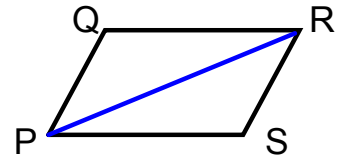


Geometry

Notes 10-2 The General Quadrilateral; The Parallelogram

Quadrilateral: a polygon with 4 sides



Consecutive Vertices: $\angle SPQ + \angle Q$
 $\angle Q + \angle QRS$

Consecutive Sides: $\overline{QP} + \overline{PS}$; $\overline{RS} + \overline{SP}$; $\overline{QR} + \overline{RS}$

Opposite Sides: $\overline{QR} + \overline{PS}$; $\overline{QP} + \overline{RS}$

Opposite Angles: $\angle Q + \angle S$; $\angle QPS + \angle QRS$

Parallelogram: a quadrilateral with both pairs of opposite sides parallel.



Theorem 10.1 A diagonal divides a parallelogram into 2 congruent triangles.

Corollaries:

1. Opposite sides of a parallelogram are congruent.
2. Opposite angles of a parallelogram are congruent.
3. Two consecutive angles of a parallelogram are supplementary.
4. The diagonals of a parallelogram bisect each other.

Ex. 1 In parallelogram ABCD, $m\angle A = 2x + 30$ and $m\angle C = 3x - 5$

Find the measures of $\angle A$ and $\angle C$

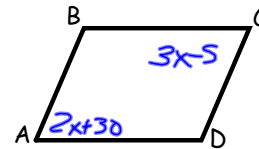
$$\angle A \cong \angle C$$

$$\begin{array}{r} 2x + 30 = 3x - 5 \\ -2x \quad -2x \\ \hline 30 = x - 5 \end{array}$$

$$\begin{array}{r} 30 = x - 5 \\ +5 \quad +5 \\ \hline 35 = x \end{array}$$

$$\angle A = 2(35) + 30 = 100$$

$$\angle C = 3(35) - 5 = 105 - 5 = 100$$



Ex. 2 In parallelogram CDEF, the ratio of the measure of $\angle C$ and $\angle D$ is 4:5. Find the degree measure of each angle.

$$\angle C + \angle D = 180$$

$$\angle C = 4x = 4(20) = 80$$

$$\angle D = 5x = 5(20) = 100$$

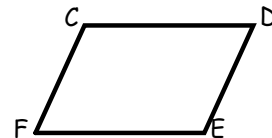
$$4x + 5x = 180$$

$$9x = 180$$

$$x = 20$$

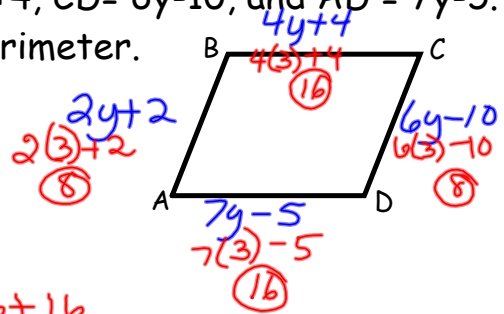
$$\angle C = 80$$

$$\angle D = 100$$



Ex. 3 In parallelogram ABCD, $AB=2y+2$, $BC=4y+4$, $CD=6y-10$, and $AD=7y-5$. Find the lengths of the sides and the perimeter.

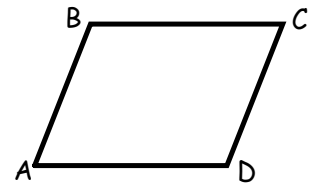
$$\begin{array}{r} 2y+2 = 6y-10 \\ -2y \quad -2y \\ \hline 2 = 4y-10 \\ +10 \quad +10 \\ \hline 12 = 4y \\ \frac{12}{4} = \frac{4y}{4} \\ \hline 3 = y \end{array}$$



$$P = 8 + 8 + 16 + 16 = 48 \text{ units}$$

Ex. 4 In parallelogram ABCD, $m\angle B$ exceeds $m\angle A$ by 46 degrees. Find

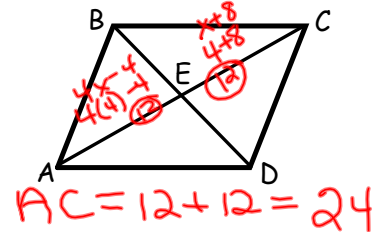
$$\begin{array}{l} m\angle B \\ \angle A + \angle B = 180 \\ \angle A = x \\ \angle B = x + 46 \\ \hline x + x + 46 = 180 \Rightarrow \angle A = 67 \\ 2x + 46 = 180 \\ -46 \quad -46 \\ \hline 2x = 134 \\ x = 67 \\ \hline \angle B = 67 + 46 = 113^\circ \end{array}$$



Ex. 5 In parallelogram ABCD, the diagonals intersect at E. Find the longer diagonal AC, if $AE=4x-4$ and $EC=x+8$.

Diagonals bisect each other
E is midpt
 $\overline{AE} \cong \overline{EC}$

$$\begin{array}{r} 4x-4 = x+8 \\ -x \quad -x \\ \hline 3x-4 = 8 \\ +4 \quad +4 \\ \hline 3x = 12 \\ \hline x = 4 \end{array}$$



Ex. 6. ABCD is a parallelogram. Find each length and angle measure.

$$\begin{array}{r} 3y-11 = 1 \\ -2y \quad -2y \\ \hline 3y-11 = 1 \\ +11 \quad +11 \\ \hline 3y = 12 \\ y = 4 \end{array}$$

$$\begin{array}{r} x+3 + 4x+12 = 180 \\ 5x+15 = 180 \\ 5x = 165 \\ x = 33 \end{array}$$

