CHAPTER 08

Quadrilaterals

Example 1:

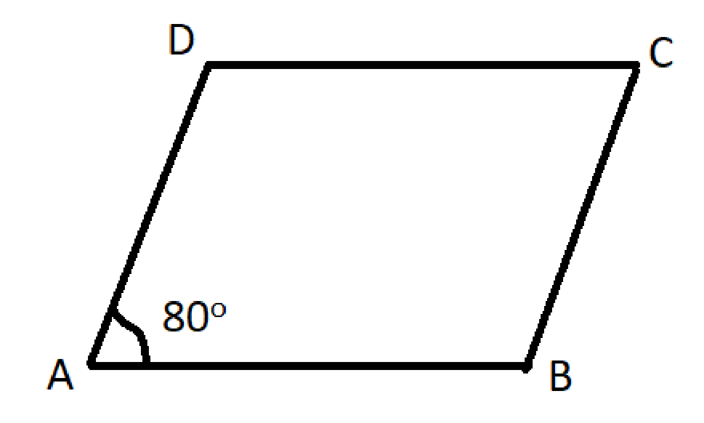
ABCD is a parallelogram, $\angle A = 80^\circ$. Find the remaining angles.

Sol.

We know that,

Opposite angles of a parallelogram are equal.

In a parallelogram ABCD,



$\angle C = \angle A = 80^\circ$ and $\angle B = \angle D$ and the sum of consecutive angles of parallelogram is equal to 180°.

As $\angle A$ and $\angle B$ are consecutive angles.

$\angle D = \angle B = 180^\circ - \angle A$

$= 180^\circ - 80^\circ$

$\angle D = \angle B = 100^\circ$

$\therefore$ The remaining angles are 100°, 80°, 100°.

Example 2:

Two adjacent sides of a parallelogram are 3.5 cm and 4 cm. Find its perimeter.

Sol.

Since, the opposite sides of a parallelogram are equal. The other two sides are 3.5 cm and 4 cm.

Hence the perimeter = 3.5 cm + 4 cm 3.5 cm + 4 cm = 15 cm

Example 3:

In a triangle ABC, AD is the median drawn on the side BC is produced to E such that AD = ED. Prove that ABEC is parallelogram.

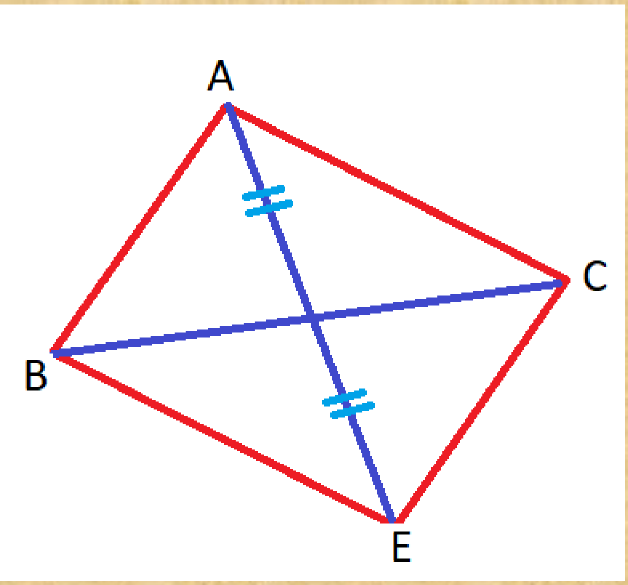
Proof:

AD is the median of ΔABC.

Produce AB to E such that AD = ED

Join BE and CE

Now, In ΔABD and ΔECD,



BD = DC	(D is the midpoint of BC)
$\angle ADB = \angle EDC$	(V.O.A)
AD = ED	(Given)
So, $\Delta ABD \cong \Delta ECD$	(S.A.S Rule)
$\therefore$ AB = CE	(C.P.C.T)
$\angle ABD = \angle ECD$	

There are interior alternate angles made by the transversal line $\overline{BC}$ with lines $\overline{AB}$ and $\overline{CE}$.

$\therefore \quad \overline{AB} \parallel \overline{CE}$

In a quadrilateral ABEC,

AB || CE and AB = CE

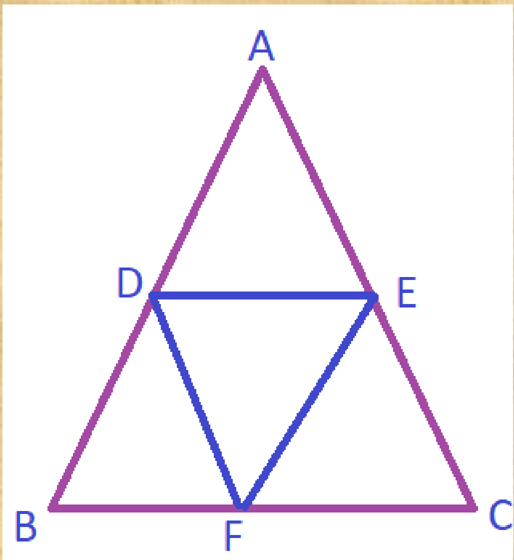
Hence, ABEC is a parallelogram.

Example 4:

In ΔABC, D, E and F are the midpoints of sides AB, BC and CA respectively. Show that ΔABC is divided into four congruent triangles when the three midpoints are joined to each other.

Sol.

D, E are midpoints of $\overline{AB}$ and $\overline{AC}$ of ΔABC respectively.



By midpoint theorem,

DE || AC

Similarly, $\Delta BDE \cong \Delta DEF$

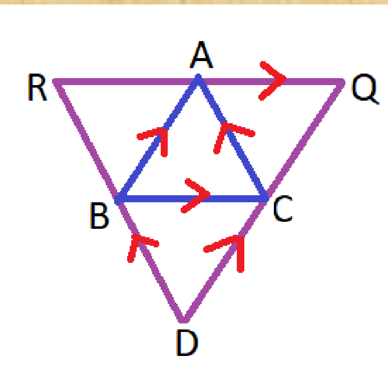
So, all the four triangles are congruent.

We have shown that the triangle ABC is divided into four congruent triangles by joining midpoints of the sides.

Example 5:

ABC is a triangle and through A, B, C lines are drawn parallel to BC, CA and AB respectively intersecting at P, Q and R. Prove that the perimeter of ΔPQR is double the perimeter of ΔABC.

Sol.



Since, AB || QP and BC || RQ

So, ABCQ is a parallelogram.

Similarly,

BCAR, ABQC are parallelograms.

$\therefore$ BC = AQ and BC = RA

$\Rightarrow$ A is the midpoint of QR.

Similarly, B and C are midpoints of PR and PQ respectively.

$\therefore$ AB = $\frac{1}{2}PQ$; BC = $\frac{1}{2}QR$; CA = $\frac{1}{2}PR$

Perimeter of ΔPQR = PQ + QR + PR

= 2AB + 2BC + 2CA

= 2 (AB + BC + CA)

= 2 (Perimeter of ΔABC)

Example 6:

The angles of a quadrilateral are in the ratio 3 : 5 : 9 : 13. Find all the angles of a quadrilateral.

Sol.

Let the angles of a quadrilateral be 3x, 5x, 9x and 13x.

By angle sum property of quadrilateral,

$3x + 5x + 9x + 13x = 360^o$

$\Rightarrow 30x = 360^o$

$x = 12^o$

$3x = 3 \text{ x } 12^o = 36^o$

$5x = 5 \text{ x } 12^o = 60^o$

$9x = 9 \times 12^o = 108^o$

$13x = 13 \times 12^o = 156^o$

The required angles of a quadrilateral are 36^o, 60^o, 108^o and 156^o.