

DAY 4

SIMILARITY

In last classes, we have studied about congruency. Two figures are said to be congruent if their all corresponding parts are equal *e. g.* circles of same radius, squares of same side, equilateral triangles of same side etc. In this section, we shall discuss about **Similarity**.

Similarity means similar shapes which are **small or large in size but shape is same** *e. g.* your hand and hand of a small child, both have same shapes but differ in size. Similarly all circles, squares and equilateral triangles are similar with each other. So we can say all congruent shapes are similar but similar shapes are not congruent. In symbolic form symbol ' \sim ' stands for 'is similar to'.

Similarity of Triangles:

We know two triangles are congruent if

- Their corresponding sides are equal.
- Their corresponding angles are equal.

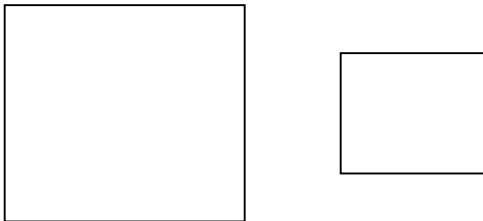
Now **two triangles are similar if**

- **Their corresponding angles are equal.**
- **Their corresponding sides are proportional (same ratio)**

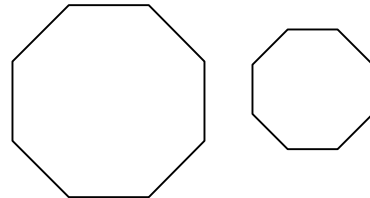
Or Let us take two photographs of a person having different sizes made from the same negative. It is observed that both of that photographs will be similar.

Look at the following figures.

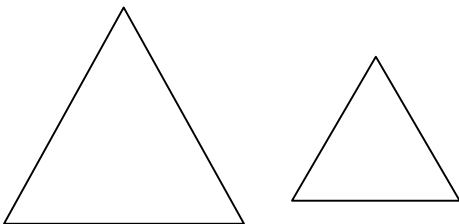
(i)



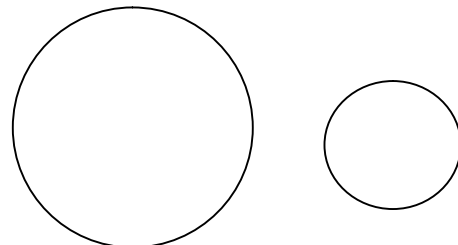
(iii)



(ii)

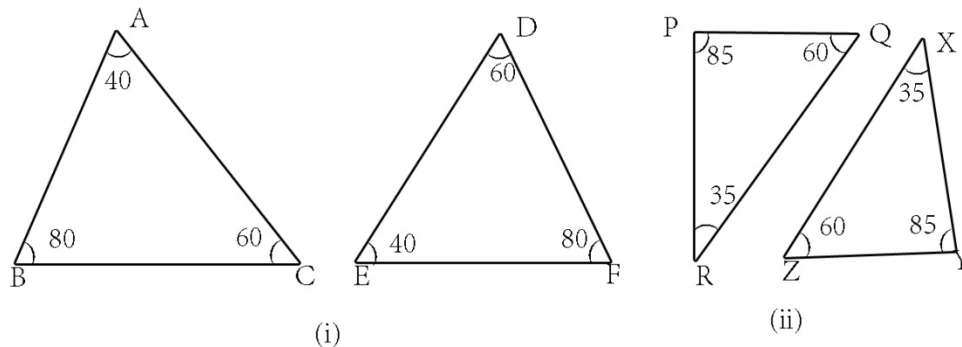


(iv)



Here understanding of '**corresponding**' word is very important. In similarity, First condition

- **Corresponding angles of triangles are equal means**
- **One angle of first triangle \Leftrightarrow One angle of second triangle**
 - **Other angle of first triangle \Leftrightarrow Other angle of second triangle**
 - **Third angle of first triangle \Leftrightarrow Third angle of second triangle**



In i) $\angle A = \angle E = 40^\circ, \angle B = \angle F = 80^\circ, \angle C = \angle D = 60^\circ$

$\triangle ABC \sim \triangle DEF$

In ii) $\angle P = \angle Y = 85^\circ, \angle Q = \angle Z = 60^\circ, \angle R = \angle X = 35^\circ$

$\triangle PQR \sim \triangle YZX$

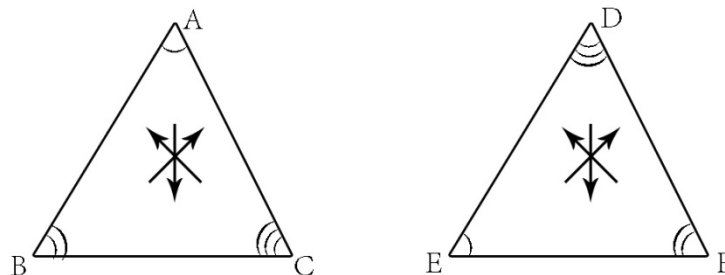
Second condition

- **Corresponding sides of triangles are in proportion**
Sides opposite to corresponding angles are respective corresponding

In i)

- Sides opposite to pair of corresponding $\angle A = \angle E$ are respective **BC and DF**
 - Sides opposite to pair of corresponding $\angle B = \angle F$ are respective **AC and DE**
 - Sides opposite to pair of corresponding $\angle C = \angle D$ are respective **AB and EF**
- $\therefore \triangle ABC \sim \triangle DEF$

$$\Rightarrow \angle A = \angle E, \angle B = \angle F, \angle C = \angle D \text{ and } \frac{AB}{EF} = \frac{BC}{FD} = \frac{AC}{ED}$$

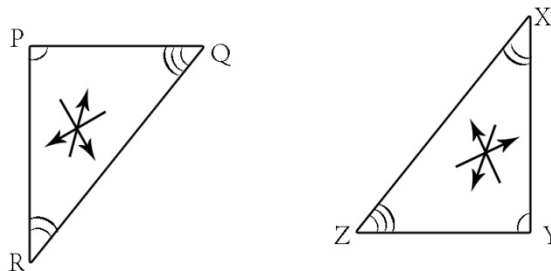


In ii)

- Sides opposite to pair of corresponding $\angle P = \angle Y$ are respective **QR and XZ**
- Sides opposite to pair of corresponding $\angle Q = \angle Z$ are respective **PR and XY**
- Sides opposite to pair of corresponding $\angle R = \angle X$ are respective **PQ and YZ**

$$\therefore \Delta PQR \sim \Delta YZX$$

$$\Rightarrow \angle P = \angle Y, \angle Q = \angle Z, \angle R = \angle X \text{ and } \frac{QR}{XZ} = \frac{PR}{XY} = \frac{PQ}{YZ}$$



CRITERIA FOR SIMILARITY OF TWO TRIANGLES

1. **AAA (Angle-Angle-Angle) or AA:** If in two triangles, the corresponding angles are equal, then their corresponding sides are proportional i.e. are in same ratio & hence the triangles are similar. This property is referred as AAA (Angle-Angle-Angle)

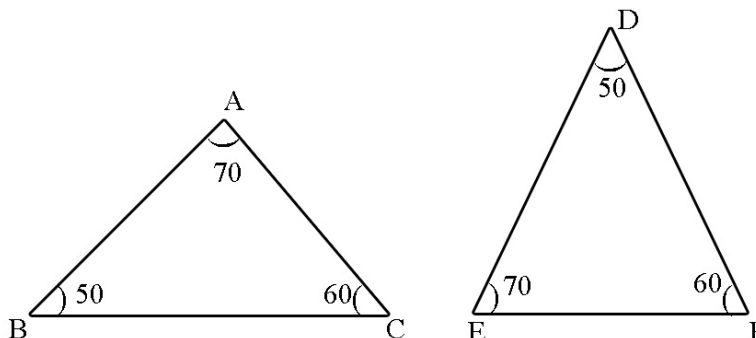
Note: If two angles of a triangle are respectively equal to two angles of another triangle, then the two triangles are similar. This is referred as AA (ANGLE-ANGLE).

2. **SSS (Side-Side-Side):** If the corresponding sides of two triangles are proportional (i.e. in the same ratio) then their corresponding angles are equal and hence the triangles are similar.
3. **SAS (Side-Angle-Side):** If the lengths of two pairs of corresponding sides of two triangles are in the same ratio and the angle included between them are equal then the triangles are similar.

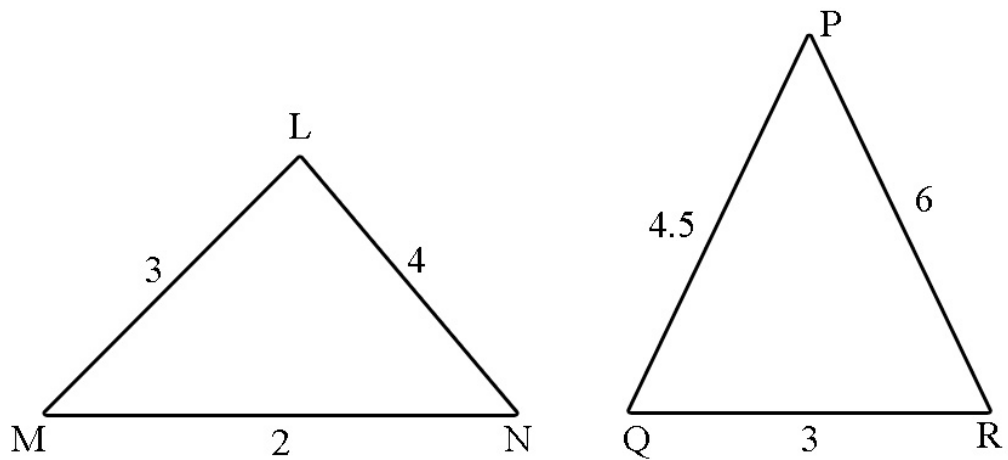
Now we shall discuss some examples on similarity of triangles.

1. **Examine each pair of triangles & state which pairs of triangles are similar. Also state the similarity criterion used & write the pair of similar triangles in symbolic form:**

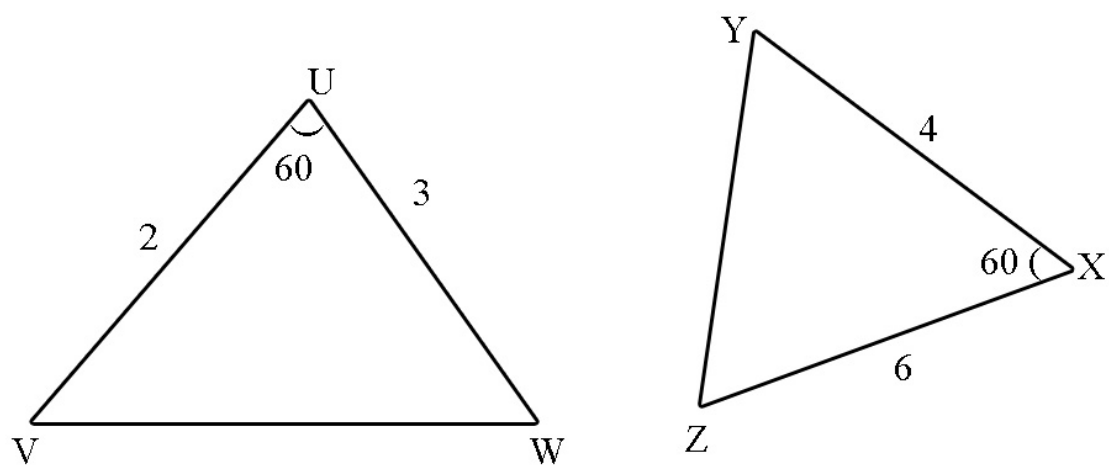
i)



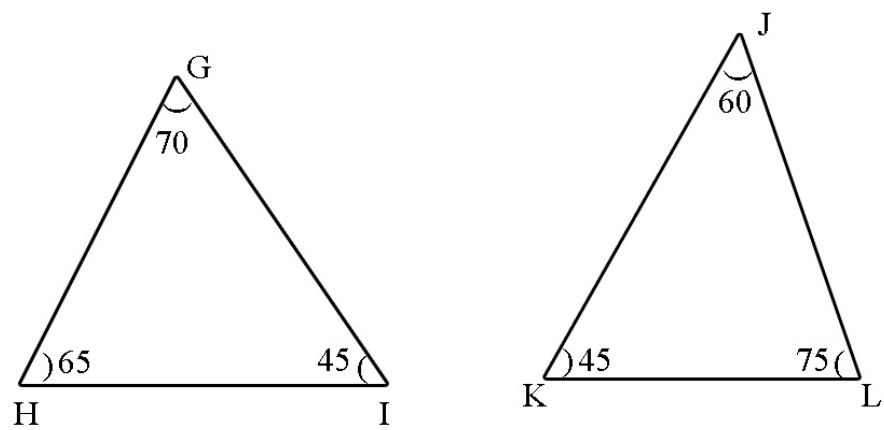
ii)



iii)



iv)



Sol :- i) $\angle A = \angle E = 70^\circ$, $\angle B = \angle D = 50^\circ$, $\angle C = \angle F = 60^\circ$
 $\therefore \triangle ABC \sim \triangle EDF$ (AA Similarity)

ii) $\frac{LM}{PQ} = \frac{3}{4.5} = \frac{30}{45} = \frac{2}{3}$; $\frac{MN}{QR} = \frac{2}{3}$; $\frac{LN}{PR} = \frac{4}{6} = \frac{2}{3}$
 $\Rightarrow \frac{LM}{PQ} = \frac{MN}{QR} = \frac{LN}{PR} = \frac{2}{3}$
 $\therefore \triangle LMN \sim \triangle PQR$ (SSS Similarity)

iii) $\frac{UV}{XY} = \frac{2}{4} = \frac{1}{2}$; $\frac{UW}{XZ} = \frac{3}{6} = \frac{1}{2}$; $\angle U = \angle X = 60^\circ$
 $\therefore \triangle UVW \sim \triangle XYZ$ (SAS Similarity)

iv) In the given triangles, corresponding angles are not equal, so triangles are not similar.

EXERCISE

1. Ex 6.1

2. Ex 6.3, Q1

come-become-educated

37bhyaas