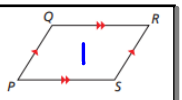
7.2 and 7.3 Parallelograms with work

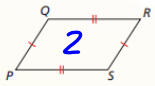
7.2 & 7.3 Parallelograms



Theorem 7.3 Parallelogram Opposite Sides Theorem

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

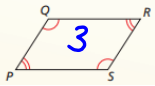
If $PQRS$ is a parallelogram, then $\overline{PQ} \cong \overline{RS}$ and $\overline{QR} \cong \overline{SP}$.



Theorem 7.4 Parallelogram Opposite Angles Theorem

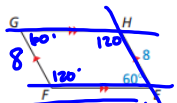
If a quadrilateral is a parallelogram, then its opposite angles are congruent.

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



Practice:

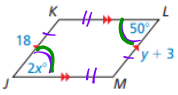
1. Find FG and $m\angle G$.



FG = 8u

m∠G = 60°

2. Find the values of x and y.



2x = 50

x = 25

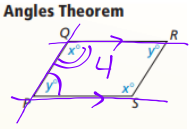
18 = y + 3

15 = y

Theorem 7.5 Parallelogram Consecutive Angles Theorem

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

If $PQRS$ is a parallelogram, then $x° + y° = 180°$.

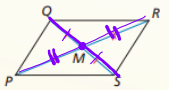


Theorem 7.6 Parallelogram Diagonals Theorem

5

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

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



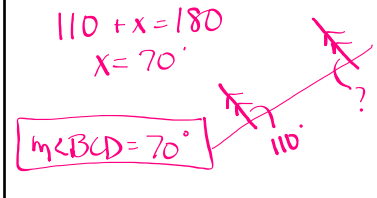
Practice:

3. As shown, part of the extending arm of a desk lamp is a parallelogram. The angles of the parallelogram change as the lamp is raised and lowered. Find $m\angle BCD$ when $m\angle ADC = 110°$.

110 + x = 180

x = 70°

m∠BCD = 70°



Summary of Properties for a Parallelogram

1) Opposite sides ~~parallel~~. $\cong$.

2) Opposite angles congruent.

3) Both pairs of opposite sides are parallel.

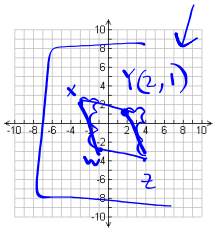
4) Consecutive angles are supplementary. x + y = 180

5) Diagonals bisect each other.

Practice:

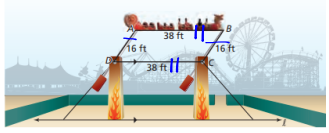
4. Three vertices of $\square WXYZ$ are $W(-1, -3)$, $X(-3, 2)$, and $Z(4, -4)$. Find the coordinates of vertex Y.

Y (2, 1)



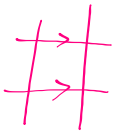
7.3 says the Converse to all theorems in 7.2 are also true!

Test if this image is a parallelogram.



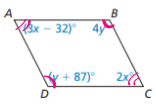
Another Converse Example

The doorway shown is part of a building in England. Over time, the building has leaned sideways. Explain how you know that $SV = TU$.



More Practice with the Converse

For what values of x and y is quadrilateral $ABCD$ a parallelogram? Explain your reasoning.



$\begin{cases} 3x - 32 + y + 87 = 180 \\ 4y + 2x = 180 \end{cases}$

$2x = 3x - 32$

$32 = x$

$4y = y + 87$

$3y = 87$

$y = 29$

Concept Summary

Ways to Prove a Quadrilateral Is a Parallelogram

1. Show that both pairs of opposite sides are parallel. *(Definition)*	
2. Show that both pairs of opposite sides are congruent. *(Parallelogram Opposite Sides Converse)*	
3. Show that both pairs of opposite angles are congruent. *(Parallelogram Opposite Angles Converse)*	
4. Show that one pair of opposite sides are congruent and parallel. *(Opposite Sides Parallel and Congruent Theorem)*	
5. Show that the diagonals bisect each other. *(Parallelogram Diagonals Converse)*	

7.2 HW: pg. 372: 3, 7, 9, 13, 17, 19, 21, 48 - 50

ANSWERS:

48. yes; $\ell \parallel m$ by the Alternate Interior Angles Converse (Thm. 3.6).

49. yes; $\ell \parallel m$ by the Alternate Exterior Angles Converse (Thm. 3.7).

50. no; By the Consecutive Interior Angles Converse (Thm. 3.8), consecutive interior angles need to be supplementary for the lines to be parallel, and the consecutive interior angles are not supplementary.

7.3 HW: pg. 381: 9, 11, 17, 21, 33, 51 - 54

ANSWERS:

52. The quadrilateral is a rectangle by the definition of a rectangle (a quadrilateral with four right angles).

53. The quadrilateral is a square by the definition of a square (a quadrilateral with four right angles and four congruent sides).

54. The quadrilateral is a rhombus by the definition of a rhombus (a quadrilateral with four congruent sides).