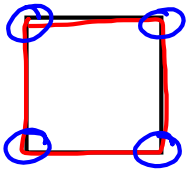
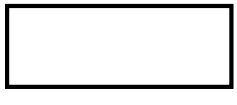
3-3 Parallelograms

Notes: Pages 495-499

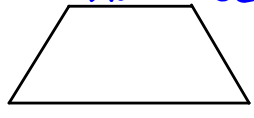
Definitions:

Quadrilateral - A polygon with four vertices and four edges. → sides



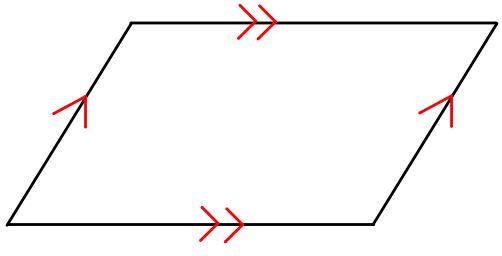


where 2 ↙ sides meet

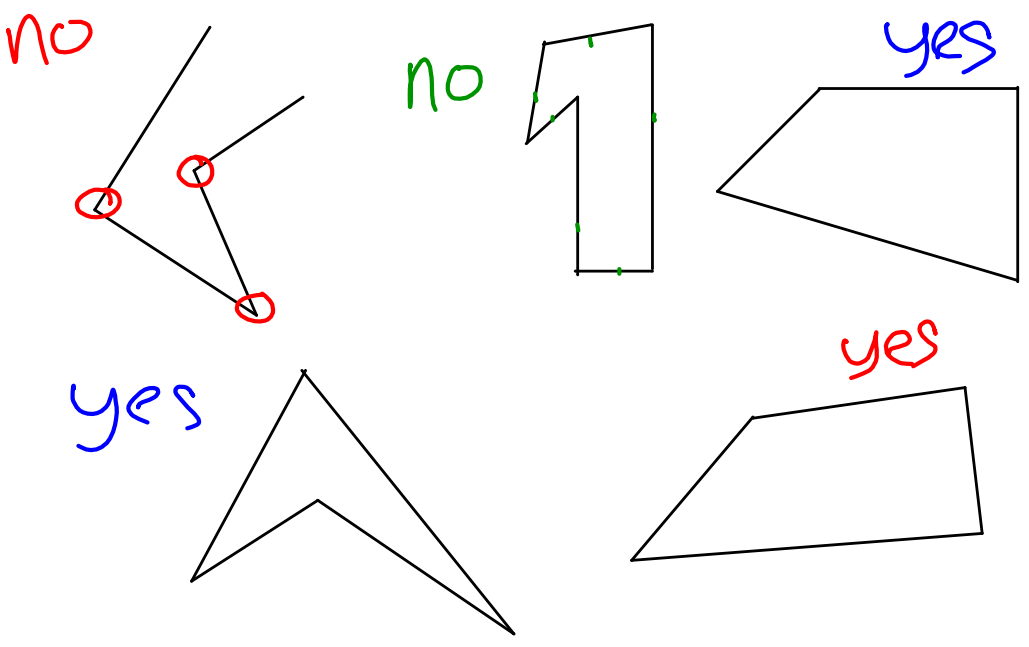


Woot Star Trek

Parallelogram - A quadrilateral with both pairs of opposite sides parallel.

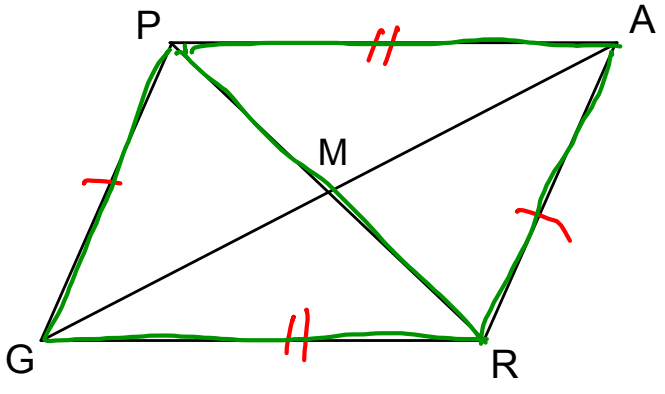


Which of the following are quadrilaterals?



P. 497 Q. 3

To prove opposite sides of a parallelogram *P* are congruent, which triangles would you prove congruent?

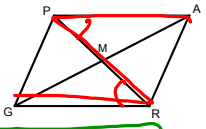


P. 497 Q. 4

Use ΔPGR and ΔRAP in the parallelogram from Question 3 to prove that opposite sides of a parallelogram are congruent . Prove the statement $\overline{PG} \cong \overline{AR}$ and $\overline{GR} \cong \overline{PA}$.

Given: Parallelogram $PARG$ with diagonals $\overline{PR}$ and $\overline{AG}$ intersecting at point M

Prove: $\overline{PG} \cong \overline{AR}$ and $\overline{GR} \cong \overline{PA}$ → goal



PA // GR
// gram

PG // AR
// gram

PR ≅ PR
reflexive

∠APR ≅ ∠GPR
AIA

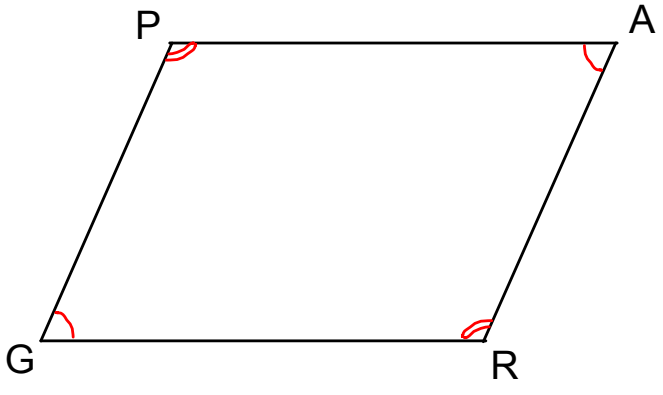
∠GPR ≅ ∠ARP
AIA

ΔPRG ≅ ΔRPA
ASA

PA ≅ GR PG ≅ AR
CPCTC

Another theorem states:

Opposite angles of a parallelogram are congruent.

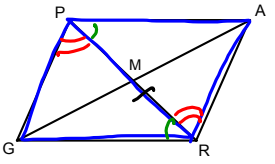


(You will prove this theorem in your homework.)

Groups: P. 499 Q. 8

Given: Parallelogram $PARG$ with diagonals $\overline{PR}$ and $\overline{AG}$ intersecting at point M

Prove: $\overline{PM} \cong \overline{RM}$ goal



$\overline{PA} \parallel \overline{GR}$ //gram

$\angle APR \cong \angle GRP$ AIA

$\angle PAG \cong \angle RGA$ AIA

$\overline{PA} \cong \overline{GR}$ //gram

$\triangle PAM \cong \triangle RGM$ ASA

$\overline{PM} \cong \overline{RM}$ CPCTC

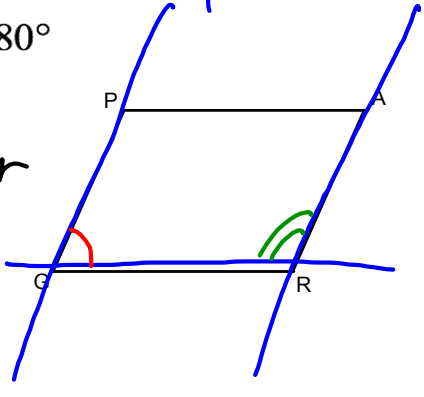
This theorem takes 2 seconds to prove

Given: PARG is a parallelogram

Prove: $m\angle PGR + m\angle GRA = 180°$

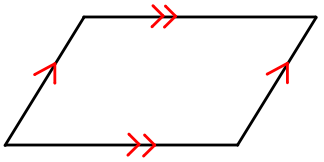
Same-side interior Supplementary 180°

Parallel lines w/transversal

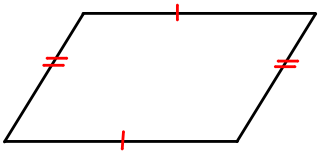


Recap: The 5 things we know about Parallelograms

In a parallelogram...

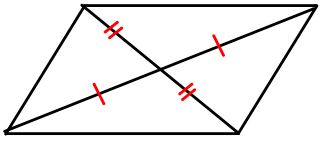


Opposite sides are parallel

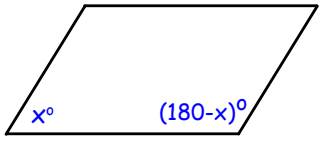


Opposite sides are congruent

Opposite angles are congruent

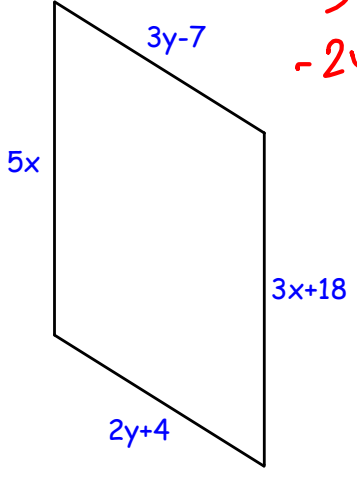


Diagonals bisect each other



Consecutive angles are supplementary

Find the value of each variable in the parallelogram.



$3y-7=2y+4$

$-2y \quad -2y$

$y-7=4$

$+7 \quad +7$

$\boxed{y=11}$

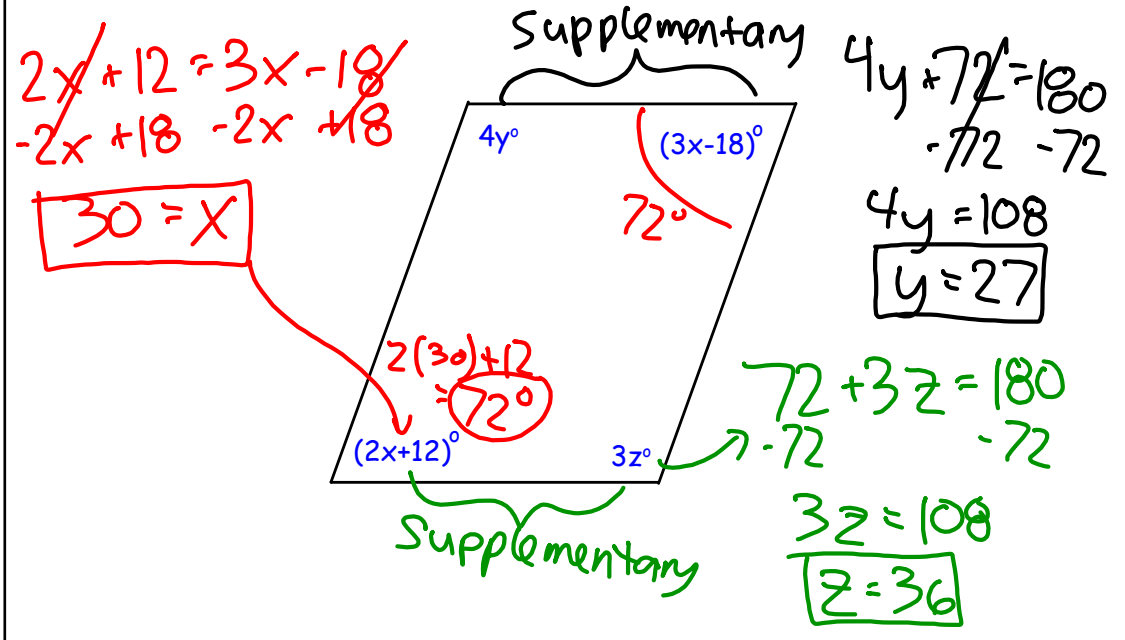
$5x=3x+18$

$-3x \quad -3x$

$\frac{2x}{2}=\frac{18}{2}$

$\boxed{x=9}$

Find the value of each variable in the parallelogram.



$2x + 12 = 3x - 18$

$-2x \quad +18 \quad -2x \quad +18$

$30 = x$

$2(30)+12 = 72^\circ$

$4y + 72 = 180$

$-72 \quad -72$

$4y = 108$

$y = 27$

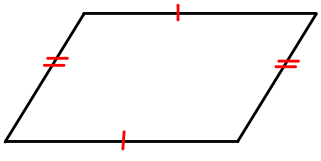
$72 + 3z = 180$

$-72 \quad -72$

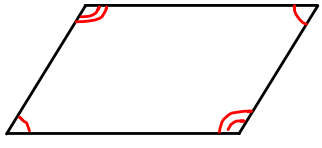
$3z = 108$

$z = 36$

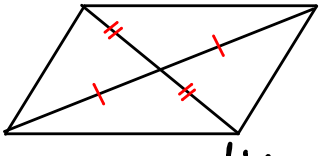
There are other converse theorems to prove that a quadrilateral is a parallelogram. We don't have time to prove them all. You will do one of them in your homework.



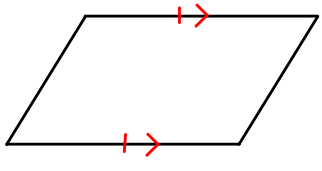
If opposite sides are congruent...



If opposite angles are congruent...



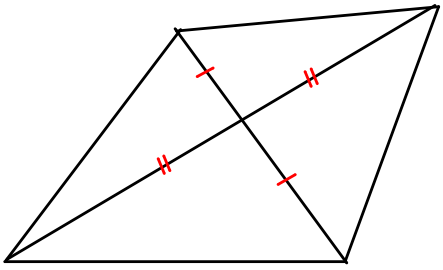
If the ~~angles~~ diagonals bisect each other...



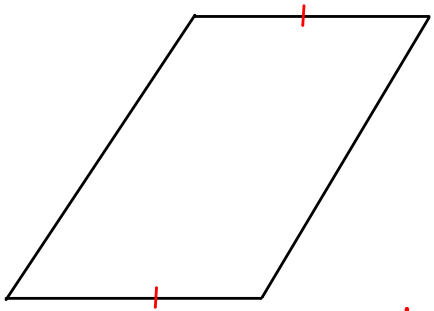
If opposite sides are congruent and parallel...

...then the quadrilateral is a parallelogram.

Are you given enough information to determine whether the quadrilateral is a parallelogram? (Remember what it is labeled is more important then what it looks like.)



yes, diagonals bisect each other



no, not enough info

9. $12 = 3x + 6$

$-6 \quad -6$

$\frac{6}{3} = \frac{3x}{3}$

$2 = x$

$27 = 2y + 9$