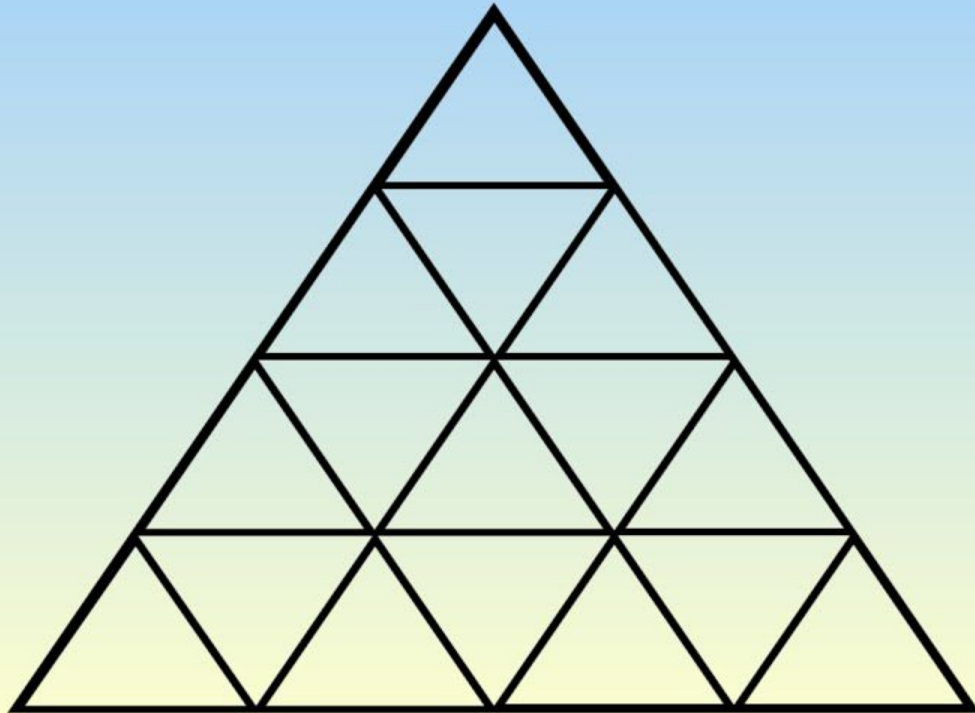

Similarity

Grade 10 : Topic : 1 , Mathematics II

- Ratios of area of two triangles (condition 1 & 2)
- Basic Proportionality theorem
- Converse of basic proportionality theorem
- Tests of similarity of triangles
- Theorem of areas of similar triangles .

How many triangles do you see ?

HOW MANY TRIANGLES DO YOU SEE?

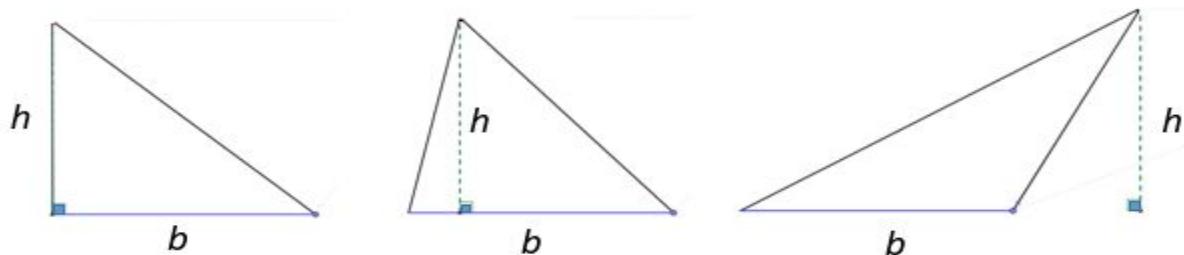


Here we are

Area of Triangle

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{perpendicular height}$$

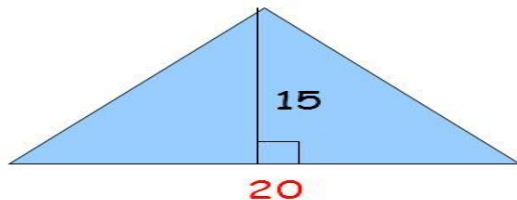
$$A = \frac{1}{2}bh$$



Comparing Areas of Triangles

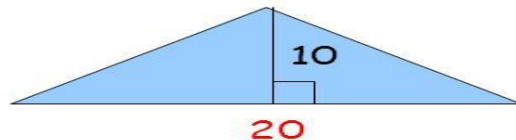
If two triangles have equal bases, then the ratio of their areas equals the ratio of their heights.

$$A = \frac{1}{2}(20)(15) = 150$$



$$\text{Ratio of heights: } \frac{15}{10} = \frac{3}{2}$$

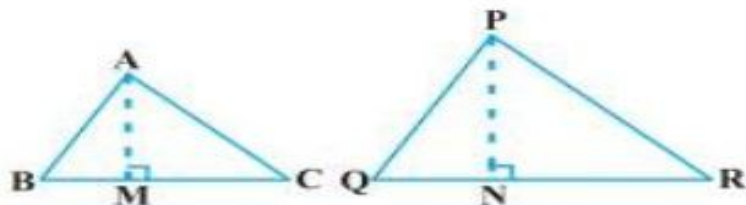
$$A = \frac{1}{2}(20)(10) = 100$$



$$\text{Ratio of areas: } \frac{150}{100} = \frac{3}{2}$$

Area Theorem

- The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides
- It proves that $\frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle PQR)} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{CA}{RP}\right)^2$ in the figure given below




Ratios of areas of two triangles

LETS LEARN

RATIO OF AREAS OF TWO TRIANGLES

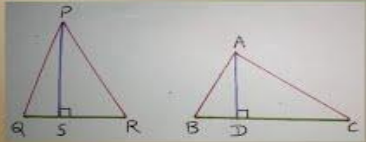
$$\frac{AB}{BC}$$
$$\frac{PQ}{QR}$$

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MATHS MADE EASY

PROPERTY OF RATIO OF AREAS OF TWO TRIANGLES



CLASS 10

Condition 1 (if the heights of the triangles are equal)



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**Ratio of Areas
of two Triangles
where Heights
are equal.**



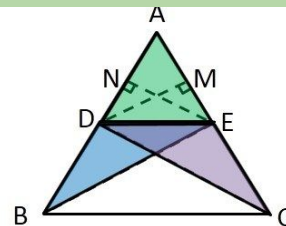
Condition 2 : If the bases of both the triangles are equal

**Ratio of areas of
two triangles
where bases are
equal.**



Basic Proportionality theorem was introduced by a famous Greek Mathematician, Thales, hence it is also called **Thales Theorem**. According to him, for any two equiangular triangles, the ratio of any two corresponding sides is always the same. Based on this concept, he gave theorem of basic proportionality (BPT). This concept has been introduced in **similar triangles**. If two triangles are similar to each other then,

- i) Corresponding angles of both the triangles are equal
- ii) Corresponding sides of both the triangles are in proportion to each other



Now,

$$\begin{aligned} \text{ar (ADE)} &= \frac{1}{2} \times \text{Base} \times \text{Height} \\ &= \frac{1}{2} \times \text{AD} \times \text{EN} \quad \dots(1) \end{aligned}$$

$$\begin{aligned} \text{ar (BDE)} &= \frac{1}{2} \times \text{Base} \times \text{Height} \\ &= \frac{1}{2} \times \text{DB} \times \text{EN} \quad \dots(2) \end{aligned}$$

Divide (1) and (2)

$$\frac{\text{ar (ADE)}}{\text{ar (BDE)}} = \frac{\frac{1}{2} \times \text{AD} \times \text{EN}}{\frac{1}{2} \times \text{DB} \times \text{EN}}$$

$$\frac{\text{ar (ADE)}}{\text{ar (BDE)}} = \frac{\text{AD}}{\text{DB}} \quad \dots(\text{A})$$

$$\begin{aligned} \text{ar (ADE)} &= \frac{1}{2} \times \text{Base} \times \text{Height} \\ &= \frac{1}{2} \times \text{AE} \times \text{DM} \quad \dots(3) \end{aligned}$$


$$\begin{aligned} \text{ar (DEC)} &= \frac{1}{2} \times \text{Base} \times \text{Height} \\ &= \frac{1}{2} \times \text{EC} \times \text{DM} \quad \dots(4) \end{aligned}$$

Divide (3) and (4)


$$\frac{\text{ar (ADE)}}{\text{ar (DEC)}} = \frac{\frac{1}{2} \times \text{AE} \times \text{DM}}{\frac{1}{2} \times \text{EC} \times \text{DM}}$$

$$\frac{\text{ar (ADE)}}{\text{ar (DEC)}} = \frac{\text{AE}}{\text{EC}} \quad \dots(\text{B})$$



Basic Proportionality Theorem



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The Learning App



**BASIC
PROPORTIONALITY**



MATH. हिन्दी

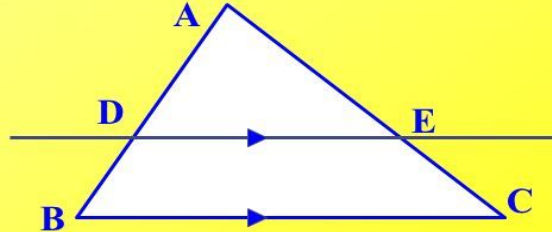
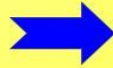
**Basic
Proportionality
Theorem**



Converse of the Basic Proportionality Theorem.

If a line intersects two sides of a triangle, and cuts off segments proportional to these two sides, then it is parallel to the third side.

$$\frac{AB}{AD} = \frac{AC}{AE}$$

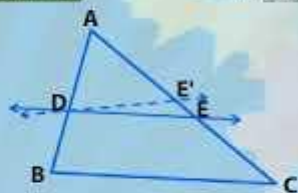


Converse of BPT

Converse Of Basic Proportionality Theorem

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Theorem: If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.



$\frac{AD}{DB} = \frac{AE}{EC}$
Adding 1 both side:

Similarity Class 10th

2

Basic Proportionality Theorem

Converse of BPT

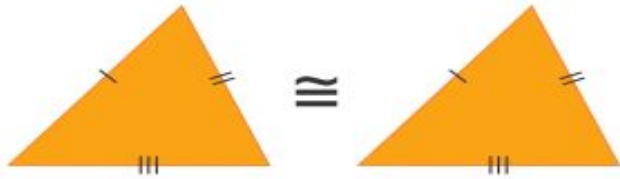
Theorem of Angle Bisector
of Triangle

Maharashtra Board
New Syllabus



Similarity of triangles

SSS (*Side – Side – Side*)



3 sides are respectively equal

SAS (*Side – Angle – Side*)



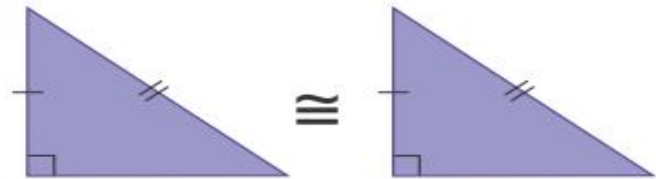
2 sides and the included angle are respectively equal

ASA (*Angle – Side – Angle*)



2 angles and the included side are respectively equal

RHS (*Right angle – Hypotenuse – Side*)

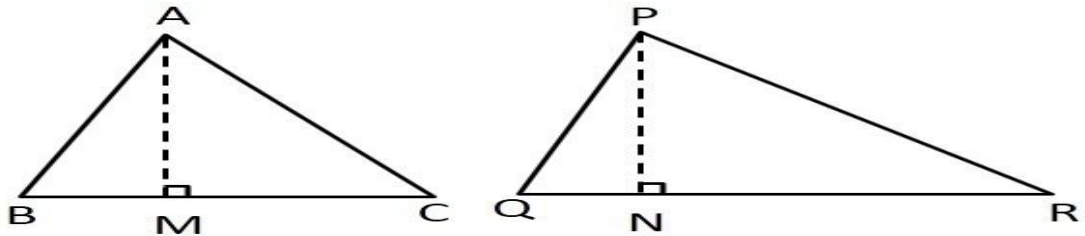


Hypotenuse and one side are respectively equal

Theorem : Areas of similar triangles.

The ratio of the areas of two similar triangles is equal to the square of ratio of their corresponding sides.

Given: $\Delta ABC \sim \Delta PQR$



To Prove: $\frac{\text{ar} (ABC)}{\text{ar} (PQR)} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{AC}{PR}\right)^2$

Construction: Draw $AM \perp BC$ and $PN \perp QR$.

Similarity

Theorem

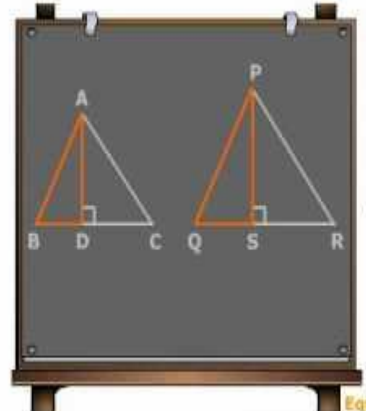
Areas of similar Triangles

Std 10th Geometry

By eLearning Institute

Theorem on Areas of Similar Triangles

The ratio of the areas of similar triangles is equal to the ratio of the squares on their corresponding sides.



Now in $\triangle ADB$ and $\triangle PSQ$,

$\angle ABD = \angle PQS$ (from 2)

$\angle ADB = \angle PSQ$ ($= 90^\circ$)

$\triangle ADB \sim \triangle PSQ$ (A-A Similarity)

$\therefore \frac{AB}{PQ} = \frac{BD}{QS} = \frac{AD}{PS} \dots(3)$

Equation (1)

Equation (2)

edurte

PAUSE REPLAY BACK NEXT

Evaluation



https://docs.google.com/forms/d/15FvH5sTyMRJICuR2xe_lKDwKfgl8Lw-VzCViQtPXRM/edit



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