Title : Basic Proportionality Theorem for a Triangle

Objective

To verify the basic proportionality theorem by using parallel lines board, triangle cut outs.

Basic Proportionality Theorem

If a line is drawn parallel to one side of a triangle, to intersect the other two sides at distinct points, the other two sides are divided in the same ratio.

Prerequisite Knowledge

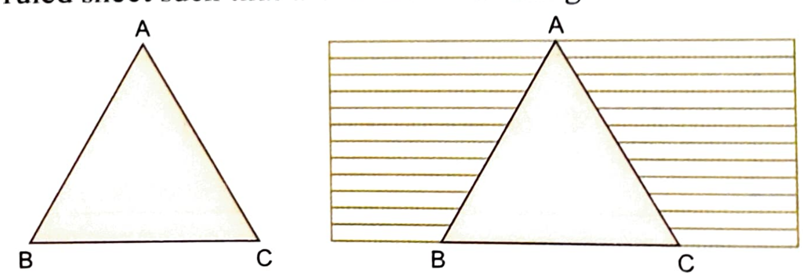
1. Statement of Basic Proportionality theorem.
2. Drawing a line parallel to a given line which passes through a given point.

Materials Required

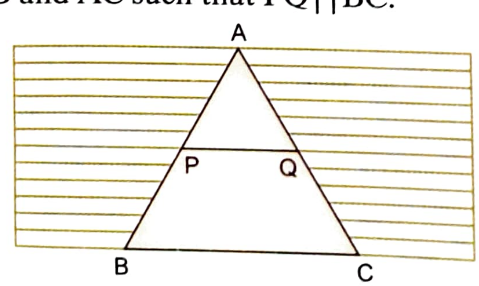
White chart paper, coloured papers, geometry box, sketch pens, fevicol, a pair of scissors, ruled paper sheet (or Parallel line board).

Procedure

1. Cut an acute-angled triangle say ABC from a coloured paper.
2. Paste the ΔABC on ruled sheet such that the base of the triangle coincides with ruled line.



3. Mark two points P and Q on AB and AC such that PQ||BC.



4. Using a ruler measure the length of AP, PB, AQ and QC.
5. Repeat the same for right-angled triangle and obtuse-angled triangle.
6. Now complete the following observation table.

Observation

Triangle ABC	Length of the segments				$\frac{AP}{PB}$	$\frac{AQ}{QC}$	Equal/Not equal
	AP	PB	AQ	QC			
Acute							
Obtuse							
Right							

Result

In each set of triangles, we verified that $\frac{AP}{PB} = \frac{AQ}{QC}$.

ARITHMETIC PROGRESSION-II

Objective

By using paper cutting and pasting, verify that the sum of first 'n' natural numbers is $\frac{n(n+1)}{2}$ *i.e.*,

$1 + 2 + 3 + \ldots\ldots\ldots\ldots + n = \frac{n(n+1)}{2}$.

Prior Knowledge

- Numbers used for counting are called natural numbers, *e.g.*, 1, 2, 3, ...
- Area of rectangle = length × breadth
- First n natural numbers form an AP whose first term is 1 and common difference is also 1.
- The sum of n terms of an AP with first term a and common difference d is obtained as

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

- Sum of 'n' natural numbers

$$1+2+3+\ldots\ldots\ldots + n$$

Here $a = 1$ and $d = 1$

$$S_n = \frac{n}{2}[2 \times 1 + (n-1) \times 1]$$

$$= \frac{n}{2}[2 + n - 1] = \frac{n(n+1)}{2}$$

- Sum of first 10 natural numbers 1+2+3+ .... +10 is:

$$= \frac{10(10+1)}{2} = 55$$

Material Required

- Squared Papers/Graph paper
- Scissors/ cutter
- Sketch pen
- Fevistick
- Geometry Box

Procedure

- Consider the sum of first 10 natural numbers *i.e.*, $1 + 2 + 3 + \ldots\ldots\ldots + 10$

  Here, $n = 10, n + 1 = 11$

- Take a graph paper (10 × 1 squares), mark 1, 2, 3, ..., 10 (n) along the horizontal line and 1, 2, 3, ..., 11 ($n+1$) along the vertical line [fig. (i)].
- Shade first one, two, three, ... ten squares of first, second, third, ... tenth column of the graph paper [fig. (i)].

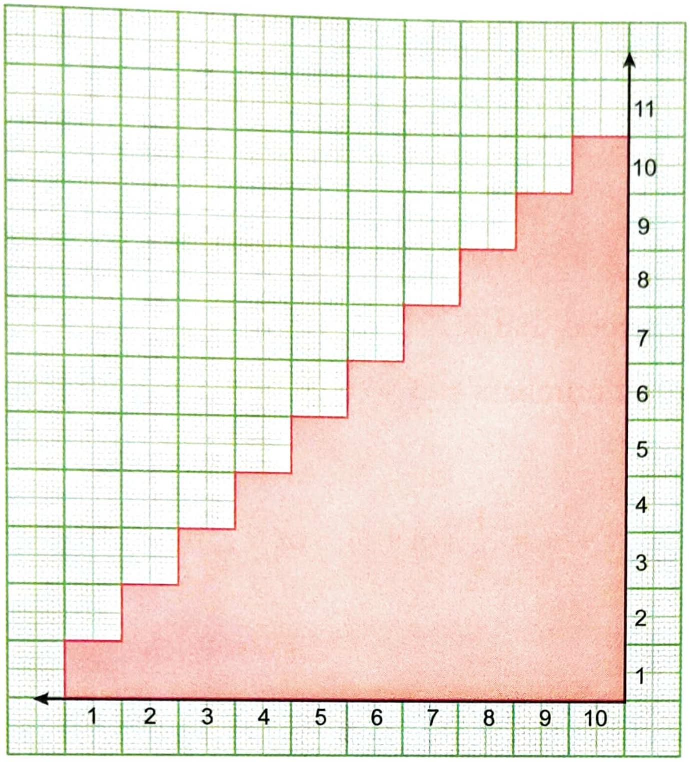


Fig. (i)

- Shade another copy of the 10 × 1 square paper in the same manner.
- Place this cut-out on the unshaded (remaining part of the square paper obtained in fig. (i) as shown in [fig. (ii)].

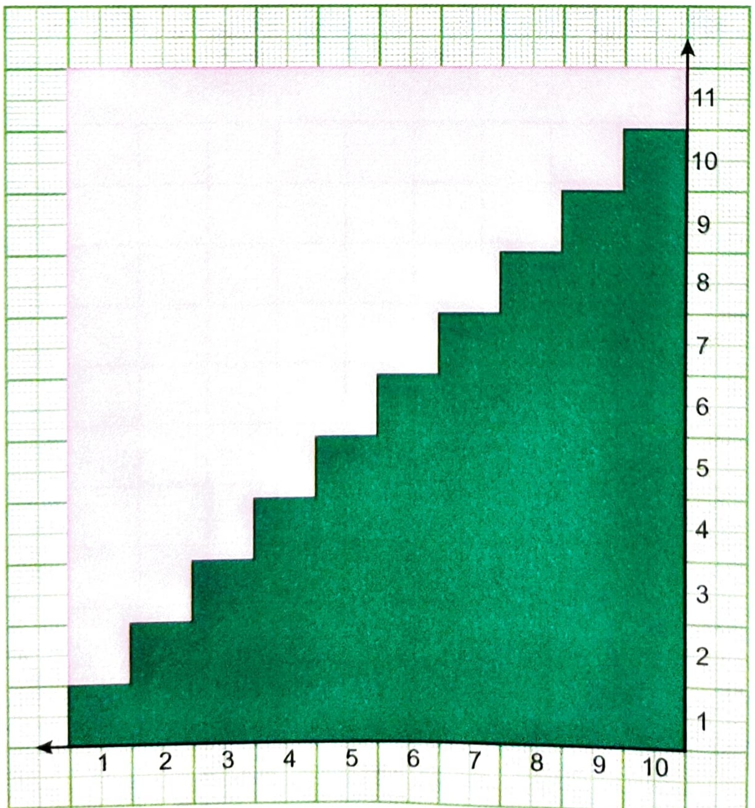


Fig. (ii)

Observation:

The two shaded portions completely cover the graph paper completely, the area of the shaded portion $= \frac{1}{2}$ (area of the shaded portion graph paper)

$$= \frac{1}{2}(10 \times 11)\ \text{cm}^2$$

$$= 55\ \text{cm}^2$$