UDAAN

2025

Triangles

Mathematics | Lecture – 03

By – Ritik Sir

Topics

to be covered

1. Homework Discussion
2. Recalling Congruency of tringles
3. Concept of Similarity and Questions


WORK HARD
DREAM BIG
NEVER GIVE UP !!

Topic : BPT

#Q. If D and E are points on sides AB and AC respectively of a ΔABC such that DE||BC and BD = CE. Prove that ΔABC is isosceles. [CBSE 2007, 2009]

G: DE||BC, BD=CE

To p: ΔABC is isosceles

Proof: By B.P.T,

$$\frac{DB}{AB} = \frac{EC}{AC} \quad (\because BD = CE)$$

$$\frac{1}{AB} = \frac{1}{AC}$$

$AC = AB$

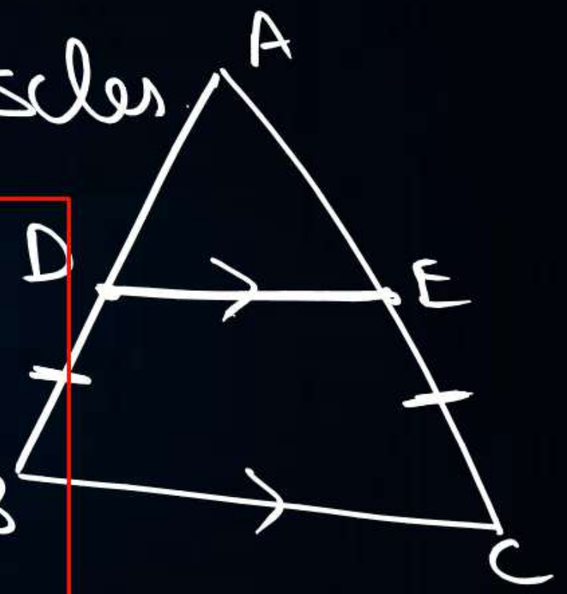
$\therefore \Delta ABC$ is isosceles

$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{AD}{DB} + 1 = \frac{AE}{EC} + 1$$

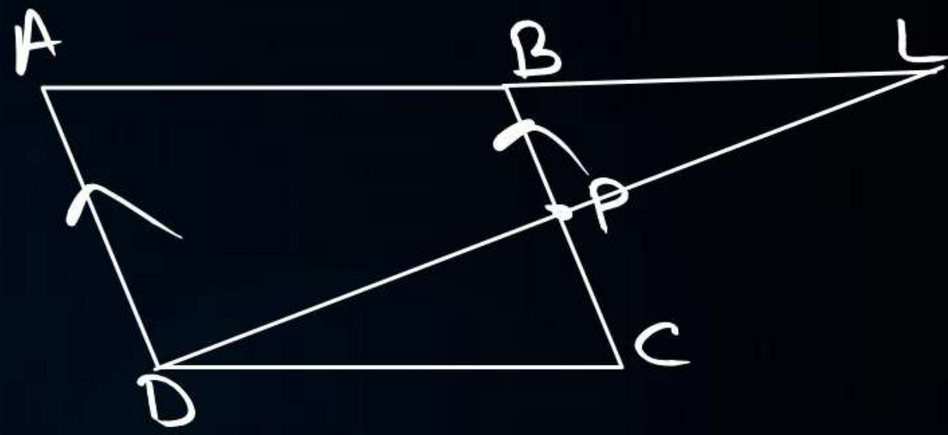
$$\frac{AD+DB}{DB} = \frac{AE+EC}{EC}$$

$$\frac{AB}{DB} = \frac{AC}{EC}$$



Topic : BPT

#Q. ABCD is a parallelogram, P is a point on side BC and DP when produced meets AB productid at L. Prove that $\frac{DP}{PL} = \frac{DC}{BL}$.



G: ABCD is a ||gm

To P: $\frac{DP}{PL} = \frac{DC}{BL}$

Proof: $\because$ AD || BC

$\Rightarrow$ AD || BP

By B.P.T,

$\frac{DP}{PL} = \frac{AB}{BL}$

$\Rightarrow \frac{DP}{PL} = \frac{DC}{BL}$

$\because$ AB = DC

Congruent → Shape, Size → same.

Similarity → Shape → same

Size → different hogo toh bhi ho sakta hai ki similar

Ho sakta hai ki similar ho.

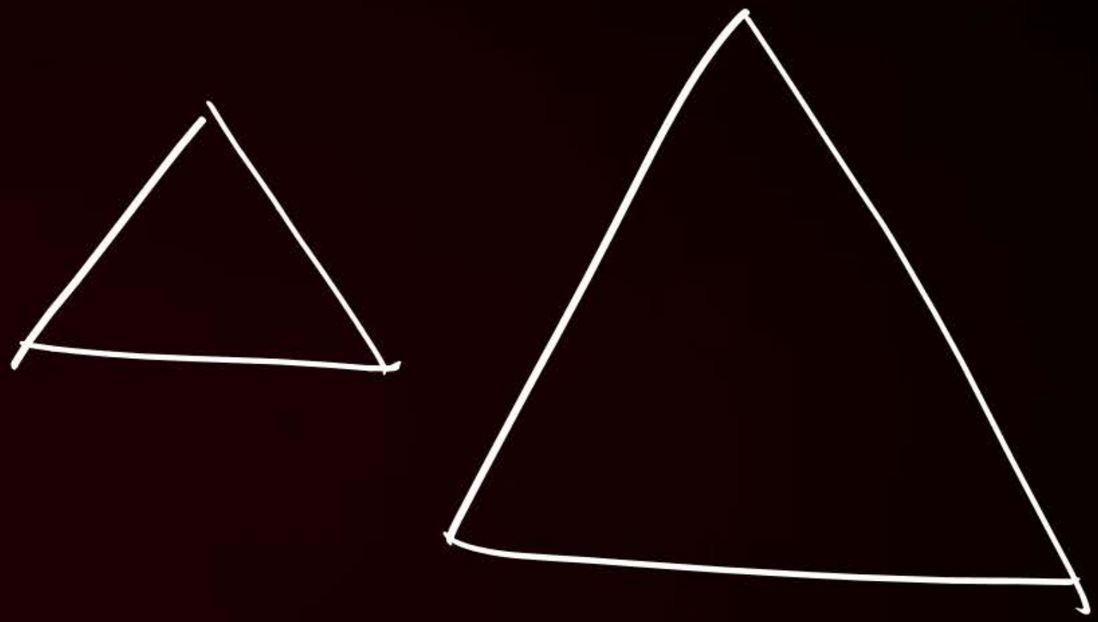
Topic : Concept of Similarity

In earlier classes, we have learnt about congruent figures. Two geometric figures having the same shape and size are known as congruent figures. Note that congruent figures are alike in every respect. In this chapter, we shall study about similarity of geometric figures. Geometric figures having the same shape but different sizes are known as similar figures. Two congruent figures are always similar but similar figures need not be congruent as discussed in the following illustrations.

$\triangle ABC \cong \triangle DEF$

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

- AAS
- SSS
- ASA
- SAS
- RHS



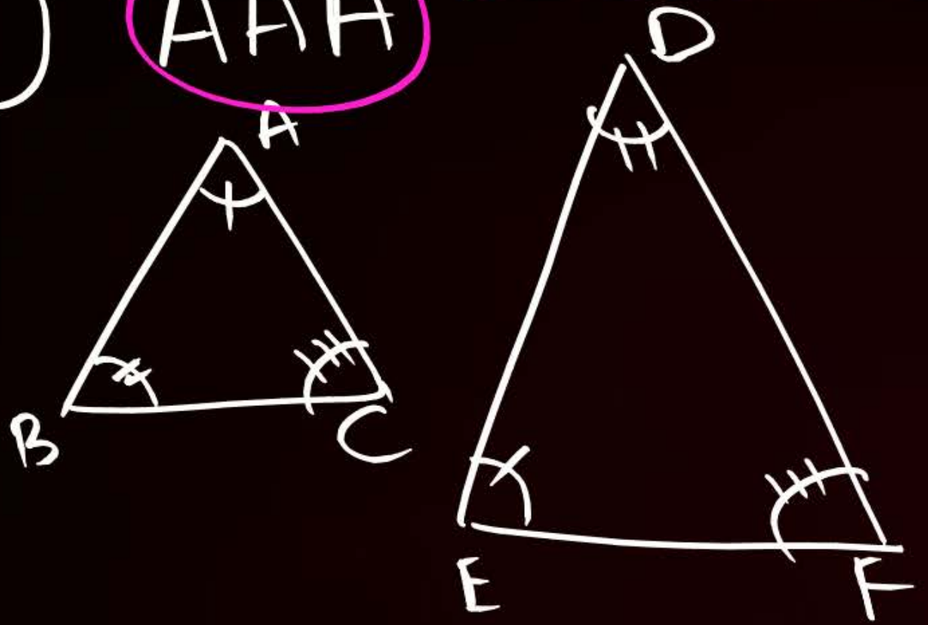
$\triangle ABC \sim \triangle DEF$

$\angle A = \angle D$ $\angle B = \angle E$ $\angle C = \angle F$	$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

1. SSS
2. SAS
3. AAA → AA

Proof Deduction

① AAA



$\triangle ABC \sim \triangle EDF$

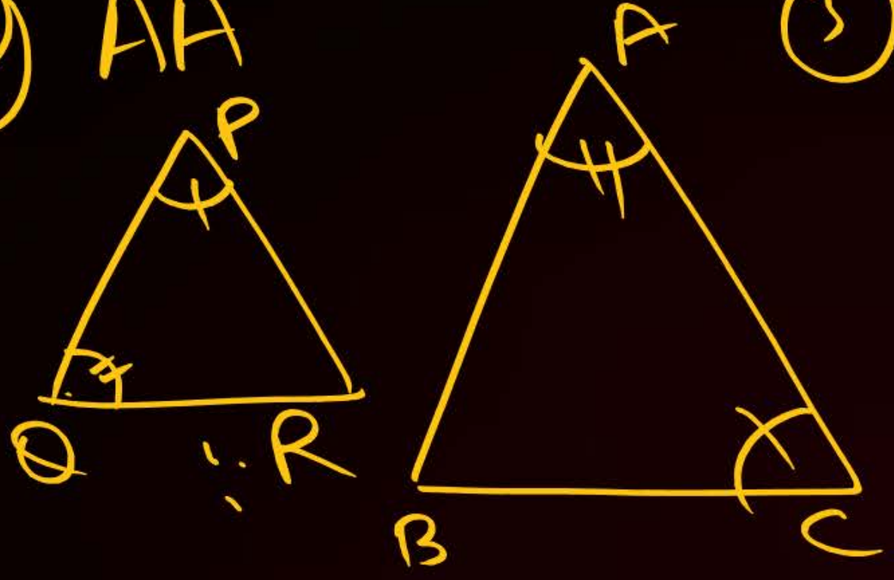
By CPST

$$\frac{AB}{ED} = \frac{BC}{DF} = \frac{AC}{FF}$$

CPST

- Corresponding Pairs
- similar Triangles

② AA



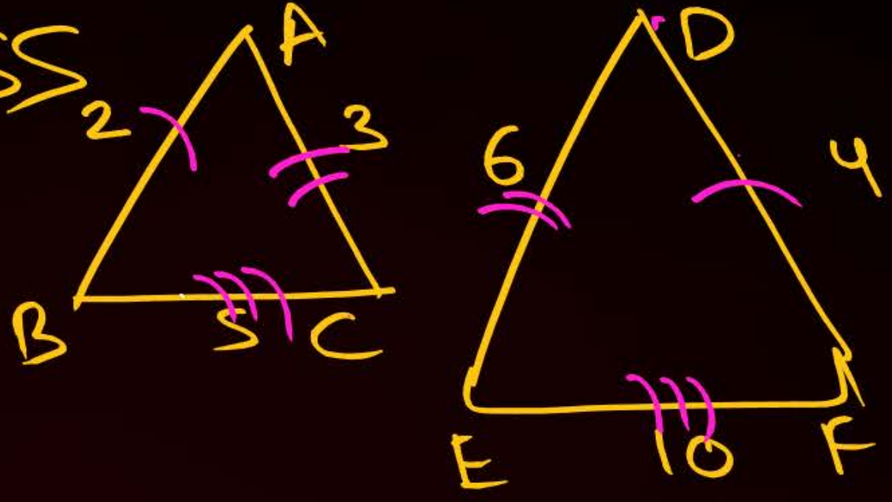
$\Delta RQP \sim \Delta BAC$

By CPST

$\angle R = \angle B$

$\frac{RQ}{BA} = \frac{QP}{AC} = \frac{RP}{BC}$

③ SSS



$\frac{2}{4} = \frac{3}{6} = \frac{5}{10}$

$\frac{AB}{DF} = \frac{AC}{DE} = \frac{BC}{FF}$

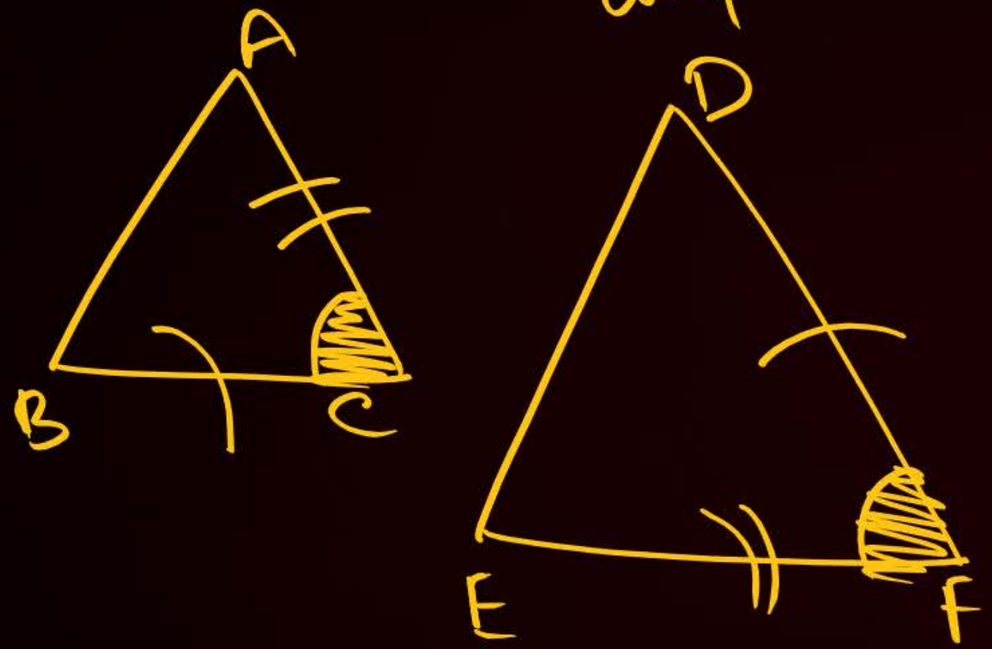
$\Delta ABC \sim \Delta DFE$

By CPST

$\angle A = \angle D, \angle B = \angle F, \angle C = \angle E$

(4) SAS → Side ka zatio.

↑ Included angle



$\triangle ACB \sim \triangle EFD$

By C.P.S.T.

$$\frac{AC}{EF} = \frac{CB}{FD} = \frac{AB}{ED}$$

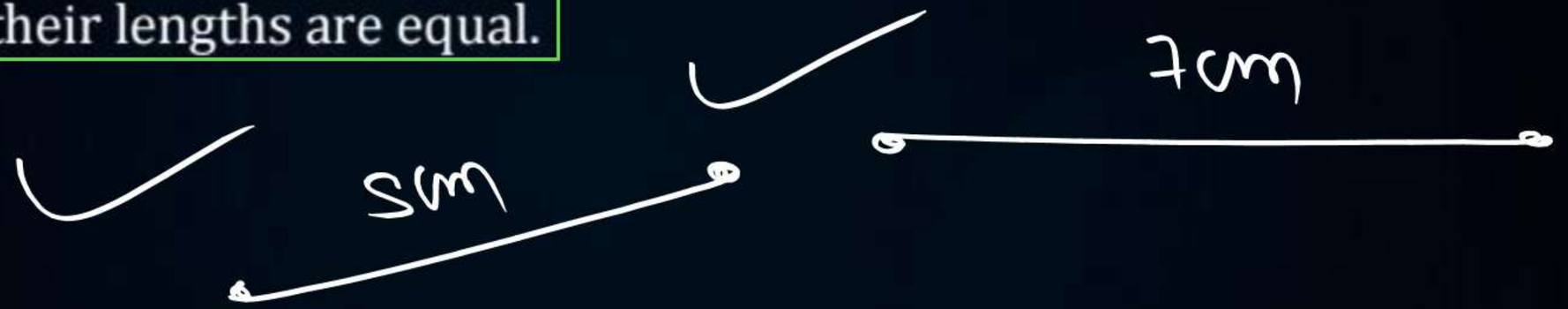
$\angle A = \angle E$

$\angle C = \angle F$

$\angle B = \angle D$

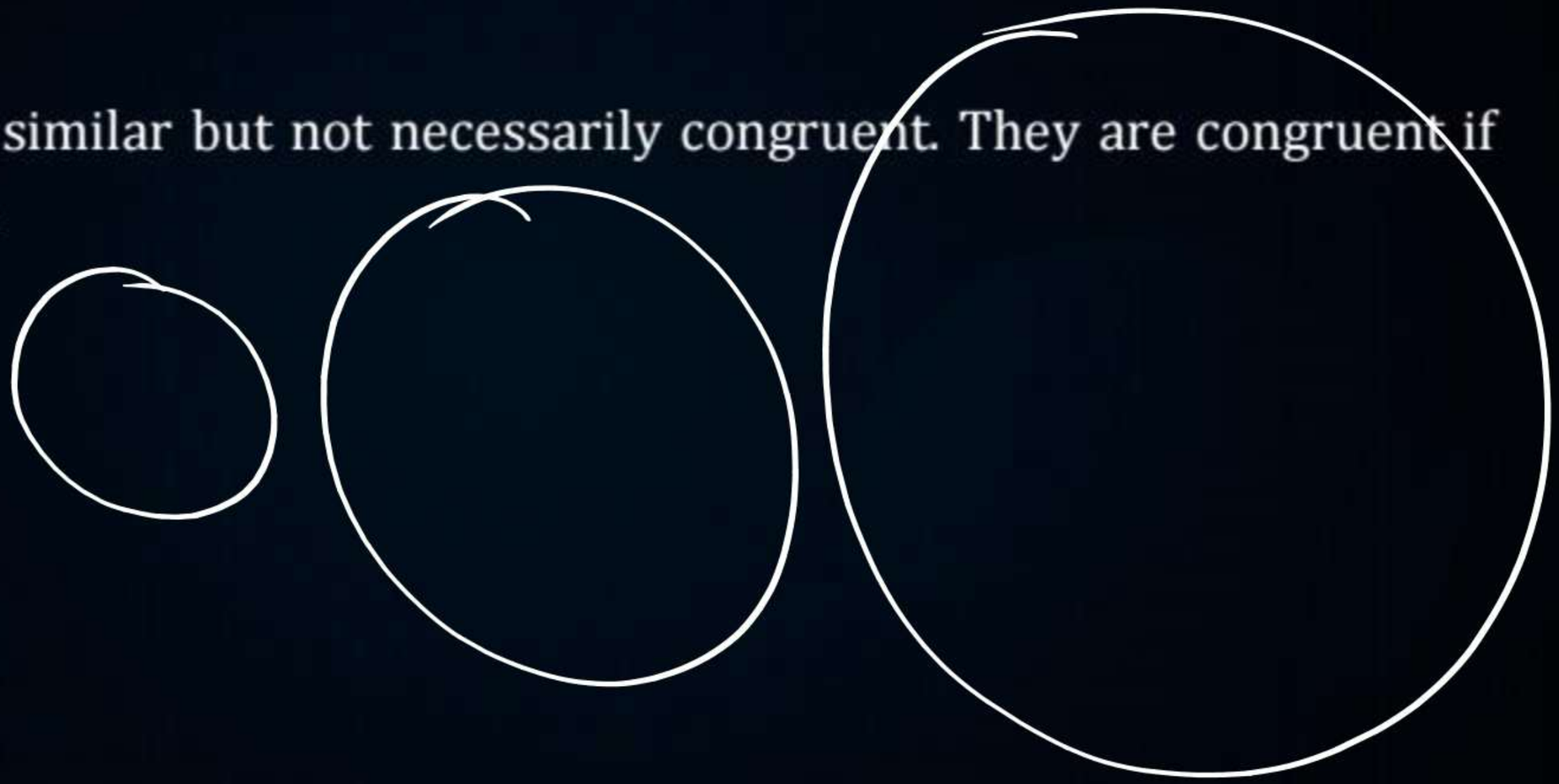
Topic : Illustration – 1

Any two line segments are always similar but they need not be congruent. They are congruent, if their lengths are equal.



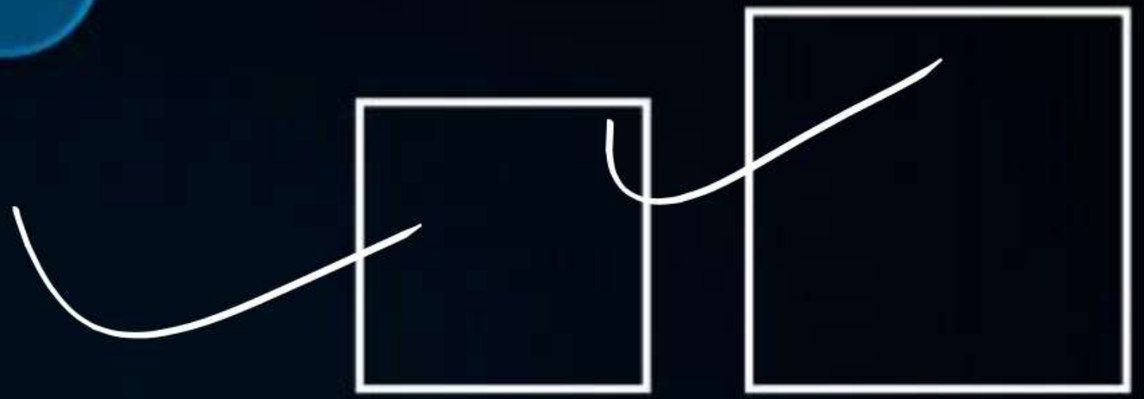
Topic : Illustration – 2

Any two circles are similar but not necessarily congruent. They are congruent if their radii are equal.



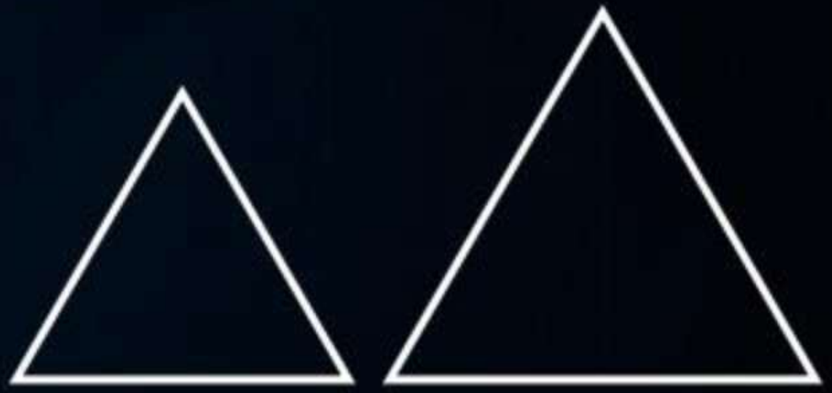
Topic : Illustration – 1

Any two squares are similar.



Topic : Any two equilateral triangles are similar

If two figures are similar one can be obtained from the other either by shrining or by stretching, without changing its shape. There is one-to-one correspondence between the parts of two similar figures.



Topic : Similar Polygons

Triangle keey alava

Definition : Two polygons are said to be similar to each other, if

(i) Their corresponding angles are equal, and

(ii) The lengths of their corresponding sides are proportional.

Topic : Similar Triangles and Their Properties

Definition : Two triangles are said to be similar, if their

(i) Corresponding angles are equal and,

(ii) Corresponding sides are proportional.

Topic : Similarity

#Q. All circles and squares are [NCERT Intex]

A Congruent

B Similar

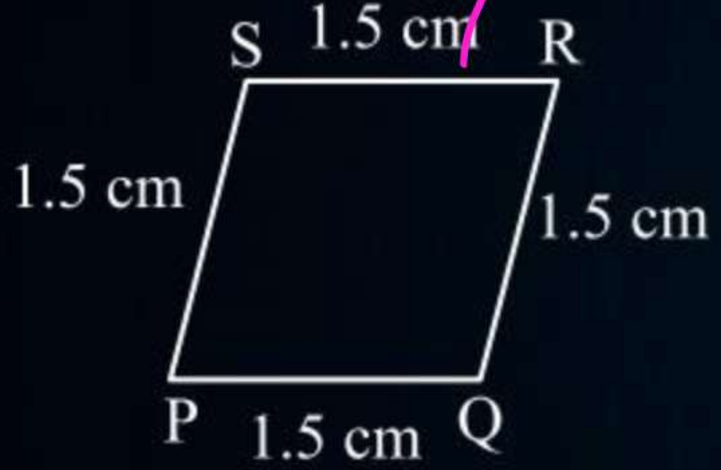
C Both (A) and (B)

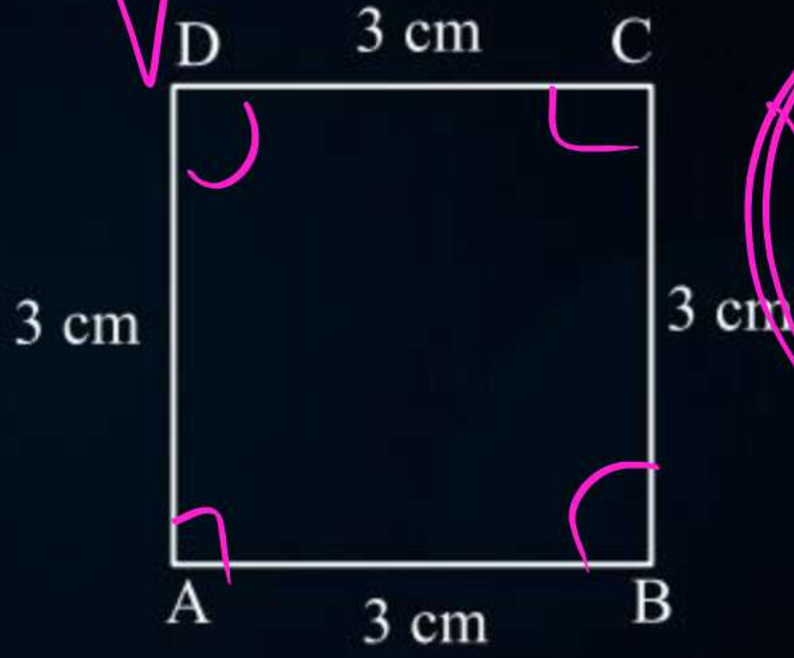
D None of these

Topic : Similarity

#Q. State whether the following quadrilaterals are similar or not:

[NCERT Intext]



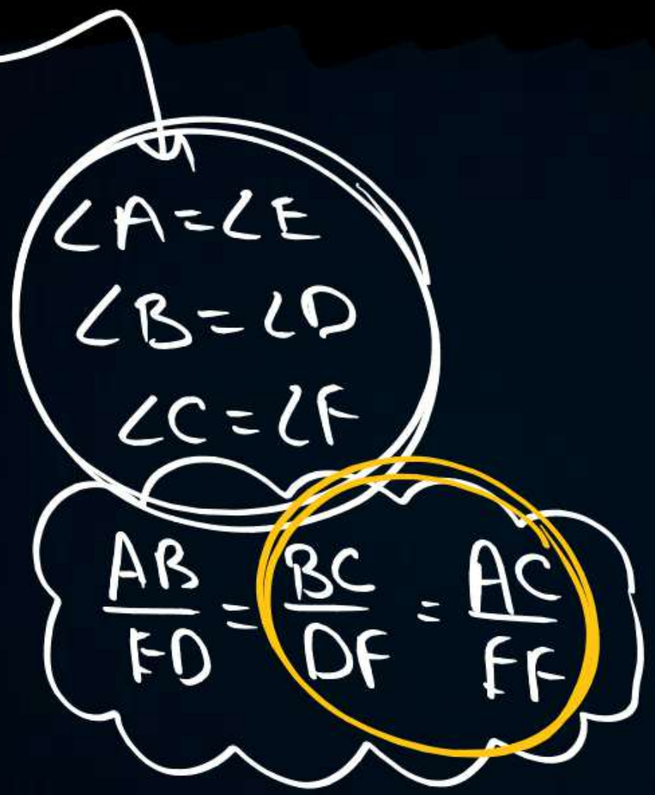


Quadrilaterals

not similar

Topic : Similarity

#Q. If $\Delta ABC \sim \Delta EDF$, [redacted] then which of the following is not true?



(A) $BC \cdot EF = AC \cdot FD$

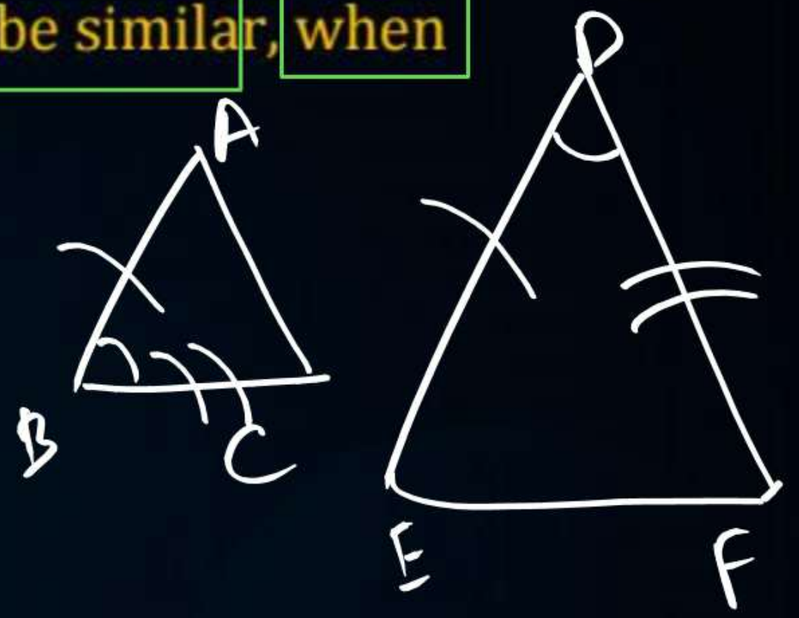
(B) $AB \cdot EF = AC \cdot DE$

(C) $BC \cdot DE = AB \cdot EF$

(D) $BC \cdot DE = AB \cdot FD$

Topic : Similarity

#Q. If in ΔABC and ΔDEF, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar, when



(A) $\angle B = \angle E$

(B) $\angle A = \angle D$

(C) $\angle B = \angle D$

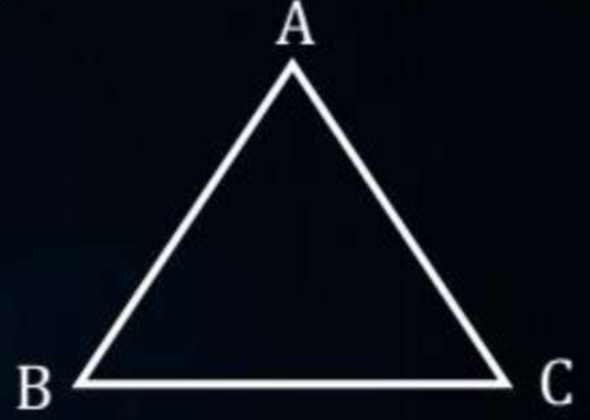
(D) $\angle A = \angle F$

Topic : Criteria of Similarity of Similar Triangles

Let ΔABC and ΔDEF be two given triangles

ΔABC will be similar to ΔDEF (i.e. $\Delta ABC \sim \Delta DEF$).

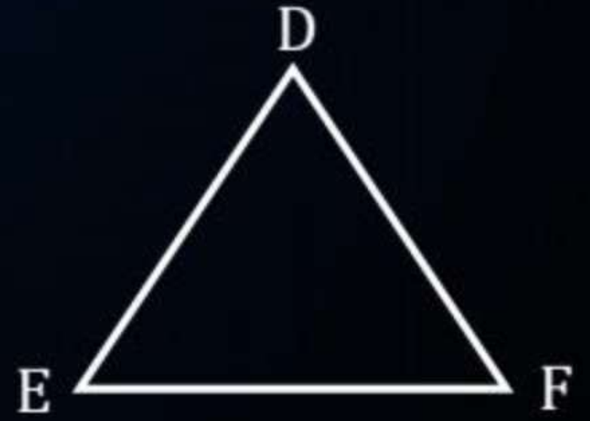
If any one of the following conditions holds good.



(a) When the corresponding angles are equal

i.e. $\angle A = \angle D$: $\angle B = \angle E$; $\angle C = \angle F$,

then the triangles are said to be similar by AAA similarity.



Topic : Criteria of Similarity of Similar Triangles

(b) When two angles are equal

i.e. $\angle A = \angle D$; $\angle B = \angle E$,

then the triangles are said to be similar by AA similarly.

(c) When the corresponding sides are proportional

i.e., $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF}$,

then the triangles are said to be similar by SSS similarity.

Topic : Criteria of Similarity of Similar Triangles

(d) When any two corresponding sides are proportional and the included angles are equal

i.e. $\frac{AB}{DE} = \frac{AC}{DF}$ and $\angle A = \angle D$,

then the triangles are said to be similar by SAS similarity.

Topic : Similarity

#Q. In a ΔABC and ΔDEF, $\angle F = \angle C$, $\angle B = \angle E$ and $AB = \frac{1}{2} DE$. Then the two triangles are

[CBSE, Board Term – I, 2021]

A Congruent, but not similar

B Similar, but not congruent

C Neither congruent nor similar

D Congruent as well as similar

Topic : Similarity

#Q. If is given that $\Delta ABC \sim \Delta DFE$, $\angle A = 30°$ $\angle C = 50°$, AB = 5 cm, AC = 8 cm and DF = 7.5 cm. Then, which of the following is true? [NCERT Exemplar]

(A) DE = 12 cm, $\angle F = 50°$

(B) DE = 12 cm, $\angle F = 100°$

(C) EF = 12 cm, $\angle D = 100°$

(D) EF = 12 cm, $\angle D = 30°$

$\angle A = \angle D = 30°$

$\angle B = \angle F = 100$

$\angle C = \angle E = 50$

$\frac{AB}{DF} = \frac{BC}{FE} = \frac{AC}{DE}$

5 8 7.5

$\frac{AB}{DF} = \frac{AC}{DE}$

$\frac{5}{7.5} = \frac{8}{DE}$

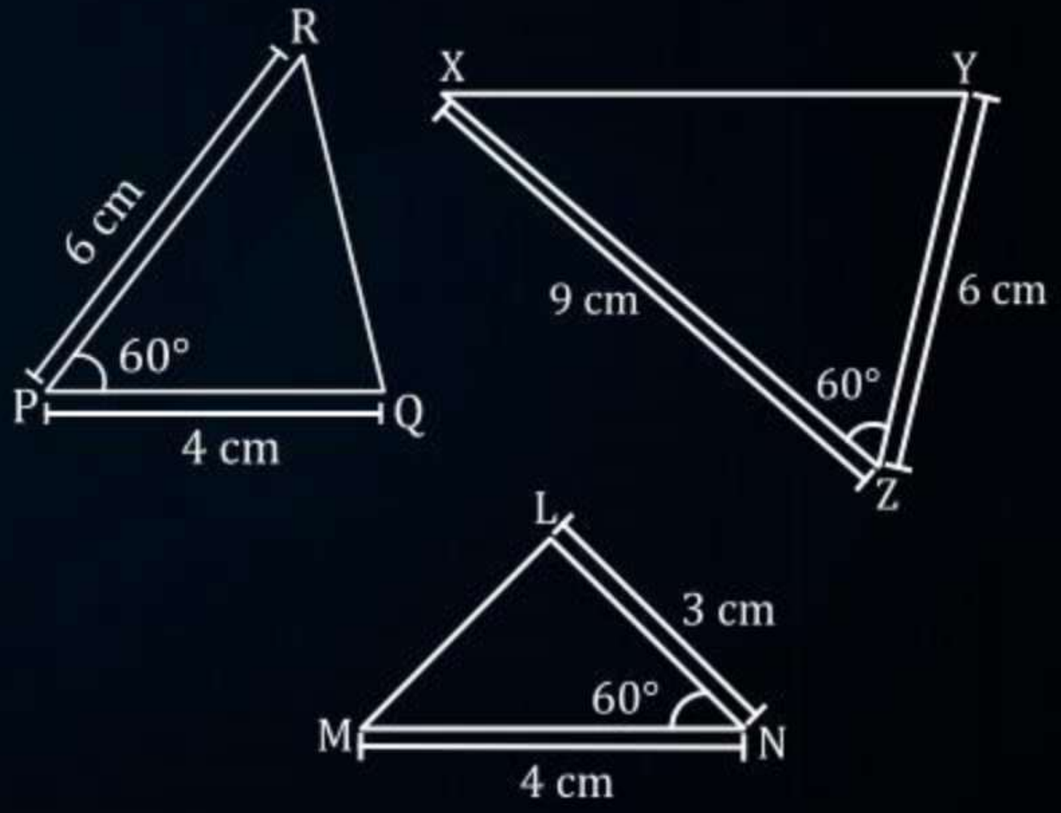
$DE = \frac{7.5 \times 8}{5}$

DE = 12

Topic : Similarity

#Q. Show below are three triangles. The measure of two adjacent sides and included angle are given for each triangle. Which of these triangles are similar?

[CBSE, Additional Questions, 2021-22]



A. ΔRPQ and ΔXZY

B. ΔRPQ and ΔMNL

C. ΔXZY and ΔMNL

D. ΔRPQ, ΔXZY and ΔMNL are similar to one another

Topic : Similarity

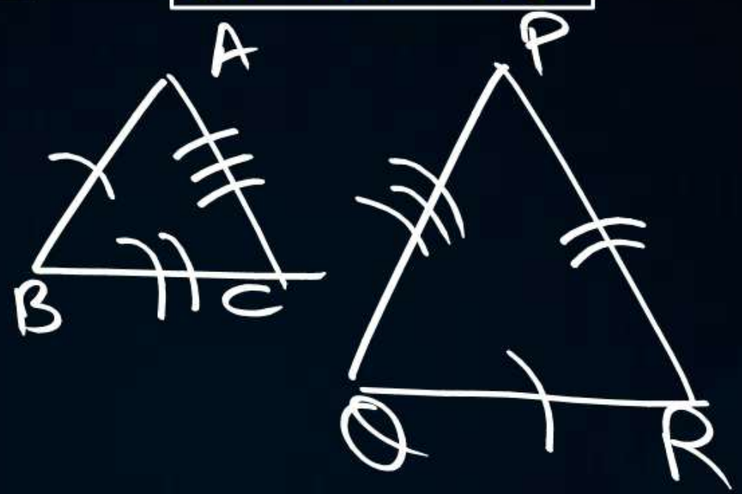
#Q. If in two triangles ABC and PQR, then $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$. [NCERT Exemp.]

(A) $\Delta PQR \sim \Delta CAB$

(B) $\Delta PQR \sim \Delta ABC$

(C) $\Delta CBA \sim \Delta PQR$

(D) $\Delta BCA \sim \Delta PQR$



$\Delta CAB \sim \Delta PQR$

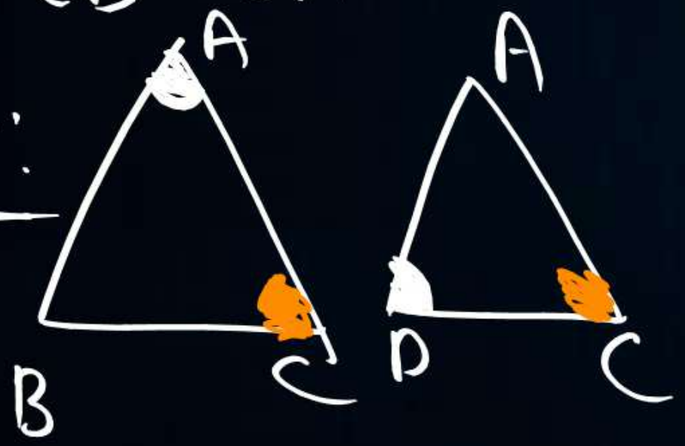
Topic : Similarity

#Q. D is a point on the side BC of ΔABC such that $\angle ADC = \angle BAC$. Prove that $\frac{CA}{CD} = \frac{CB}{CA}$ or, $CA^2 = CB \times CD$. **[NCERT, CBSE 2004]**

G: $\angle ADC = \angle BAC$

TOP: $\frac{CA}{CD} = \frac{CB}{CA}$ or $CA^2 = CB \times CD$

Proof:



In ΔACB and ΔADC

$\angle BAC = \angle ADC$ (given)

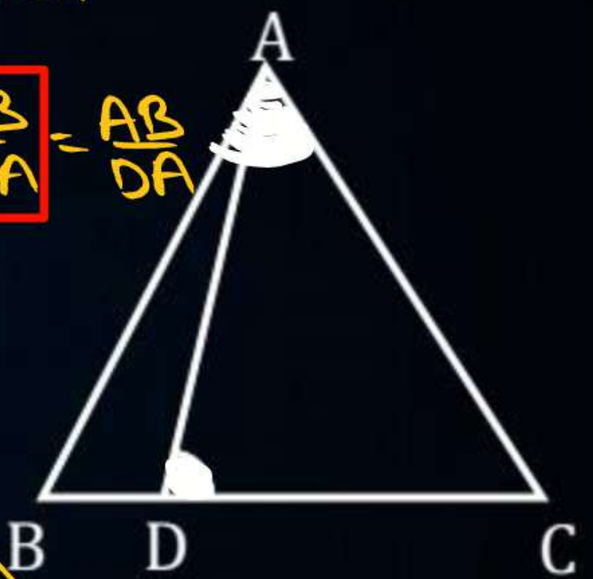
$\angle ACB = \angle ACD$ (common)

By AA similarity criterion,

$\Delta ACB \sim \Delta DCA$

By CPST...

$\frac{AC}{DC} = \frac{CB}{CA} = \frac{AB}{DA}$



Topic : Similarity

#Q. In the figure, PQRS is a trapezium in which PQ ∥ RS. On PQ and RS, there are points E and F respectively such that EF intersects SQ at G. Prove that $EQ \times GS = GQ \times FS$.

[CBSE Term – 1, 2016]

G: PQ ∥ RS.

To P: $EQ \times GS = GQ \times FS$

Proof: $\triangle GFS$ and $\triangle GEQ$

$\angle FSG = \angle GQE$ [A.I.A]

$\angle SGF = \angle QGE$ [V.O.A]

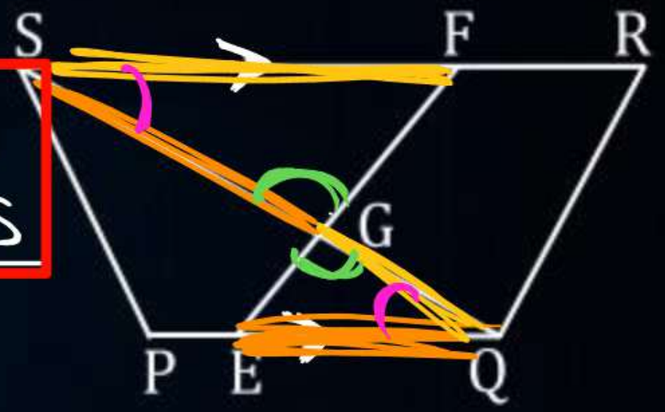
By AA - - -

$\triangle GEQ \sim \triangle GFS$

By CPST - - -

$\frac{GE}{GF} = \frac{EQ}{FS} = \frac{GQ}{GS}$

HP ∥



Homework

DPP

1. Proof's of Congruence Criterion (Recorded)
2. Deleted position
   - Pyth. Theorem..
   - Area of Δ's

Topic : Similarity

#Q. If in two triangles DEF and PQR, $\angle D = \angle Q$ and $\angle R = \angle E$, then which of the following is not true? [NCERT Exemp.]

(A) $\frac{EF}{PR} = \frac{DF}{PQ}$

(B) $\frac{DE}{PQ} = \frac{FE}{RP}$

(C) $\frac{DE}{QR} = \frac{DF}{PQ}$

(D) $\frac{EF}{RP} = \frac{DE}{QR}$

THANK YOU