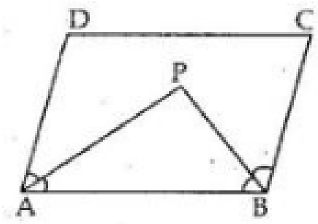
Exercise 9B

Question 15:

Given: A parallelogram ABCD in which angle bisectors of $\angle A$ and $\angle B$ intersect at P.



To Prove : $\angle APB = 90^0$

Proof : $\angle PAB = \frac{1}{2}\angle A$

and $\angle PBA = \frac{1}{2}\angle B$ [Given]

$\therefore$AD and BC are parallel and AB is a transversal.

So sum of consecutive angles is 180^0.

$\Rightarrow$ $\angle A + \angle B = 180^0$ .....(1)

$$\angle PAB + \angle PBA = \frac{1}{2}\angle A + \frac{1}{2}\angle B$$

$$= \frac{1}{2}(\angle A + \angle B)$$

$$= \frac{1}{2} \times 180^0 \quad \text{[from (1)]}$$

$$\angle PAB + \angle PBA = 90^0 \quad \text{......(2)}$$

Now in ΔPAB,

$\angle PAB + \angle PBA + \angle APB = 180^0$

$\Rightarrow$ $90^0 + \angle APB = 180^0$ [from (2)]

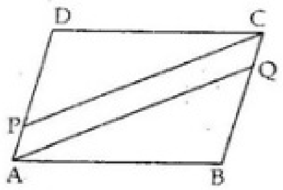
$\Rightarrow$ $\angle APB = 180^0 - 90^0 = 90^\circ$

$\therefore$ $\angle APB = 90^0$

Question 16:

Given: A parallelogram ABCD in which AP = $\frac{1}{3}$AD and

CQ=$\frac{1}{3}$BC



To Prove: PAQC is a parallelogram.

Proof : In ΔABQ and ΔCDP

$AB = CD$

$[\because$ opposite sides of a parallelogram$]$

$\angle B = \angle D$

and $DP = AD - PA = \frac{2}{3}AD$

and, $BQ = BC - CQ = BC - \frac{1}{3}BC$

$= \frac{2}{3}BC = \frac{2}{3}AD \quad [\because AD = BC]$

$\therefore \quad BQ = DP$

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

So, $\Delta ABQ \cong \Delta CDP$ [By SAS]

The corresponding parts of the congruent triangles are equal.

$AQ = CP$ [By cpct]

and $PA = \frac{1}{3}AD$

and $CQ = \frac{1}{3}BC = \frac{1}{3}AD$

$PA = CQ \quad [\because AD = BC]$

Also, by c.p.c.t, $\angle QAB = \angle PCD$.....(1)

Therefore,

$\angle QAP = \angle A - \angle QAB$

$= \angle C - \angle PCD$ [since $\angle A = \angle C$ and from (1)]

$= \angle PCQ$ [alternate interior angles are equal]

Therefore, AQ and CP are two parallel lines.

So, PAQC is a parallelogram.

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