

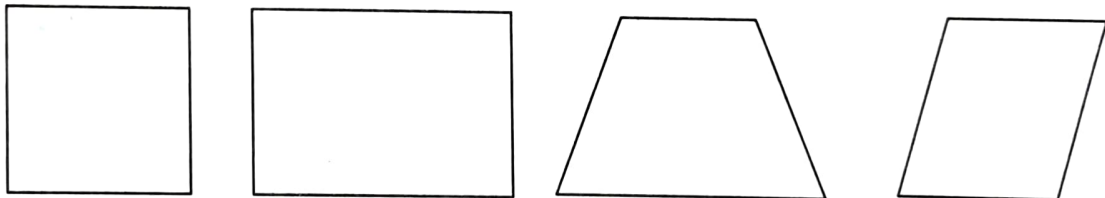
- To increase the allotted pattern.
- To search the number of blank places.
- Number game.

13.1. Introduction

You see the objects near to you. You obey some rule and regulation when coming from home to college. For example moving left, moving of vehicles in an order, to obey traffic rules etc. See in a botanical world, all leaves of a particular tree are of the same size. There is a fixed pattern of leaves and bunch of flowers. They are found in form of bunch of single, double, triple, fourth, fifth, sixth, eighth etc. Although these universal truth has came before lacs of year together with nature. But first of all it was observed in 13th century by Leonardo Fibonacci.

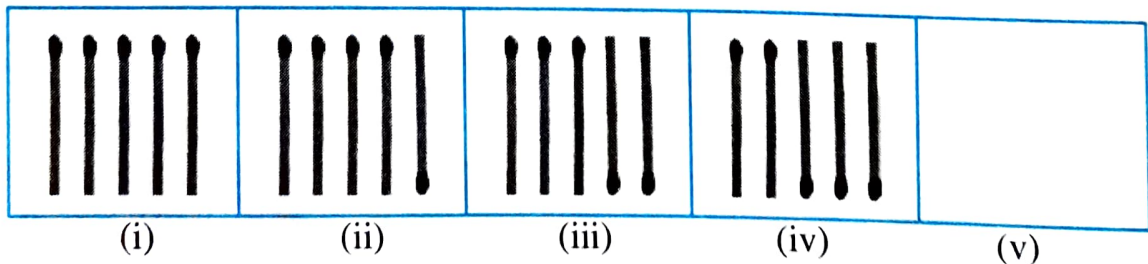
Similarity is found in shape of some plane and solid figures also.

13.2 Pattern



See the square, rectangle, trapezium and quadrilateral. There is a pattern in above figure. All figures are enclosed by four sides. If we increase this pattern then next figure also will be a plane figure enclosed by four arms.

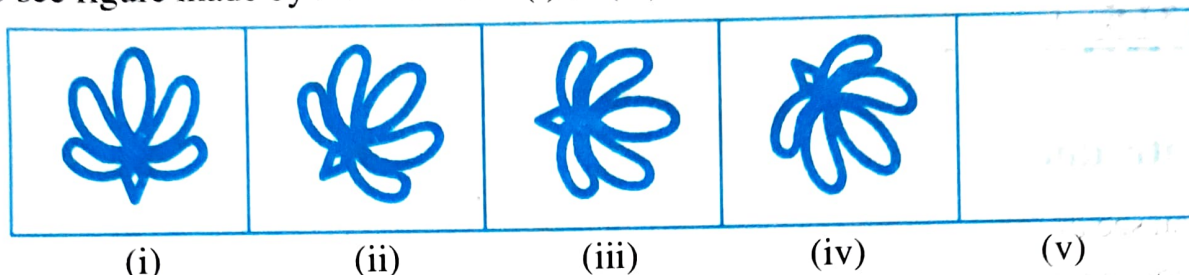
See these figures made by sticks of match box.



There is a pattern in figure from (i) to (iv). In first box there are five sticks are straight, again in the next box one stick is opposite direction. After this two sticks are in opposite directions. Following the above pattern we can make the figure in fifth box. So figure coming in last will be :



To see figure made by flowers from (i) to (iv) we can make flower in fifth box.



Conclusion :

Any figure or format which repeats itself in a proper direction is a pattern.

Example 1. Given figures follow a pattern. According to that pattern fill up the blanks.

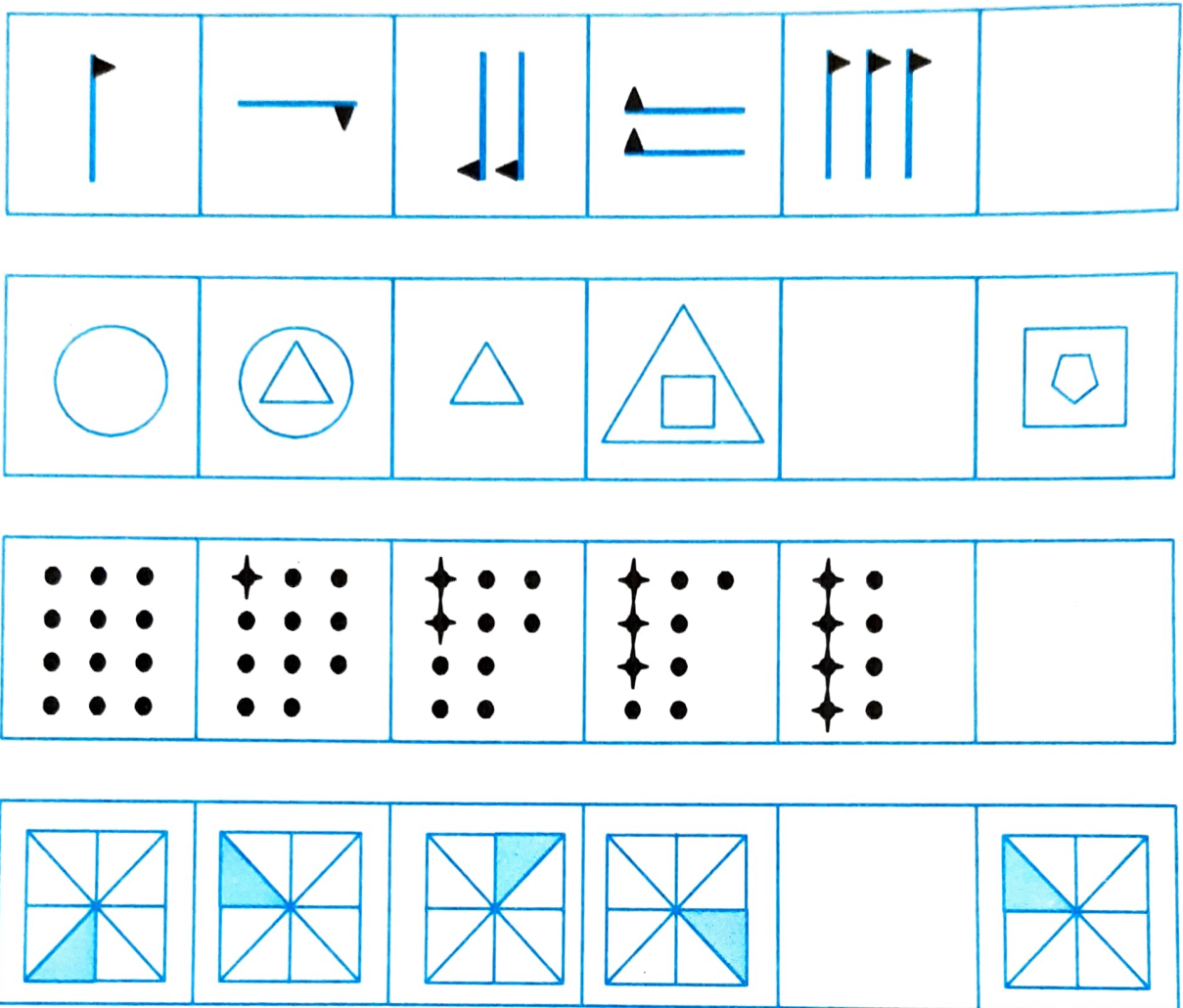


Solution : In first box there is one stick, in second box it is 2, in third box it is 3 sticks. So in fifth box there will be 5 sticks. Now see the head of sticks and position. Starting from first box head sticks moving in clockwise direction. In first box stick is in vertical direction and in next box, stick in horizontal and after that in next box stick is vertical. Similarly pattern is increasing, so in fifth box figure will be: .



Try it

See the following figure. These figure follow a pattern, find out the pattern and fill in blanks :



13.3 Pattern of Numbers

See the pattern of following numbers :

- (i) 1, 4, 7, 10, 13, 16, 19, 22

(Number are increasing with difference of 3 i.e. difference in number is 3)

- (ii) -1, -3, -5, -7, -9, -11

(Numbers are decreasing with difference 2, i.e., difference in number is 2)

- (iii) 1, 4, 9, 16, 25, 36, 49, 64, 81

(Numbers are square of 1, 2, 3)

- (iv) 1, 8, 27, 64, 125, 216

(Numbers are cube of 1, 2, 3, 4, 5, 6)

Above numbers follow a pattern.

13.4 To find missing numbers in the blanks.

Think on the following pattern :

- (i) 2, 4, 6, 8, 10, 20.
- (ii) 15, 12, 9, 6, 3, 0, -3, -6,
- (iii) 1, 4, 9, 16,
- (iv) 2, 3, 5, 7, 11, 13,
- (v) $1, \frac{-1}{2}, \frac{1}{4}, \frac{-1}{8}, \dots, \frac{-1}{128}$

On observation of above we get the following fact :

- (i) Every next term is found after adding 2 in the term before it.
- (ii) Every next term is found by subtracting 3 from previous term.
- (iii) In this term every number is square of natural number.
- (iv) This is pattern of prime number.
- (v) In this pattern, next term will be found by multiply $\left(-\frac{1}{2}\right)$ in the previous term.

Note it :

Pattern (i) and (v) are finite because the number of terms are finite, while rest are infinite patterns.

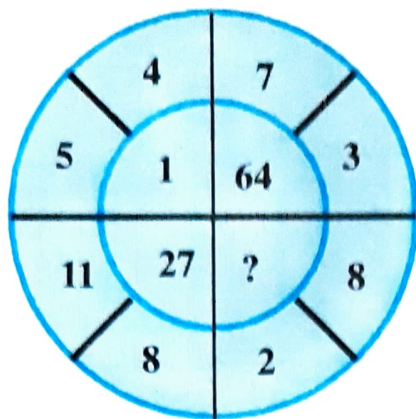
When a group of numbers is arranged in such a way that its first number, second number, third number can be understood and next number can be found out then that group of number is called pattern.

Try it

In following group of number, there is a pattern. After finding out the pattern, fill up the number in blank places.

- (i) -3, -5, -7 -11.
- (ii) 4, 2, 1,, $\frac{1}{4}$
- (iii) 1, 8, 27, 64

Example 2. Find out the number which can be fill up in the blank places.



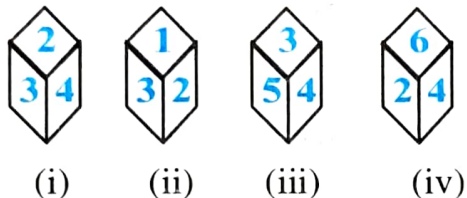
Solution : In figure, there are two concentric circles. Outer circle is divided in four parts. In every fourth parts cube of difference of two numbers is present in the same part of circle is a number of internal circle.

$$(5 - 4)^3 = 1, (7 - 3)^3 = 64, (11 - 8)^3 = 27$$

Hence in blank part there will be a number $(8 - 2)^3 = 216$

13.4 Number Puzzle :

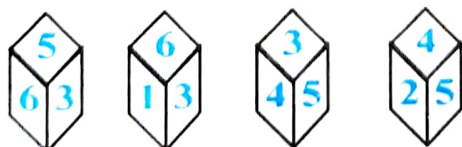
Example 3. A dice has been thrown four times. Position of dice has been shown in the figure. On opposite side of number 2 which number is printed ? Find out.



Solution : Here number 2 is shown in situation of dice in fig. (i), (ii) and (iv). In dice we take number from 1 to 6 and number 3, 4, 1 and 6, are adjacent to number 2. So there will be no any number from these will be opposite face to 2. So only number 5, will be opposite to face 2.

Try it :

A dice is thrown four times, whose different positions are shown in the adjacent figure which number is situated at opposite face of number 6 ?



Ans. = 4

Activity 1

Come, we play an entertaining game with numbers.

$$259 \times 39 \times \text{your age} = ?$$

See, in product, your age will be written three time.

as $259 \times 39 \times 16 = 161616$

Cleaification

If we multiply 259 by 39 then we get product 10101. If we multiply this number by 16 again then the product will be 161616. In this way in the product obtained number 16 is repeated three time.

Activity 2

This calculation will tell you that for study which subject is most likely to you. Choose any number from 1 to 9. Multiply that number by 3. In the prodcut add 3. Now again multiply by 3. You will get a two digit number. Add both digits of this number. This number will tell you that which subject is more likely to you.

- | | | |
|---------------|-------------------|-------------|
| 1. Hindi, | 2. English, | 3. Art, |
| 4. Shilp, | 5. Biology, | 6. Physics, |
| 7. Chemistry, | 8. General Study, | 9. Math. |

Important

Choose any number from 1 to 9. You will always get answer 9.

Activity 3

Make 64 square on a plane paper as in fig. 1. Write number from 1 to 64 in each box. Ask any student to take a number from this. Now according to figure 2 to 7. Take '6' paper and show the paper in which number are written above and below and ask to the student in which paper your number lies. Collect the papers on which the number taken by that student lie.

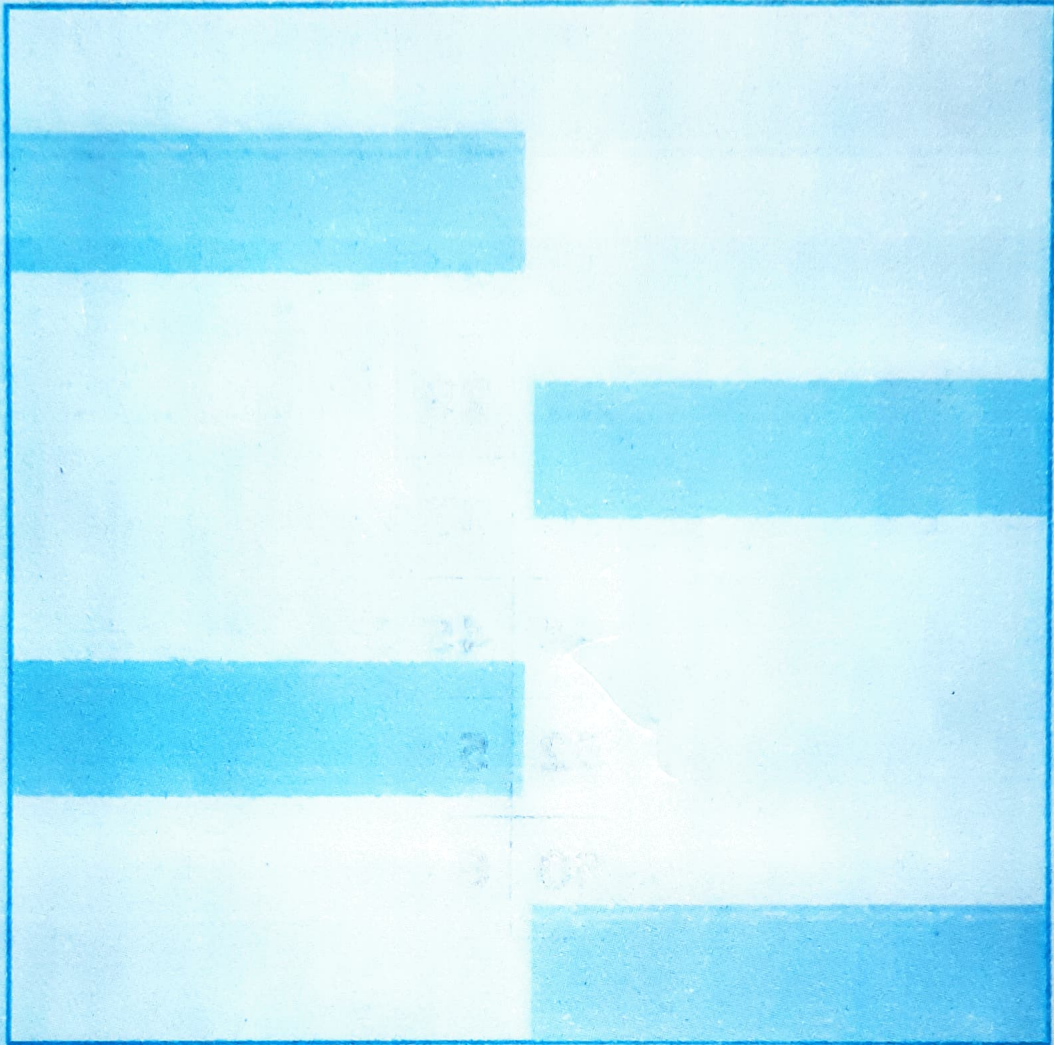
Now put selected papers on squaral paper in a serial order of a paper there is no number taken by the student put them aside. You will be that on square paper that number is present, which number was choosen.

- (i) The size of the square made on plane paper will be same as square made in rest paper.
- (ii) Measurement of the portion cut out from fig. 2 to 7 should be identical with the measurement of the portion cut from page 2 to 6.

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

Figure 1

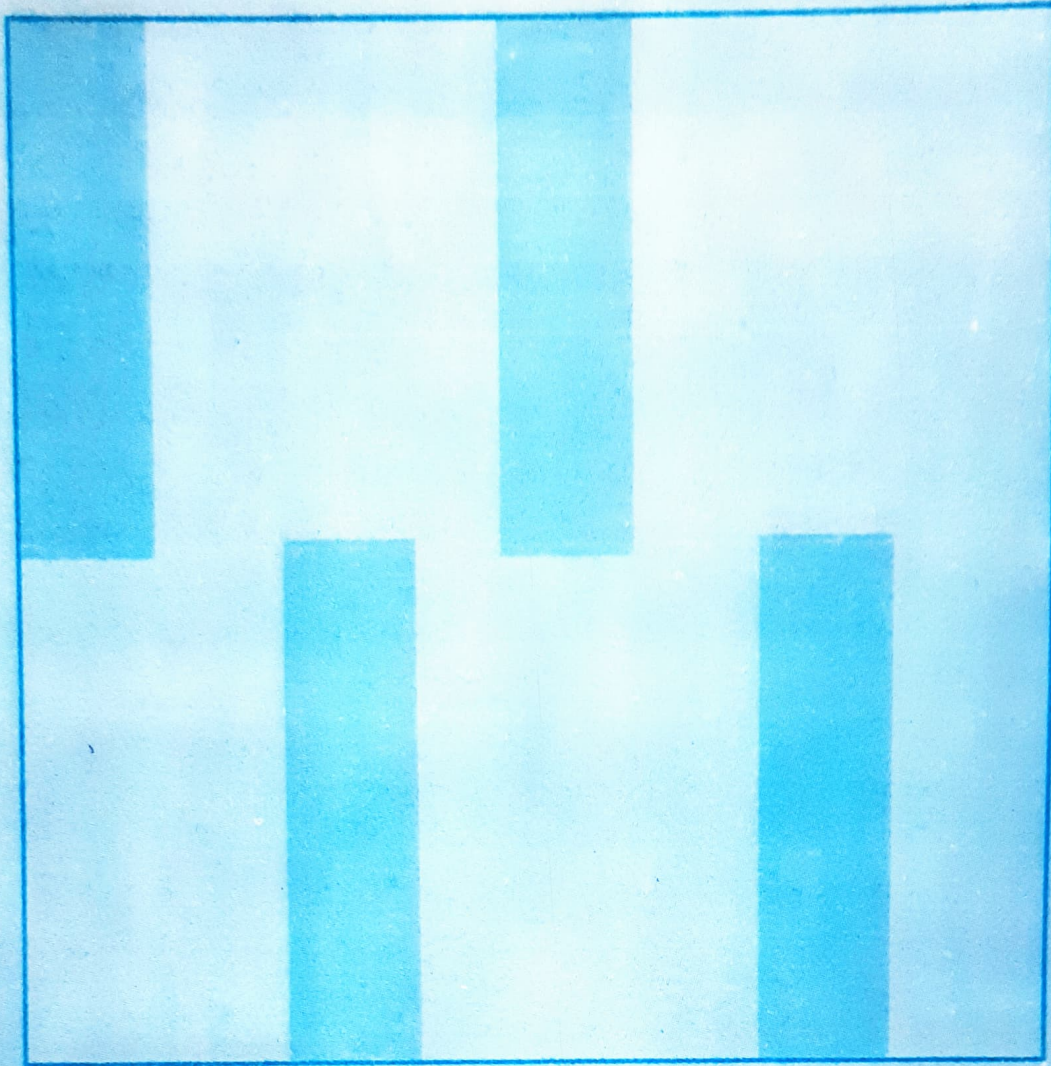
**9, 10, 11, 12, 13, 29, 30, 31, 32, 41, 42,
43, 44, 61, 62, 63, 64**



**3, 4, 21, 22, 23, 24, 22, 34, 35, 36,
53, 54, 55, 56**

Figure 2

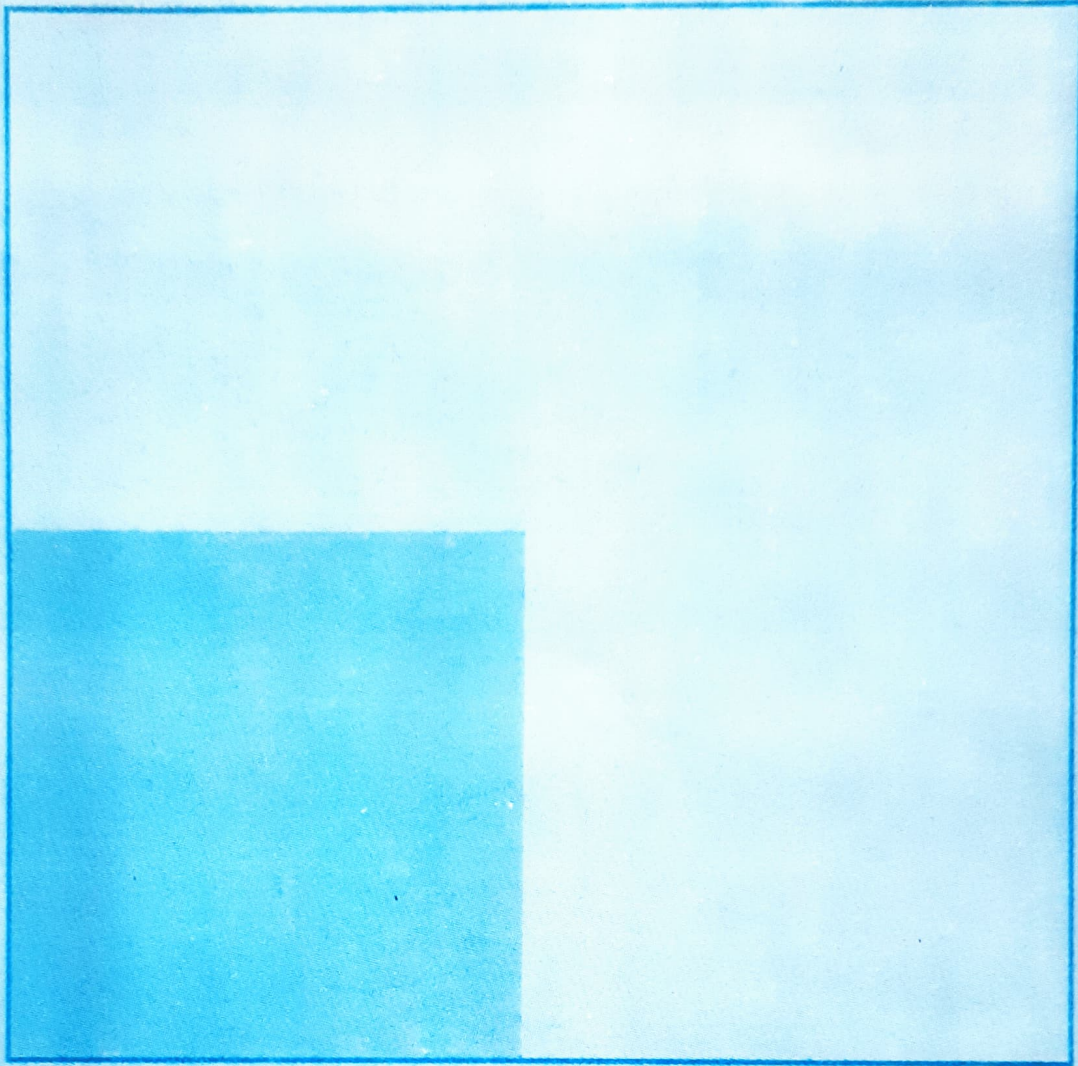
**1, 5, 9, 13, 17, 21, 25, 29, 35, 39, 43,
47, 51, 55, 59, 63**



**2, 6, 10, 14, 18, 22, 26, 30, 36, 40, 44,
48, 50, 56**

Figure 3

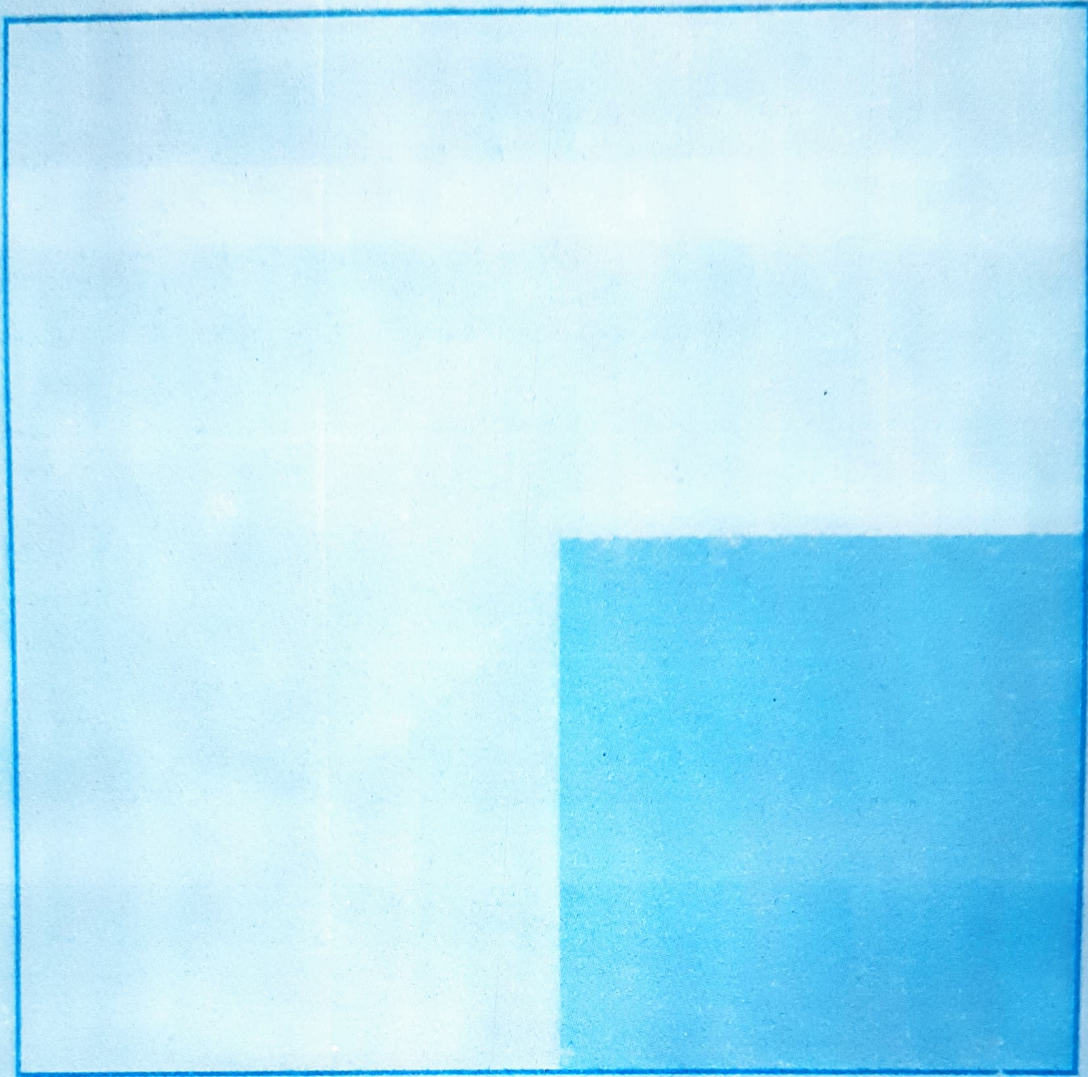
**33, 34, 35, 36, 41, 42, 43, 44, 49, 50,
51, 52, 57, 58, 59, 60**



**5, 6, 7, , 8, 13, 14, 15, 16, 21, 22, 23
24, 29, 30, 31, 32**

Figure 4

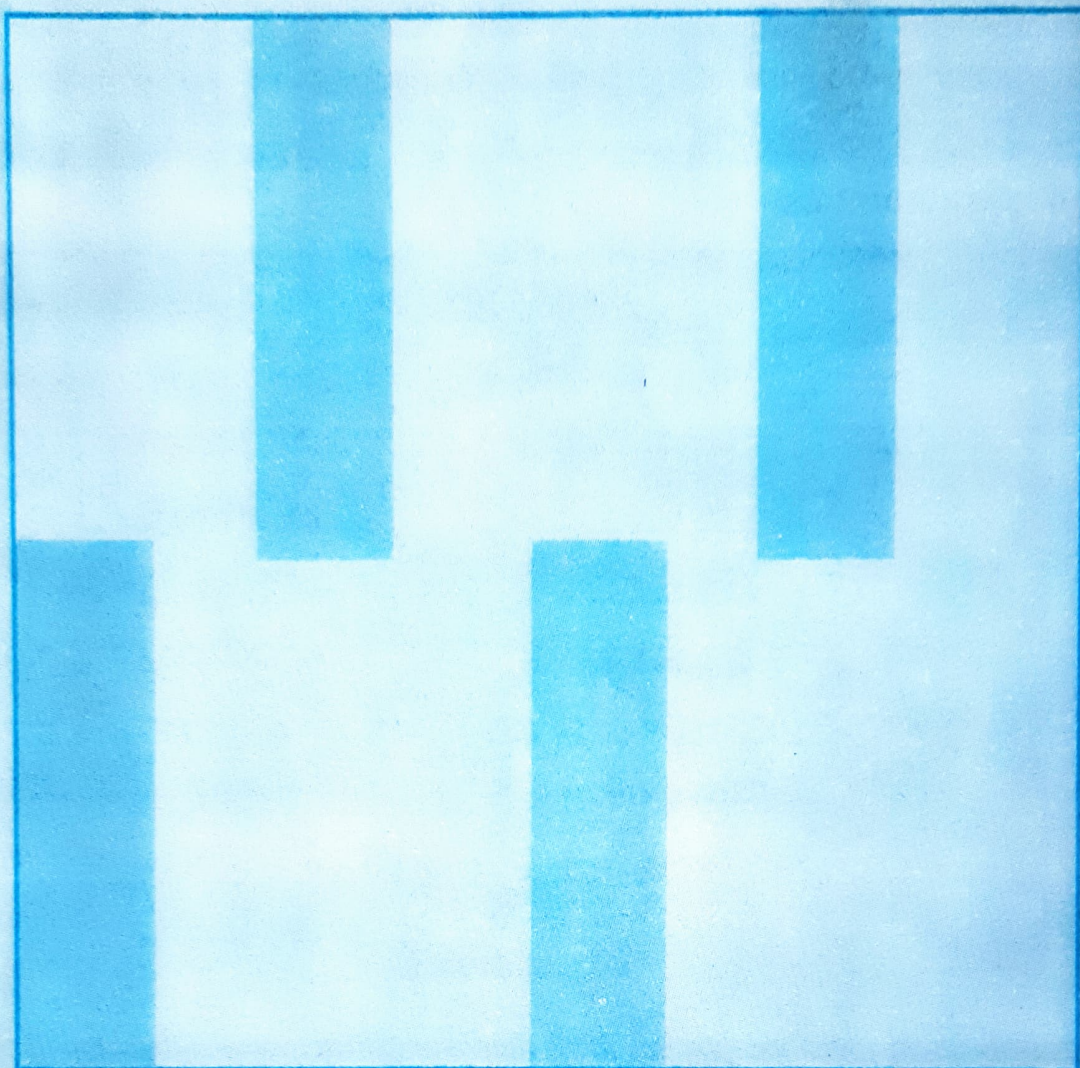
**37, 38, 39, 40, 45, 46, 47, 48, 53,
54, 55, 56, 61, 62, 63, 64**



**1, 2, 3, 4, 9, 10, 11, 12, 17, 18, 19,
20, 25, 26, 27, 28**

Figure 5

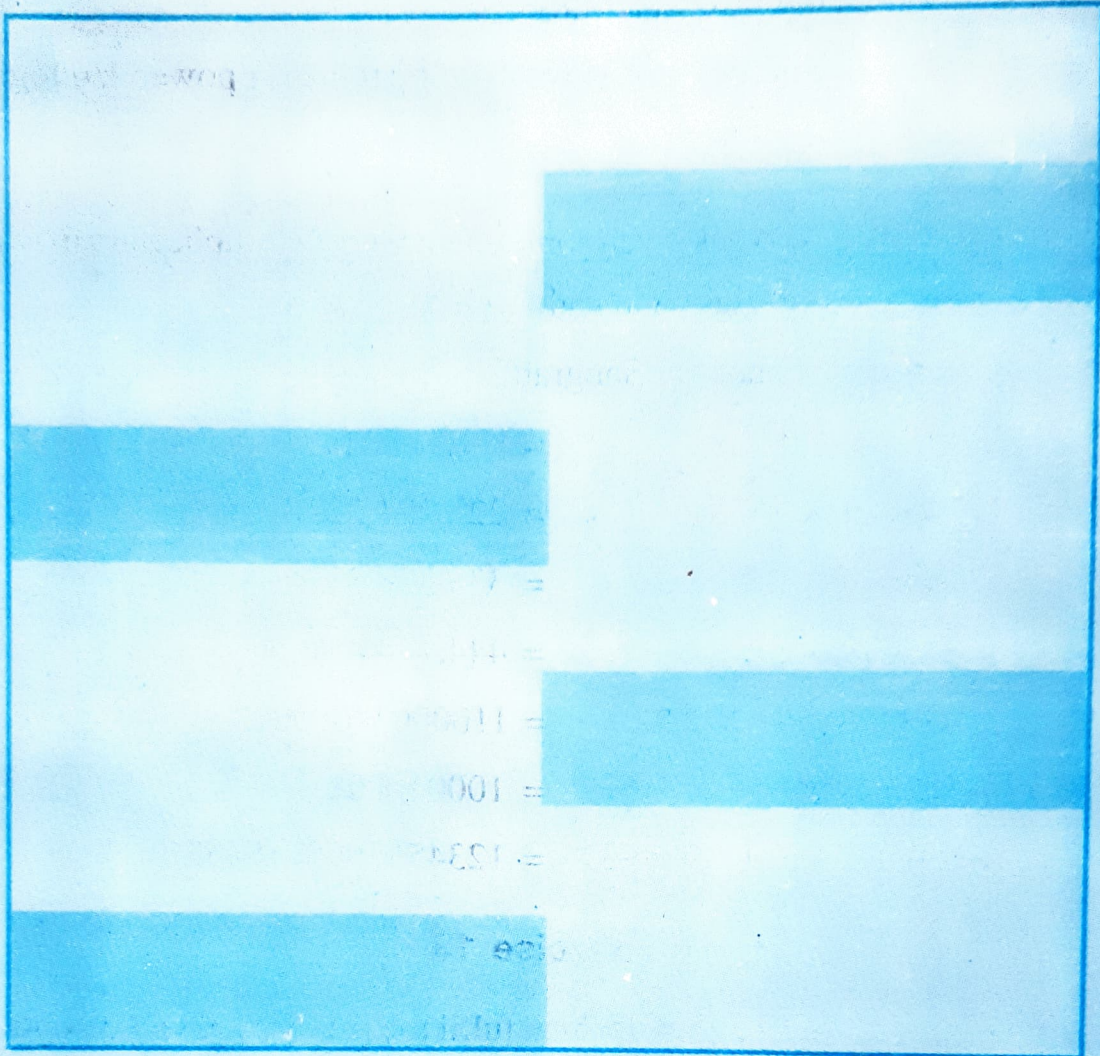
**3, 7, 11, 15, 19, 23, 27, 31, 33, 37, 41
45, 49, 53, 57, 61**



**4, 8, 12, 16, 20, 24, 28, 32, 34, 38
42, 46, 50, 54, 58, 62**

Figure 6

**13, 14, 15, 16, 25, 26, 27, 28, 45, 46,
47, 48, 57, 58, 59, 60**



**5, 6, 7, 8, 17, 18, 19, 20, 37, 38,
39, 40, 49, 50, 51, 52**

Figure 7

What we have learned in this Unit

1. We get knowledge about sequential order or patterns.
2. On the basis of pattern we change intangible thinking to tangible thinking for matters related to figure and numbers.
3. On the basis of number puzzle we develop thinking power and logical habits.

Group Discussion

Mahabharacharya (850 AD) has given some examples of multiplication in which the digit of product are same from left to right and right to left.

These example are in "Ganit Sar Sangrah"

$$\begin{array}{ll} 12345679 \times 9 & = 111,111,111 \\ 12345679 \times 18 & = 222,222,222 \\ 12345679 \times 27 & = 333,333,333 \\ 12345679 \times 36 & = 444,444,444 \\ 333333666667 \times 33 & = 11000011000011 \\ 14287143 \times 7 & = 100010001 \\ 999999999 \times 999999999 & = 12345678987654321 \end{array}$$

Exercise 13

For filling the blanks, choose the number which fulfil the pattern from given options :

1. ABE, BCF, CDG ? EFI

- (a) CDH (b) EFH (c) DEG (d) DEH

2. 2, 6, 12, 20, 30, 42, ?

- (a) 50 (b) 52 (c) 54 (d) 56

3. 14, 15, 32, 99, ?

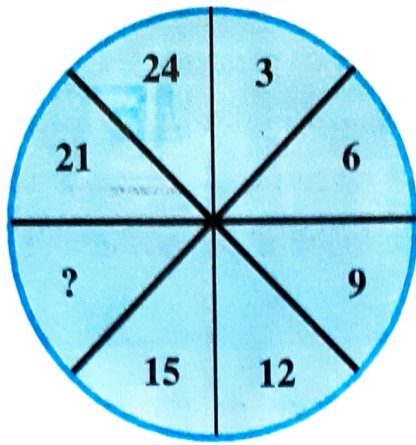
- (a) 300 (b) 350 (c) 400 (d) 450

4. 4, 9, 16, 25 ?

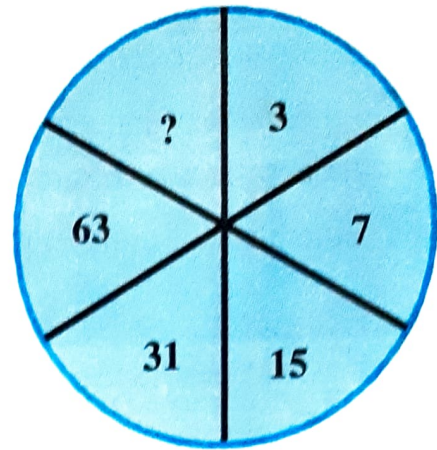
- (a) 36 (b) 45 (c) 49 (d) 50

5.

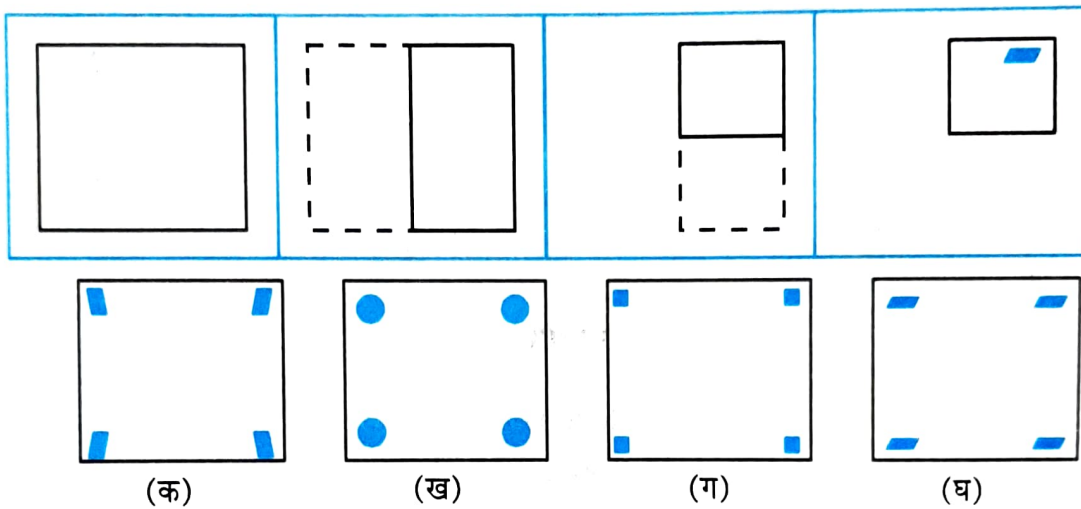
(a)



(b)

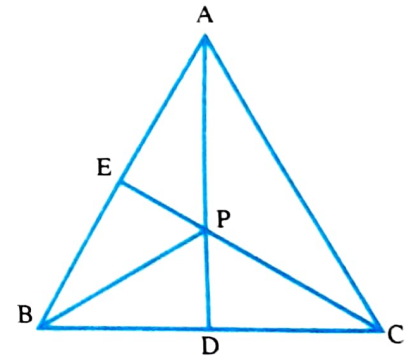
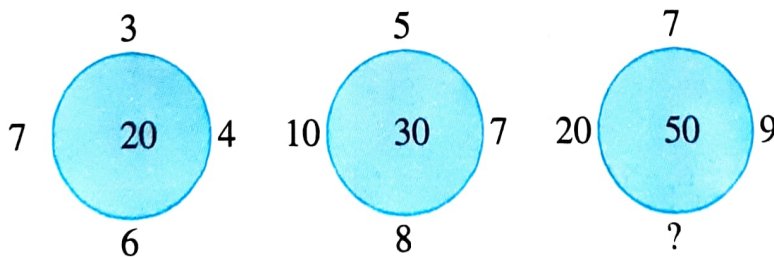


6. What will be answer figure when we fold, cut and open according to the question figure.



7. Find out total number of triangle in given figure.

8. Find out vanishing number :



ANSWERS

Exercise 13

1. (d) DEH, 2. (d) 56, 3. (c) 400, 4. (a) -36; 5. (a) -18, (b) -127; 6. (d) , 7. 12.

8. 14