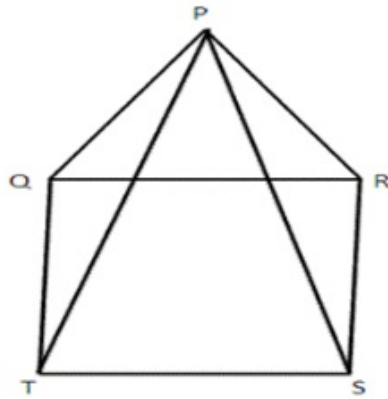




Exercise 5A

Question 22:

Given: PQR is an equilateral triangle and QRST is a square.



To Prove: $PT = PS$

and $\angle PSR = 15^\circ$

Proof: Since $\triangle PQR$ is an equilateral triangle,

$\angle PQR = 60^\circ$ and $\angle PRQ = 60^\circ$

Since QRTS is a square,

$\angle RQT = 90^\circ$ and $\angle QRS = 90^\circ$

In $\triangle PQT$

$$\angle PQT = \angle PQR + \angle RQT$$

$$= 60^\circ + 90^\circ$$

$$= 150^\circ$$

In $\triangle PRS$

$$\begin{aligned}\angle PRS &= \angle PRQ + \angle QRS \\ &= 60^\circ + 90^\circ = 150^\circ \dots\dots(1)\end{aligned}$$

$$\Rightarrow \angle PQT = \angle PRS \dots\dots(2)$$

Thus, in $\triangle PQT$ and $\triangle PRS$

$$PQ = PR \quad [\text{sides of equilateral triangle } \triangle PQR]$$

$$\angle PQT = \angle PRS \quad [\text{from (2)}]$$

$$QT = RS \quad [\text{sides of square } \square QRST]$$

Thus, by Side-Angle-Side criterion of congruence, we have

$$\therefore \triangle PQT \cong \triangle PRS \quad [\text{By SAS}]$$

The corresponding parts of the congruent triangles are equal.

$$\therefore PT = PS \quad [\text{C.P.C.T}]$$

Now in $\triangle PRS$, we have

$$PR = RS$$

$$\Rightarrow \angle RPS = \angle PSR$$

$$\text{But } \angle PRS = 150^\circ \quad [\text{from (1)}]$$

So, by angle sum property in $\triangle PRS$

$$\angle PRS + \angle SPR + \angle PSR = 180^\circ$$

$$\Rightarrow 150^\circ + \angle PSR + \angle PSR = 180^\circ$$

$$\Rightarrow 2 \angle PSR = 180^\circ - 150^\circ$$

$$\Rightarrow 2 \angle PSR = 30^\circ$$

$$\Rightarrow \angle PSR = \frac{30}{2} = 15^\circ$$

***** END *****