

SSC FOUNDATION



सम्यान बैच

समय से तैयारी, समय से सफलता

MATHEMATICS

GEOMETRY - TRIANGLE

समरूप त्रिभुज

★ सबसे सटीक, सबसे बेहतर ★



सटीक
CONCEPT



BEST
STRATEGY



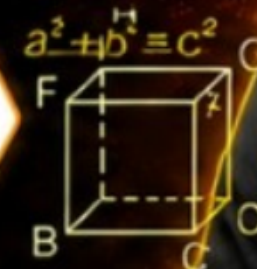
सटीक
PRACTICE



बेहतरीन
RESULT

LIVE STREAM : 11:00 AM

BY - SHASHI SIR





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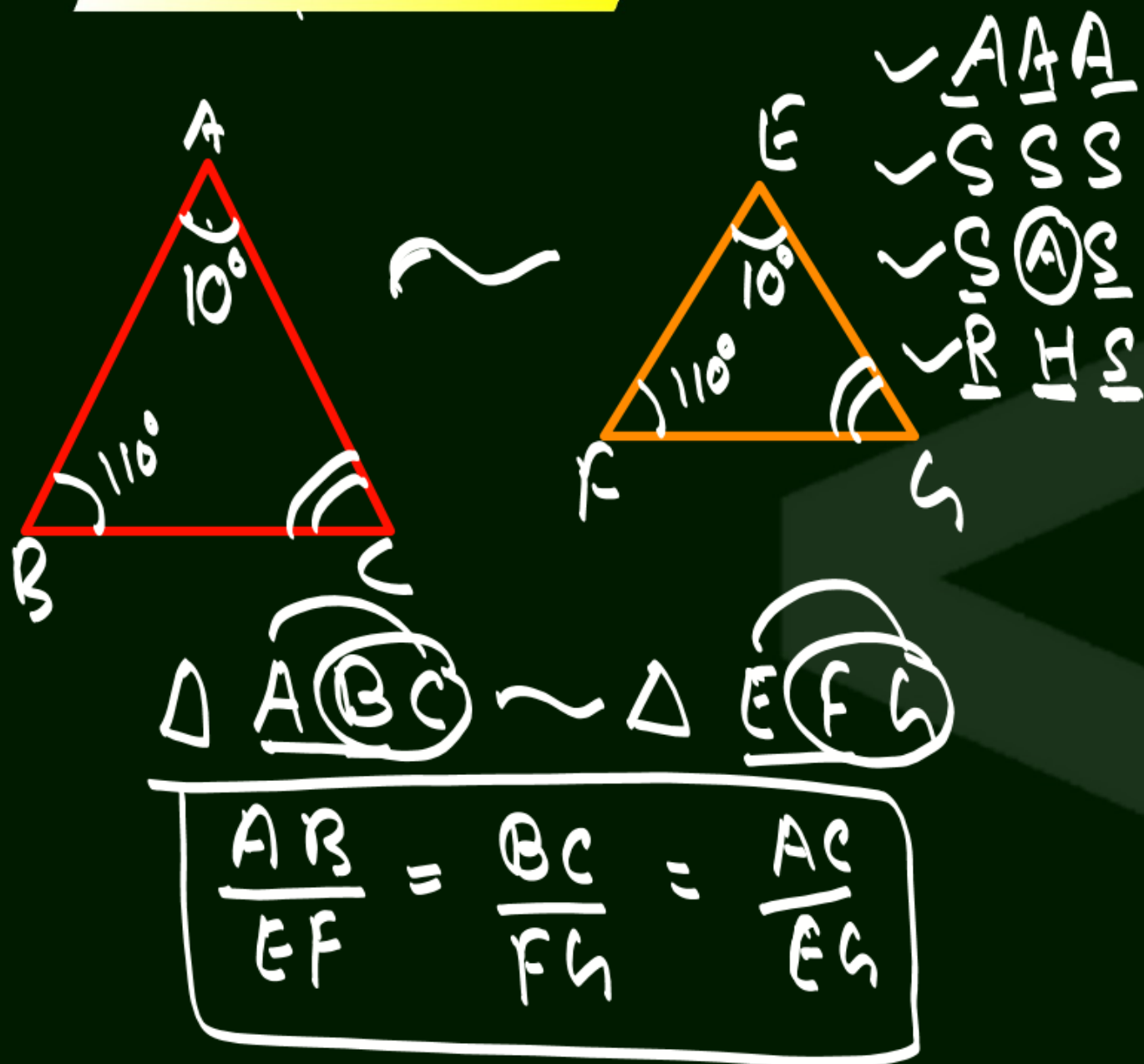
Triangle (त्रिभुज)

Triangle (condition)



Similarity
(समरूपता)

Congruent
(सर्वांगसमता)

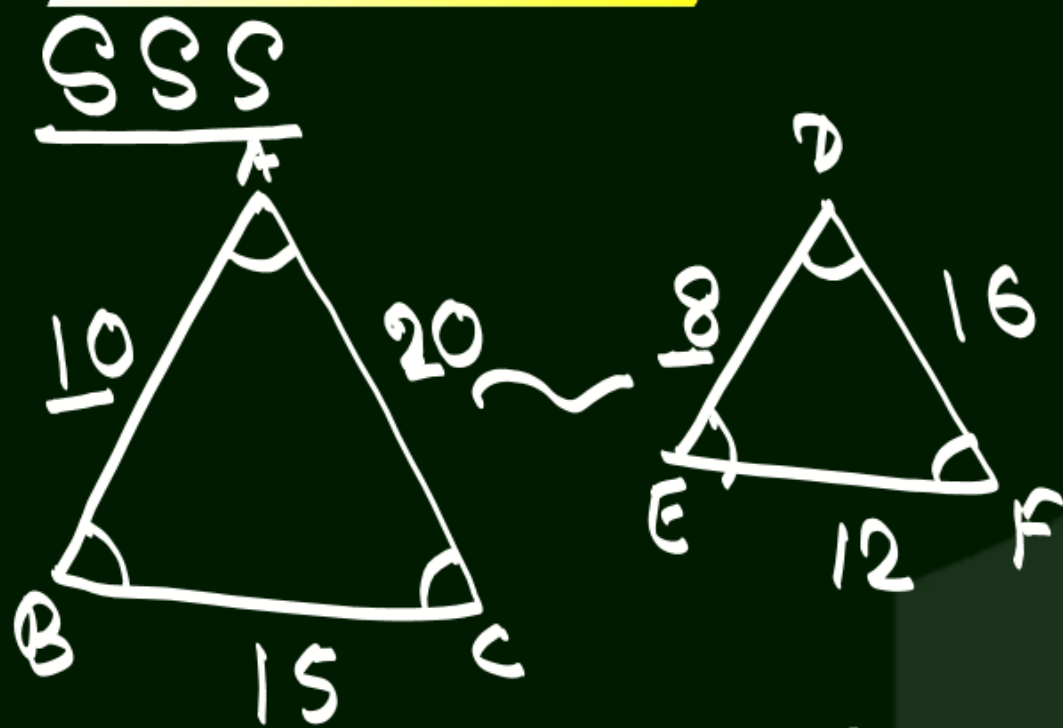


Conditions for Similarity of triangles/त्रिभुजों की संमरूपता के लिए शर्तें
Angle - Angle - Angle (AAA):-

If three corresponding angle of two triangle are equal, then two triangle are similar.

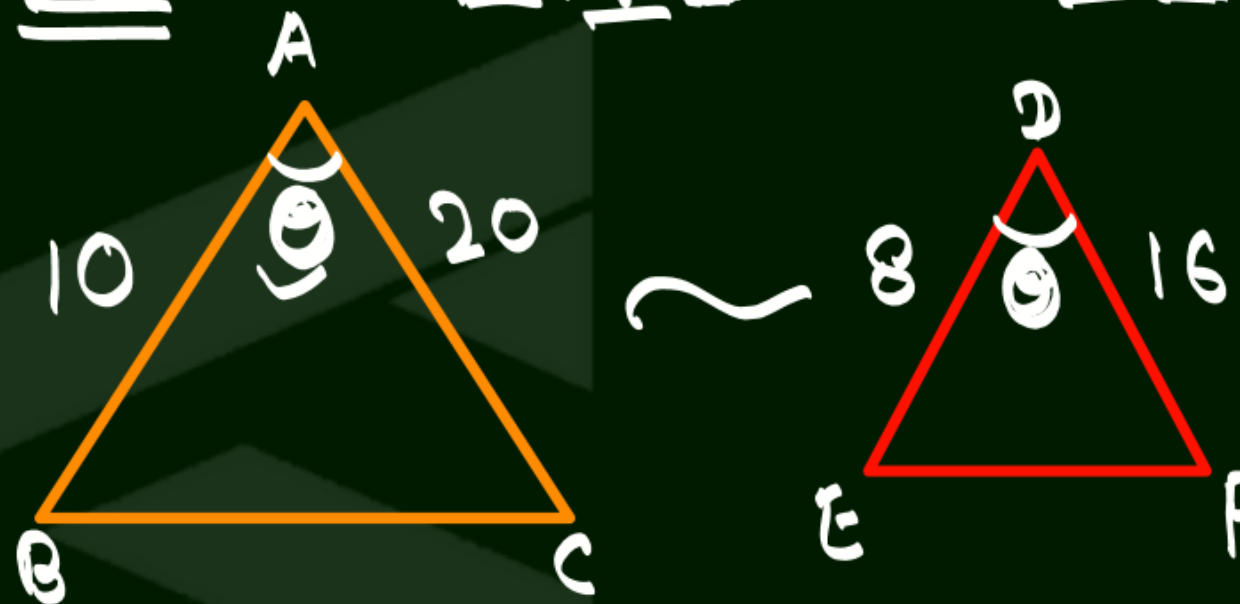
यदि दो त्रिभुज के तीनों संगत कोण बराबर है तो दोनों त्रिभुज समरूप होंगे।

$\angle BCA \angle CAB = \angle GEF \& \angle ABC = \angle EFG, = \angle FGE$ then $\Delta ABC \sim \Delta EFG$



$$\frac{5}{4} = \frac{10}{8} = \frac{20}{16} = \frac{15}{12} = \left(\frac{5}{4}\right)$$

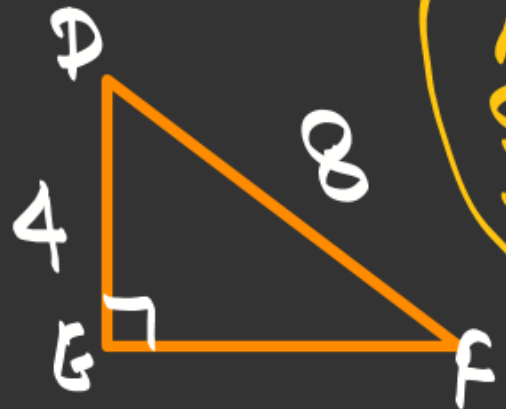
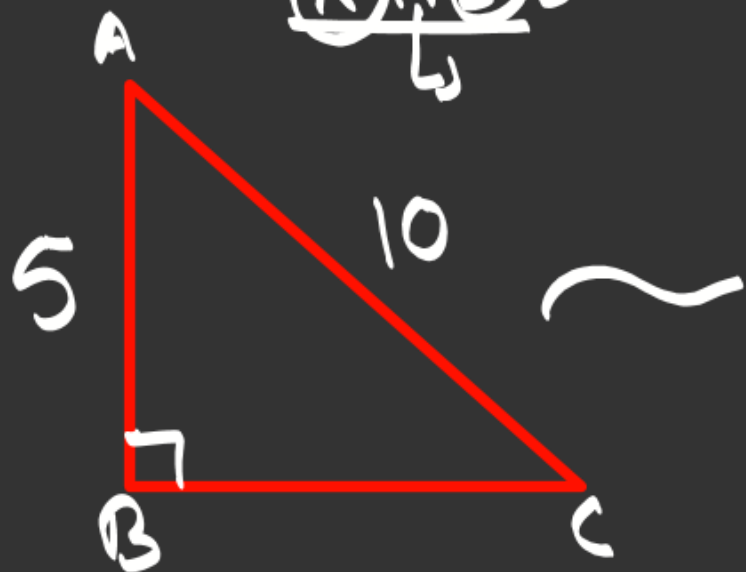
SAS $\triangle ABC \sim \triangle DEF$



$$\frac{AB}{DE} = \frac{AC}{DF} = \left[\frac{5}{4}\right] \quad \angle A = \angle D$$

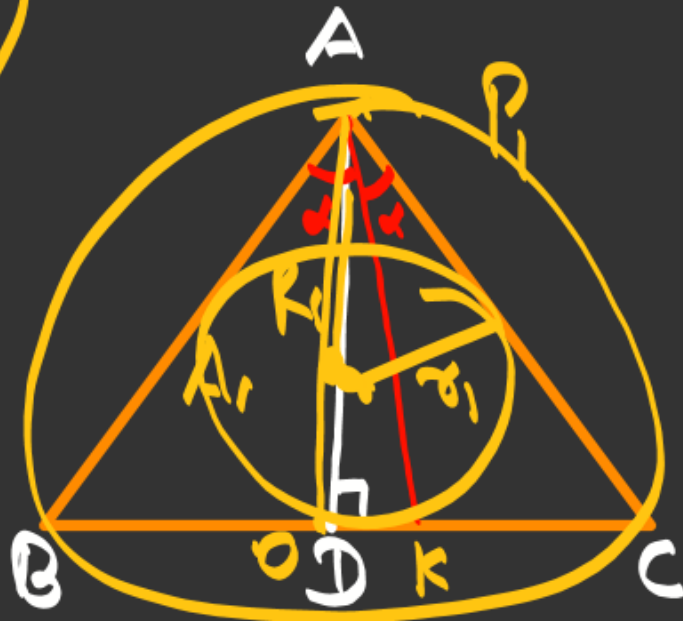
$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

(RHS) →



SSS
AA
SAS
RHS

समरूप



$$\triangle ABC \sim \triangle DEF$$

$$\boxed{\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}}$$

$$\left(\frac{r_1}{r_2}\right)^2 = \left(\frac{\alpha_1}{\alpha_2}\right)^2 = \frac{A_1}{A_2}$$

$$\left[\frac{AB}{EF}\right]^2 = \left[\frac{BC}{FG}\right]^2 = \left[\frac{AC}{EG}\right]^2 = \left[\frac{AO}{Em}\right]^2 = \left[\frac{AK}{EK_1}\right]^2 = \left(\frac{AO}{EP}\right)^2 = \left[\frac{r_1}{r_2}\right]^2$$

SIMILAR TRIANGLES

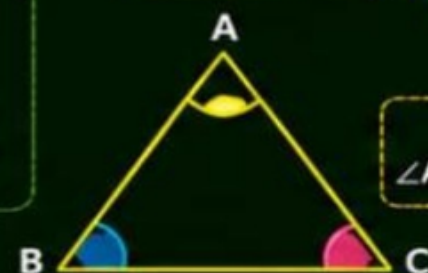
(समान त्रिभुज)

DEFINITION

If two triangles have the same shape but not necessarily the same size, then such triangles are called **Similar Triangles**.

SYMBOLIC REPRESENTATION

If $\triangle ABC \sim \triangle PQR$
(read as "triangle ABC is similar to triangle PQR")



$$\triangle ABC \sim \triangle PQR$$

$$\angle A = \angle P, \angle B = \angle Q, \angle C = \angle R$$



BASIC PROPORTION

If $\triangle ABC \sim \triangle PQR$, then the corresponding sides are proportional.

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP}$$

CORRESPONDENCE

$$\begin{aligned} \angle A &\hat{=} \angle P, & \angle B &\hat{=} \angle Q, & \angle C &\hat{=} \angle R \\ AB &\hat{=} PQ, & BC &\hat{=} QR, & CA &\hat{=} PR \end{aligned}$$

CONDITIONS FOR SIMILARITY OF TRIANGLES

1 AA (Angle – Angle) Similarity

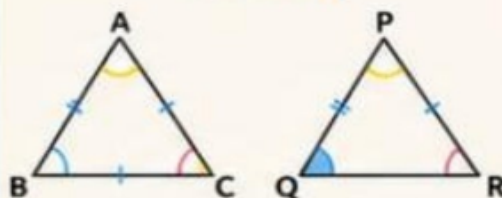


If two angles of one triangle are equal to the two angles of another triangle, then the triangles are similar.

$$\angle A = \angle P, \angle B = \angle Q$$

$$\Rightarrow \triangle ABC \sim \triangle PQR$$

2 SAS (Side – Angle – Side) Similarity

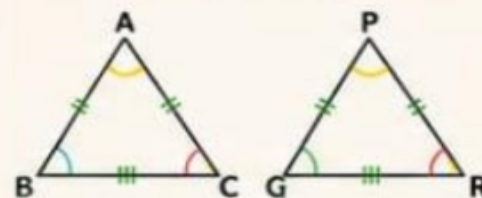


If two sides of one triangle are proportional to two sides of another triangle and the included angles are equal, then the triangles are similar.

$$\frac{AB}{PQ} = \frac{AC}{PR} \text{ and } \angle A = \angle P$$

$$\Rightarrow \triangle ABC \sim \triangle PQR$$

3 SSS (Side – Side – Side) Similarity

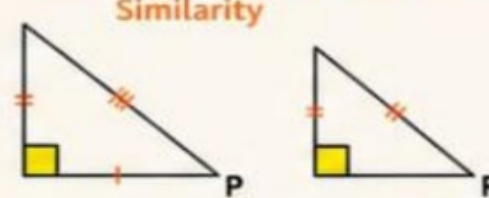


If three sides of one triangle are proportional to the three sides of another triangle, then the triangles are similar.

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{PR}$$

$$\Rightarrow \triangle ABC \sim \triangle PQR$$

4 RHS (Right angle – Hypotenuse – Side) Similarity

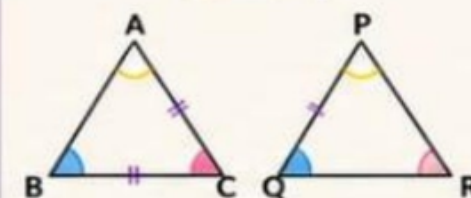


If in two right triangles, the hypotenuse and one side of one triangle are respectively proportional to the hypotenuse and one side of another triangle, then the triangles are similar.

$$\frac{\text{Hyp}_1}{\text{Hyp}_2} = \frac{\text{Side}_1}{\text{Side}_2}$$

$$\Rightarrow \triangle ABC \sim \triangle PQR$$

5 SS (Side – Side) Similarity

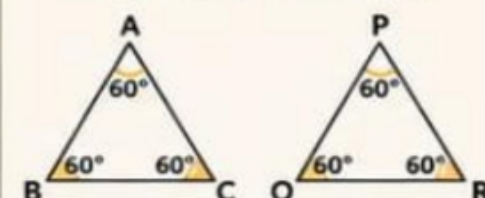


If two sides of one triangle are proportional to two sides of another triangle and the third sides are also in the same ratio, then the triangles are similar.

$$\frac{AB}{PQ} = \frac{AC}{PR} = \frac{BC}{QR}$$

$$\Rightarrow \triangle ABC \sim \triangle PQR$$

6 Special Case (Equilateral Triangles)



All equilateral triangles are similar to each other.

$$\triangle ABC \sim \triangle PQR$$

(each angle = 60°)

★ IMPORTANT FACTS

- ✓ Similar triangles have the same shape.
- ✓ Corresponding angles are equal.
- ✓ Corresponding sides are proportional.
- ✓ The ratio of areas = (ratio of corresponding sides)²
- ✓ The ratio of perimeters = ratio of corresponding sides

💡 USEFUL IN



Height & Distance Problems



Map Scale & Measurement

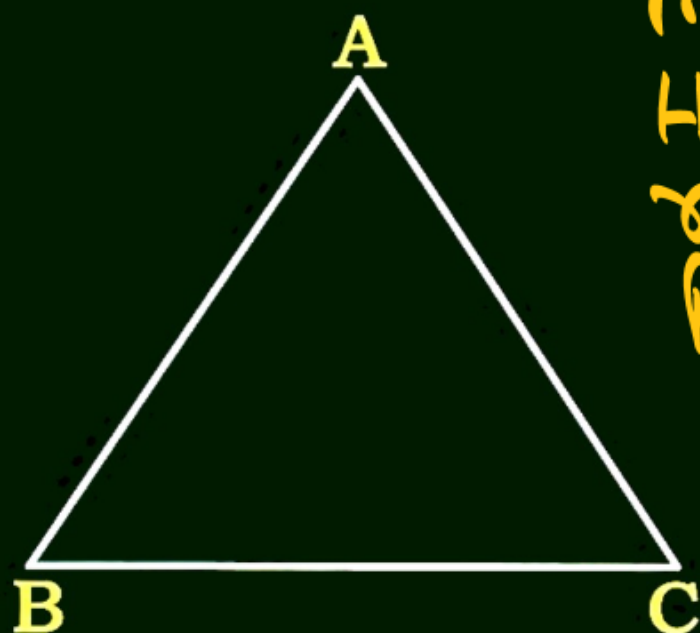


Real Life Applications

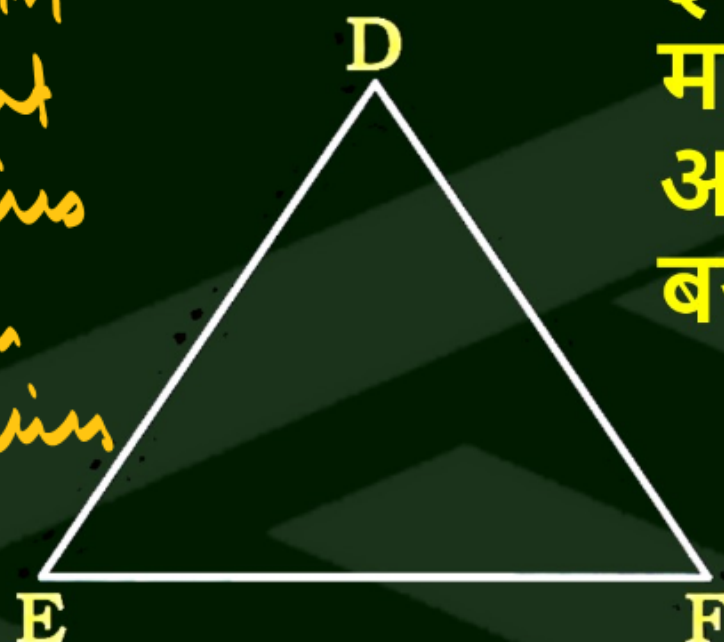
💡 QUICK TIP

Remember: AAA is not a similarity condition, because sum of angles of a triangle is always 180°.





m = median
 H = Height
 r = inradius
 R = circumradius

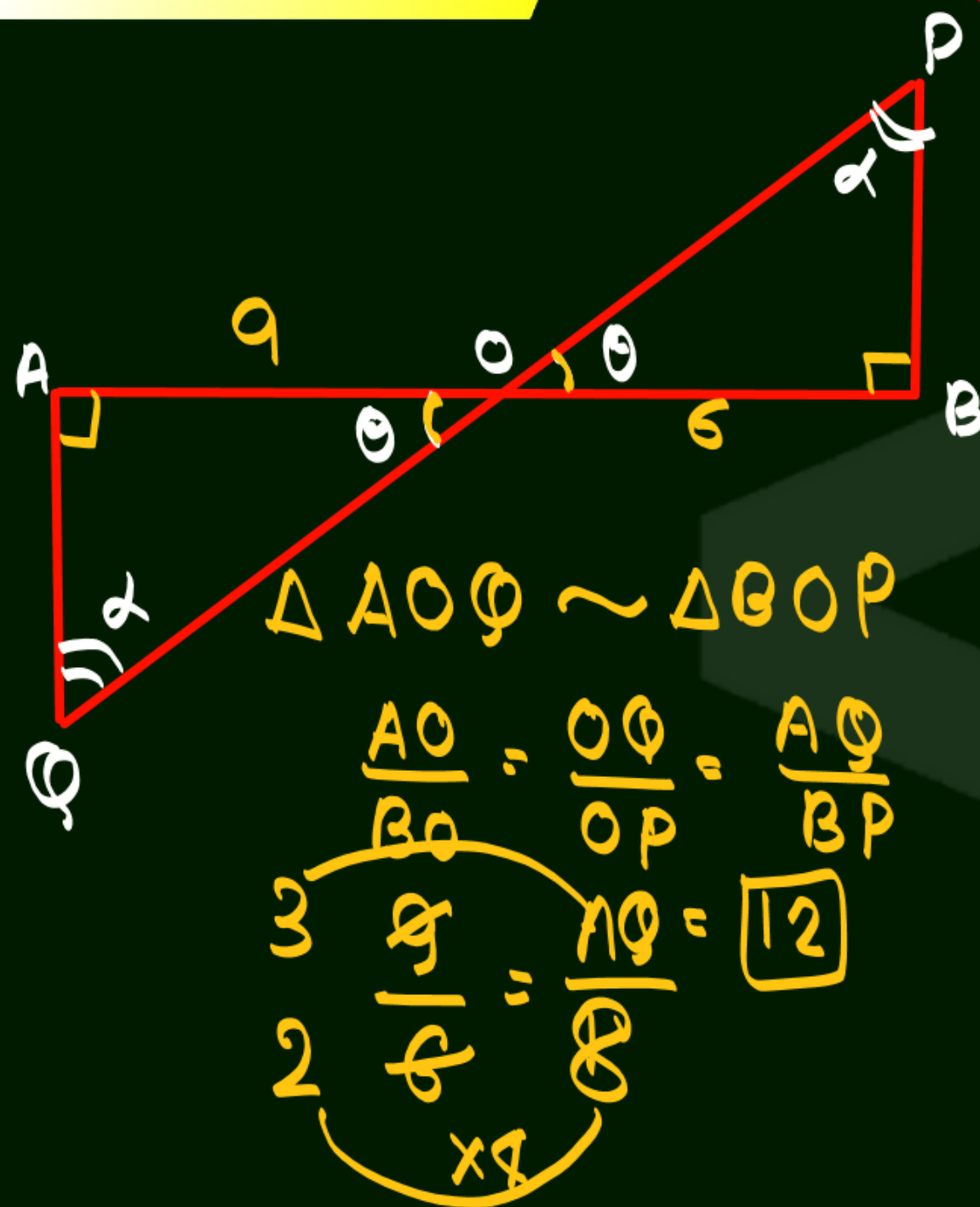


इनकी संगत ऊंचाई, संगत माधिकाओं एवं संगत कोणों के अर्धक रेखा खंडों का अनुपात के बराबर होता है ?

$$\frac{\text{Perimeter}(\triangle ABC)}{\text{Perimeter}(\triangle DEF)} = \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{M_1}{M_2} = \frac{H_1}{H_2} = \frac{r_1}{r_2} = \frac{R_1}{R_2} = \frac{AB_1}{AB_2}$$

✓ $[AB_1 \rightarrow \text{Angle by sector of } \triangle ABC]$

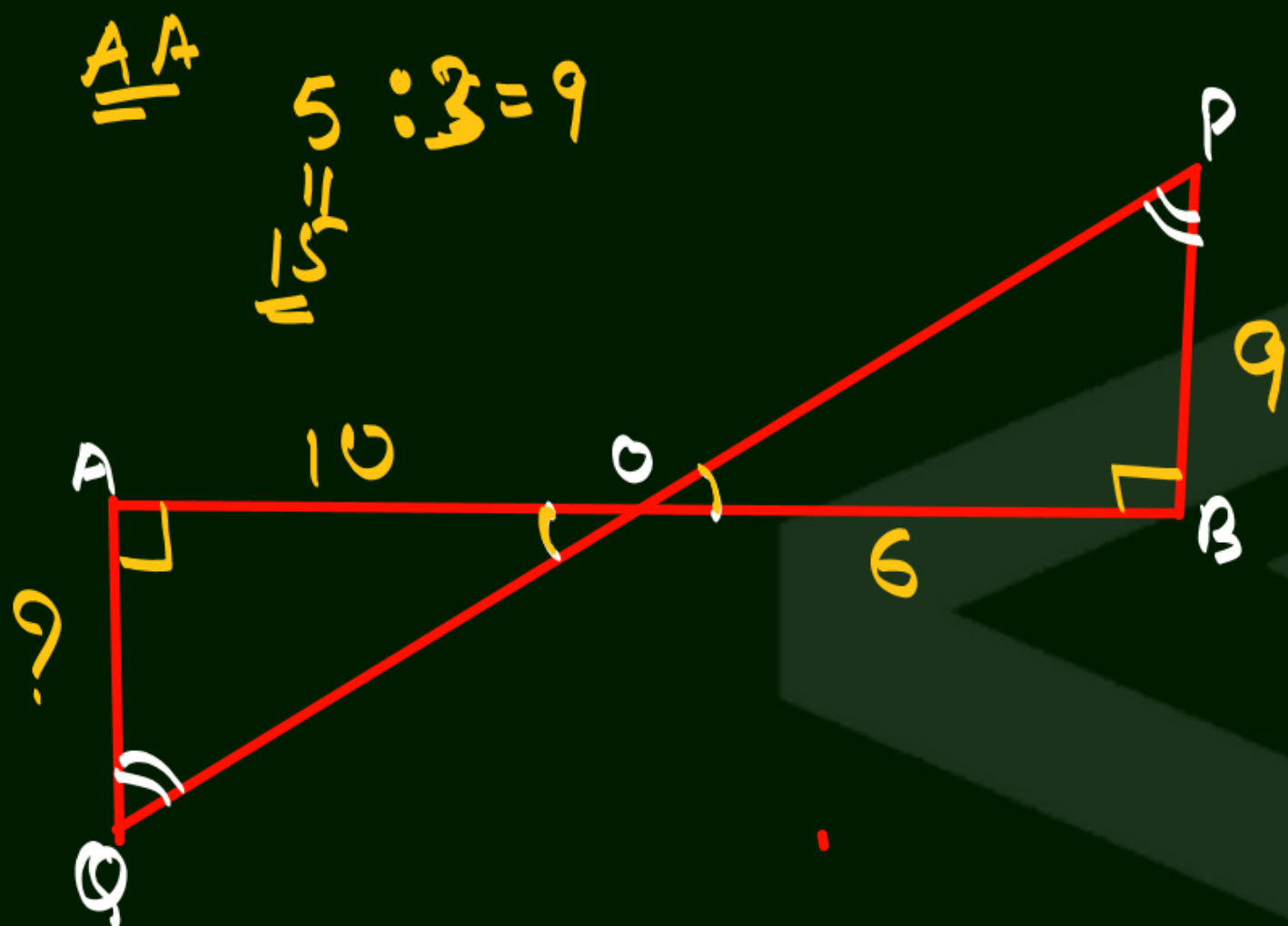
✓ $[AB_2 \rightarrow \text{Angle by sector of } \triangle DEF]$



In the given figure, QA and PB are perpendiculars to AB. If AO = 9cm , BO = 6cm and BP = 8cm . Find AQ:

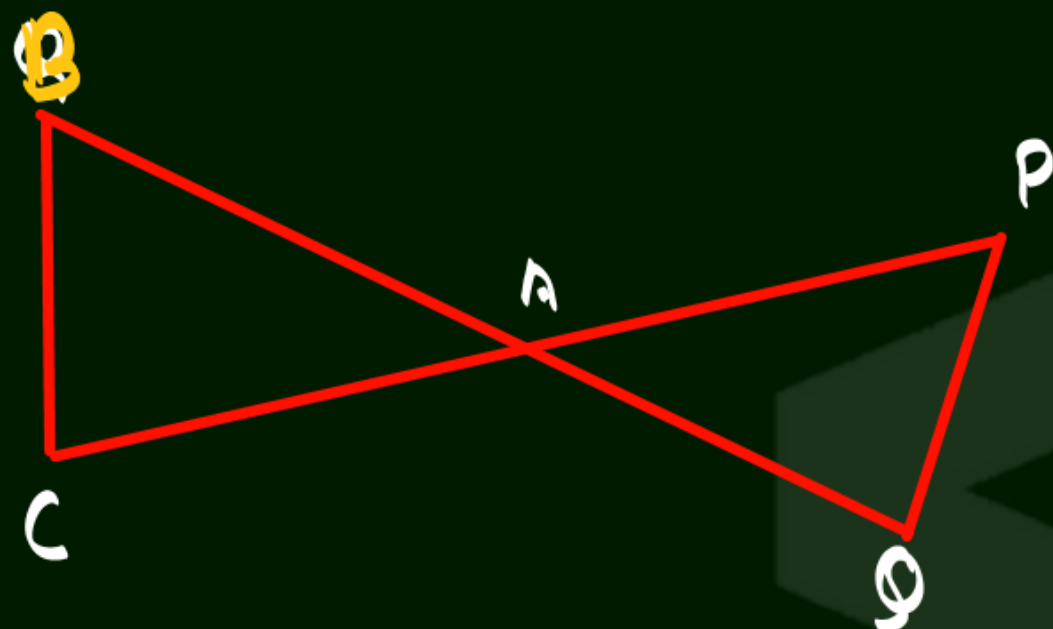
दिए गए चित्र में और QA और PB, AB पर लंब हैं। यदि 9cm, BO = 6cm और BP = 8cm. तब AQ का मान ज्ञात करें?

- (a) 12cm
- (b) 13cm
- (c) 14cm
- (d) 15cm



In the figure QA and PB are perpendicular to AB. If $AO = 10\text{cm}$, $BO = 6\text{cm}$ and $PB = 9\text{cm}$. Find AQ: /
 दिए गए चित्र में QA और PB, AB पर लंब है। यदि $AO = 10\text{cm}$, $BO = 6\text{cm}$ और $PB = 9\text{cm}$, तब AQ का मान ज्ञात करो ?

- (a) 8cm
- (b) 9cm
- ☒ (c) 15cm
- (d) 12cm



In the figure $\triangle ACB \sim \triangle APQ$. If $BC = 8$ cm, $PQ = 4$ cm, $AP = 2.8$ cm, find CA :
 दिए गए चित्र में $\triangle ACB \sim \triangle APQ$ यदि $BC = 8$ cm, $PQ = 4$ cm $AP = 2.8$ cm तब CA का मान ज्ञात करो?

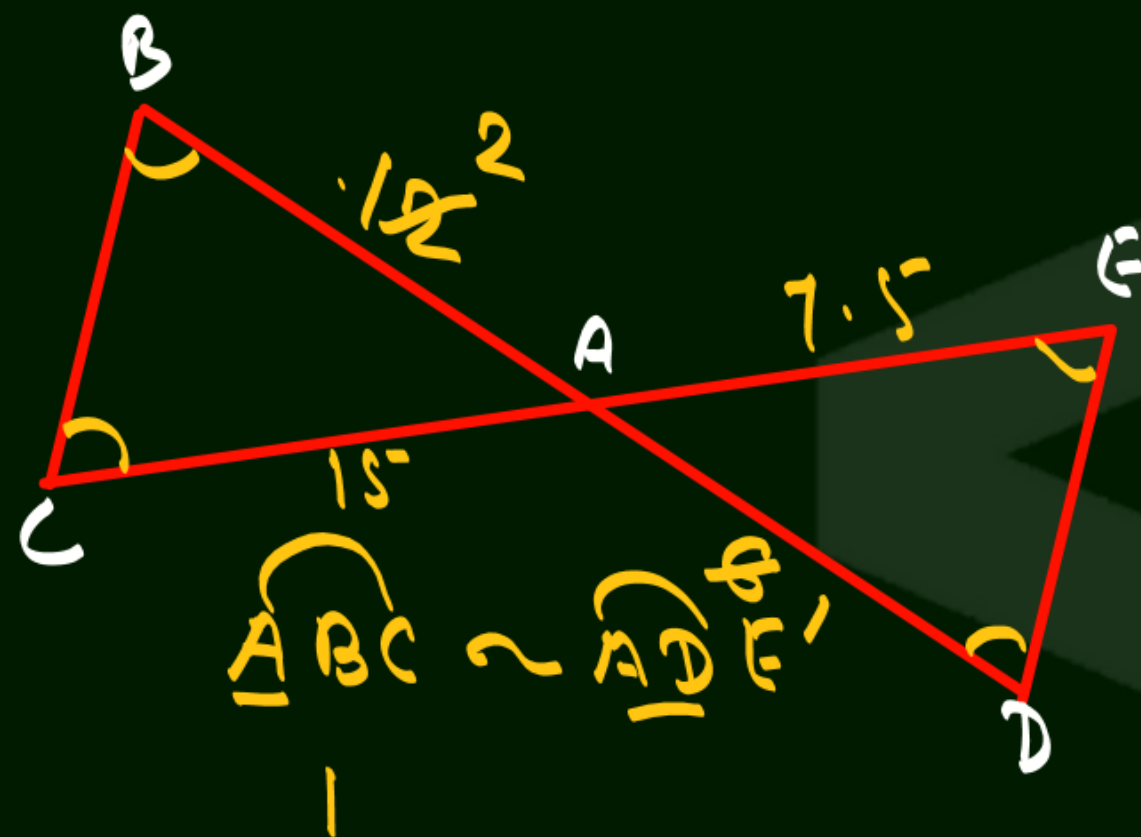
- (a) 8cm
- (b) 6.5cm
- ✓ (c) 5.6cm
- (d) N.O.T

$$\frac{AC}{AP} = \frac{CB}{PQ} = \frac{AB}{AQ}$$

$$2 \frac{AC}{2.8} = \frac{8}{4} \quad 2$$

$$1 = \frac{8}{4} \quad 1$$

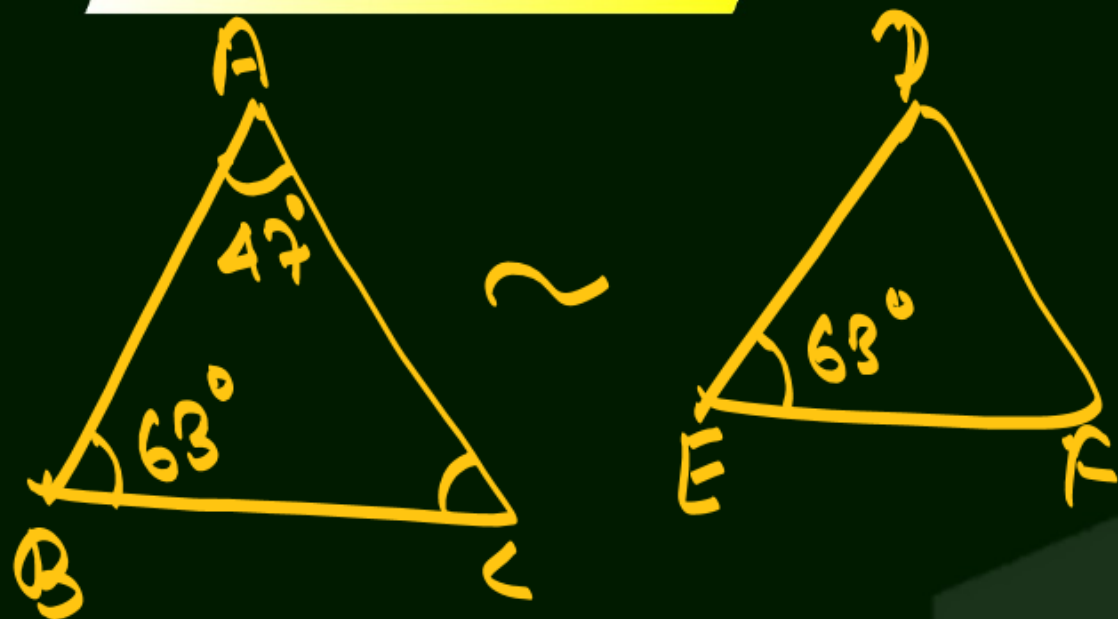
$$AC = 5.6$$



In the given figure $AB = 12\text{cm}$ $AC = 15\text{cm}$ and $AD = 6\text{ cm}$. $BC \parallel DE$, Find the length of AE :

दिए गए चित्र में $AB = 12\text{cm}$, $AC = 15\text{ cm}$ और $AD = 6\text{cm}$ यदि $BC \parallel DE$, तब AE की लंबाई ज्ञात करो?

- (a) 6 cm
- ~~(b) 7.5 cm.~~
- (c) 9 cm
- (d) 10 cm



$$\begin{aligned}\angle C &= 180^\circ - (63 + 47) \\ &= 180^\circ - 110 = 70^\circ\end{aligned}$$

If $\triangle ABC$ is similar to $\triangle DEF$, such that $\angle A = 47^\circ$ and $\angle E = 63^\circ$, then $\angle C$ is equal to:

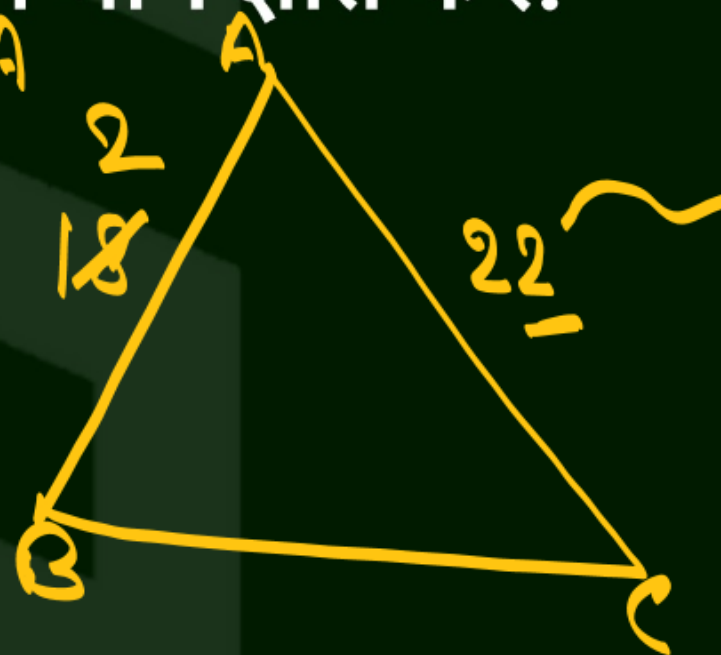
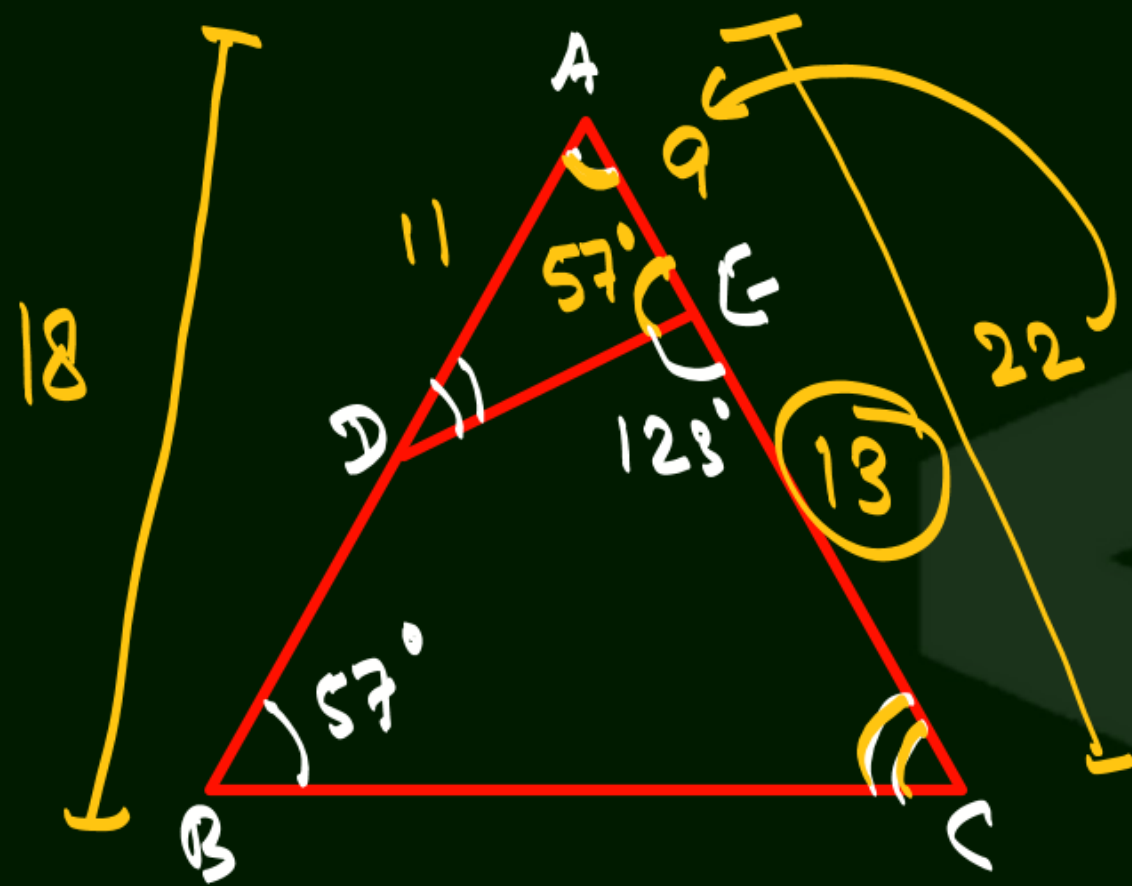
यदि $\triangle ABC$ तथा $\triangle DEF$ इस प्रकार समरूप है कि $\angle A = 47^\circ$ और $\angle E = 63^\circ$, तब $\angle C$ बराबर है।

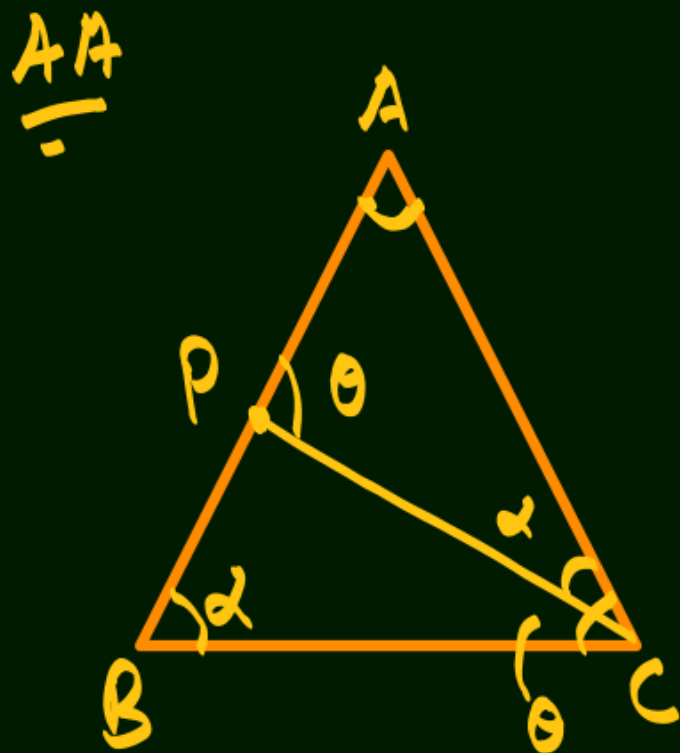
- (a) ~~70°~~
- (b) 50°
- (c) 40°
- (d) 60°

In the given figure, $AD = 11\text{cm}$, $AB = 18\text{cm}$ and $AE = 9\text{cm}$ Find EC :

दिए गए चित्र में $AD = 11\text{cm}$, $AB = 18\text{cm}$ और $AE = 9\text{cm}$ तब EC का मान ज्ञात करें:

- (a) 11cm
- (b) 12cm
- (c) 13cm
- (d) 14cm





$$\triangle ABC \sim \triangle ACP$$

$$\frac{AC}{AP} = \frac{BC}{CP}$$

$$\frac{9}{AP} = \frac{15}{12}$$

$$AP = \frac{9 \times 12}{15} = 7.2$$

ABC is a triangle and P is any point on AB such that $\angle ACP = \angle ABC$, if $AC = 9$ cm, $CP = 12$ cm and $BC = 15$ cm then AP is equal to:

त्रिभुज ABC में भुजा AB पर कोई बिंदु P इस प्रकार है कि $\angle ACP = \angle ABC$ यदि $AC = 9$ cm $CP = 12$ cm and $BC = 15$ cm तब AP बराबर है।

- (a) 7.2 cm
- (b) 8.2 cm
- (c) 9.0 cm
- (d) 5.6 cm

$$\triangle ABC \sim \triangle DEF$$

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{2}{3}$$

$$\frac{2}{3} = \frac{5}{x} = \frac{6}{9}$$

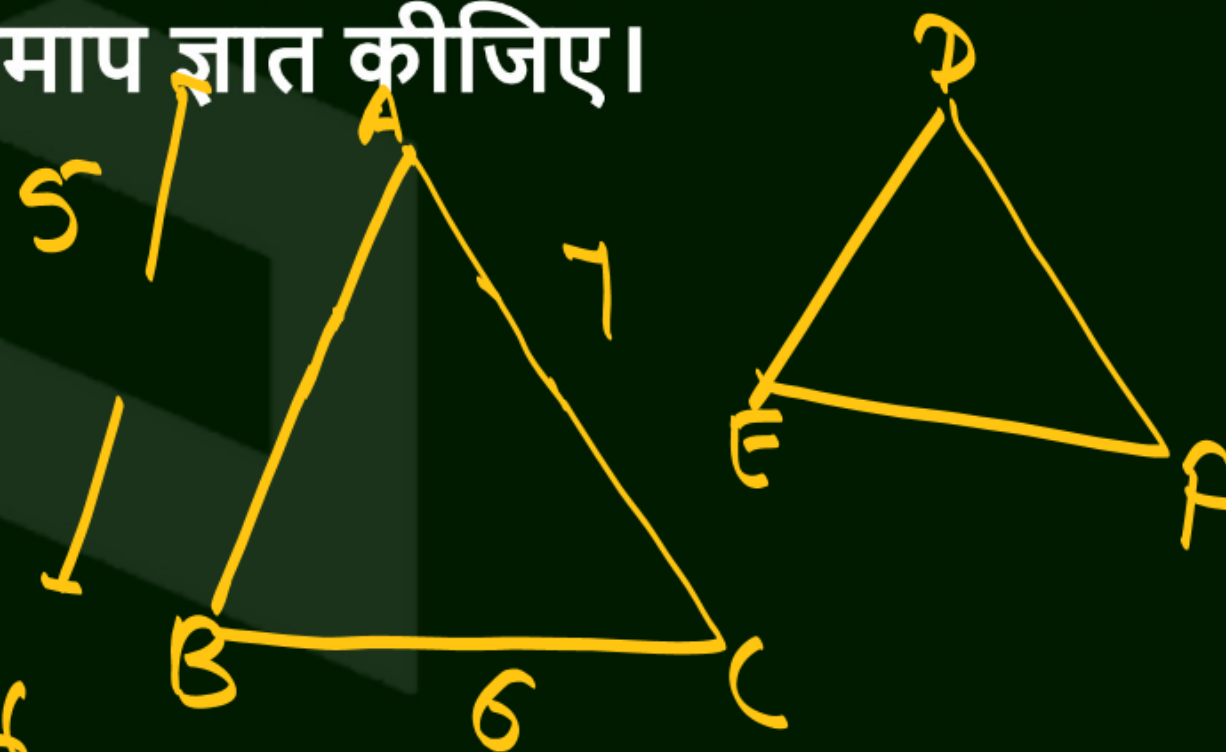
$$EF = 9$$

$\triangle ABC$ and $\triangle DEF$ are similar such that $AB = 5\text{cm}$, $BC = 6\text{cm}$, $DE = 7.5\text{cm}$ and $DF = 10.5\text{cm}$. Then find the perimeter of $\triangle ABC$.

$\triangle ABC$ और $\triangle DEF$ इस प्रकार समरूप हैं कि $AB = 5\text{ cm}$, $BC = 6\text{cm}$, $DE = 7.5\text{cm}$ और $DF = 10.5\text{ cm}$ है। फिर $\triangle ABC$ का परिमाप ज्ञात कीजिए।

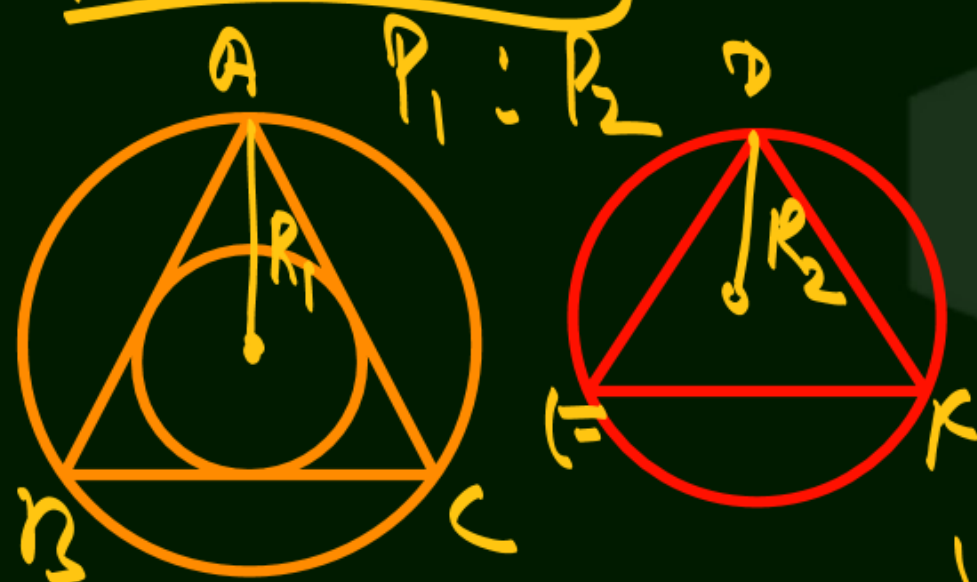
- (a) 15cm
- (b) 18cm
- (c) 21cm
- (d) 24cm

$$P = 5 + 6 + 6 = 18$$



$$\triangle ABC \sim \triangle DEF$$

$$\frac{AB}{DE} = \frac{R_1}{R_2}$$

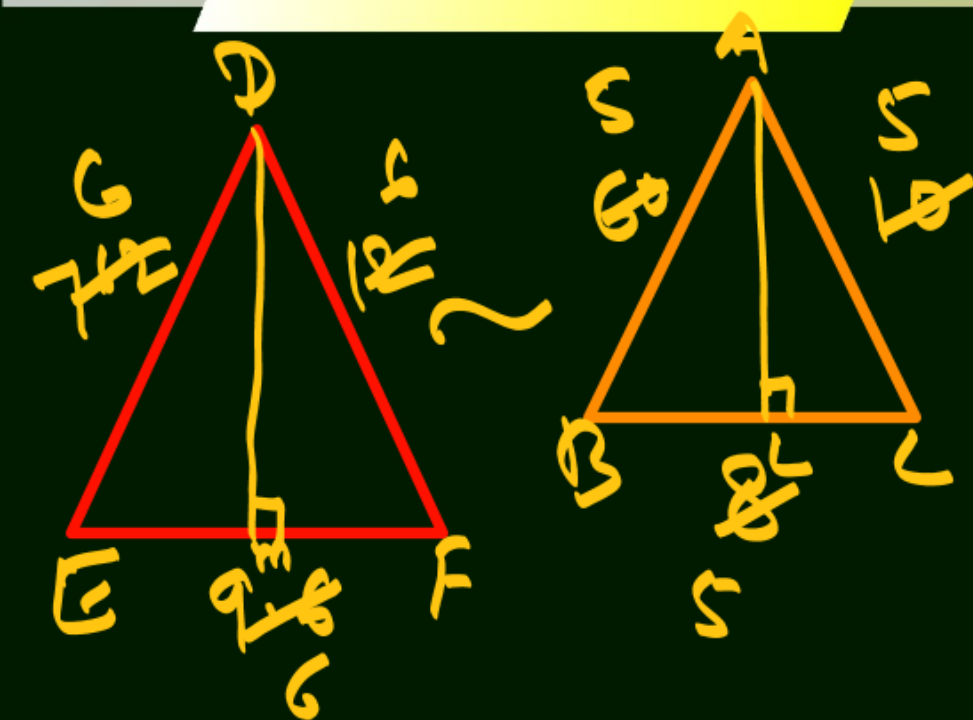


$$\frac{AB}{DE} = \frac{R_1}{R_2}$$

In two similar triangles to ABC and DEF, if their corresponding sides AB and DE are in the ratio 4:5, find the ratio of their circumradius.

ABC और DEF के समरूप दो त्रिभुजों में, यदि उनकी संगत भुजाएँ AB और DE का अनुपात 4:5 है, तो उनके परित्रिज्या का अनुपात ज्ञात कीजिए।

- (a) 9:4
- (b) 3:7
- (c) 4:9
- (d) 4:5



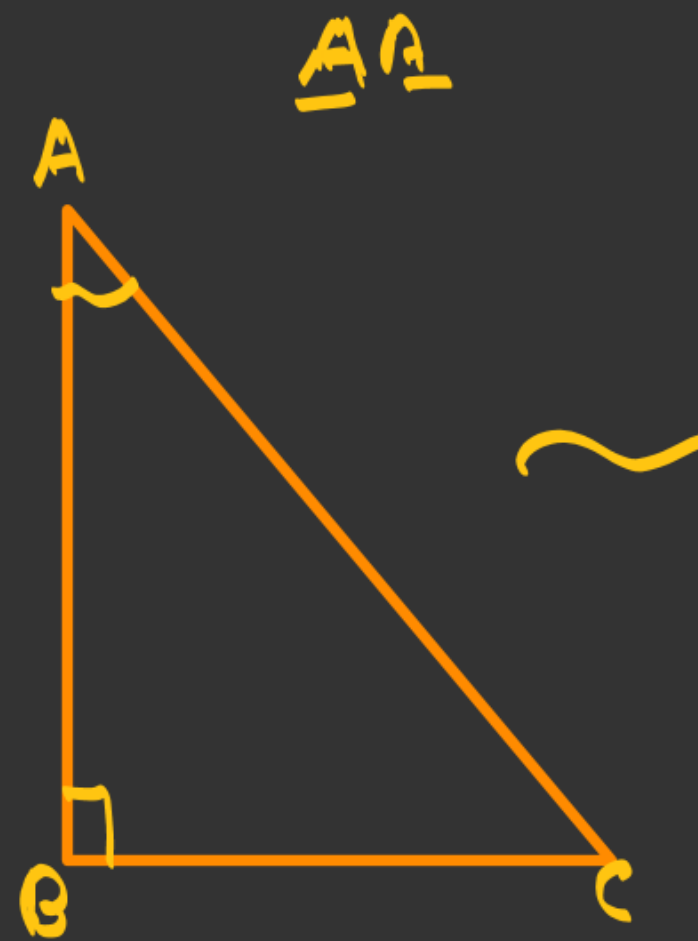
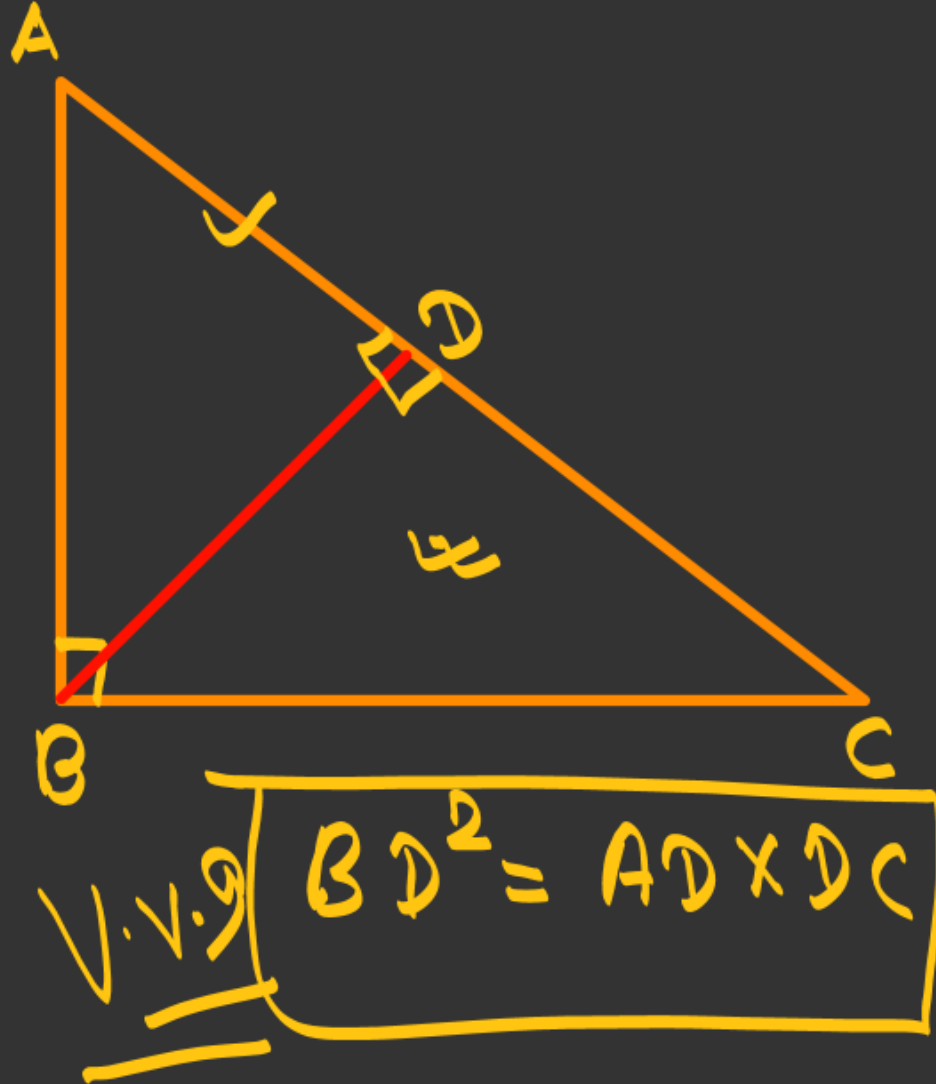
$$\begin{aligned} AL : DM \\ 5 : 6 \\ = \end{aligned}$$

In $\triangle ABC$ and $\triangle DEF$, it is being given that: $AB = 6\text{cm}$, $BC = 8\text{cm}$, $CA = 10\text{cm}$, $DE = 7.2$, $EF = 9.6\text{cm}$ and $FD = 12\text{cm}$. If $AL \perp BC$ and $DM \perp EF$. Find $AL : DM$.

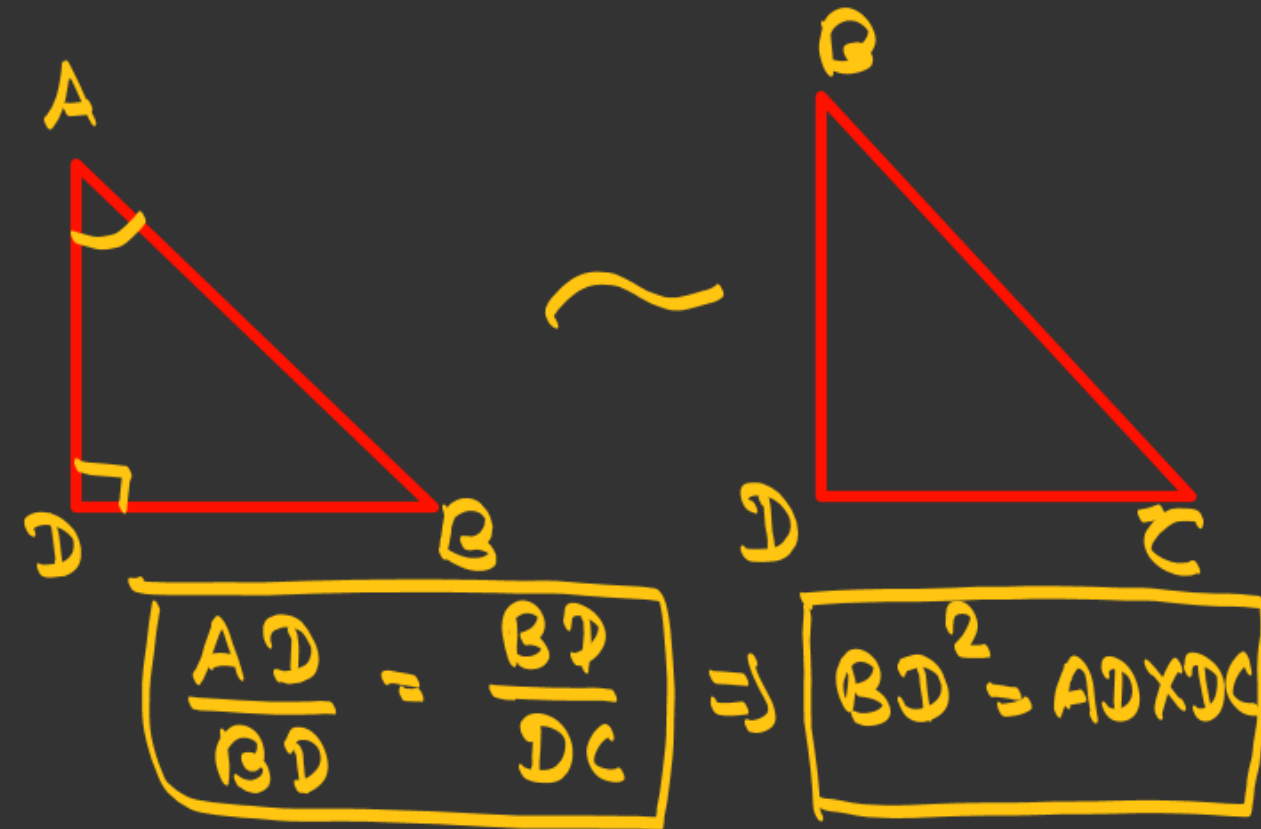
$\triangle ABC$ और $\triangle DEF$ में, यह दिया जा रहा है कि: $AB = 6\text{ cm}$, $BC = 8\text{cm}$, $CA = 10\text{cm}$, $DE = 7.2$, $EF = 9.6\text{cm}$ और $FD = 12\text{cm}$ यदि $AL \perp BC$ और $DM \perp EF$ तो $AL : DM$?

- (a) 5:4
- ☒ (b) 5:6
- (c) 2:3
- (d) 3:4

Right Angled Triangle



$$\frac{AB}{AD} = \frac{BC}{DB} = \frac{AC}{AB}$$



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

$AB^2 = AD \times AC$

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