

# Activity 8

## OBJECTIVE

To find the sum of the first  $n$ -even natural numbers.

## MATERIAL REQUIRED

Cardboard, thermocol balls, pins, pencil, ruler, white paper, chart paper, adhesive.

## METHOD OF CONSTRUCTION

1. Take a piece of cardboard of a convenient size and paste a white paper on it.
2. Draw a rectangle of suitable size on it ( $10 \text{ cm} \times 11 \text{ cm}$ ).
3. Divide this rectangle into unit squares.
4. Fix a thermocol ball in each square using a pin as shown in the Fig. 1.
5. Enclose the balls as shown in the figure.

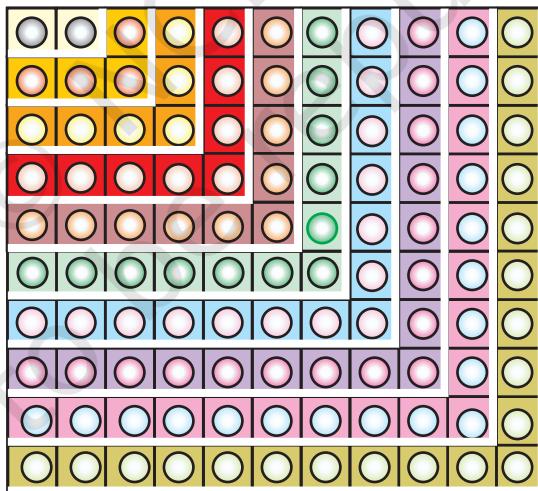


Fig. 1

## DEMONSTRATION

Starting from the uppermost left corner,

the number of balls in first enclosure = 2 ( $= 1 \times 2$ ),

the number of balls in first two enclosures =  $2 + 4 = 6$  ( $= 2 \times 3$ ),

the number of balls in first three enclosures =  $2 + 4 + 6 = 12$  ( $= 3 \times 4$ ),

⋮

the number of balls in first six enclosures =  $2 + 4 + 6 + 8 + 10 + 12 = 42$  ( $= 6 \times 7$ )

the number of balls in first ten enclosures =  $2 + 4 + 6 + 8 + \dots + 20 = 110$  ( $= 10 \times 11$ )

This gives the sum of first ten even natural numbers.

This result can be generalised for the sum of first  $n$  even natural numbers as

$$S_n = 2 + 4 + 6 + \dots + 2n = n \times (n + 1) \quad (1)$$

### OBSERVATION

For  $n = 4$  in (1),  $S_n = \dots$

For  $n = 7$  in (1),  $S_n = \dots$

For  $n = 40$  in (1),  $S_n = \dots$

For  $n = 70$  in (1),  $S_n = \dots$

For  $n = 100$  in (1),  $S_n = \dots$

### APPLICATION

The formula  $S_n = n(n+1)$  is useful in finding out the sum of the first  $n$  even numbers.