ACTIVITY 1

Title

Observation and generalisation of number pattern.

Objective

With the help of activity, observe and generalise the number pattern of the given numbers.

Such that

$$1^2 = 1$$

$$11^2 = 1\ 2\ 1$$

$$111^2 = 1\ 2\ 3\ 2\ 1$$

Prerequisite knowledge

1. Concept of natural numbers.
2. Concept of addition of natural numbers.
3. Concept of squares of natural numbers.

Materials required

Coloured paper, drawing sheets, glue and geometry box.

Procedure

1. Draw and cut one square of size 1 × 1 from coloured paper and paste it on a drawing sheet.

$1^2 = 1$

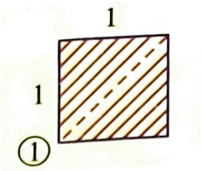

Fig. (*i*)

2. Draw and cut four squares of size 1 × 1 from coloured paper and paste them on the drawing sheet.

$11^2 = 1 \quad 2 \quad 1$

$1 + 2 + 1 = 4 = 2^2$

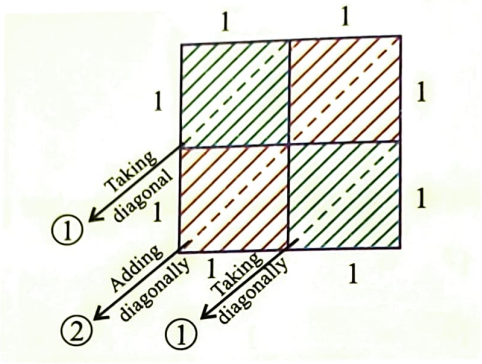

Fig. (*ii*)

3. Cut nine squares of size 1 × 1 from coloured paper and paste them together on the drawing sheet.

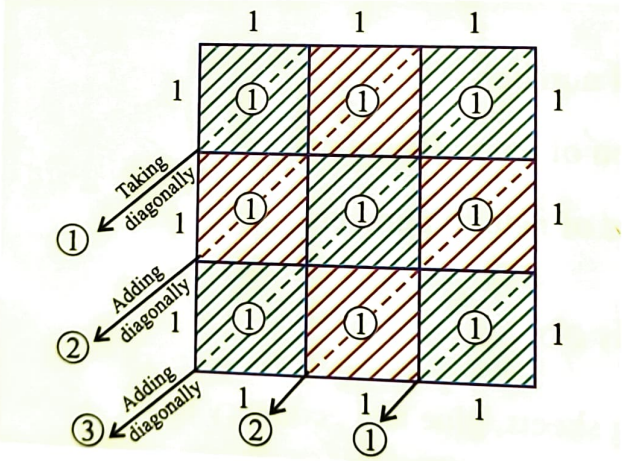

Fig. (*iii*)

$111^2 = 1 \quad 2 \quad 3 \quad 2 \quad 1$

$1 + 2 + 3 + 2 + 1 = 9 = 3^2$

4. Cut sixteen squares of size 1 × 1 from coloured paper and paste these squares together on the drawing sheet.

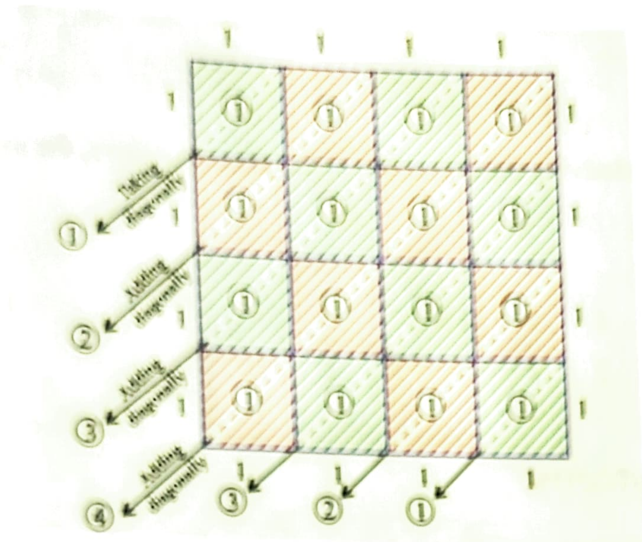

Fig. (*iv*)

$1111^2 = 1 \quad 2 \quad 3 \quad 4 \quad 3 \quad 2 \quad 1$

$= 1 + 2 + 3 + 4 + 3 + 2 + 1$

$= 16 = 4^2$

Similarly we can find for

$11111^2 = 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 4 \quad 3 \quad 2 \quad 1$

$111111^2 = 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 5 \quad 4 \quad 3 \quad 2 \quad 1$

Observation

After doing this activity, following observations are made :

1. In Fig. (*i*) $1^2 = 1$

   Number of digit is 1

   ∴ One square is needed.

2. In Fig. (*ii*) $11^2 = 121$

   In the square of 11^2 number of digit is 2

   ∴ $2^2 = 4$ then number of 4 squares are needed.

3. In Fig. (*iii*) $111^2 = 12321$

   Number of digits in 111^2 is 3

   ∴ $3^2 = 9$ then 9 squares are needed.

   Similarly and so on

We observe the number of squares are increasing diagonally and then decreasing diagonally up to 1.
For example in the square of 1111^2, number of digits are 4 and number of squares are 16.
$\therefore$ The squares increases from 1 to 4 diagonally and then decreases diagonally up to 1.

Result

By observing and studying the expansion of the given numbers, the number pattern is as follows :

1. $1^2 =$ 1
2. $11^2 =$ 1 2 1
3. $111^2 =$ 1 2 3 2 1
4. $1111^2 =$ 1 2 3 4 3 2 1

Learning outcome

After performing this activity students can generalise the number pattern of numbers.

Activity time

1. Generalise the number pattern of the following numbers :

$11^2 =$ 1 2 1
$101^2 =$ 1 0 2 0 1
$1001^2 =$ 1 0 0 2 0 0 1

and so on.

2. (*i*) Find the number pattern of the following number :

$5^2 =$ _____
$15^2 =$ _____
$25^2 =$ _____

(*ii*) $1^2 + 2^2 + 2^2 = 3^2$
$2^2 + 3^2 + 6^2 =$ _____
$3^2 + 4^2 + 12^2 =$ _____
$4^2 + 5^2 + 20^2 =$ _____
and so on.

(*iii*)
$1 + 3 = 4 = 2^2$
$1 + 3 + 5 = 9 = 3^2$
$1 + 3 + 5 + 7 = 16 = 4^2$