7.2 Properties of Parallelograms

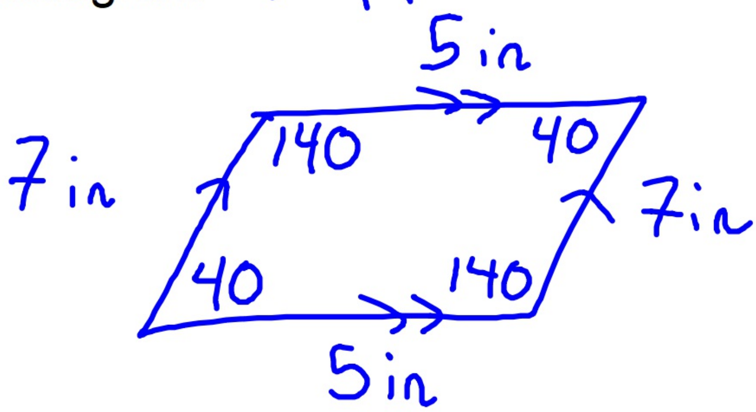
Learning Target Prove and use properties of parallelograms.

Success Criteria

- I can prove properties of parallelograms.
- I can use properties of parallelograms.
- I can solve problems involving parallelograms in the coordinate plane.

Vocab:

Parallelogram → opposite sides are Parallel

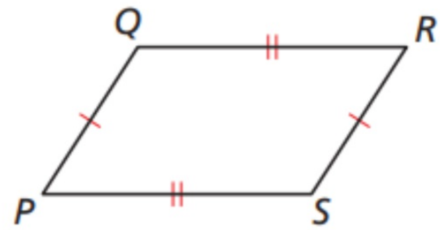


THEOREMS

7.3 Parallelogram Opposite Sides Theorem

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

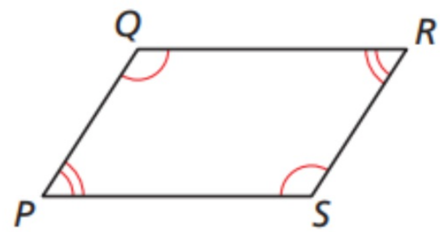
If $PQRS$ is a parallelogram, then $\overline{PQ} \cong \overline{RS}$ and $\overline{QR} \cong \overline{SP}$.



7.4 Parallelogram Opposite Angles Theorem

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

If $PQRS$ is a parallelogram, then $\angle P \cong \angle R$ and $\angle Q \cong \angle S$.

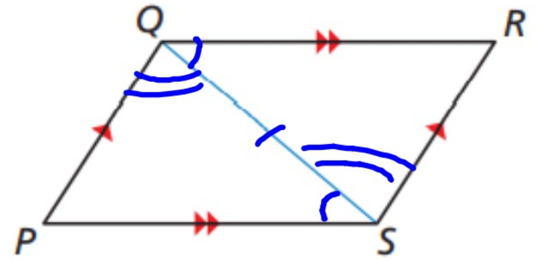


Prove this Theorem Exercise 33, page 361

PROOF **Parallelogram Opposite Sides Theorem**

Given *PQRS* is a parallelogram.

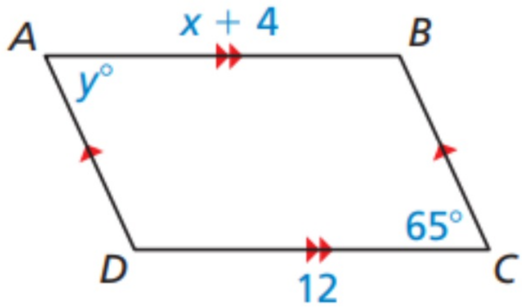
Prove $\overline{PQ} \cong \overline{RS}$, $\overline{QR} \cong \overline{SP}$



	Given
$\overline{QS} \cong \overline{QS}$	Reflexive
$\angle PSQ \cong \angle RQS$, $\angle PQS \cong \angle RSQ$	Alt. interior
$\triangle PQS \cong \triangle RSQ$	ASA
$\overline{PQ} \cong \overline{RS}$, $\overline{QR} \cong \overline{SP}$	CPCTC

EXAMPLE 1 Using Properties of Parallelograms

Find the values of x and y.

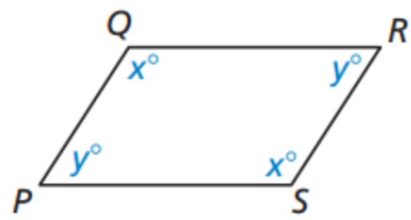


THEOREMS

7.5 Parallelogram Consecutive Angles Theorem

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

If $PQRS$ is a parallelogram, then $x^\circ + y^\circ = 180^\circ$.

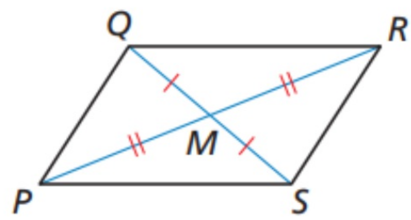


Prove this Theorem Exercise 34, page 361

7.6 Parallelogram Diagonals Theorem

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

If $PQRS$ is a parallelogram, then $\overline{QM} \cong \overline{SM}$ and $\overline{PM} \cong \overline{RM}$.

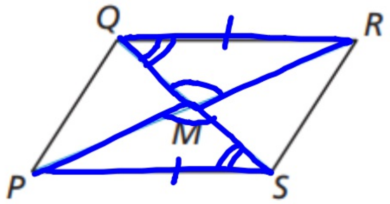


Proof page 358
Prove this Theorem Exercise 35, page 361

PROOF Parallelogram Diagonals Theorem

Given *PQRS* is a parallelogram. Diagonals $\overline{PR}$ and $\overline{QS}$ intersect at point *M*.

Prove *M* bisects $\overline{QS}$ and $\overline{PR}$.

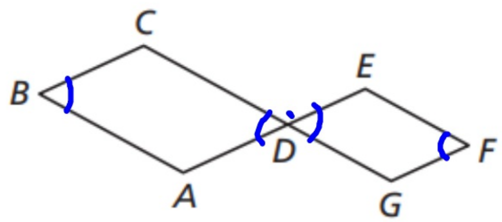


	Given
$\overline{QR} \cong \overline{PS}$	Def of ▱
$\angle QMR \cong \angle PMS$	Vertical
$\angle MPS \cong \angle QRM$, $\angle RQM \cong \angle PSM$	Alt. interior
$\triangle PMS \cong \triangle RMQ$	AAS, ASA
$\overline{PM} \cong \overline{MR}$, $\overline{QM} \cong \overline{MS}$	CPCTC
M bisects $\overline{QS}$ + $\overline{PR}$	Def of Bisect

EXAMPLE 3 Writing a Two-Column Proof

WATCH

Write a two-column proof.



Given $ABCD$ and $GDEF$ are parallelograms.

Prove $\angle B \cong \angle F$

STATEMENTS	REASONS
	Given
$\angle B \cong \angle CDA$	Def of ▱
$\angle EDG \cong \angle F$	"
$\angle CDA \cong \angle EDG$	Vertical
$\angle B \cong \angle F$	Transitive

Using Parallelograms in the Coordinate Plane

GO D

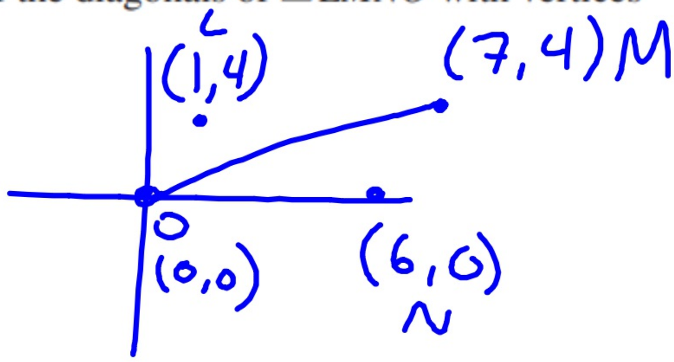
EXAMPLE 4 Using Parallelograms in the Coordinate Plane

WATCH

Find the coordinates of the intersection of the diagonals of ▱*LMNO* with vertices *L*(1, 4), *M*(7, 4), *N*(6, 0), and *O*(0, 0).

$$\left(\frac{7+0}{2}, \frac{4+0}{2}\right)$$

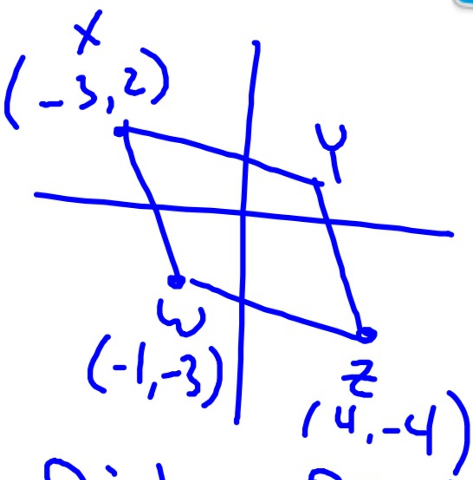
$$(3.5, 2)$$



EXAMPLE 5 Using Parallelograms in the Coordinate Plane

Three vertices of ▱$WXYZ$ are $W(-1, -3)$, $X(-3, 2)$, and $Z(4, -4)$. Find the coordinates of vertex Y.

(2, 1)



W→Z

Distance Right 5

Distance up/down

down 1

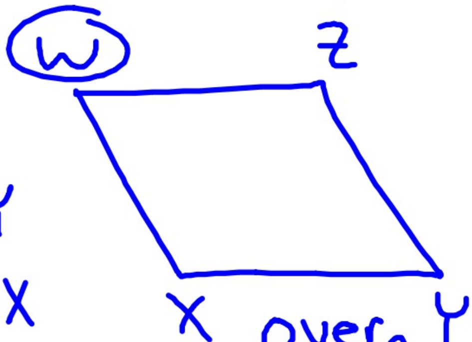
$(-5,7)$ $(-2,3)$ $(4,5)$

W X Y Z

over 6

up 2

$(4,8)$

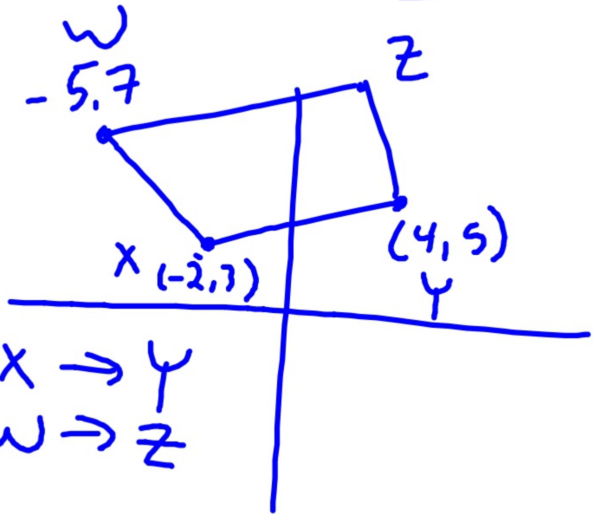


$X \to Y$

$Y \to X$

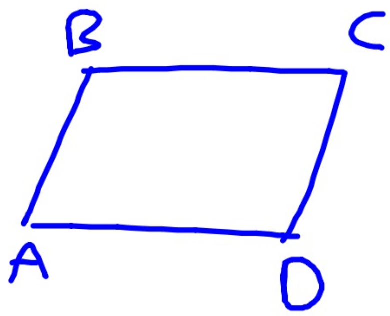
over 2

up 8



$X \to Y$

$W \to Z$



HW:

p 360

2-30e