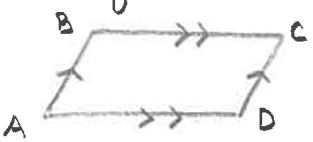
Geometry CP
6.2 Parallelograms

Parallelogram: a quadrilateral w/ both pairs of opposite sides parallel

ex) 

$\square ABCD$

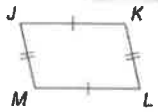
$\overline{AB} \parallel \overline{CD}$ and $\overline{BC} \parallel \overline{AD}$

Theorems — **Properties of Parallelograms** — For Your FOLDABLE

6.3 If a quadrilateral is a parallelogram, then its opposite sides are congruent.

Abbreviation *Opp. sides of a ▱ are ≅.*

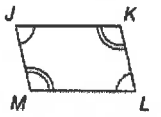
Example If *JKLM* is a parallelogram, then $\overline{JK} \cong \overline{ML}$ and $\overline{JM} \cong \overline{KL}$.



6.4 If a quadrilateral is a parallelogram, then its opposite angles are congruent.

Abbreviation *Opp. ∠s of a ▱ are ≅.*

Example If *JKLM* is a parallelogram, then $\angle J \cong \angle L$ and $\angle K \cong \angle M$.



6.5 If a quadrilateral is a parallelogram, then its consecutive angles are supplementary.

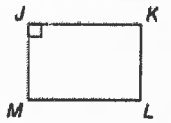
Abbreviation *Cons. ∠s in a ▱ are supplementary.*

Example If *JKLM* is a parallelogram, then $x + y = 180$.

6.6 If a parallelogram has one right angle, then it has four right angles.

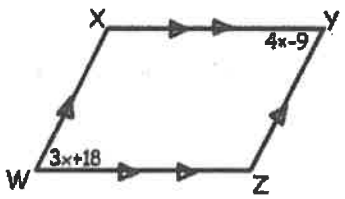
Abbreviation *If a ▱ has 1 rt. ∠, it has 4 rt. ∠s.*

Example In ▱*JKLM*, if $\angle J$ is a right angle, then $\angle K$, $\angle L$, and $\angle M$ are also right angles.



1. The figures below are parallelograms. Solve for the variable below:

a.

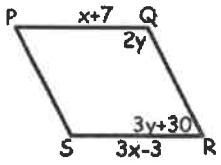


Thm 6.4

$3x + 18 = 4x - 9$

$27^\circ = x$

b.



$2y + 3y + 30 = 180$ Thm 6.5

$5y = 150$

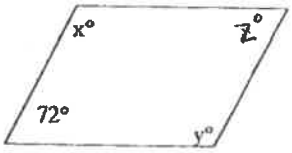
$y = 30^\circ$

$x + 7 = 3x - 3$ Thm 6.3

$10 = 2x$

$5 = x$

c.



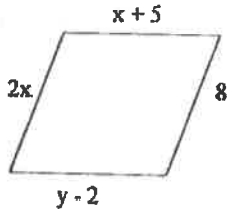
$z = 72°$

$x + 72 = 180$

$x = 108°$

$y = 108°$

d.



$2x = 8$

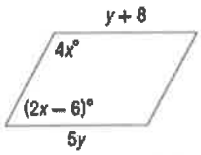
$x = 4$

$x + 5 = y - 2$

$4 + 5 = y - 2$

$7 = y$

e.



$5y = y + 8$

$4y = 8$

$y = 2$

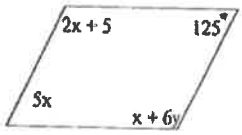
$4x = 2x - 6$

$2x = -6$

$x = -3$

No Solution for x

f.



$5x = 125$

$x = 25°$

$2x + 5 = x + 6y$

$2(25) + 5 = 25 + 6y$

$55 = 25 + 6y$

$30 = 6y$

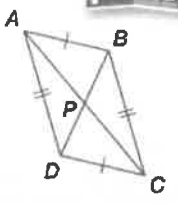
$5 = y$

Theorems — **Diagonals of Parallelograms** — For Your FOLDABLE

6.7 If a quadrilateral is a parallelogram, then its diagonals bisect each other.

Abbreviation *Diag. of a ▱ bisect each other.*

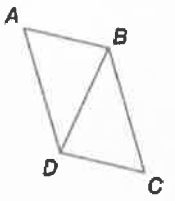
Example If *ABCD* is a parallelogram, then $\overline{AP} \cong \overline{PC}$ and $\overline{DP} \cong \overline{PB}$.



6.8 If a quadrilateral is a parallelogram, then each diagonal separates the parallelogram into two congruent triangles.

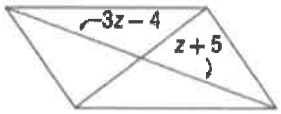
Abbreviation *Diag. separates a ▱ into 2 ≅ △.*

Example If *ABCD* is a parallelogram, then $\triangle ABD \cong \triangle CDB$.



2. The figures below are parallelograms. Determine the value of the variables.

a.

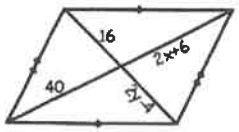


$3z - 4 = z + 5$ Thm 6.7

$2z = 9$

$z = 4.5$

b.



$40 = 2x + 6$

$34 = 2x$

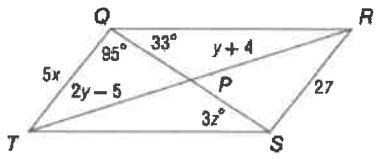
$17 = x$

$16 = 2y - 4$

$20 = 2y$

$10 = y$

3. If QRST is a parallelogram, find the value of the variables.



diagonals:

$2y - 5 = y + 4$

$y = 9$

sides:

$5x = 27$

$x = 27/5$

angles:

$33 = 3z$ Thm 6.8

$11° = z$

4. Use the diagram to find the measures. $m\angle ZVX = 80°$, $VZ = 7$, $VX = 10$, $VT = 5$

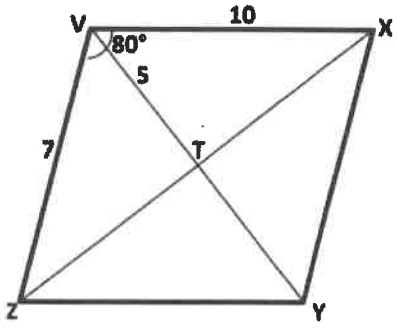
$m\angle VZY =$ 100°

$m\angle XYZ =$ 80°

$TY =$ 5

$ZY =$ 10

$XY =$ 7



5. Determine the coordinates of the intersection of the diagonals of $\square FGHJ$ with vertices $F(-2,4)$, $G(3,5)$, $H(2,-3)$, and $J(-3,-4)$.

* diagonals bisect each other so find midpoint of opposite vertices

midpoint of $\overline{FH}$:

$$\left(\frac{-2+2}{2}, \frac{4+(-3)}{2}\right)$$

$$\boxed{\left(0, \tfrac{1}{2}\right)}$$

check by finding midpoint of $\overline{GJ}$ → also $\left(0, \tfrac{1}{2}\right)$

6. Determine the coordinates of the intersection of the diagonals $\square RSTU$ with vertices $R(-8,-2)$, $S(-6,7)$, $T(6,7)$, and $U(4,-2)$.

midpoint of $\overline{RT}$:

$$\left(\frac{-8+6}{2}, \frac{-2+7}{2}\right)$$

$$\boxed{\left(-1, \tfrac{5}{2}\right)}$$