# CHAPTER – 1

# BASIC PROPORTIONALITY THEOREM

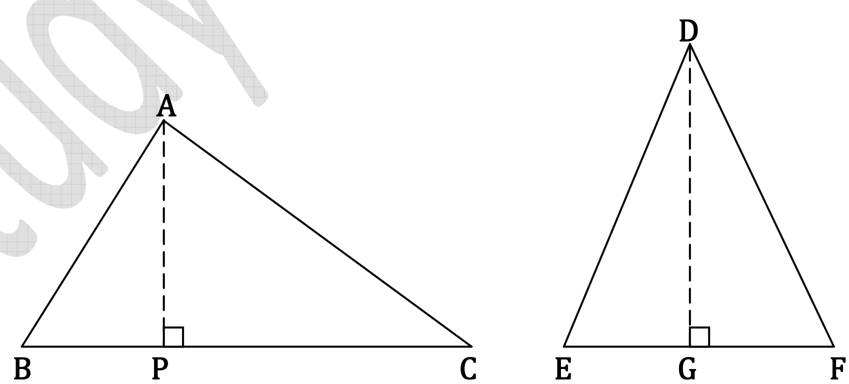
**Ratio of areas of triangles :**

The areas of triangles are proportional to the product of bases and corresponding heights of the triangles.

(Textual Solved Example)

**Ex. 1 In fig. 1.9 in ΔABC, Seg AP ⊥ seg BC and in ΔDEF, sig DG ⊥ seg EF.**

**BC = 8, EF = 5, AP = 4, DG = 6, Find $\frac{A(\Delta ABC)}{A(\Delta DEF)}$**




**Solution :**

**Given :** In ΔABC, Seg AP ⊥ seg BC

In $\Delta DEF$, sig $DG \perp$ seg $EF$.

$BC = 8, \; EF = 5, \; AP = 4, \; DG = 6,$

**Find** : $\dfrac{A(\Delta ABC)}{A(\Delta DEF)}$

You know that, the ratio of area of two triangles is equal to the ratio of the product of their bases and corresponding height.

$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta DEF)} = \frac{BC \times AP}{EF \times DG}$$

$$= \frac{8 \times 4}{5 \times 6}$$

$$= \frac{32}{30}$$

$$= \mathbf{\frac{16}{15}}$$

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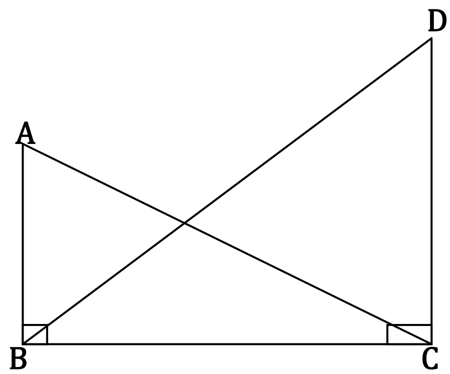
## EXERCISE – 1.1

Textual

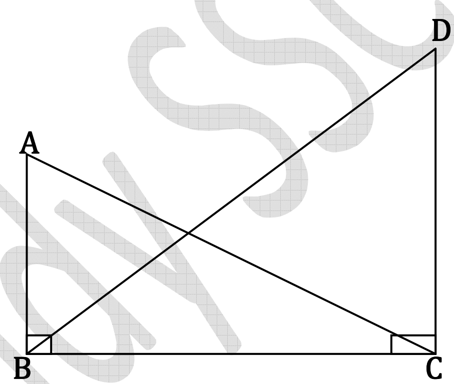
**1.** $\angle ABC = \angle DCB = 90^0, \; AB = 10$ and $DC = 15$. Find $\dfrac{A(\Delta ABC)}{A(\Delta DCB)}$




# EXERCISE – 1.1

## Solutions

1. $\angle ABC = \angle DCB = 90^0$, $AB = 10$ and $DC = 15$. Find $\frac{A(\Delta ABC)}{A(\Delta DCB)}$




**Given :** $\angle ABC = \angle DCB = 90^0$,

$AB = 10$ and $DC = 15$.

**Find :** $\frac{A(\Delta ABC)}{A(\Delta DCB)}$

**Solution :**

$$\frac{A(\Delta ABC)}{A(\Delta DCB)} = \frac{BC \times AB}{BC \times DC} = \frac{10}{15} = \frac{2}{3}$$

$$\therefore \quad \frac{\mathbf{A(\Delta ABC)}}{\mathbf{A(\Delta DCB)}} = \frac{\mathbf{2}}{\mathbf{3}}$$

**If bases are same then areas are in proportion to their corresponding heights.**

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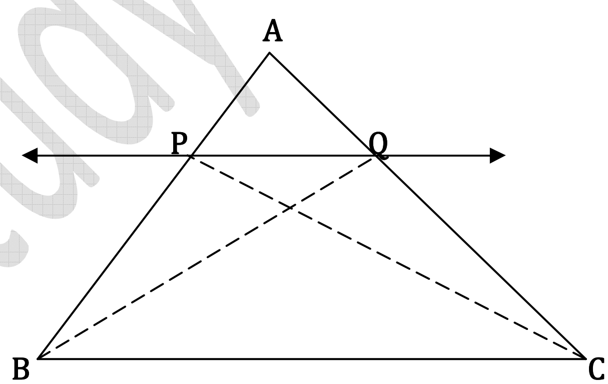
<u>Basic Proportionality Theorem (B. P. T)(Thale's Theorem)</u> :

**Theorem** : If a line drawn parallel to one side of a triangle, intersects the other two sides in two distinct points , then that line divides the sides in proportion.




**Given** : In ΔABC, A-P-B, A-Q-C and line PQ ∥ side BC.

**Show** : $\frac{AP}{PB} = \frac{AQ}{QC}$

**Construction :** Draw seg BQ and CP.

**Proof** : Consider ΔAPQ and ΔPQB.

$$\frac{A(\Delta APQ)}{A(\Delta\ PBQ)} = \frac{AP}{PB} \quad \text{--- (1)(}\Delta\text{s having same height)}$$

Similarly consider ΔAPQ and ΔPQC

$$\frac{A(\Delta APQ)}{A(\Delta\ PQC)} = \frac{AQ}{QC} \quad \text{--- (2)(}\Delta\text{s having same height)}$$

For ΔPQB and ΔPQC we have,

$$A(\Delta\ PQB) = A(\ \Delta\ PQC) \quad \text{-- (3)}\begin{pmatrix}\Delta\text{s having same base,} \\ \text{same height}\end{pmatrix}$$

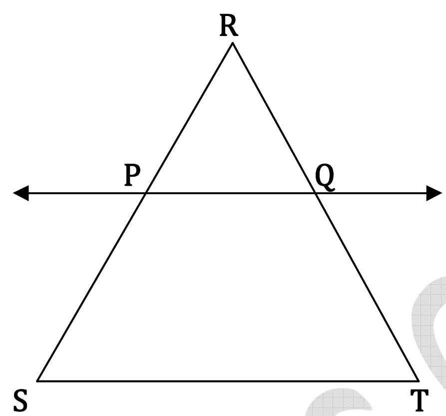
∴ From (iii) we have

$$\frac{A(\Delta APQ)}{A(\Delta\ PQB)} = \frac{A(\Delta APQ)}{A(\Delta\ PQC)}$$

$$\therefore \quad \mathbf{\frac{AP}{PB} = \frac{AQ}{QC}}$$

(Textual Solved Example)

**Ex.1 In the fig. line PQ ∥ seg ST, R-P–S and R-Q-T, RP = 4, PS = 6, RQ = 3, then find QT.**




**Solution :**

In ΔRST,

line PQ ∥ seg ST

$\therefore \quad \frac{RP}{PS} = \frac{RQ}{QT}$ --- (By B.P.T)

$\therefore \quad \frac{4}{6} = \frac{3}{QT}$

$\therefore \quad 4 \times QT = 6 \times 3$

$\therefore \quad QT = \frac{6 \times 3}{4}$

$\therefore \quad \mathbf{QT = 4.5}$

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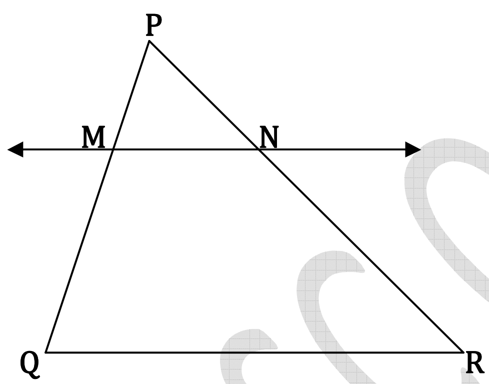
## EXERCISE – 1.2

### Textual

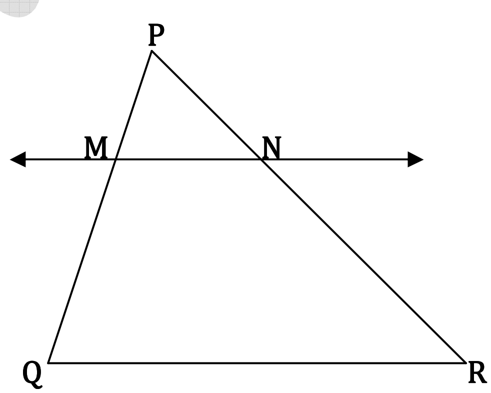
1. Line MN ∥ side QR, If $PM = 4$, $MQ = 6$, $PN = 5$, then find NR.




## EXERCISE – 1.2

### Solutions

1. **In fig., line MN ∥ side QR, If $PM = 4$, $MQ = 6$, $PN = 5$, then find NR.**

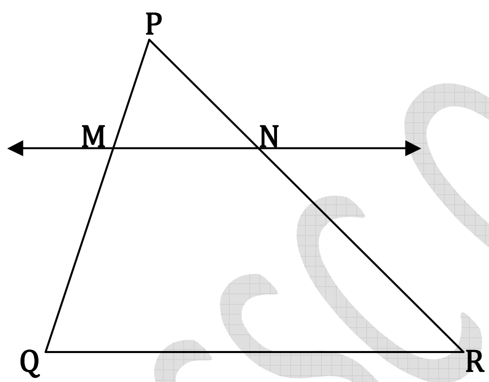


Solution :

**Given :** line MN ∥ side QR,

PM = 4, MQ = 6, PN = 5

**Find :** **NR**




In ΔPQR,

MN ∥ QR --- (Given)

$\therefore \quad \frac{PM}{MQ} = \frac{PN}{NR}$ --- (B.P.T)

$\therefore \quad \frac{4}{6} = \frac{5}{NR}$

$\therefore \quad NR = \frac{6 \times 5}{4} = \frac{15}{2} = 7.5$

$\therefore$ **NR = 7.5**

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## PROBLEM SET – 1

### Textual

1. $\Delta$ABC and $\Delta$PQR have same base and their corresponding heights are 5 and 3.5 units. Find $\frac{A(\Delta ABC)}{A(\Delta PQR)}$

## PROBLEM SET – 1

### Solutions

**1. $\Delta$ABC and $\Delta$PQR have same base and their corresponding heights are 5 and 3.5 units. Find $\frac{\mathbf{A(\Delta ABC)}}{\mathbf{A(\Delta PQR)}}$**

**Given :** $\Delta$ABC and $\Delta$ PQR have same base and heights are 5 and 3.5 units.

**Find :** $\frac{\mathbf{A(\Delta ABC)}}{\mathbf{A(\Delta PQR)}}$

**Solution :**

$$\frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{b \times 5}{b \times 3.5} = \frac{10}{7}$$

$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{10}{7}$$

If the bases are same the areas are in proportion to their corresponding heights.