CHAPTER 16

Non-Verbal Reasoning

Non-Verbal reasoning tests candidates thinking ability, ability to identify similarity and dissimilarity and come to a conclusion quickly on the basis of given figures, patterns and symbols.

The following topics are covered in this chapter.

1. Analogy

2. Classification

3. Series

4. Embedded figure

5. Counting of Figures

6. Figure completion

7. Paper cutting and folding

8. Mirror & Water Image.

1. Analogy- Analogy refers to correspondence or similarity in relationship. When a figure exhibits some kind of relationship with another figure on some basis then the two figures are said to be analogous to each other.

In questions based on analogy, two sets of figures namely problem figures and answer figures are given.

The set of problem figures consist of two parts which bear certain relationship between them. The second part comprises of one figure and a sign of '?'.
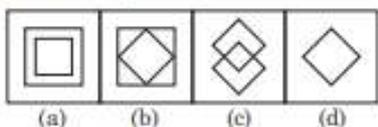
The candidate is asked to select one figure from the set of answer figures to replace '?' but maintaining similar relationship as depicted between the first two figures.

**Example 1:** Find the figure from the set of answers figures that will replace the question mark'?'.
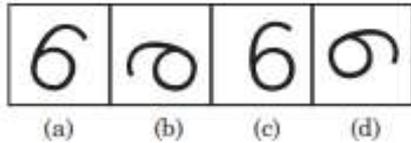

Sol. (c) First design of first pair of problem figures is inverted and then placed on the original figure to get the second figure. Similar concept is used in second pair.

Example 2: Find the figure from the set of answer figures that will replace the question mark '?'.

Problem figures


Answer figure

(a)   (b)   (c)   (d)
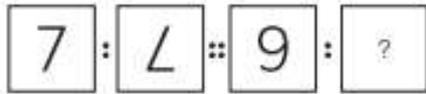
Sol. (c) The figure rotates through 180° anti-clockwise. On following the same pattern, the answer figure (c) will replace the question mark '?'.

2. Classification- Classification is the process of putting things or objects into a group and then finding the different object or thing that does not belong to that group based on some common properties.

In questions based on classification, the candidate has to find an odd figure from a set of four figures based on some common properties.

Example 3: Find the odd figure from the set of given figures.

(a)   (b)   (c)   (d)
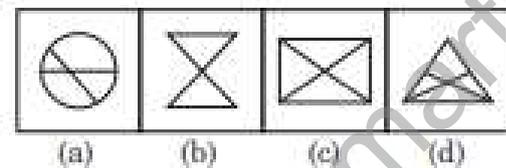
Sol. (b) Except figure (b), in all other figures the main figure is divided into four parts while in second figure two parts are there.

**Example 4:** Find the odd figure from the set of given figures.

(a)   (b)   (c)   (d)
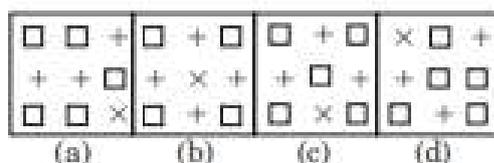
**Sol. (b)** Figure (b) has 4 plus signs and other have 3.

3. Series- Series is a continuous sequence of figures following a certain defined pattern. In this type of questions, a series of figures is given as problem figures and the candidate is asked to select one figures from the set of answer figures which will continue the given sequence.

Example 5: Find the figure that will continue the set of problem figures.
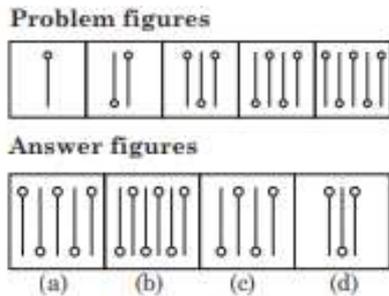
Sol. (b) In each step, a pin is added on the left hand side of existing pin/pins. The head of the pin is in a direction opposite to adjacent pin.

Example 6: Find the figure that will continue the set of problem figures
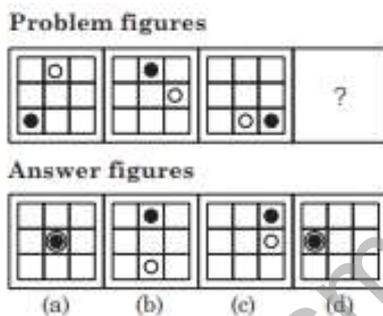
Sol. (d) In each successive problem figure, black dot moves three steps clockwise and white circle moves two steps clockwise.

4. Embedded Figures- A figure is said to be an embedded figure when that figure is completely contained by another figure.

Questions based on embedded figures comprise of a question figure and four answer figures and it is asked to find to correct answer figure embedded in given figure or the correct answer figure in which the given question figure is embedded.
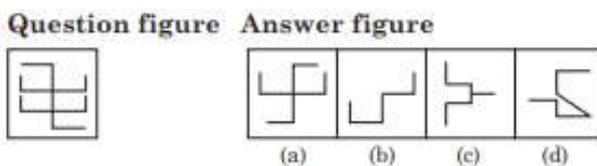
Example 7: Find the answer figure in which the question figure is embedded

Question figure   Answer figures
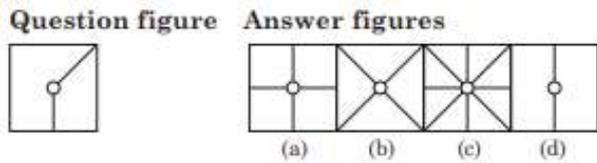
Sol. (c) The question figure is embedded in answer Fig. (c)

Example 8: Find the answer figure which is embedded in the question figure.

Question figure   Answer figure

Sol. (b) The answer figure (b) is embedded in the question figure.

## 5. Counting of Figures- Counting of figures is simply the realization of different geometrical figures from a complex one.

In questions based on counting of figures the candidate is asked to count straight lines, triangles, squares, circles etc. from a given figure.

Example 9: How many squares are there in the figure given below?
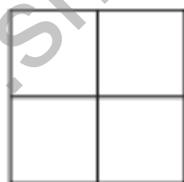
(a) 4   (b) 5   (c) 6   (d) 7

Sol. (b) There are 5 squares in the given figure
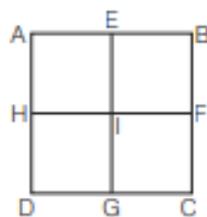
 viz. ABCD, AEIH, EBFI, FICG, and HIGD.

Example 10: How many triangles are there in the figure given below?
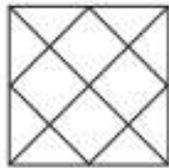
(a) 20

(b) 27

(c) 18

(d) 29

Sol. (a) Naming the figure,
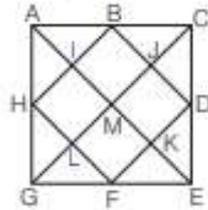
Smallest triangles are ΔABI, ΔBCJ, ΔCDJ, ΔDEK, ΔEFK, ΔFGL, ΔGHL, ΔHAI = 8 Small triangles formed with two triangles

ΔBCD, ΔDEF, ΔFGH, ΔHAB = 4

Large triangles formed with two triangles and one square are

ACM, ΔCEM, ΔEGM, ΔGAM = 4

Largest triangles ΔACE, ΔAGE, ΔGAC, ΔGEC = 4

∴ Total triangles = 8 + 4 + 4 + 4 = 20

Example 11: How many circles are there in the figure given below?

(a) 4

(b) 8

(c) 9

(d) 10

Sol. (b)
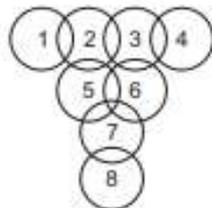
Clearly, total number of circles = 8

6. Figure Completion- Figure completion is a process to find out the missing part of an incomplete figure to complete it.

In this type of questions, a figure is given and a part of it is missing, generally 1/4th part of the figure and the candidate is asked to find that missing part from the given set of answer figures.
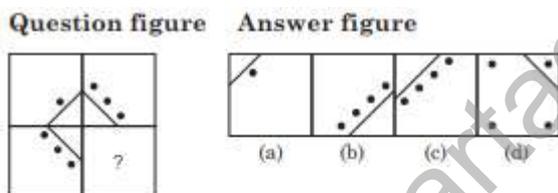
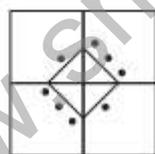**Example 12:** Choose the answer figure that will complete the question figure
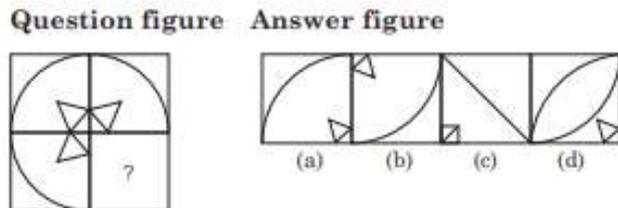
Sol. *(b)* Clearly, option (b) completes the original figure which looks like the figure given below
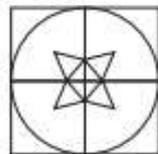
Example 13: Choose the answer figure that will complete the question figure

Sol. *(a)* Clearly, option (a) completes the question figure which looks like the figure given below.

7. Paper Cutting and Folding- Paper folding and cutting problems are based on a transparent sheet which is folded along a dotted line or folded and cut (or punched) in a particular manner.

In questions based on paper folding, a transparent sheet having a certain design and a dotted line is given on it.

The candidate is required to identify the design that would appear on the sheet when it is folded along the dotted line.

In questions based on paper cutting, few figures are given showing the way in which a piece of paper is to be folded and then cut to form a particular section.

Example 14: In the given question, a square transparent sheet with a pattern is given. Find out from amongst the four alternatives as to how the pattern would appear when the transparent sheet is folded along the dotted line.


Transparent sheet   Answer figures
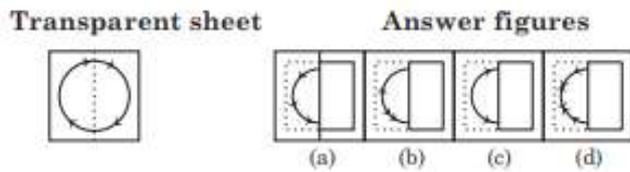
Sol. (c) The transparent sheet will appear like option figure (c)

Directions (Ex. Nos. 15 and 16) In the following questions a set of three figure (X), (Y) and (Z) have been given showing a sequence in which paper is folded and finally cut from a particular section. These figures are followed by a set of answer figures marked (a), (b), (c) and (d) showing the design which the paper actually acquires when it is unfolded. You need to select the answer figure.

Example 15:

Question figures   Answer figures

Sol. (d)

Example 16:

Question figures   Answer figures

Sol. (c)
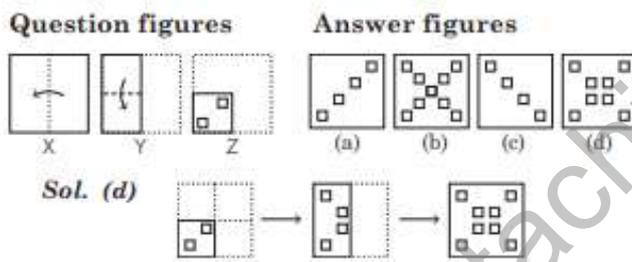
8. Mirror and Water Image
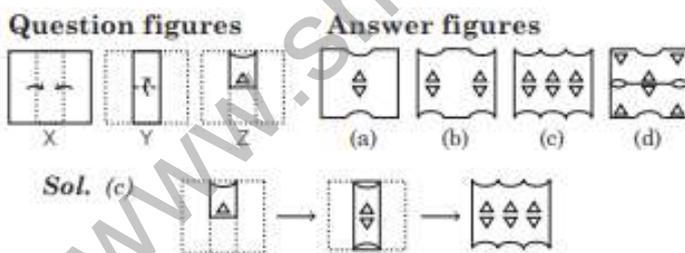
8. Mirror and Water Image- Mirror image is the reflection of an object into the mirror, and water image of an object is its reflection into the water.
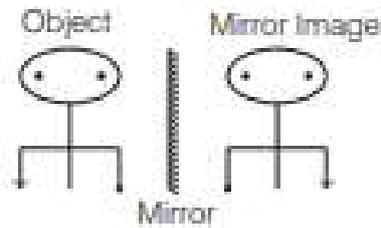
In mirror image, the left hand side and right hand side of an object interchange their places, while top and bottom remains constant.

In water image, the top and bottom of an object interchange their places, while the left hand side and right hand side remains constant.
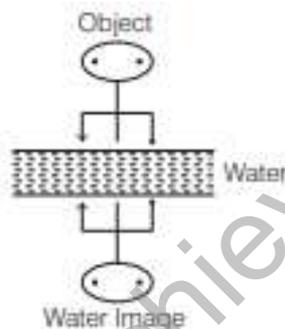
Note If the mirror is placed along the horizontal line than the mirror image of the object would be same as water image.

Example 17: Find the mirror image of the question figure when the mirror is placed along the line MN.

Question figure   Answer figures
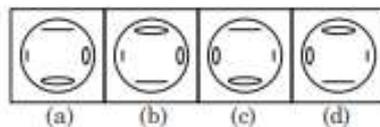
Sol. *(c)* Option figure (c) is the correct mirror image of question figure.

Example 18: If a mirror is placed on the line XY, then which of the answer figure is the right image of the given figure?
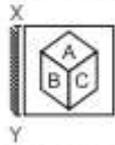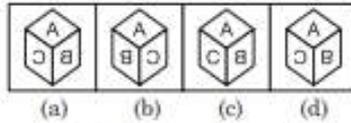
Sol. *(a)* Option figure (a) is the correct mirror image of question figure

Example 19: Find the Water image of the question figure.
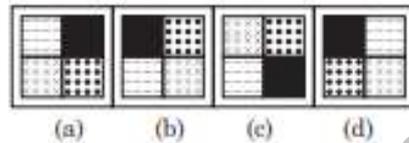
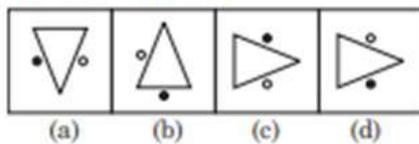**Sol.** *(d)* option figure (d) is the correct water image of question figure.
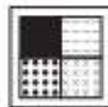
Practice Questions

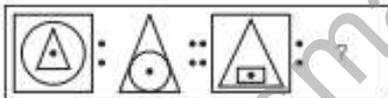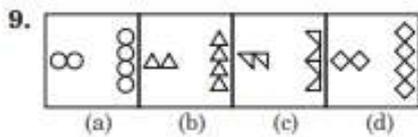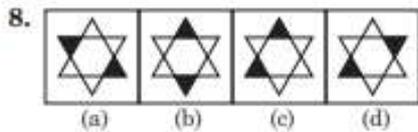**Directions (Q. Nos. 1-5)** Find a figure from the set of answer figures that will replace the question mark (?).

1. **Question figures**
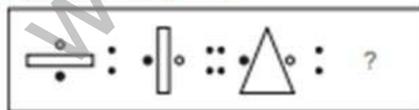
Answer figures

2. Question figures
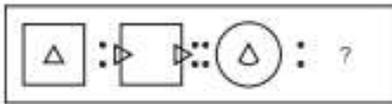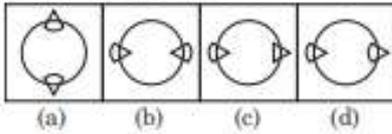
Answer figures

(a)　　(b)　　(c)　　(d)

3. Question figures

Answer figures

(a)　　(b)　　(c)　　(d)

4. Question figures

Answer figures

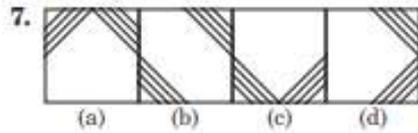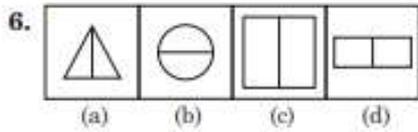
(a)　　(b)　　(c)　　(d)

5. Question figures

Answer figures

(a)　　(b)　　(c)　　(d)
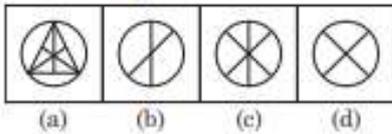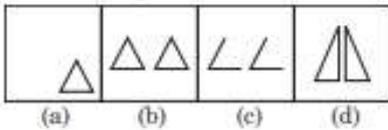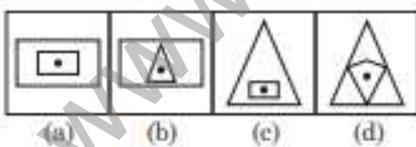
Directions (Q. Nos. 6-10) In the following questions select the figure which is different from the other three responses

6. (a) (b) (c) (d)

7. (a) (b) (c) (d)

8. (a) (b) (c) (d)

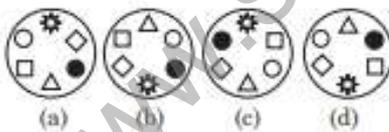9. (a) (b) (c) (d)

10. (a) (b) (c) (d)
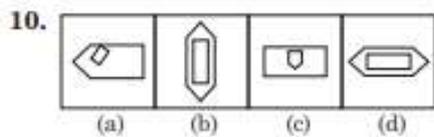
Directions (Q. Nos. 11-15) Find the figure form the set of answer figure that will follow the pattern of question figure and will replace question mark (?)
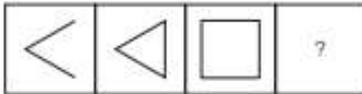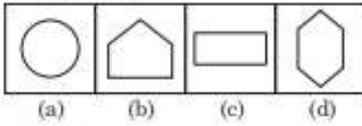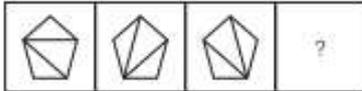
11. Question figures

Answer figures

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

12. Question figures

Answer figures

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

13. Question figures

Answer figures

(a) (b) (c) (d)
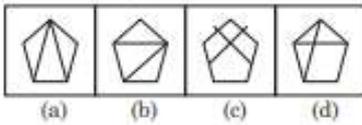
14. Question figures

Answer figures

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

15. Question figures

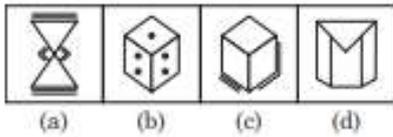**Answer figures**

(a) (b) (c) (d)
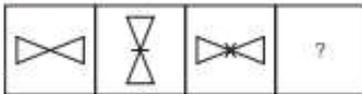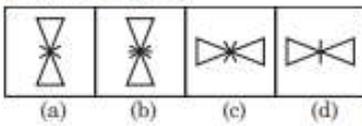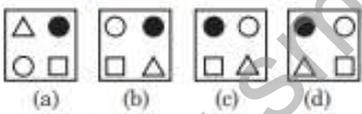
Directions (Q. Nos. 16-18) In the following questions from the given answer figures, select the one in which the question figure is hidden/embedded.
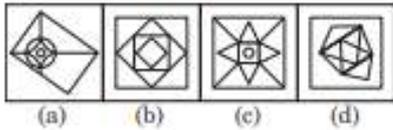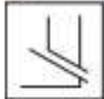
16. Question figure

Answer figures

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

17. Question figure

Answer figures

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

18. Question figure

Answer figures
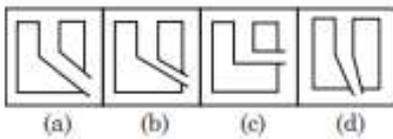
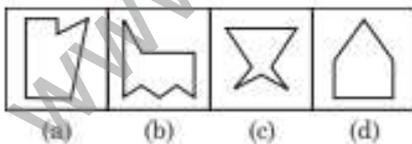(a)   (b)   (c)   (d)

Directions (Q. Nos. 19 and 20) Which of the answer figure is hidden oblique line embedded in the question figure?

19. Question figure

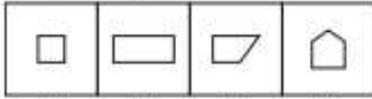**Answer figures**

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

20. Question figure
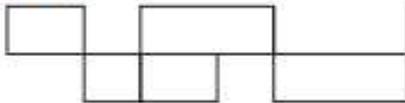

Answer figures

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

21. What is the minimum number of straight lines required to make the figure?

(a) 20   (b) 15
(c) 11   (d) 7

Directions (Q. Nos. 22 and 23) Find the total number of triangles in the given figures

22.
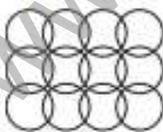

(a) 9   (b) 10
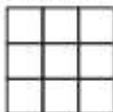(c) 11   (d) 12

23.

(a) 5   (b) 12
(c) 9   (d) 10

24. What is the number of circles in the following figure?

(a) 8   (b) 10
(c) 12   (d) 15

25. Find the total number of squares in the given figure.
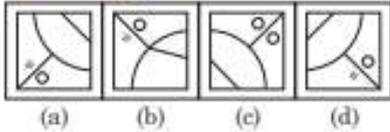

(a) 10   (b) 14
(c) 12   (d) 16

Directions (Q. Nos. 26-30) In the following questions, find the answer figure that will complete the pattern in the question figure.

26. Question figure

Answer figures

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

27. Question figure

Answer figures

(a)   (b)   (c)   (d)
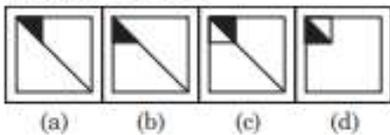
28. Question figure

Answer figures

(a)   (b)   (c)   (d)
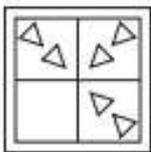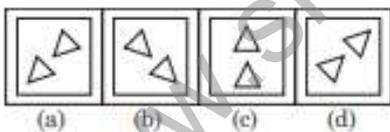
29. Question figure
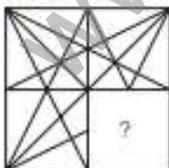
Answer figures

30. Question figure
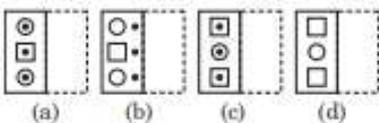

Answer figures

(a)　(b)　(c)　(d)
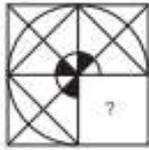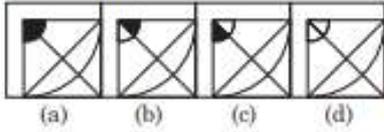
Directions (Q. Nos. 31 and 32) In each of the following questions, a figure marked as transparent sheet is given and followed by four answer figures, one out of these four options resembles the figure which is obtained by folding transparent sheet along the dotted line.

Find the answer from these figures.

31. Transparent sheet

Answer figures

(a)　(b)　(c)　(d)

32. Transparent Sheet

Answer figures

(a)　(b)　(c)　(d)
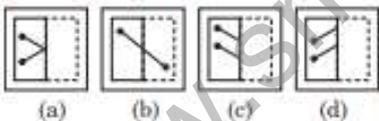
Directions (Q. Nos. 33-35) In each of the following questions, a set of three figure (X), (Y) and (Z) has been given, showing a sequence in which a paper is folded and finally cut at a particular section. Below these figures a set of answer figures marked (a), (b), (c) and (d) showing the design which the paper actually acquires when it is unfolded are also given.

You have to select the answer figure which is closest to the unfolded piece of paper.

33.

X　Y　Z

(a)　(b)　(c)　(d)

34.

X Y Z

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

35.

X Y Z

(a) (b) (c) (d)
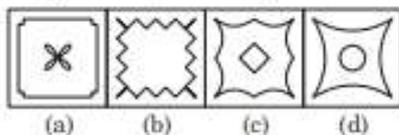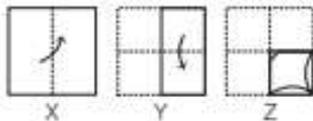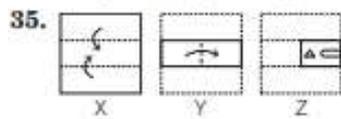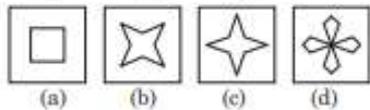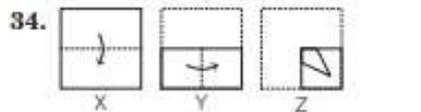
Direction (Q. Nos. 36-38) Find the mirror image of the question figure if the mirror is placed along the line MN.

36. Question figure

Answer figures

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

37. Question figure

Answer figures

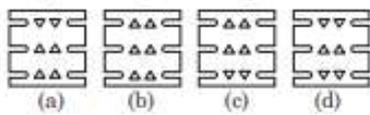| HOAORPPA	HOAOR99A	HOAORRPA	APPROACH
(a)	(b)	(c)	(d)
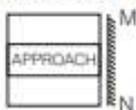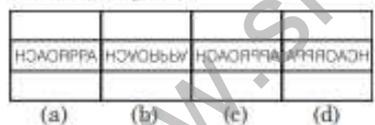
38. Question figure

Answer figures

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

Directions (Q. Nos. 39 and 40) Find the water image of the given question figure.

39. Question figure

Answer figures

(a)   (b)   (c)   (d)
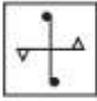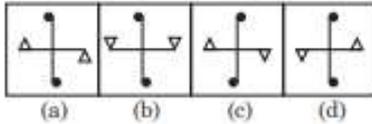
40. Question figure

Answer figures

(a)   (b)   (c)   (d)
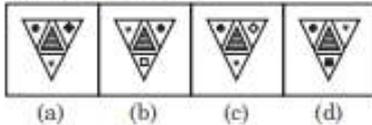
ANSWERS

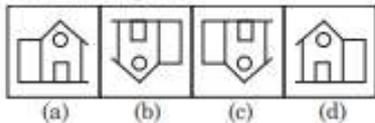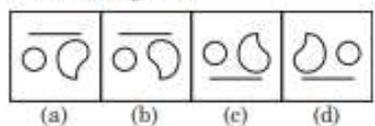| 1.	(c)	2.	(d)	3.	(c)	4.	(d)	5.	(b)	6.	(b)	7.	(b)	8.	(c)	9.	(c)	10.	(c)
11.	(c)	12.	(b)	13.	(b)	14.	(b)	15.	(c)	16.	(b)	17.	(b)	18.	(b)	19.	(c)	20.	(c)
21.	(c)	22.	(d)	23.	(d)	24.	(c)	25.	(b)	26.	(d)	27.	(c)	28.	(d)	29.	(b)	30.	(b)
31.	(c)	32.	(d)	33.	(c)	34.	(b)	35.	(d)	36.	(a)	37.	(c)	38.	(d)	39.	(c)	40.	(d)

Hints & Solutions:

1. (c) From first figure to second the main figure is rotated 90º clockwise. So, answer figure (c) will replace the '?'.

2. (d) From figure first to second, the figure inside the main figure rotates 90º clockwise and moves to the sides. So, answer figure (c) will replace the '?'

3. (c) From first figure to second the main figure is divided into six parts. So, option figure (c) will replace the '?'.

4. (d) From first figure to second the main figure is divided into two equal parts. So, option figure (d) will replace the '?'

5. (b) From first figure to second, the outermost figure is removed and the second figure from inside becomes the outermost figure. So, option figure (b) will replace the '?'

6. (b) Except in figure (b) in all others the design has been divided vertically.

7. (b) In the given question option (b) is different of all other three options because in every option lines are meeting in shape except figure (b).

8. (c) Except in figure (c), in all other figures, two exactly opposite triangles are shaded. In option (c) shaded figure is not opposite to another one.

9. (c) Except in figure (c), in all other figures the left and right designs consist of similar figures. In figure (c), the left and right designs consist of different figure, so option (c) is correct.

10. (c) Except in figure (c), in all other figures, the inner design consists of less number of sides than that of the outer design. In option (c) the inner design have more sides that outer design.

**11. (c)** In each step the elements are moving as follows.
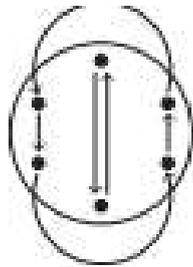
Following above pattern option figure (c) will replace the question mark(?).

12. (b) In each subsequent figure one line segment is added. So, option (b) figure will follow the same pattern.

13. (b) The inner line segments move in anti-clockwise direction. So, option (b) figure will replace symbol '?'.

14. (b) In each subsequent figure. The design rotates clockwise (or anti-clockwise) through 90° along with the addition of a line segment.

Hence, option (b) is the correct choice as it follows the corresponding pattern.

15. (c) In each step the elements are moving as follows
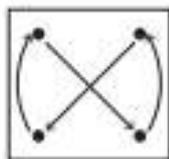
Following the above pattern option figure (c) will replace the question mark(?).

16. (b) Clearly, the question figure is embedded in answer figure (b) as shown below
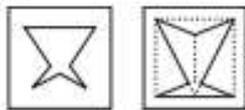

17. (b) Clearly, question figure is embedded in answer figure (b) as shown below

18. (b) Clearly, question figure is embedded in answer figure (b) as shown below

19. (c) Clearly, the answer figure (c) is embedded after inverting in question figure as shown below.
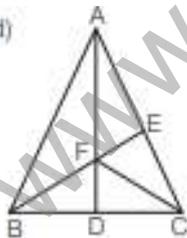

20. (c) Clearly, the answer figure (c) is embedded in question figure as shown below

21. (c) There are 5 horizontal lines and 6 vertical lines.

$\therefore$ Number of lines = 5 + 6 = 11
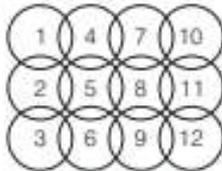
22. (d)

Number of triangles = 12 viz.

ΔAFB, ΔAFE, ΔFEC, ΔFDC, ΔBFD, ΔBFC, ΔAFC, ΔABD, ΔADC, ΔABE, ΔCBE and ΔABC

23. (d)

Number of triangles = 10, viz.
$\triangle ABC$, $\triangle ACD$, $\triangle ADE$, $\triangle AEF$,
$\triangle ABD$, $\triangle ACE$, $\triangle ADF$, $\triangle ABE$,
$\triangle ACF$ and $\triangle ABF$

24. (c)

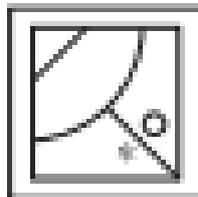Thus, there are all 12 circles in the figure.
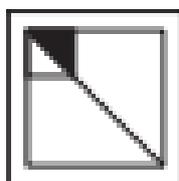
25. (b)
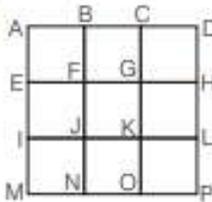
Number of squares=14

viz. ABFE, BCGF, CDHG, EFJI, FGKJ,

GHLK, IJNM, JKON, KLPO, ACKI,

BDLJ, EGOM, FHPN and ADPM.

26. (d) Clearly, option (d) figure will complete the pattern of the given figure.

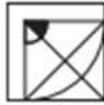**27. (c)** Clearly, option (c) figure will complete the pattern of the given figure

28. (d) Clearly, option (d) figure will complete the pattern of the given figure.

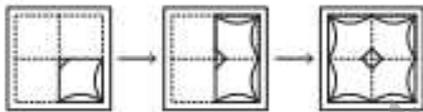**29. (b)** Clearly, option (b) figure will complete the pattern of the given figure.

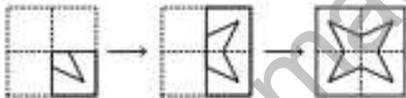**30. (b)** Clearly, option (b) figure will complete the pattern of the given figure.

31. (c) The transparent sheet will appear like option figure (c)

32. (a) The transparent sheet will appear like option figure (a).

33. (c)

34. (b)

35. (d)

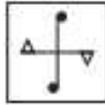**36. (a)** The mirror image would be like

37. (c) The mirror image would be like

38. (d) The mirror image would be like

39. (c) The water image of the question figure would be

40. (d) The water image of the question figure would be.