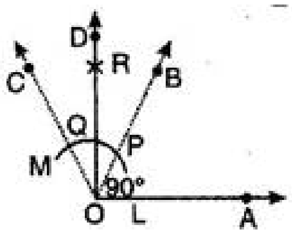
Q1. Construct an angle of 90° at the initial point of a given ray and justify the construction.

Ans. Steps of construction:



(a) Draw a ray OA.

(b) With O as centre and convenient radius, draw an arc LM cutting OA at L.

(c) Now with L as centre and radius OL, draw an arc cutting the arc LM at P.

(d) Then taking P as centre and radius OL, draw an arc cutting arc PM at the point Q.

(e) Join OP to draw the ray OB. Also join O and Q to draw the OC. We observe that:

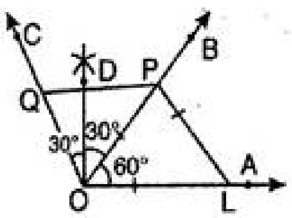
$\angle AOB = \angle BOC = 60^\circ$

(f) Now we have to bisect $\angle$ BOC. For this, with P as centre and radius greater than $\frac{1}{2}$ PQ draw an arc.

(g) Now with Q as centre and the same radius as in step 6, draw another arc cutting the arc drawn in step 6 at R.

(h) Join O and R and draw ray OD.

Then $\angle$ AOD is the required angle of 90°.



Justification:

Join PL, then OL = OP = PL [by construction]

Therefore ΔOQP is an equilateral triangle and $\angle$ POL which is same as $\angle$ BOA is equal to 60°.

Now join QP, then OP = OQ = PQ [by construction]

Therefore ΔOQP is an equilateral triangle.

$\therefore$ $\angle$POQ which is same as $\angle$BOC is equal to 60°.

By construction OD is bisector of $\angle$ BOC.

$\therefore \angle DOC = \angle DOB = \frac{1}{2}\angle BOC = \frac{1}{2}\times 60^\circ = 30^\circ$

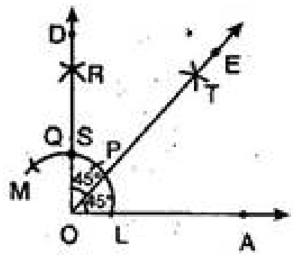
Now, $\angle$DOA = $\angle$BOA + $\angle$DOB

$\Rightarrow \angle DOA = 60^\circ + 30^\circ$

$\Rightarrow \angle DOA = 90^\circ$

Q2. Construct an angle of 45° at the initial point of a given ray and justify the construction.

Ans. Steps of construction:



(a) Draw a ray OA.

(b) With O as centre and convenient radius, draw an arc LM cutting OA at L.

(c) Now with L as centre and radius OL, draw an arc cutting the arc LM at P.

(d) Then taking P as centre and radius OL, draw an arc cutting arc PM at the point Q.

(e) Join OP to draw the ray OB. Also join O and Q to draw the OC. We observe that: $\angle$ AOB = $\angle$ BOC = 60°

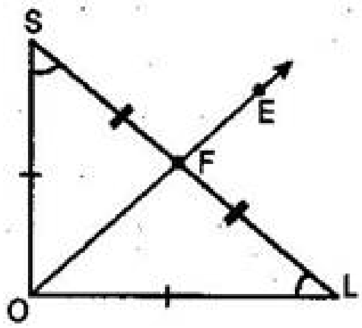
(f) Now we have to bisect $\angle$ BOC. For this, with P as centre and radius greater than $\frac{1}{2}$ PQ draw an arc.

(g) Now with Q as centre and the same radius as in step 6, draw another arc cutting the arc drawn in step 6 at R.

(h) Join O and R and draw ray OD. Then $\angle$ AOD is the required angle of 90°.

(i) With L as centre and radius greater than $\frac{1}{2}$ LS, draw an arc.

(j) Now with S as centre and the same radius as in step 2, draw another arc cutting the arc draw in step 2 at T.



Justification:

Join LS then ΔOLS is isosceles right triangle, right angled at O.

$\therefore$ OL = OS

Therefore, O lies on the perpendicular bisector of SL.

$\therefore$ SF = FL

And $\angle$OFS = $\angle$OFL [Each 90°]

Now in ΔOFS and ΔOFL,

OF = OF [Common]

OS = OL [By construction]

SF = FL [Proved]

$\therefore$ ΔOFS $\cong$ Δ OFL [By SSS rule]

$\Rightarrow$ $\angle$SOF = $\angle$ LOF [By CPCT]

Now $\angle$SOF + $\angle$ LOF = $\angle$ SOL

$\Rightarrow$ $\angle$SOF + $\angle$ LOF = 90°

$\Rightarrow$ 2$\angle$LOF = 90°

$\Rightarrow$ $\angle LOF = \frac{1}{2} \times 90^\circ = 45^\circ$

And $\angle$AOE = 45°

*********** END **********