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CLASS – 9

MATHEMATICS

Chapter – 8

Quadrilaterals

Part - 7

Exercise 8.1 (Question 1 - 2)

Vikas Saini

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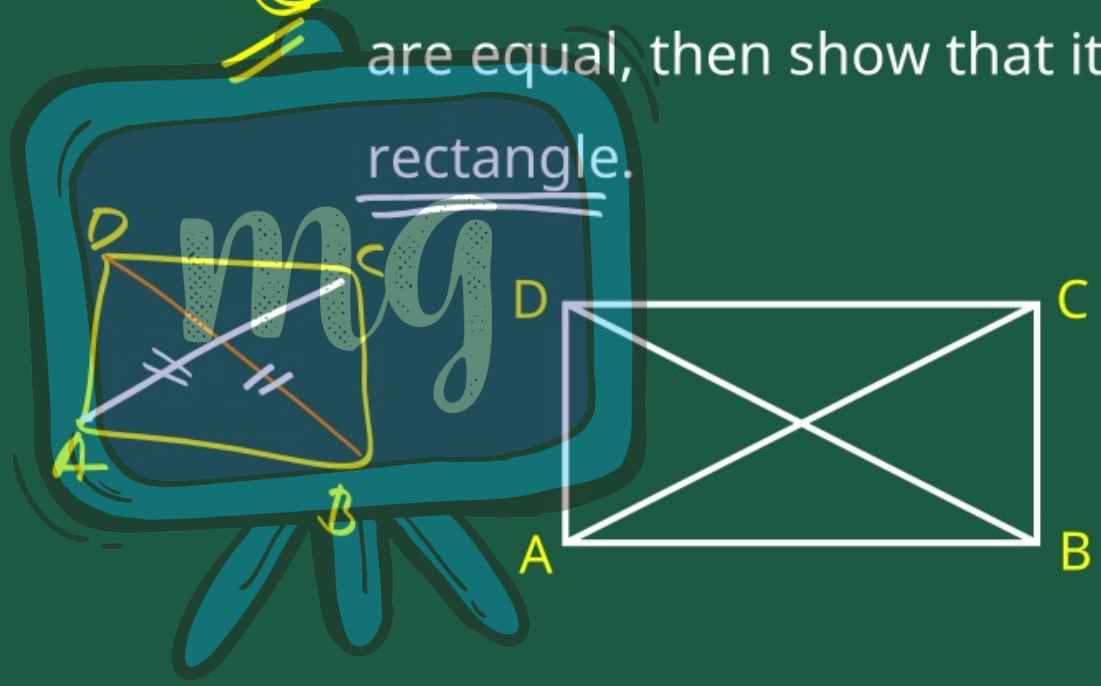
1. If the diagonals of a parallelogram are equal, then show that it is a rectangle.



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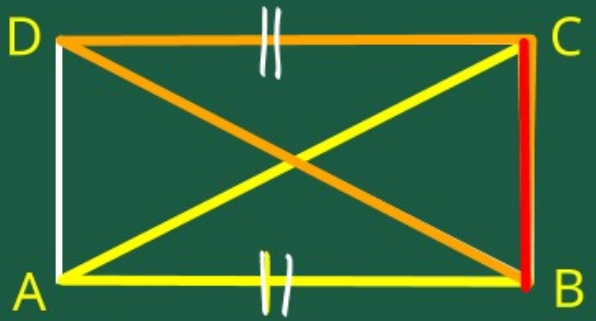
Given :→ ABCD is llgm

in which

diagonals AC = diagonal BD



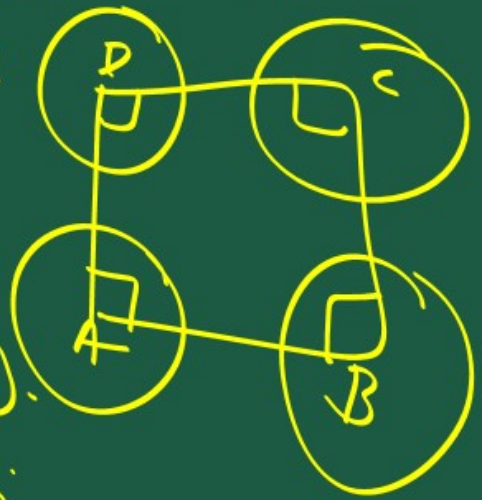
To prove :→ ABCD is Rectangle

Soln :→ In $\triangle ABC$ & $\triangle DCB$

$AB = DC$ [∵ ABCD is llgm]

$BC = CB$ [common]

$AC = DB$ [Given]



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$\Delta ABC \cong \Delta DCB$ By SSS Rule

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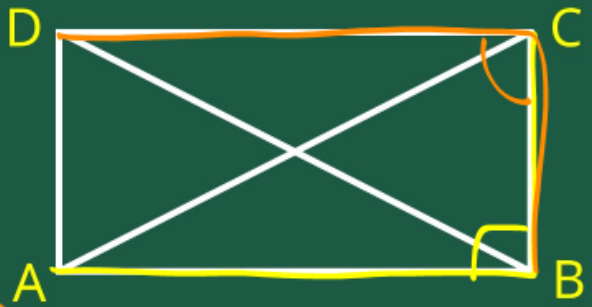
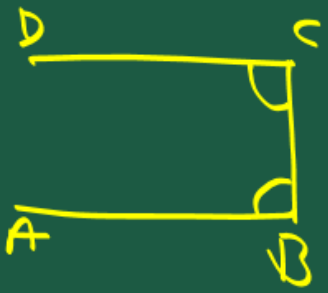


Since $\Delta ABC \cong \Delta DCB$

(I) $\angle ABC = \angle DCB$ [$\because$ C.P.C.T].

Now, $AB \parallel CD$ & BC is transversal

(II) $\angle ABC + \angle DCB = 180^\circ$ [Co-interior Angles].



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Now

from eq ① & ②

$\angle ABC = \angle DCB$

$\angle ABC + \angle DCB = 180^\circ$

$\angle ABC + \angle DCB = 180^\circ$

$\angle ABC + \angle ABC = 180^\circ$

$2\angle ABC = 180^\circ$

$\angle ABC = \frac{180^\circ}{2}$

$\angle ABC = 90^\circ$

$\therefore \angle ABC = 90^\circ = \angle DCB$

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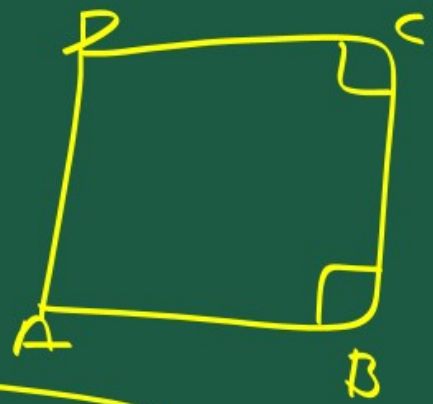
Since In llgm ABCD

One of it's angle is a Right angle

∴ ABCD is Rectangle



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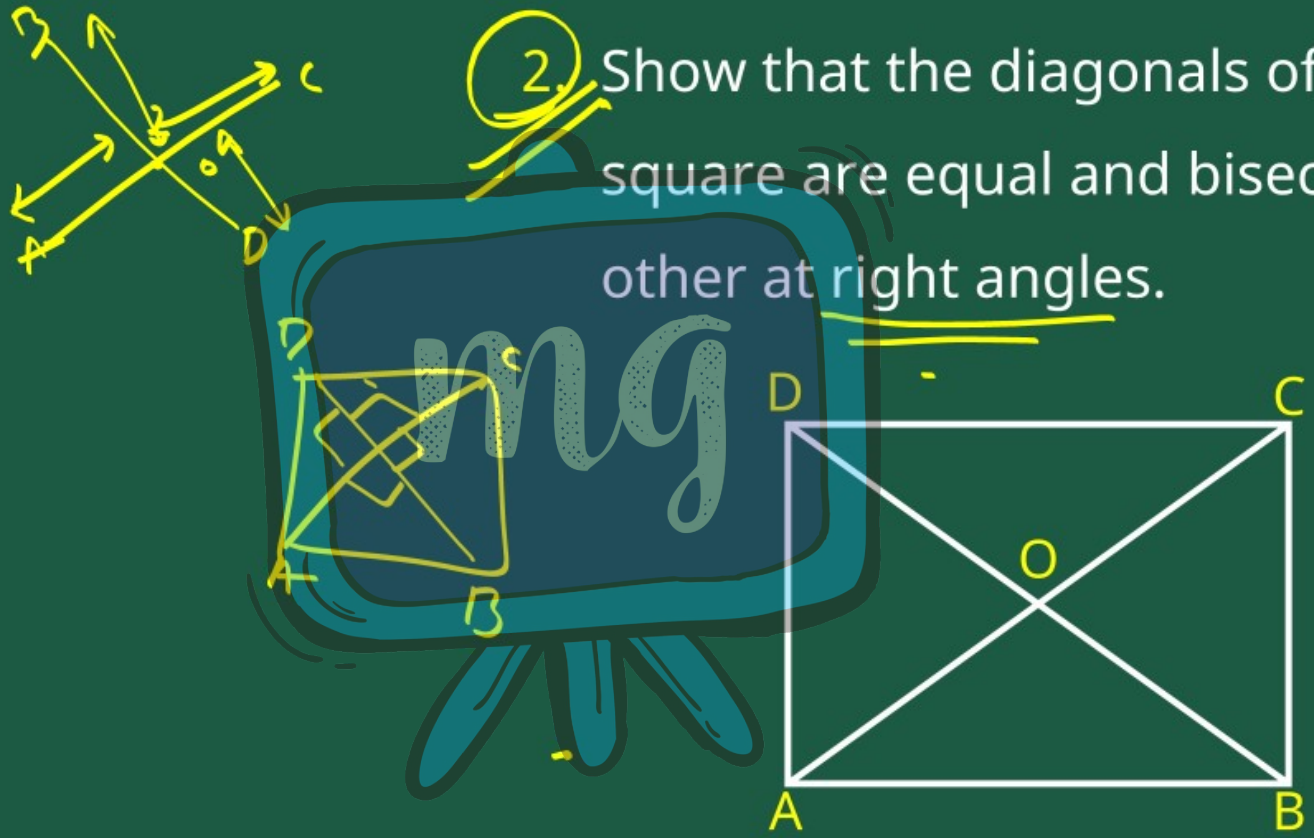
2. Show that the diagonals of a square are equal and bisect each other at right angles.



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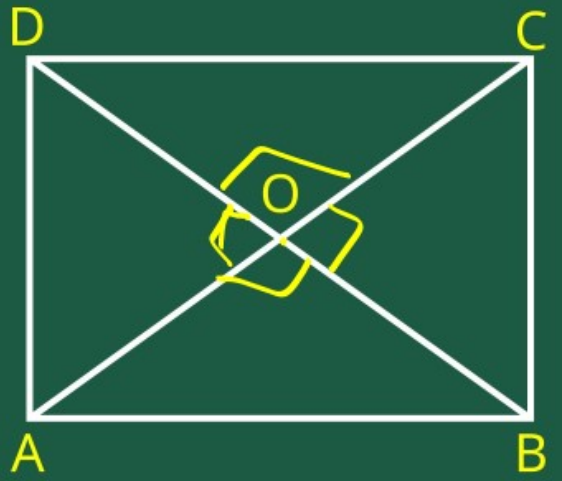
Given :→ ABCD is Square

$AB = BC = CD = AD$

$\angle A = \angle B = \angle C = \angle D = 90^\circ$ each

in which AC & BD are diagonals which intersect at O.



To prove :→ (i) $AC = BD$

(ii) AC & BD bisect each other at O

$OA = OC$

$OB = OD$

(iii) $\angle DOA = \angle COD = \angle BOC = \angle AOB = 90^\circ$

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Soln :→

In $\triangle ABC$ & $\triangle DCB$

$AB = DC$ [Given]

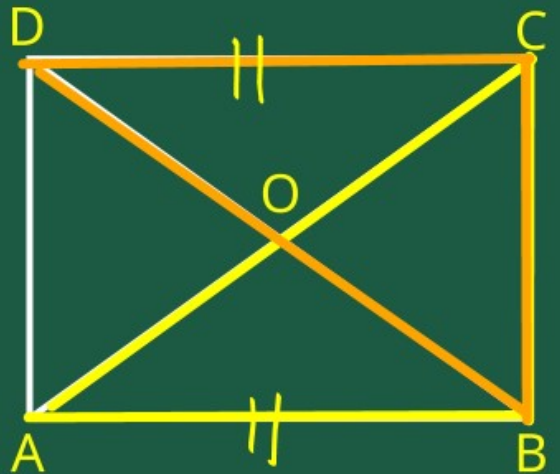
$\angle B = \angle C = 90^\circ$ [Given]

$BC = CB$ [Common]

$\therefore \triangle ABC \cong \triangle DCB$ [By SAS Rule]

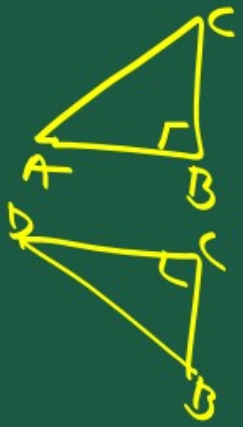
$AC = DB$ [C.P.C.T]

$\therefore$ diagonals of sq. ABCD are equal



$\triangle ABC$

$\triangle DCB$



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Now,

In $\triangle AOB$ & $\triangle COD$

$AB = CD$ [Given].

$\angle OAB = \angle OCD$ [$\because AB \parallel CD$, AC & BD act as transversal $\angle OAB, \angle OCD$, $\angle OBA, \angle ODC$ are A.I.A].

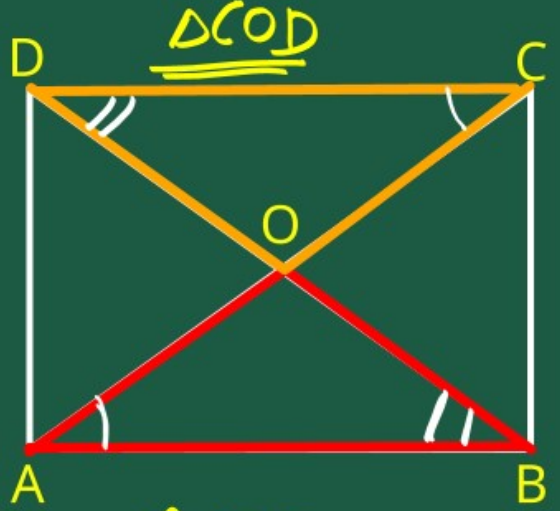
$\angle OBA = \angle ODC$

$\therefore AOB \cong \triangle COD$ [By ASA Rule]

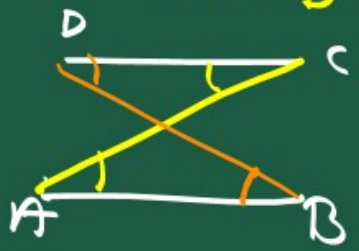
$OA = OC$

$OB = OD$ [C.P.C.T].

$\triangle COD$



$\triangle AOB$



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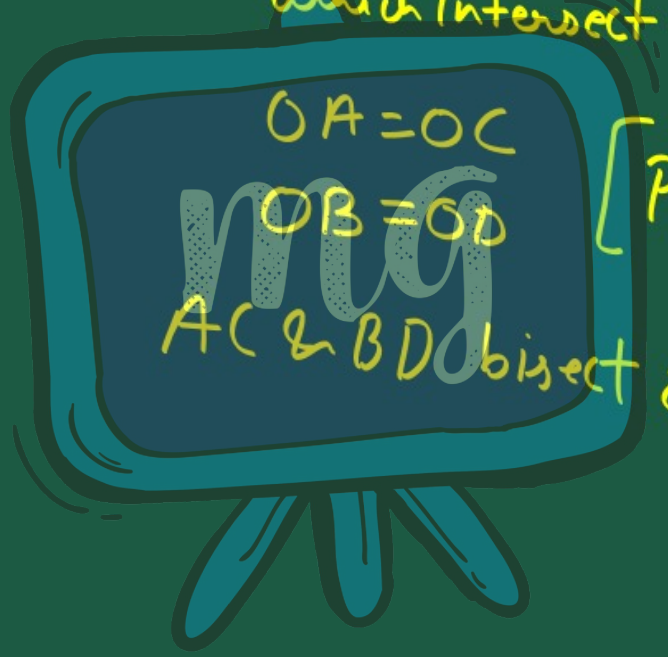
AC & BD are diagonals of Sq. ABCD which intersect at O. St



$OA = OC$

$OB = OD$ [Proved above].

AC & BD bisect each other.

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Now, In $\triangle AOB$ & $\triangle COB$

$OA = OC$ [Proved above]

$OB = OB$ [Common].

$AB = CB$ [Given]

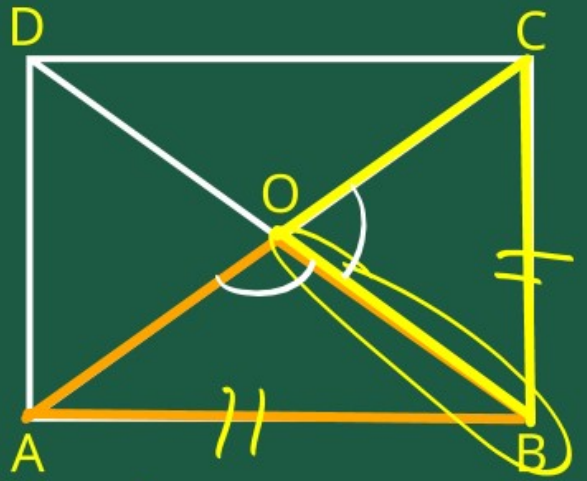
$\triangle AOB \cong \triangle COB$ By S.S.S Rule

$\angle AOB = \angle COB$ [C.P.C.T].

Now, AC is St. line

OB is line on AC.

$\angle AOB + \angle COB = 180^\circ$ [L.P.].



$\triangle AOB$

$\triangle COB$

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$\angle AOB + \angle COB = 180$ [L.P.]

If $\angle AOB = \angle BOA$

$\angle AOB + \angle AOB = 180$

$2\angle AOB = 180$

$\angle AOB = \frac{180}{2} = 90$

$\angle AOB = 90 = \angle COB$

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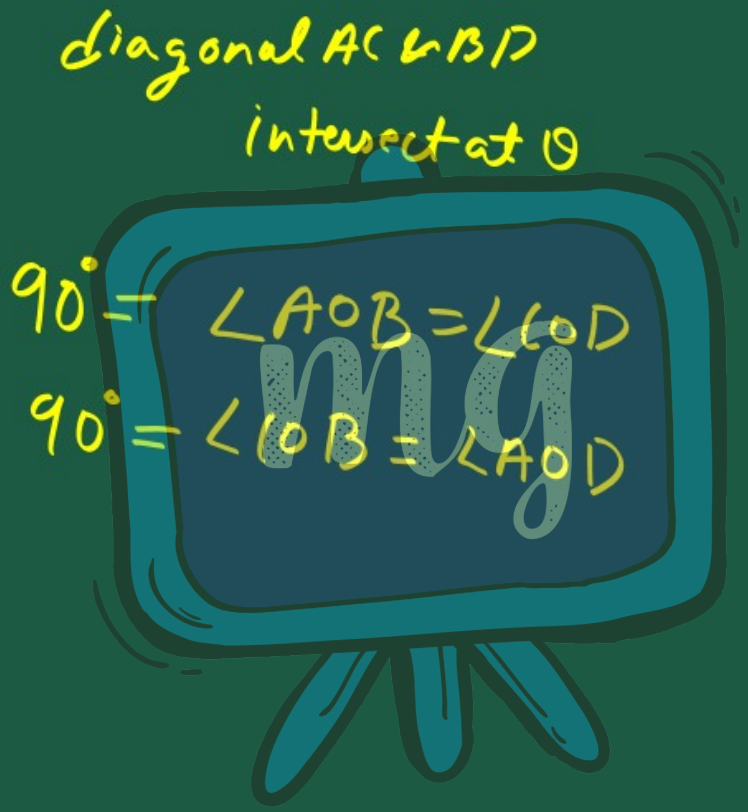

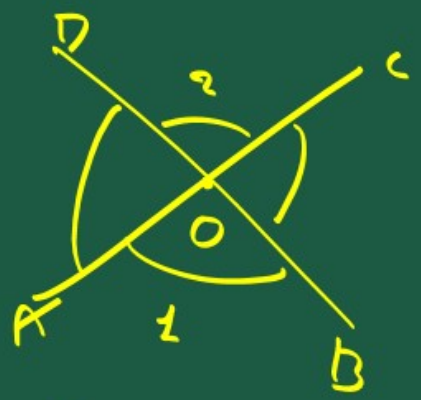

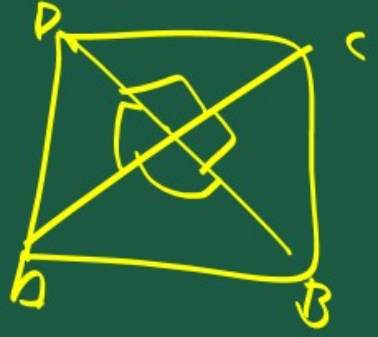

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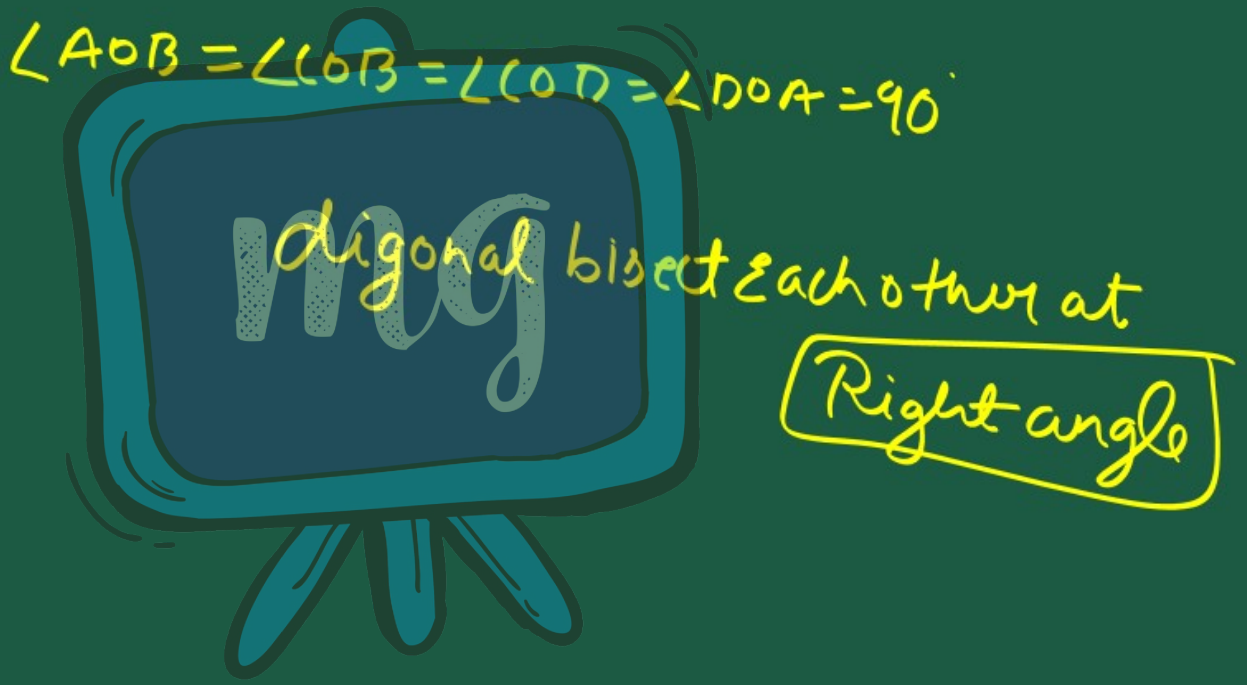

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