

Activity 14

OBJECTIVE

To verify experimentally the different criteria for congruency of triangles using triangle cut-outs.

MATERIAL REQUIRED

Cardboard, scissors, cutter, white paper, geometry box, pencil/sketch pens, coloured glazed papers.

METHOD OF CONSTRUCTION

1. Take a cardboard of a convenient size and paste a white paper on it.
2. Make a pair of triangles ABC and DEF in which $AB = DE$, $BC = EF$, $AC = DF$ on a glazed paper and cut them out [see Fig. 1].
3. Make a pair of triangles GHI, JKL in which $GH = JK$, $GI = JL$, $\angle G = \angle J$ on a glazed paper and cut them out [see Fig. 2].

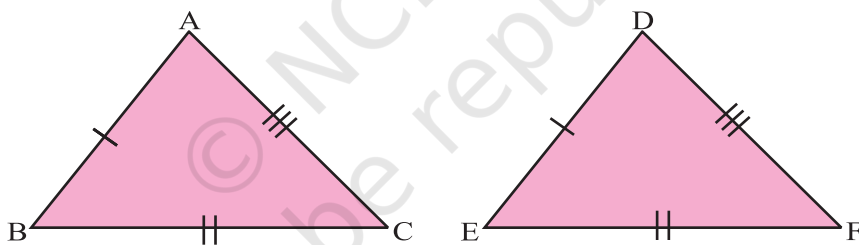


Fig. 1

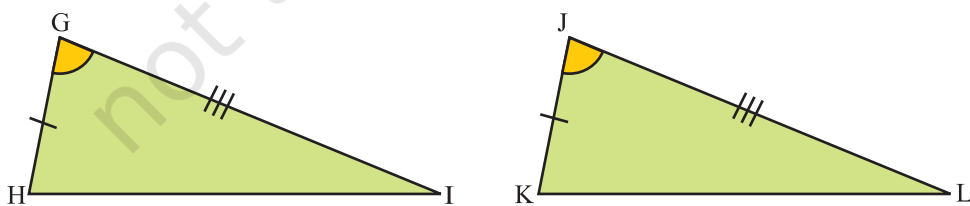


Fig. 2

4. Make a pair of triangles PQR, STU in which $QR = TU$, $\angle Q = \angle T$, $\angle R = \angle U$ on a glazed paper and cut them out [see Fig. 3].
5. Make two right triangles XYZ, LMN in which hypotenuse $YZ = MN$ and $XZ = LN$ on a glazed paper and cut them out [see Fig. 4].

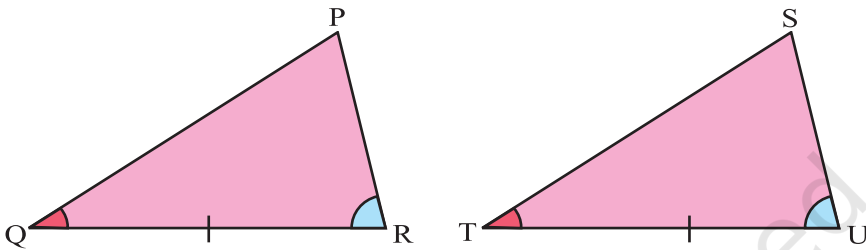


Fig. 3



Fig. 4

DEMONSTRATION

1. Superpose $\triangle ABC$ on $\triangle DEF$ and see whether one triangle covers the other triangle or not by suitable arrangement. See that $\triangle ABC$ covers $\triangle DEF$ completely only under the correspondence $A \leftrightarrow D$, $B \leftrightarrow E$, $C \leftrightarrow F$. So, $\triangle ABC \cong \triangle DEF$, if $AB = DE$, $BC = EF$ and $AC = DF$.

This is SSS criterion for congruency.

- Similarly, establish $\triangle GHI \cong \triangle JKL$ if $GH = JK$, $\angle G = \angle J$ and $GI = JL$. This is SAS criterion for congruency.
- Establish $\triangle PQR \cong \triangle STU$, if $QR = TU$, $\angle Q = \angle T$ and $\angle R = \angle U$.
This is ASA criterion for congruency.
- In the same way, $\triangle STU \cong \triangle LMN$, if hypotenuse $YZ =$ hypotenuse MN and $XZ = LN$.
This is RHS criterion for right triangles.

OBSERVATION

On actual measurement :

In $\triangle ABC$ and $\triangle DEF$,

$AB = DE = \dots\dots\dots$, $BC = EF = \dots\dots\dots$,
 $AC = DF = \dots\dots\dots$, $\angle A = \dots\dots\dots$,
 $\angle D = \dots\dots\dots$, $\angle B = \dots\dots\dots$, $\angle E = \dots\dots\dots$,
 $\angle C = \dots\dots\dots$, $\angle F = \dots\dots\dots$

Therefore, $\triangle ABC \cong \triangle DEF$.

2. In $\triangle GHI$ and $\triangle JKL$,

$GH = JK = \dots\dots\dots$, $GI = JL = \dots\dots\dots$, $HI = \dots\dots\dots$,
 $KL = \dots\dots\dots$, $\angle G = \dots\dots\dots$, $\angle J = \dots\dots\dots$,
 $\angle H = \dots\dots\dots$, $\angle K = \dots\dots\dots$, $\angle I = \dots\dots\dots$,
 $\angle L = \dots\dots\dots$

Therefore, $\triangle GHI \cong \triangle JKL$.

3. In $\triangle PQR$ and $\triangle STU$,

$QR = TU = \dots\dots\dots$, $PQ = \dots\dots\dots$, $ST = \dots\dots\dots$,
 $PR = \dots\dots\dots$, $SU = \dots\dots\dots$ $\angle S = \dots\dots\dots$,
 $\angle Q = \angle T = \dots\dots\dots$, $\angle R = \angle U = \dots\dots\dots$, $\angle P = \dots\dots\dots$

Therefore, $\triangle PQR \cong \triangle STU$.

4. In $\triangle XYZ$ and $\triangle LMN$, hypotenuse $YZ =$ hypotenuse $MN = \dots\dots\dots$

$XZ = LN = \dots\dots\dots$, $XY = \dots\dots\dots$,

$LM = \dots\dots\dots$, $\angle X = \angle L = 90^\circ$

$\angle Y = \dots\dots\dots$, $\angle M = \dots\dots\dots$, $\angle Z = \dots\dots\dots$,

$\angle N = \dots\dots\dots$,

Therefore, $\triangle XYZ \cong \triangle LMN$.

APPLICATION

These criteria are useful in solving a number of problems in geometry.

These criteria are also useful in solving some practical problems such as finding width of a river without crossing it.

© NCERT
not to be republished