

Mathematics

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(Chapter – 6) (Lines and Angles)(Exemplar Problems)

(Class – IX)

Exercise 6.4

Question 7:

In Fig. 6.17, $\angle Q > \angle R$, PA is the bisector of $\angle QPR$ and $PM \perp QR$. Prove that $\angle APM = \frac{1}{2}(\angle Q - \angle R)$.

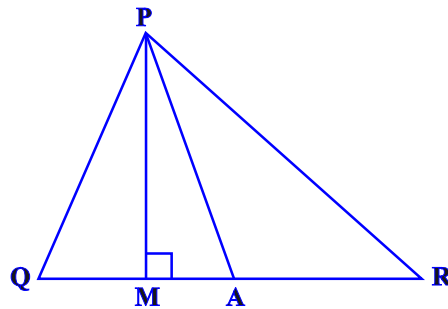


Fig. 6.17

Answer 7:

Given:

ΔPQR , $\angle Q > \angle R$, PA is the bisector of $\angle QPR$ and $PM \perp QR$.

To prove:

$$\angle APM = \frac{1}{2}(\angle Q - \angle R).$$

Proof:

Since, PA is the bisector of $\angle QPR$

$$\therefore \angle QPA = \angle APR \quad \dots (i)$$

$$\text{In } \Delta PQM \quad \angle Q + \angle PMQ + \angle QPM = 180^\circ$$

[Angle sum property of triangles]

$$\Rightarrow \angle Q + 90^\circ + \angle QPM = 180^\circ$$

[$\angle PMQ = 90^\circ$]

$$\Rightarrow \angle Q = 90^\circ - \angle QPM$$

... (ii)

$$\text{In } \Delta PMR, \quad \angle PMR + \angle R + \angle RPM = 180^\circ$$

[Angle sum property of triangles]

$$\Rightarrow 90^\circ + \angle R + \angle RPM = 180^\circ$$

[$\angle PMR = 90^\circ$]

$$\Rightarrow \angle R = 180^\circ - 90^\circ - \angle RPM$$

$$\Rightarrow \angle PRM = 90^\circ - \angle RPM$$

... (iii)



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From equations (iii) from and (ii), we get

$$\angle Q - \angle R = (90^\circ - \angle QPM) - (90^\circ - \angle RPM)$$

$$\Rightarrow \angle Q - \angle R = \angle RPM - \angle QPM$$

$$\Rightarrow \angle Q - \angle R = (\angle RPA + \angle APM) - (\angle QPA - \angle APM) \quad \dots(\text{iv})$$

$$\Rightarrow \angle Q - \angle R = \angle QPA + \angle APM - \angle QPA + \angle APM$$

[Using equation (i)]

$$\Rightarrow \angle Q - \angle R = 2\angle APM$$

$$\therefore \angle APM = \frac{1}{2}(\angle Q - \angle R)$$

