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Class – 9

Mathematics

Chapter – 6

Lines and Angles

Part – 2

Theorem – 6.1

Vikas Saini

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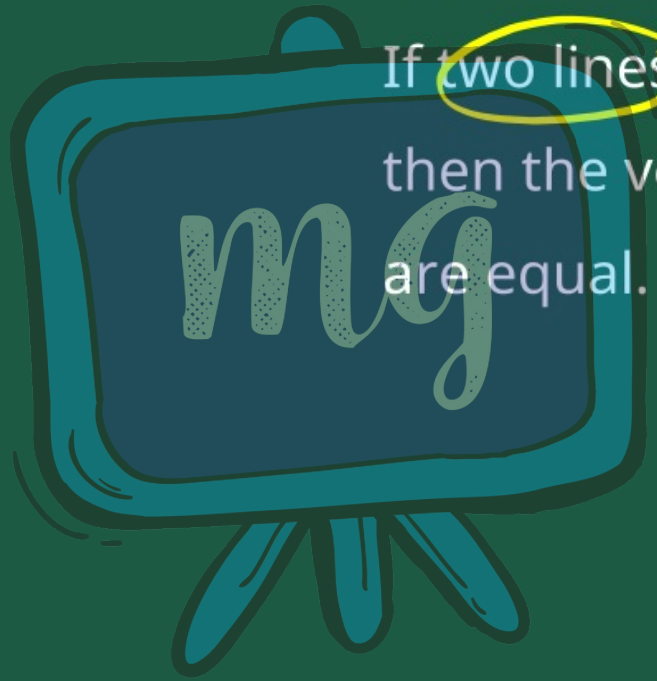
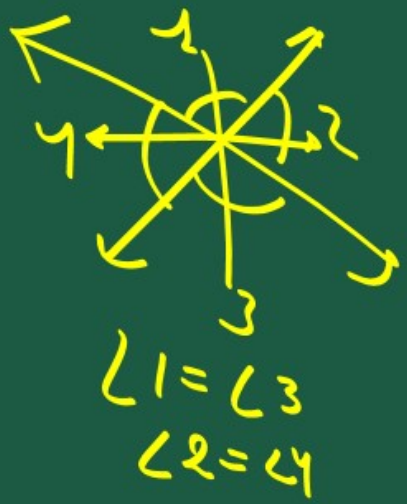
Theorem – 6.1

If two lines intersect each other, then the vertically opposite angles are equal.





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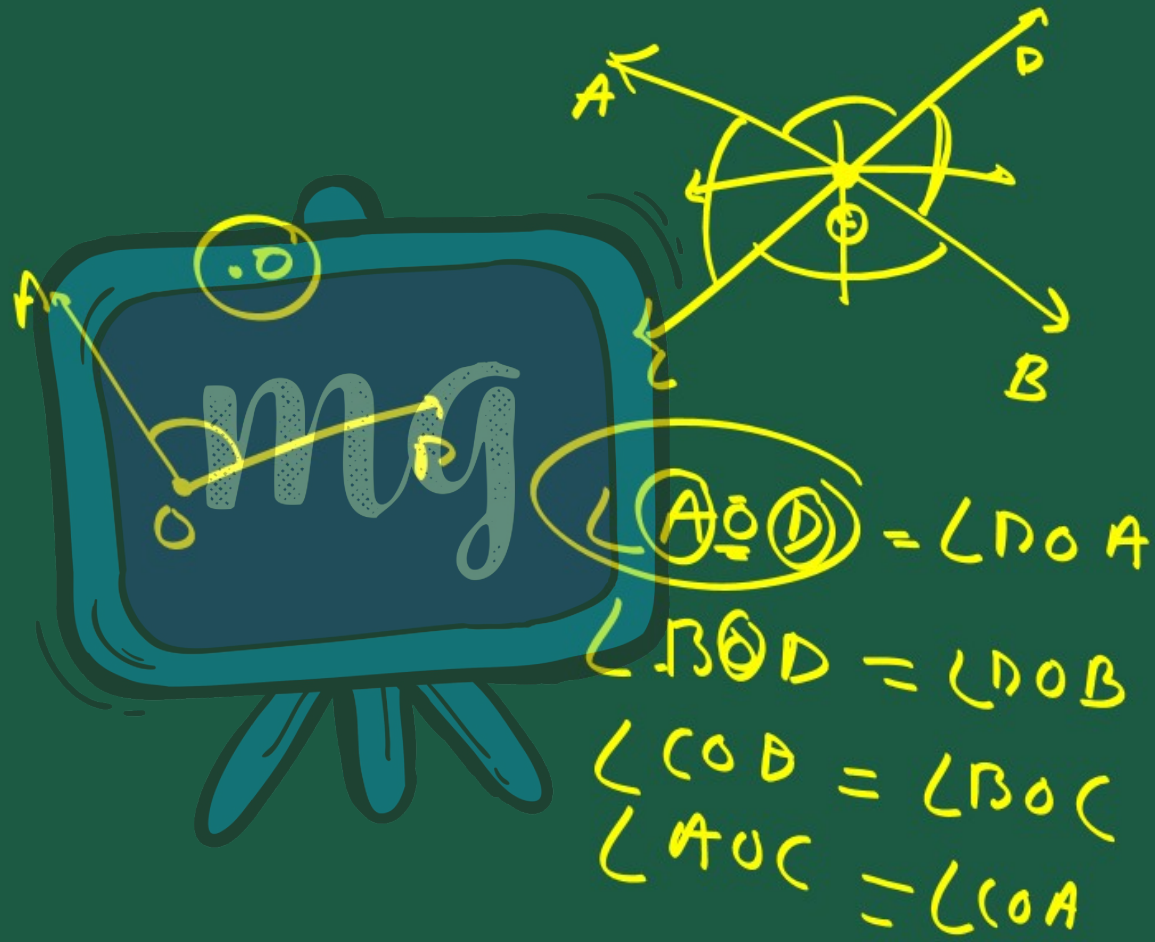

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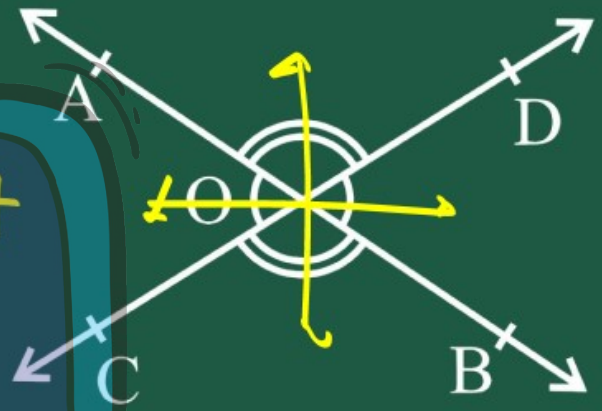
Given:→

two lines AB & CD intersect at O.



To prove:-

$\angle AOC = \angle BOD$

$\angle AOD = \angle BOD$

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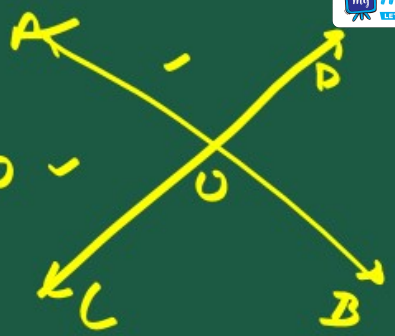
Sol^{n} :→

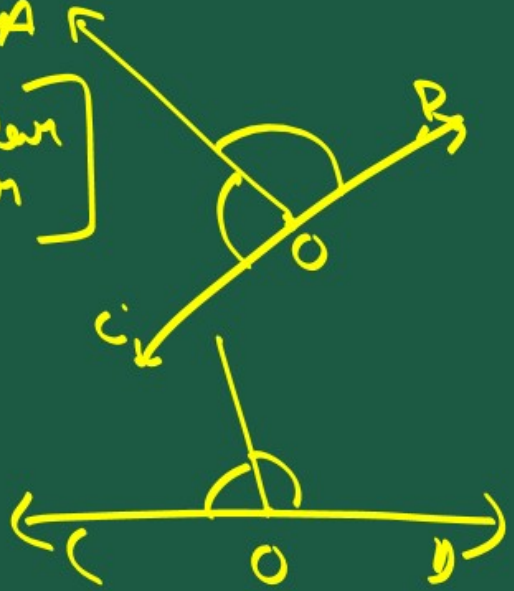
OA is Ray on St. line CD at O ~

So,

$\angle AOC + \angle AOD = 180^{\circ}$

∴ Linear Pair





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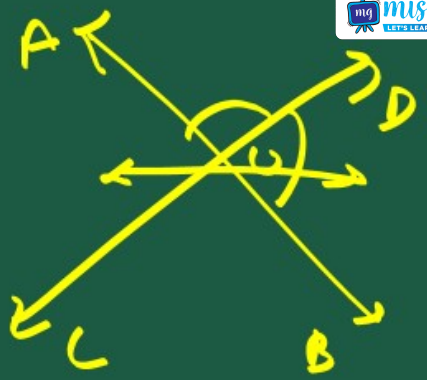
Since OD is Ray on St. AOB

So,

$\angle AOD + \angle BOD = 180^\circ$ [linear pair] ——— (2)



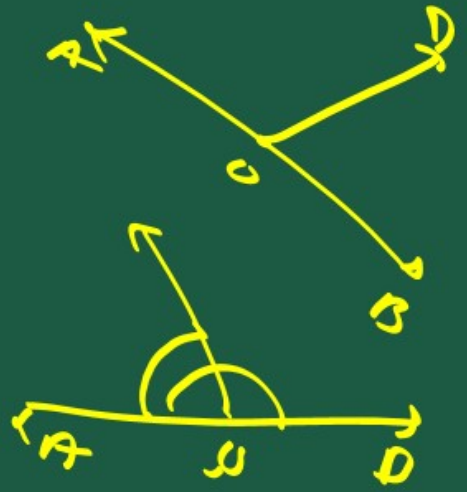
then from eq (1) & (2)

$\angle AOD + \angle BOD = 180^\circ = \angle AOC + \angle AOD$

$\angle AOD + \angle BOD = \angle AOC + \angle AOD$

$\angle BOD = \angle AOC + \cancel{\angle AOD} - \cancel{\angle AOD}$

$\angle BOD = \angle AOC$



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Now,

OB is Ray on st. COD

$\angle BOD + \angle BOC = 180^\circ$ [linear Pair] ③

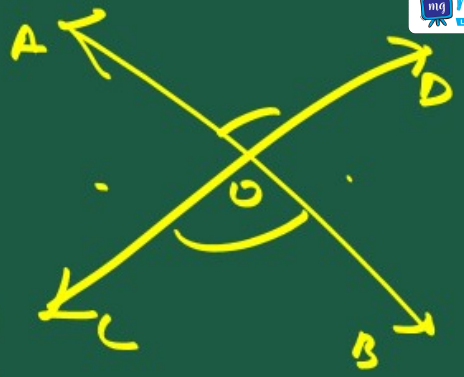
from eq ② & ③

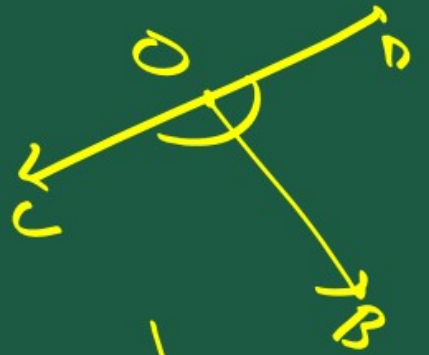
$\angle BOD + \angle BOC = \angle AOD + \angle BOD$

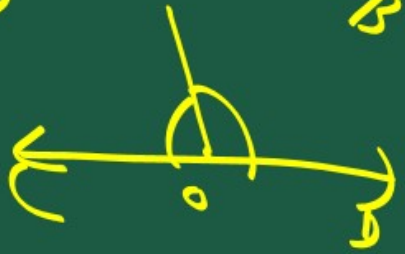
$\angle BOC = \angle AOD + \angle BOD - \angle BOD$

$\angle BOC = \angle AOD$

H.P







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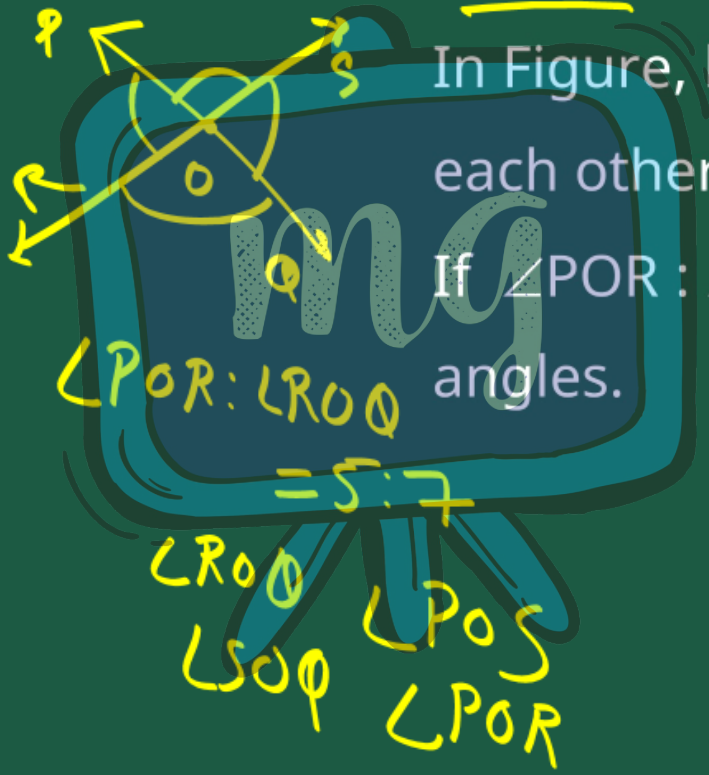
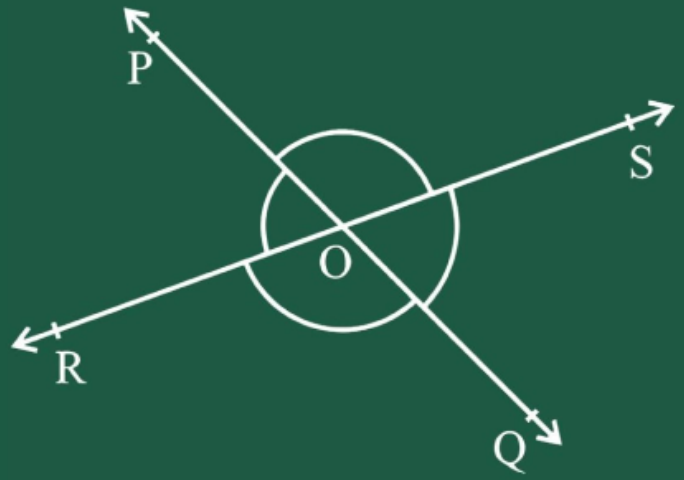
Example : 1

In Figure, lines PQ and RS intersect each other at point O.

If ∠POR : ∠ ROQ = 5 : 7, find all the angles.





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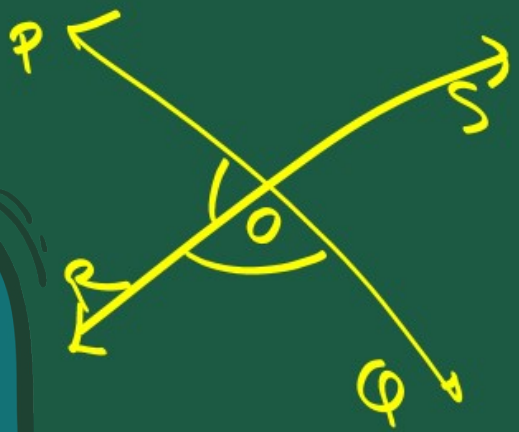
$\angle POR : \angle ROQ = 5 : 7$



$\rightarrow \angle POR = 5x$ [let]

$\rightarrow \angle ROQ = 7x$

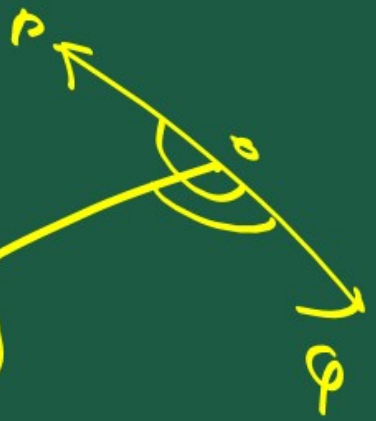
Since OR is Ray on st. POQ.

So, $\angle POR + \angle ROQ = 180°$

$5x + 7x = 180°$

$12x = 180$

$x = \frac{180}{12} = 15°$



[Linear Pair]

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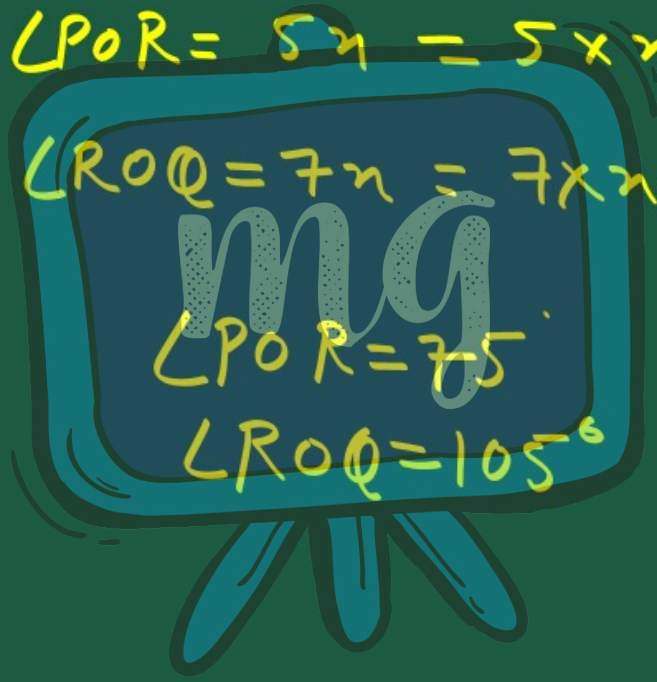
$x = 15^\circ$

$\angle POR = 5x = 5 \times x = 5 \times 15^\circ = 75^\circ$

$\angle ROQ = 7x = 7 \times x = 7 \times 15^\circ = 105^\circ$



$\angle SOQ$

$\angle RUS$

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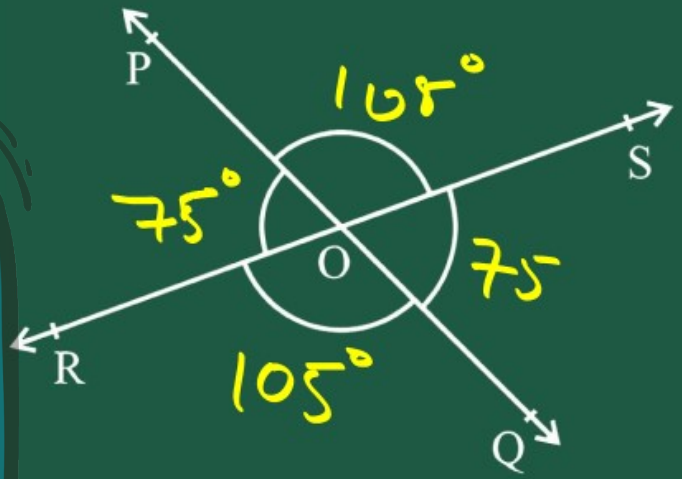
PQ & RS st lines intersect at O



$\angle POS = \angle ROQ$ [V.O.A]

$\angle POR = \angle SOQ$

$\angle POS = 105° = \angle ROQ$

$\angle SOQ = 75° = \angle POR$

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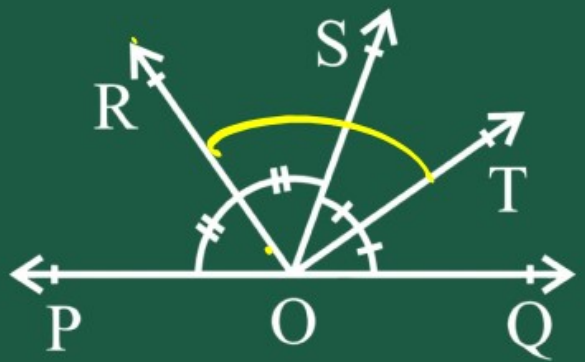
Example : 2

In Figure, ray OS stands on a line POQ. Ray OR and ray OT are angle bisectors of ∠POS and ∠SOQ, respectively.

If ∠POS = x, find ∠ROT.



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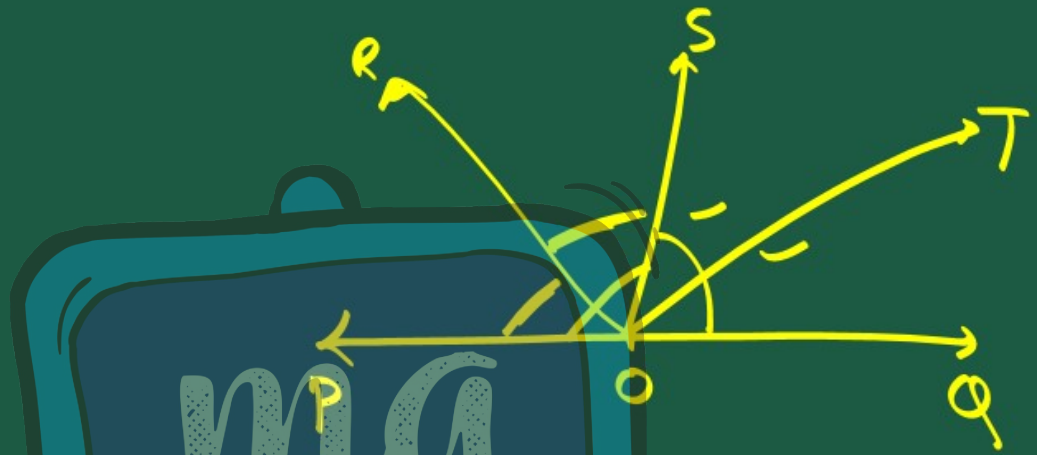

$\angle POR = \angle ROS$

$\angle POS + \angle SOQ = 180^\circ$ (Linear Pair)

$\angle SOT = \angle TOQ$

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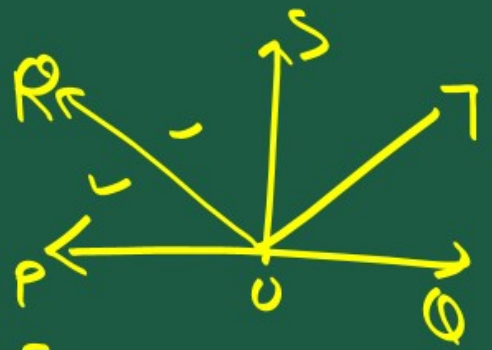
Given:→ OS is Ray on St line POQ

Lin OR & OT Ray

are angle bisector

of ∠POS & ∠SOQ



$\angle POR = \angle ROS = \frac{\angle POS}{2}$

$\angle SOT = \angle TOQ = \frac{\angle SOQ}{2}$

To find = $\angle ROT = ?$

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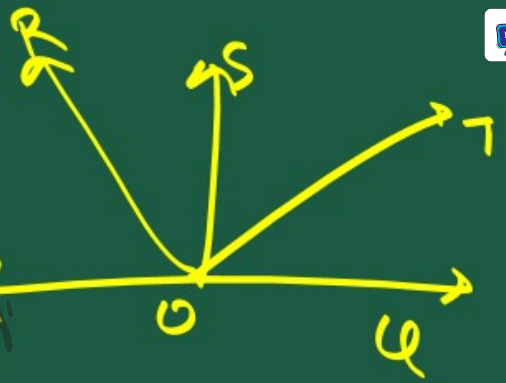
Soln :- Since OS is Ray on st. POQ



$\angle POS + \angle SOQ = 180^\circ$ [L.P]

$\angle POS = 180^\circ - \angle SOQ$ — (1)

multiplying $\frac{1}{2}$ to this eq (1)

$\frac{1}{2} \times POS = \frac{1}{2}(180 - \angle SOQ)$

$\frac{\angle POS}{2} = \frac{1}{2} \times 180 - \frac{1}{2} \times \angle SOQ = 90^\circ - \frac{\angle SOQ}{2}$

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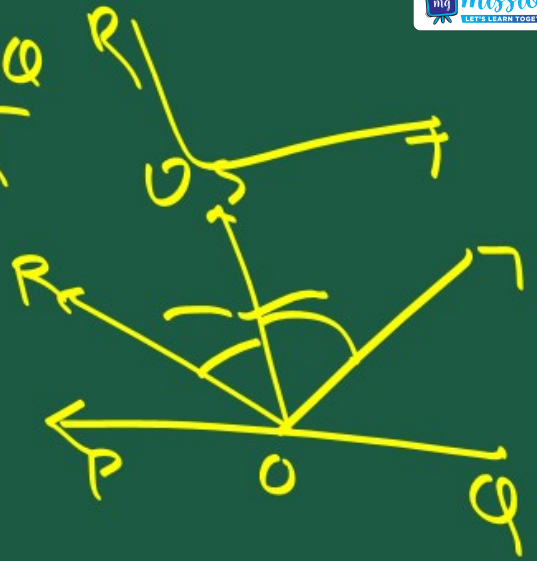
$$\frac{\angle POS}{2} = 90^\circ - \frac{\angle SOQ}{2}$$



$\angle ROS = 90^\circ - \angle SOT$

$\angle ROS + \angle SOT = 90^\circ$

$\angle ROT = 90^\circ$

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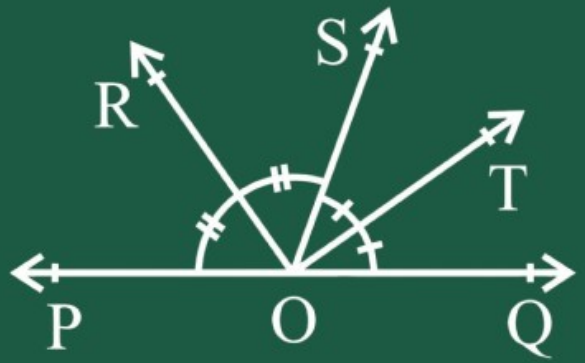

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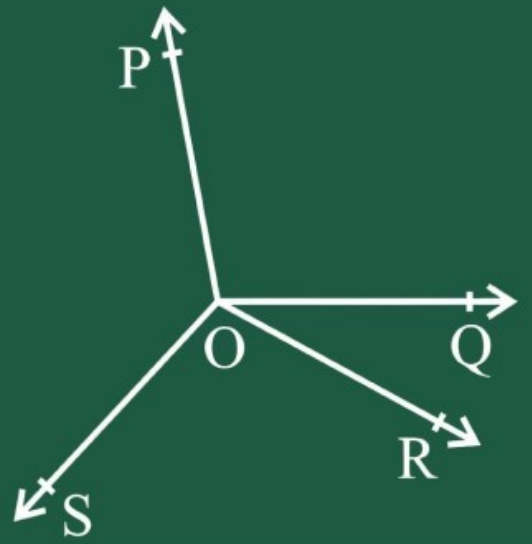
Example : 3

In Figure, OP, OQ, OR and OS are four rays. Prove that

$\angle POQ + \angle QOR + \angle SOR + \angle POS = 360°$



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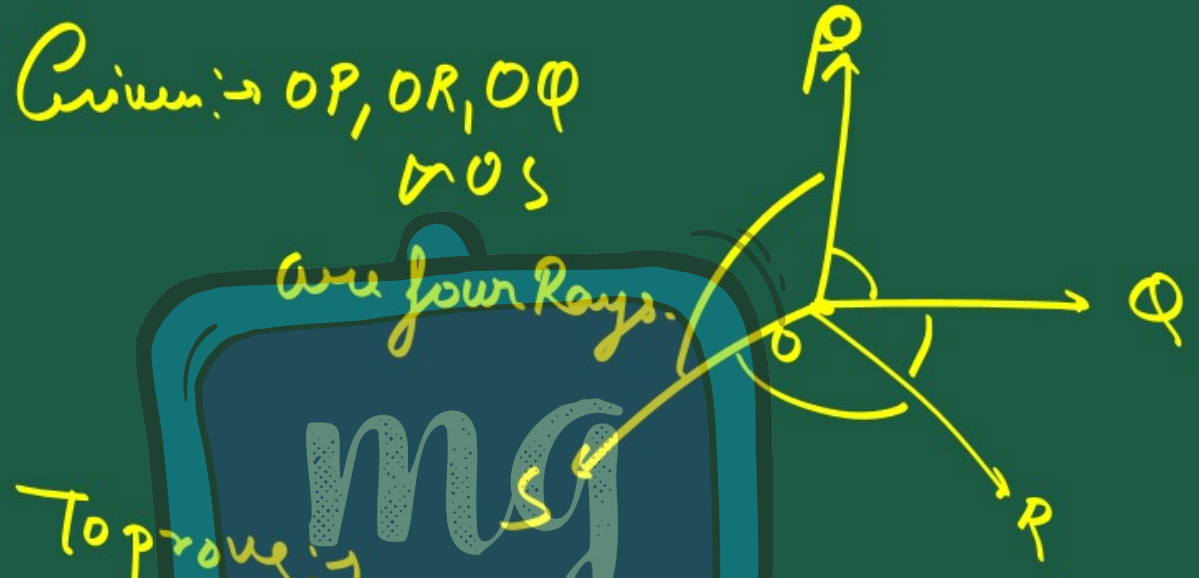
Given :- OP, OR, OQ and OS are four Rays.



To prove :- $\angle POQ + \angle QOR + \angle ROS + \angle POS = 360^\circ$

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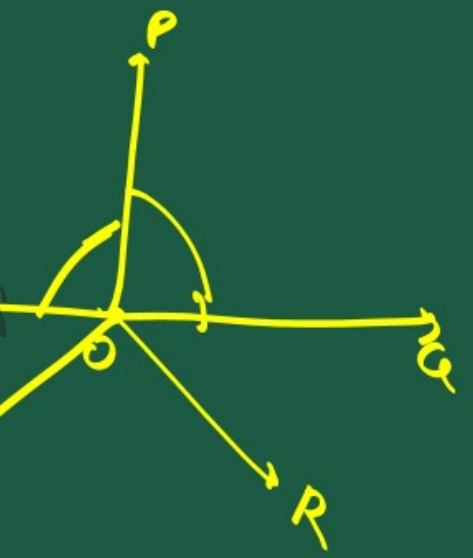
Construction :→ OQ Extended towards O to t point



Soln :→

Line TOR is St. line

OP ray on St. line TOQ

$\angle POT + \angle POQ = 180^\circ$ (linear pair) — (1)

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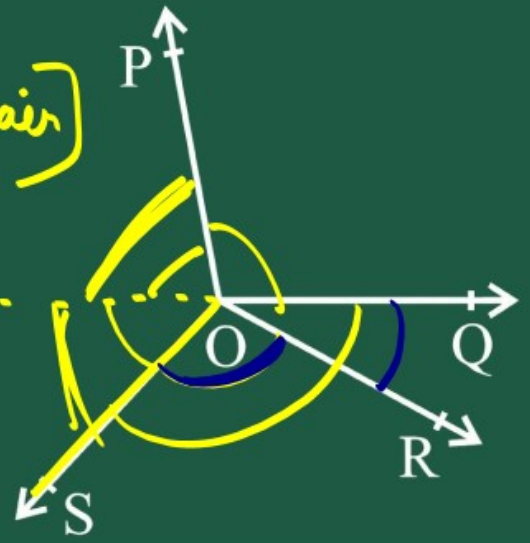
OS is Ray on St TO Q

$\angle TOS + \angle SOQ = 180^\circ$ [Linear Pair] — (2)



Now this Ray OR is btw $\angle SOQ$

$\angle SOQ = \angle ROS + \angle QOR$ — (3)

From eq (2) & (3)

$\angle TOS + \angle ROS + \angle QOR = 180^\circ$ — (4)

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eq(1) + eq(4)

→ $\angle POT + \angle POQ + \angle TOS + \angle ROS + \angle QOR$

$= 180^\circ + 180^\circ$

→ $\angle POT + \angle TOS + \angle POQ + \angle ROS + \angle QOR = 360^\circ$

→ $\angle POS + \angle POQ + \angle ROS + \angle QOR = 360^\circ$

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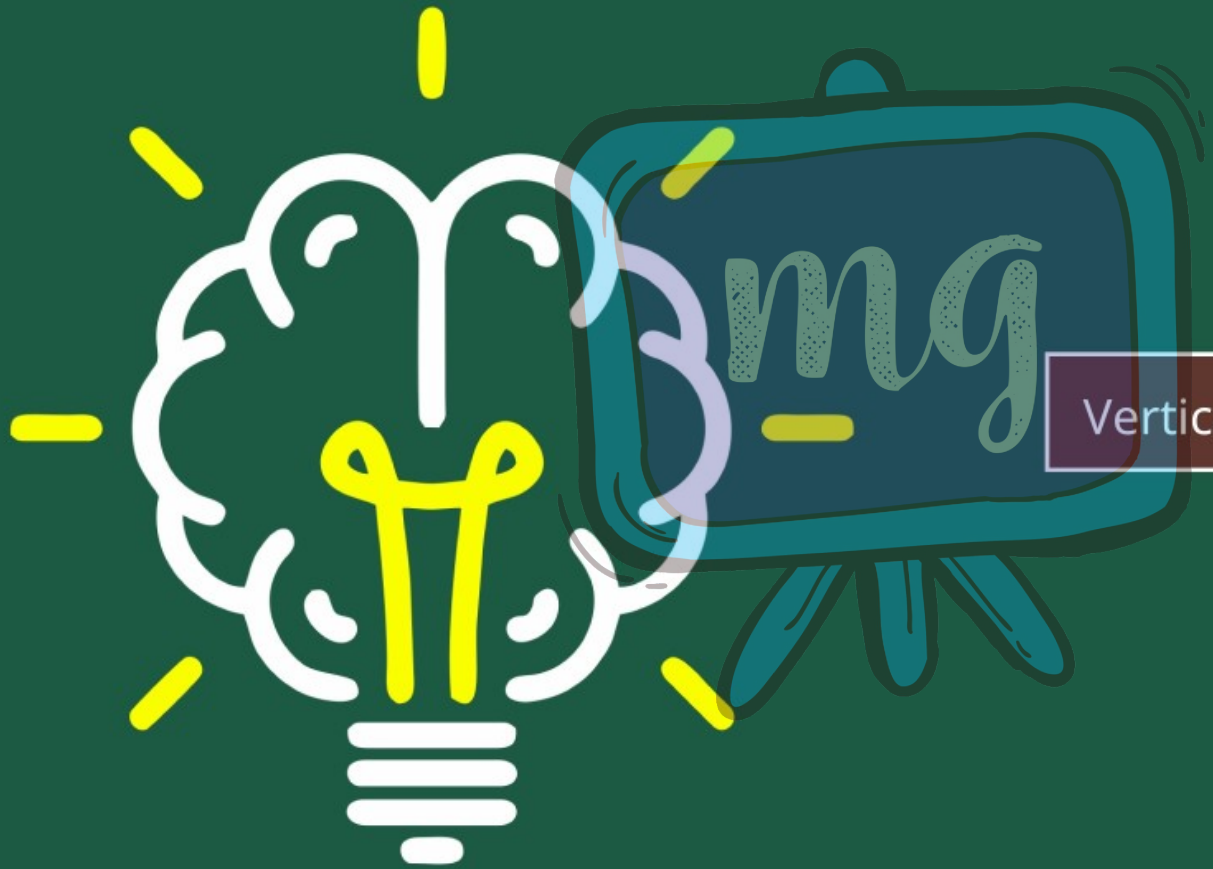

Vertically Opposite Angles