Revised Edition

A MODERN APPROACH TO

Verbal & Non-Verbal Reasoning

Dr. R.S. AGGARWAL

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A MODERN APPROACH TO VERBAL & NON-VERBAL REASONING

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PREFACE FOR THE REVISED EDITION

I feel immense pleasure in presenting a new enriched edition of this widely acclaimed book in an extremely unique field of reasoning. Now a-days, success in every competitive examination, be it M.B.A., M.A.T., C.A.T., Bank P.O., L.I.C.A.A.O., G.I.C.A.A.O., S.S.C., Railways, Hotel Management or even Campus Interviews, depends much on the candidate's performance in the Reasoning section. So, a much faster, shorter and intelligent approach to it is the need of the day. This book serves the purpose. The salient features of the new edition are:

(i) Coverage of all types of questions based on the latest pattern in a classified, well-arranged and graded manner.

(ii) A whole lot of questions for practice, with solutions that can teach one the right approach to deal with similar questions that one may come across elsewhere.

(iii) Fully solved examples to explain the essence of each topic.

Stringent efforts have been made to incorporate most of the questions asked in various examinations in the recent years, which our readers have been sending to us on memory basis from time to time. The requirements and suggestions of our readers has been the prime factor kept in mind during the compilation of the book and I am sure that it will make the students the masters in this field.

I convey my gratitude to the entire management of S. Chand & Company Pvt. Ltd. for having extended immense cooperation in the publication of this book.

I once again thank my sons Deepak Aggarwal and Vikas Aggarwal who have worked hard and taken great pains to present the book in this revised form.

AUTHOR

CONTENTS

PART I – VERBAL REASONING

PART II – NON-VERBAL REASONING

analytical ability

SACA, MWSC, FPPR, GCDCF

GENERAL MENTAL ABILITY

1 SERIES COMPLETION

This chapter consists of questions in which series of numbers or alphabetical letters or combinations of both are given, which are generally called the terms of the series. These terms follow a certain pattern throughout the series. The candidate is required to study the given series, identify the pattern followed in the series and either complete the given series with the most suitable alternative or find the wrong term in the series.

TYPE 1 : NUMBER SERIES

Case I : Completing The Given Series By Finding The Missing Term(s)

Directions : *Find the missing term in each of the following series :*

Ex. 1. 1, 6, 15, ?, 45, 66, 91 (B.B.S. 2004)

(a) 25 (b) 26 (c) 27 (d) 28

Sol. Clearly, the given sequence follows the pattern : + 5, + 9, + 13, + 17, + 21, + 25, ...

Thus, 1 + 5 = 6, 6 + 9 = 15, ...

So, missing term = 15 + 13 = 28.

Hence, the answer is (d).

Ex. 2. 2, 5, 9, 19, 37, ? (C.P.O. 2003)

(a) 73 (b) 75 (c) 76 (d) 78

Sol. Clearly, we have : $2 \times 2 + 1 = 5$, $5 \times 2 - 1 = 9$, $9 \times 2 + 1 = 19$, $19 \times 2 - 1 = 37$, ...

So, missing term = $37 \times 2 + 1 = 75$.

Hence, the answer is (b).

Ex. 3. 4, 8, 28, 80, 244, ? (B.T.M. 2006)

(a) 278 (b) 428 (c) 628 (d) 728

Sol. The terms of the given series are : $3^1 + 1$, $3^2 - 1$, $3^3 + 1$, $3^4 - 1$, $3^5 + 1$, ...

So, missing term = $3^6 - 1 = 729 - 1 = 728$.

Hence, the answer is (d).

Ex. 4. 10000, 11000, 9900, 10890, 9801, ? (PGDTM, 2006)

(a) 10241 (b) 10423 (c) 10781 (d) 10929

Sol. Clearly, alternately we add and subtract 10% of a term to obtain the next term of the series.

Thus, 10000 + (10% of 10000) = 11000; 11000 − (10% of 11000) = 9900,

9900 + (10% of 9900) = 10890, 10890 − (10% of 10890) = 9801.

So, missing term = 9801 + (10% of 9801) = 9801 + 980 = 10781.

Hence, the answer is (c).

Ex. 5. 0, 6, 24, 60, 120, 210, ?

(a) 240 (b) 290 (c) 336 (d) 504

Sol. Clearly, the given series is : $1^3 - 1$, $2^3 - 2$, $3^3 - 3$, $4^3 - 4$, $5^3 - 5$, $6^3 - 6$.

$\therefore$ Missing term = $7^3 - 7 = 343 - 7 = 336$.

Hence, the answer is (c).

Ex. 6. 1, 4, 27, 16, ?, 36, 343 (SNAP, 2004)

(a) 25 (b) 87 (c) 120 (d) 125

Sol. Clearly, the given series consists of cubes of odd numbers and squares of even numbers, *i.e.*, $1^3, 2^2, 3^3, 4^2, ...$

So, missing term = $5^3 = 125$.

Hence, the answer is (*d*).

Ex. 7. 4, 6, 12, 14, 28, 30, ?

(*a*) 32 (*b*) 60 (*c*) 62 (*d*) 64

Sol. The given sequence is a combination of two series :

I. 4, 12, 28, ? and II. 6, 14, 30, ...

Now, the pattern followed in each of the above two series is : + 8, + 16, + 32, ...

So, missing number = (28 + 32) = 60.

Hence, the answer is (*b*).

Ex. 8. 1, 3, 3, 6, 7, 9, ?, 12, 21

(*a*) 10 (*b*) 11 (*c*) 12 (*d*) 13

Sol. Clearly, the given sequence is a combination of two series :

I. 1, 3, 7, ?, 21 and II. 3, 6, 9, 12

The pattern followed in I is + 2, + 4, ... and the pattern followed in II is + 3.

So, missing number = 7 + 6 = 13.

Hence, the answer is (*d*).

Ex. 9. Which fraction comes next in the sequence $\frac{1}{2}, \frac{3}{4}, \frac{5}{8}, \frac{7}{16}, ?$ **(M.A.T. 2005)**

(*a*) $\frac{9}{32}$ (*b*) $\frac{10}{17}$ (*c*) $\frac{11}{34}$ (*d*) $\frac{12}{35}$

Sol. Clearly, the numerators of the fractions in the given sequence form the series 1, 3, 5, 7, in which each term is obtained by adding 2 to the previous term.

The denominators of the fractions form the series 2, 4, 8, 16, *i.e.*, $2^1, 2^2, 2^3, 2^4$.

So, the numerator of the next fraction will be (7 + 2) *i.e.* 9 and the denominator will be 2^5 *i.e.* 32.

Thus, the next term is $\frac{9}{32}$. Hence, the answer is (*a*).

Triangular Pattern Series :

Sometimes, the differences between the consecutive terms of a series, again form a series. The differences between the consecutive terms of the new series so formed, again form a series. This pattern continues till we attain a uniform difference between the consecutive terms of the series.

Ex. 10. Find the missing term in the series : 3, 20, 63, 144, 275, ? **(B.T.M. 2005)**

(*a*) 354 (*b*) 468 (*c*) 548 (*d*) 554

Sol. As discussed above, we may label the given series as series I and then form series II to IV as shown below :

Series I :	3	20	63	144	275	?
Series II :	17	43	81	131	?	
Series III :	26	38	50	?		
Series IV :	12	12				

Clearly, the pattern in series III is + 12.

So, missing term in series III = 50 + 12 = 62;

missing term in series II = 131 + 62 = 193;

missing term in series I = 275 + 193 = 468.

Thus, the missing term is 468. Hence, the answer is (*b*).

LOGICAL DEDUCTION

1. LOGIC

The word 'Logic' is derived from the Greek noun '*logos*' meaning both 'thought' and 'the word expressing thought'.

Thus, LOGIC is the 'science of thought as expressed in language'. This means that the questions on logic are to be solved as per the information given without any concern of the formal validity or truth of the statements i.e. conclusion should follow directly from the statements given.

With this unique characteristic, the Logic Test becomes an instrument of teaching the candidates to follow the rules and work as per the instructions without an error. Thus, it prepares the mind for all types of reasoning practices and teaches how to detect and avoid mistakes in the same.

LOGICAL REASONING

In Logic, any categorical statement is termed as the **Proposition**.

A **Proposition** *(or a categorical statement) is a statement that asserts that either a part of, or the whole of, one set of objects — the set identified by the subject term in the sentence expressing that statement — either is included in, or is excluded from, another set — the set identified by the predicate term in that sentence.*

The standard form of a proposition is :

Quantifier + Subject + Copula + Predicate

Thus, the proposition consists of four parts :

1. **Quantifier :** The words 'all', 'no' and 'some' are called quantifiers because they specify a quantity. 'All' and 'no' are universal quantifiers because they refer to every object in a certain set, while the quantifier 'some' is a particular quantifier because it refers to at least one existing object in a certain set.
2. **Subject (denoted by 'S') :** The subject is that about which something is said.
3. **Predicate (denoted by 'P') :** The predicate is the part of the proposition denoting that which is affirmed or denied about the subject.
4. **Copula :** The copula is that part of the proposition which denotes the relation between the subject and the predicate.

Examples : (*i*)

All	men	are	animals
↓	↓	↓	↓
Quantifier	Subject	Copula	Predicate

(*ii*)

Some	pens	are	erasers
↓	↓	↓	↓
Quantifier	Subject	Copula	Predicate

Four-Fold Classification of Propositions :

A proposition is said to have a universal quantity if it begins with a universal quantifier, and a particular quantity if it begins with a particular quantifier. Besides, propositions which assert something about the inclusion of the whole or a part of one set in the other are said to have affirmative quality, while those which deny the inclusion of the whole or a part of one set in the other are said to have a negative quality. Also, a term is distributed in a proposition if it refers to all members of the set of objects denoted by that term. Otherwise, it is said to be undistributed.

Based on the above facts, propositions can be classified into four types :

1. **Universal Affirmative Proposition (denoted by A)** : It distributes only the subject i.e. the predicate is not interchangeable with the subject while maintaining the validity of the proposition *e.g.*,
   All snakes are reptiles.
   This is proposition A since we cannot say 'All reptiles are snakes'.
2. **Universal Negative Proposition (denoted by E)** : It distributes both the subject and the predicate i.e. an entire class of predicate term is denied to the entire class of the subject term, as in the proposition. *e.g.*,
   No boy is intelligent.
3. **Particular Affirmative Proposition (denoted by I)** : It distributes neither the subject nor the predicate e.g.,
   Some men are foolish.
   Here, the subject term 'men' is used not for all but only for some men and similarly the predicate term 'foolish' is affirmed for a part of subject class. So, both are undistributed.
4. **Particular Negative Proposition (denoted by O)** : It distributes only the predicate. *e.g.*,
   Some animals are not wild.
   Here, the subject term 'animals' is used only for a part of its class and hence is undistributed while the predicate term 'wild' is denied in entirety to the subject term and hence is distributed.

These facts can be summarized as follows :

Statement Form	Quantity	Quality	Distributed
(A) : All S is P.	Universal	Affirmative	S only
(E) : No S is P.	Universal	Negative	Both S and P
(I) : Some S is P.	Particular	Affirmative	Neither S nor P
(O) : Some S is not P.	Particular	Negative	P only

LOGICAL DEDUCTION

The phenomenon of deriving a conclusion from a single proposition or a set of given propositions, is known as ***logical deduction***. The given propositions are also referred to as the **premises**.

Two Inferential Processes of Deduction :

I. Immediate Deductive Inference :

Here, conclusion is deduced from one of the given propositions, by any of the three ways – conversion, obversion and contraposition.

1. **Conversion :** The Conversion proceeds with interchanging the subject term and the predicate term i.e. the subject term of the premise becomes the predicate term of the conclusion and the predicate term of the premise becomes the subject of the conclusion. The given proposition is called **convertend**, whereas the conclusion drawn from it is called its **converse**.

Table of Valid Conversions

Convertend	Converse
A : All S is P. **Ex.** All pins are tops.	**I** : Some P is S. Some tops are pins.
E : No S is P. **Ex.** No fish is whale.	**E** : No P is S. No whale is fish.
I : Some S is P. **Ex.** Some boys are poets.	**I** : Some P is S. Some poets are boys.
O : Some S is not P.	No valid conversion

Note that in a conversion, the quality remains the same and the quantity may change.

2. **Obversion :** In obversion, we change the quality of the proposition and replace the predicate term by its complement.

Table of Valid Obversions

Obvertend	Obverse
A : All birds are mammals	E : No birds are non-mammals.
E : No poets are singers.	A : All poets are non-singers.
I : Some nurses are doctors.	O : Some nurses are not non-doctors.
O : Some politicians are not statesmen.	I : Some politicians are non-statesmen.

3. **Contraposition :** To obtain the contrapositive of a statement, we first replace the subject and predicate terms in the proposition and then exchange both these terms with their complements.

Table of Valid Contrapositions

Proposition	Contrapositive
A : All birds are mammals	**A** : All non-mammals are non-birds.
I : Some birds are mammals.	**I** : Some non-mammals are non-birds.

Note : The valid converse, obverse or contrapositive of a given proposition always logically follows from the proposition.

II. Mediate Deductive Inference (SYLLOGISM) : First introduced by Aristotle, a ***Syllogism*** *is a deductive argument in which conclusion has to be drawn from two propositions referred to as the premises.*

Example :
1. All lotus are flowers.
2. All flowers are beautiful.
3. All lotus are beautiful.

Clearly, the propositions 1 and 2 are the premises and the proposition 3, which follows from the first two propositions, is called the conclusion.

Term : In Logic, a ***term*** is a word or a combination of words, which by itself can be used as a subject or predicate of a proposition.

Syllogism is concerned with three terms :

1. **Major Term :** It is the predicate of the conclusion and is denoted by P (first letter of 'Predicate').
2. **Minor Term :** It is the subject of the conclusion and is denoted by S (first letter of 'Subject').
3. **Middle Term :** It is the term common to both the premises and is denoted by M (first letter of 'Middle').

Example : **Premises :**
1. All dogs are animals.
2. All tigers are dogs.

Conclusion : All tigers are animals.

Here 'animals' is the predicate of the conclusion and so, it is the major term, P.

'Tigers' is the subject of the conclusion and so, it is the minor term, S.

'Dogs' is the term common to both the premises and so, it is the middle term, M.

Major And Minor Premises : Of the two premises, the **major premise** is that in which the middle term is the subject and the **minor premise** is that in which the middle term is the predicate.

Rules For Deriving The Conclusion From Two Given Premises

1. ***The conclusion does not contain the middle term.***

1. SERIES (Picture Sequence Problem)

This chapter deals with the problems based upon the continuation of figures. There are various types of problems on series. However, the fundamental concept for each type is the same. There is a sequence of figures depicting a change step by step. Either one of these figures is out of order and has to be omitted or figure has to be selected from a separate set of figures, which would continue the series.

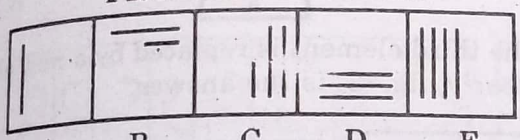
TYPE 1 : FIVE FIGURE SERIES

This type of problems on series consists of five figures numbered A, B, C, D and E forming the set of ***Problem Figures***, followed by five other figures numbered 1, 2, 3, 4 and 5 forming the set of ***Answer Figures***. The five consecutive Problem Figures form a definite sequence and it is required to select one of the figures from the set of Answer Figures which will continue the same sequence.

ILLUSTRATIVE EXAMPLES

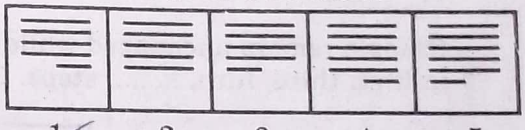
Example 1.

PROBLEM FIGURES



A B C D E

ANSWER FIGURES

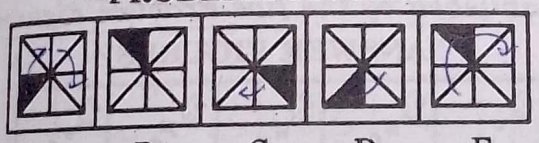


1 2 3 4 5

Solution : The figure rotates 90° CW in each step and half a line segment and one complete line segment are added to the figure alternately. Clearly, fig. (1) is the answer.

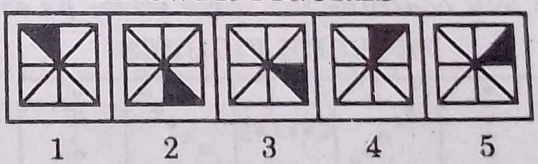
Example 2.

PROBLEM FIGURES



A B C D E

ANSWER FIGURES



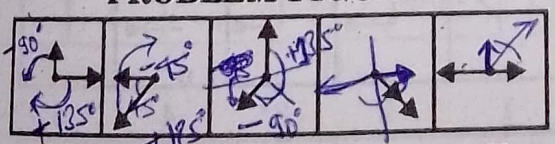
1 2 3 4 5

Solution : The shading moves two spaces CW and three spaces CW alternately. Clearly, fig. (5) is the answer.

"Problem को पहले तोड़ कर देखें कि मिला कर देखें" और Question को आसानी से solve करने का प्रयास करें।

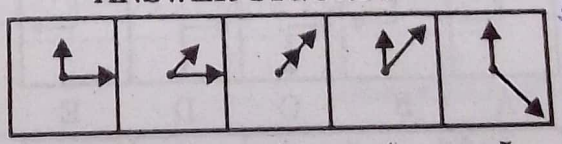
Example 3.

PROBLEM FIGURES



A B C D E

ANSWER FIGURES



1 2 3 4 5

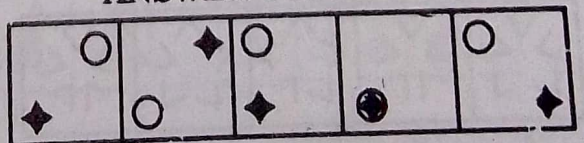
Solution: The smaller arrow rotates through 90° ACW and 45° ACW alternately while the larger arrow rotates through 135° CW in each step. Hence, the answer is fig. (4).

Example 4.

PROBLEM FIGURES

A B C D E

ANSWER FIGURES

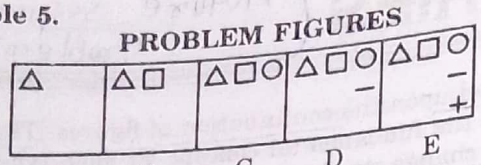


1 2 3 4 5

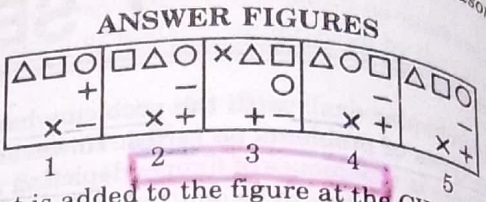
Solution : In each step, the circle moves to the adjacent corner (of the square boundary) in an ACW direction while the other element moves to the adjacent corner in a CW direction. Clearly, fig. (4) is the answer.

Example 5.

PROBLEM FIGURES



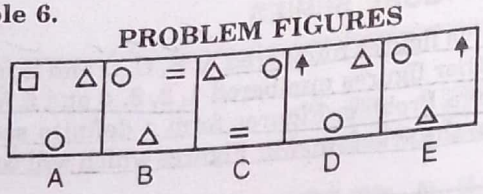
ANSWER FIGURES



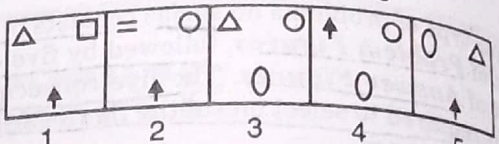
Solution: Clearly, in each step, one new element is added to the figure at the CW end of the existing elements. Hence, fig. (5) is the answer.

Example 6.

PROBLEM FIGURES



ANSWER FIGURES



(G.I.C. A.A.O. 2005)

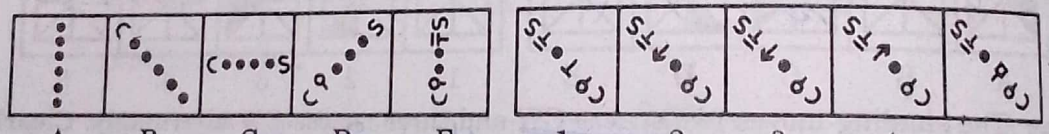
Solution: In each step, the elements move in the sequence  . The circle and the triangle remain unchanged while the third element is replaced by a new element in first, third, fifth, ... steps. Clearly, fig. (3) is the answer.

EXERCISE 1A

Directions : ***Each of the following questions consists of five figures marked A, B, C, D and E called the Problem Figures followed by five other figures marked 1, 2, 3, 4 and 5 called the Answer Figures. Select a figure from amongst the Answer Figures which will continue the same series as established by the five Problem Figures.***

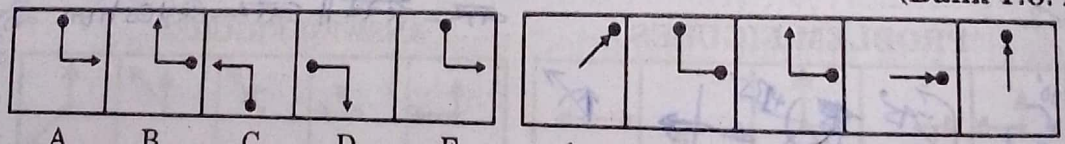
PROBLEM FIGURES ANSWER FIGURES

1.



(Bank P.O. 2004)

2.



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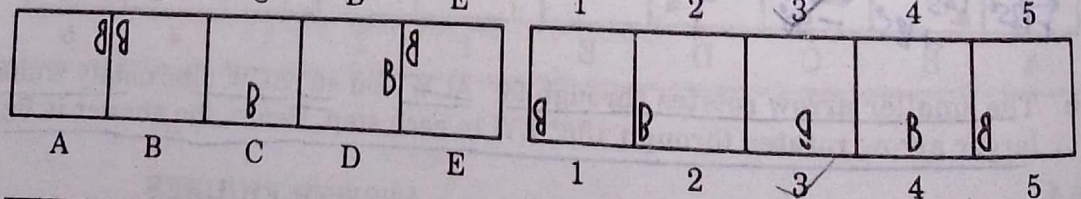
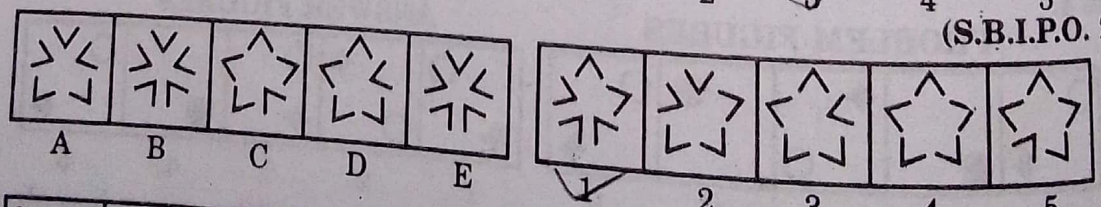


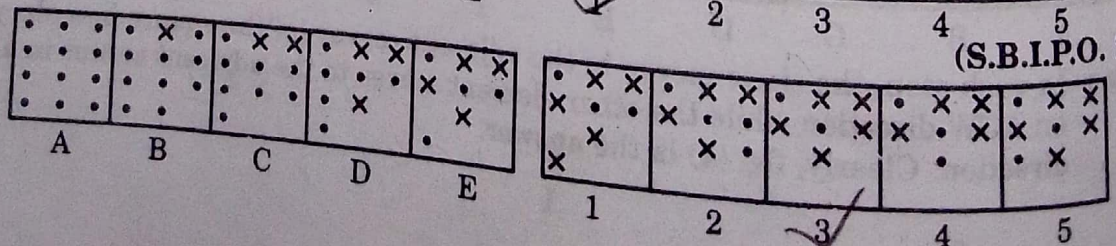
(S.B.I.P.O. 2003)

4.



(S.B.I.P.O. 2005)

5.



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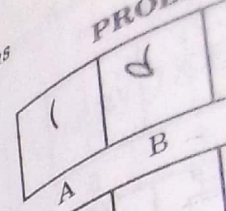

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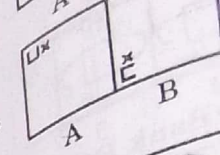

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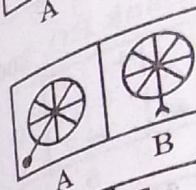

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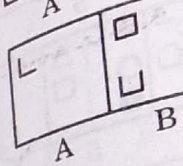

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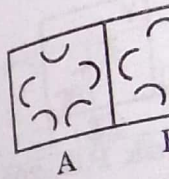

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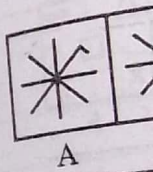

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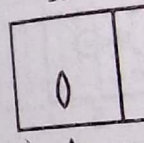

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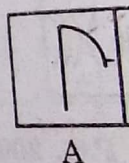

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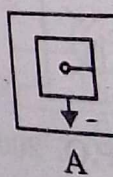
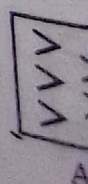


15.

16.



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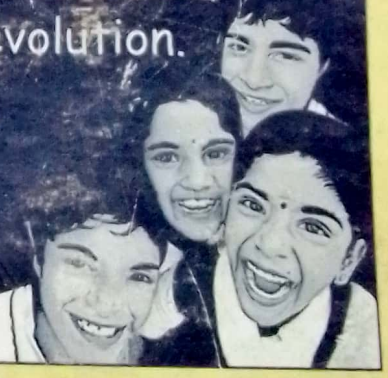

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