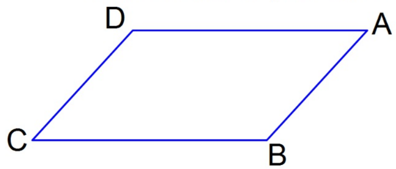
Sec 6-3: Proving that a Quadrilateral is a Parallelogram.

What do you think you would have to know about Quadrilateral ABCD for you to be able to conclude that it is a Parallelogram?

Make a list of possible answers.



- If opp ∠'s ≅
- If opp sides ≅
- If opp sides ∥
- If diag bisect each other

To prove a quadrilateral is a parallelogram you can show that the converses of the definition and theorems about parallelograms are true,

plus one other theorem.

Quadrilateral Booklet

Parallelogram	Proving a Quad is a ||-gram:
	1.
	2.
	3.
	4.
	5.

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

Converse of the definition:

1. If both pair of opposite sides of a quadrilateral are parallel, then the quad is a parallelogram.

Theorem 6-1

Opposite sides of a parallelogram are congruent.

Converse of Theorem 6-1:

2.

Theorem 6-5

If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Theorem 6-2

Opposite angles of a parallelogram are congruent.

Converse of Theorem 6-2:

3.

Theorem 6-6

If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Theorem 6-3

The diagonals of a parallelogram bisect each other.

Converse of Theorem 6-3:

4.

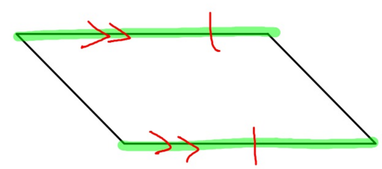
Theorem 6-7

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

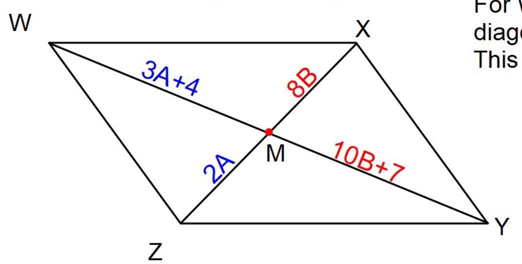
5.

Theorem 6-8

If one pair of opposite sides of a quadrilateral is both congruent and parallel, then the quadrilateral is a parallelogram.



Find the value of each variable such that the quadrilateral must be a parallelogram.



For WXYZ to be a parallelogram the diagonals must bisect each other.
This means $\overline{MX} \cong \overline{MZ}$ and $\overline{MW} \cong \overline{MY}$

$2A = 8B$
$\frac{2A}{2} = \frac{8B}{2}$

$A = 4B$

$A = 4(1.5)$

$A = 6$

$3A+4 = 10B+7$

$3(4B)+4 = 10B+7$

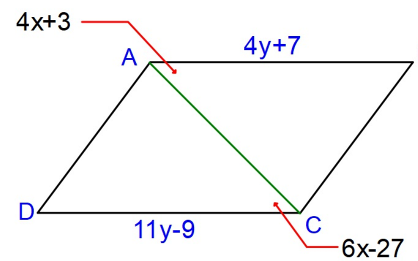
$12B+4 = 10B+7$
$-10B \quad -10B$

$2B+4 = 7$
$-4 \quad -4$

$2B = 3$

$B = 1.5$

Find the value of each variable such that the quadrilateral must be a parallelogram.



For ABCD to be a parallelogram $\overline{AB}$ and $\overline{CD}$ must be both parallel and congruent.

for $\overline{AB}$ to be congruent to $\overline{CD}$:

$4y+7 = 11y-9$
$-4y \quad -4y$

$7 = 7y - 9$
$+9 \quad +9$

$16 = 7y \longrightarrow y = \frac{16}{7}$

for AB to be parallel to CD: Angles BAC & DAC must be congruent.
Alternate Interior Angles

$4x+3 = 6x-27$
$-4x \quad -4x$

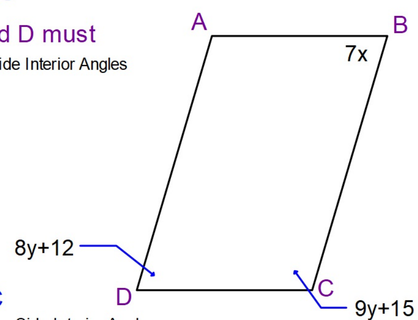
$3 = 2x - 27$
$+27 \quad +27$

$30 = 2x$ — $x = 15$

Find the value of each variable such that the quadrilateral must be a parallelogram.

For $\overline{AD} \parallel \overline{BC}$ angles C and D must be supplementary. Same-Side Interior Angles

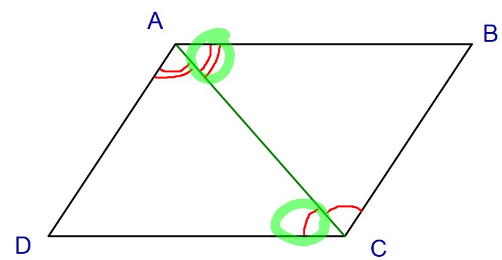
$8y+12 + 9y+15 = 180$
$17y + 27 = 180$
$17y = 153$
$y = 9$



for $\overline{AB} \parallel \overline{DC}$ angles B and C must be supplementary. Same-Side Interior Angles

$7x + 9y+15 = 180$
$7x + 9(9) +15 = 180$
$7x + 81 + 15 = 180$
$7x +96 = 180$
$7x = 84$
$x = 12$

Is this quadrilateral a parallelogram?



If $\overline{AB}$ is going to be parallel to $\overline{CD}$ angles BAC and DAC must be congruent (alternate-interior angles). Since they these angles are not congruent $\overline{AB}$ is not parallel to $\overline{CD}$.

Therefore, ABCD can't be a parallelogram.

Hwk #4 Sec 6-3

Page 324

Problems: 3, 4, 7-9, 14, 15, 17, 22-24