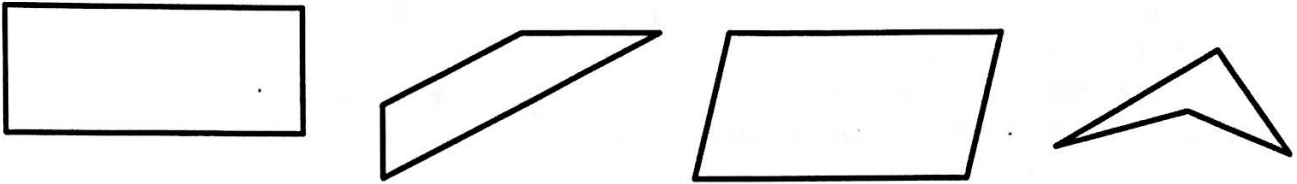
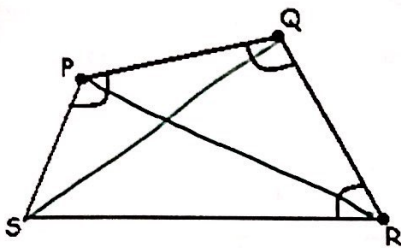


Day 1 – Properties of Parallelograms – Notes

A **quadrilateral** is a closed geometric figure or polygon, with 4 sides and 4 angles. The angles in a quadrilateral add to 360° .



Any two vertices of a quadrilateral are either consecutive (next to) or nonconsecutive (across from) vertices. Segments that join nonconsecutive vertices are called diagonals.



Consecutive Vertices: $\angle Q \hat{=} \angle R$ / $\angle P \hat{=} \angle S$
 Nonconsecutive Vertices: $\angle Q \hat{=} \angle S$ / $\angle P \hat{=} \angle R$
 Diagonals: \overline{PR} \overline{QS}

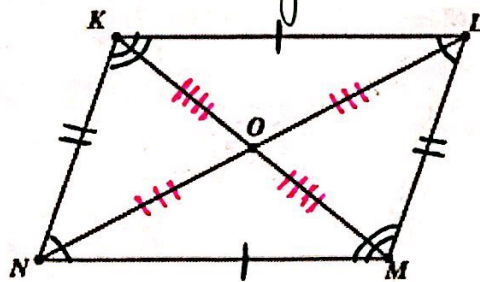
A **parallelogram** is a type of quadrilateral that has **two pairs of opposite sides that are parallel**. Parallelograms are denoted by the symbol \square . If a quadrilateral has two pairs of parallel, opposite sides, then it can be classified as a parallelogram. We are going to use the following Geogebra activity to discover the properties of parallelograms: <https://www.geogebra.org/m/sf5MXdUj>

There are 5 theorems associated with PARALLELOGRAMS:

- Opposite sides are Congruent
- Opposite angles are Congruent
- Consecutive angles are Supplementary
- Diagonals bisect each other
- Diagonals form two Congruent triangles

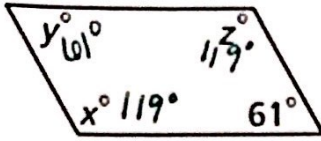
$\angle K + \angle L = 180^\circ$
 $\angle K + \angle N = 180^\circ$

$\triangle KLM \cong \triangle MNL$
 $\triangle KON \cong \triangle MOL$



Applying Properties of Quadrilaterals

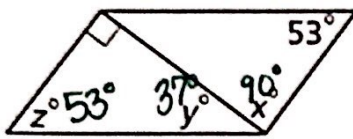
1. Solve for x, y, and z.



Relationship: opp angles are \cong
consecutive \angle 's are supp

$x = 119^\circ$ (cons. \angle 's are supp)
 $y = 61^\circ$ (opp \angle 's are \cong)
 $z = 119^\circ$

2. Solve for x, y, and z.

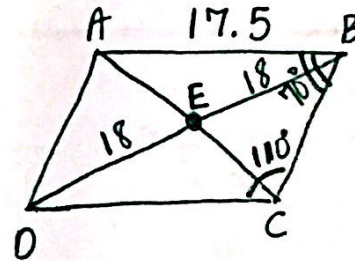


Relationship: opp \angle 's are \cong
consecutive \angle 's are supp

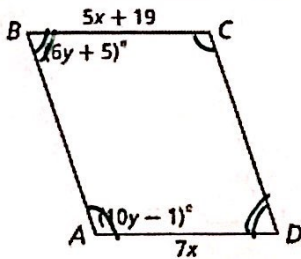
$x = 90^\circ$ (alt int \angle 's are \cong)
 $y = 37^\circ$ (triangle sum)
 $z = 53^\circ$ (opp \angle 's are \cong)

3. In parallelogram ABCD, $AB = 17.5$, $DE = 18$, and $m\angle BCD = 110^\circ$. Point E represents the intersection of the diagonals. Draw a picture of parallelogram ABCD and answer the following questions:

- a. $BD = \underline{36}$
- b. $CD = \underline{17.5}$
- c. $BE = \underline{18}$
- d. $m\angle ABC = \underline{70^\circ}$
- e. $m\angle ADC = \underline{70^\circ}$
- f. $m\angle DAB = \underline{110^\circ}$



4. Find the value of x. Then find the length of BC.



$5x + 19 = 7x$
 $19 = 2x$
 $9.5 = x$

$BC = \underline{66.5}$

Relationship: consecutive \angle 's are supp

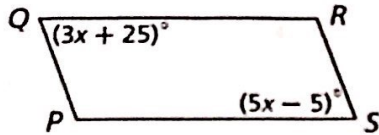
opp sides are \cong
 $6y + 5 + 10y - 1 = 180$
 $16y + 4 = 180$
 $16y = 176$
 $y = 11$

$\angle C = 10(11) - 1$
 $\angle C = \underline{109^\circ}$

$\angle D = 6(11) + 5$
 $\angle D = \underline{71^\circ}$

5. Find the value of x . Then find Angle Q.

Relationship: opp \angle 's are \cong



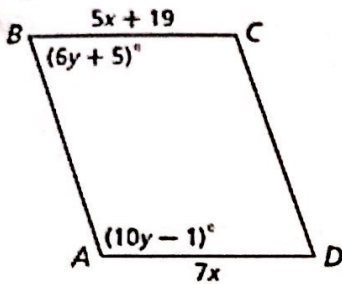
$$3x + 25 = 5x - 5$$

$$30 = 2x$$

$$\boxed{x = 15}$$

6. Find the value of y . Then find the measure of Angle C and D.

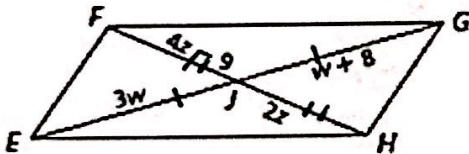
Relationship: _____



See problem 4

7. EFGH is a parallelogram. Find w and z .

Relationship: diagonals bisect each other



$$3w = w + 8$$

$$2w = 8$$

$$\boxed{w = 4}$$

$$4z - 9 = 2z$$

$$-9 = -2z$$

$$\boxed{z = 4.5}$$