

Activity -5 (25/11/13)

Arithmetic Progression - II

Objective

To verify that the sum of first n natural numbers is $n(n+1)/2$, i.e. $\Sigma n = n(n+1)/2$, by graphical method.

Pre-requisite knowledge

1. Natural number system
2. Area of squares and rectangles

Procedure

Let us consider the sum of natural numbers say from 1 to 10, i.e. $1 + 2 + 3 + \dots + 9 + 10$.

Here $n = 10$ and $n + 1 = 11$.

1. Take a squared paper of size 10×11 squares and paste it on a chart paper.
2. On the left side vertical line, mark the squares by 1, 2, 3, ... 10 and on the horizontal line, mark the squares by 1, 2, 3 ... 11.
3. With the help of sketch pen, shade rectangles of length equal to 1 cm, 2 cm, ..., 10cm and of 1 cm width each.

Observations

The shaded area is one half of the whole area of the squared paper taken. To see this, cut the shaded portion and place it on the remaining part of the grid. The student will observe that it completely covers the grid.

Area of the whole squared paper is $10 \times 11 \text{ cm}^2$.

Area of the shaded portion is $(10 \times 11) / 2 \text{ cm}^2$.

This verifies that, for $n = 10$,

$$\Sigma n = n \times (n + 1) / 2$$

The same verification can be done for any other value of n .

Learning outcome

Students develop a geometrical intuition of the formula for the sum of natural numbers starting from one.

Materials required

chart paper,
sketch pens,
geometry box,
squared paper.