given input?
(A) 30 (B) 21 (C) 94 (D) 31

49. What is the sum of the third number from the right end in step 4 and the second number from the left end in step 5 of the given input?
(A) 81 (B) 83 (C) 84 (D) 98

50. Which of the following numbers appear sixth to the right of '63' in step 5 of the given input?
(A) 94 (B) 57 (C) 21 (D) 67

Key

Exercise – 5

1. D	6. A	11. B	16. B	21. B	26. A	31. C	36. D	41. D	46. D
2. D	7. A	12. D	17. C	22. C	27. D	32. D	37. A	42. C	47. B
3. D	8. A	13. C	18. A	23. C	28. D	33. B	38. B	43. B	48. A
4. D	9. A	14. A	19. B	24. A	29. D	34. D	39. C	44. A	49. C
5. D	10. A	15. D	20. D	25. B	30. B	35. C	40. C	45. B	50. A