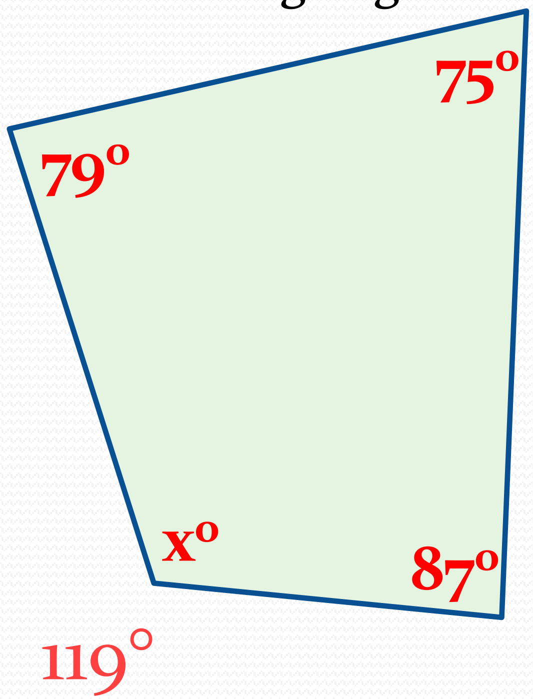
Created by Mr. Lischwe

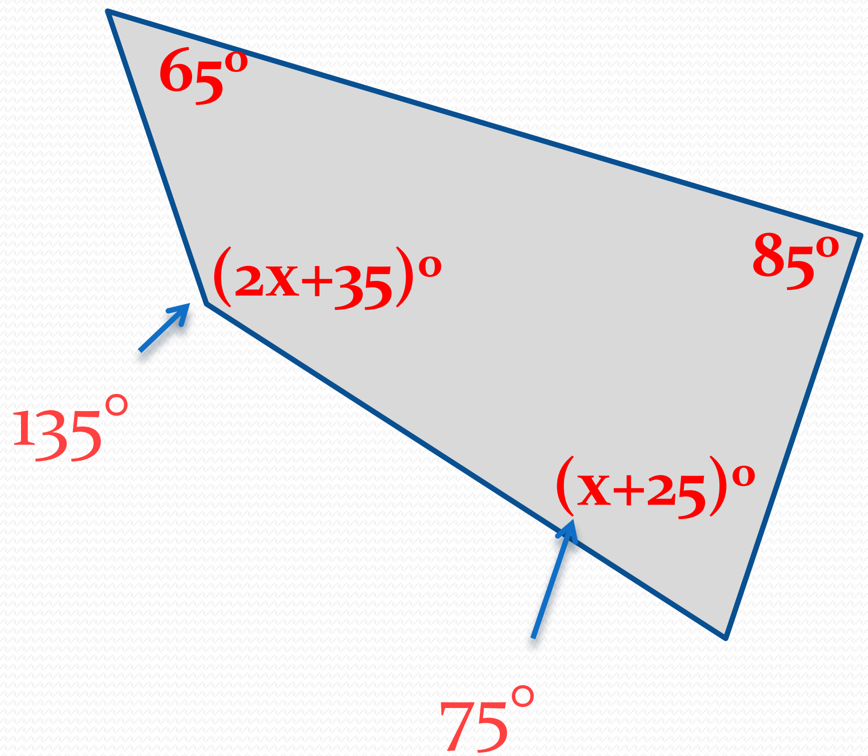
Warmup 3/(The sum or product of 1, 2, and 3)

Ruler and Protractor

Find the missing angle measure.

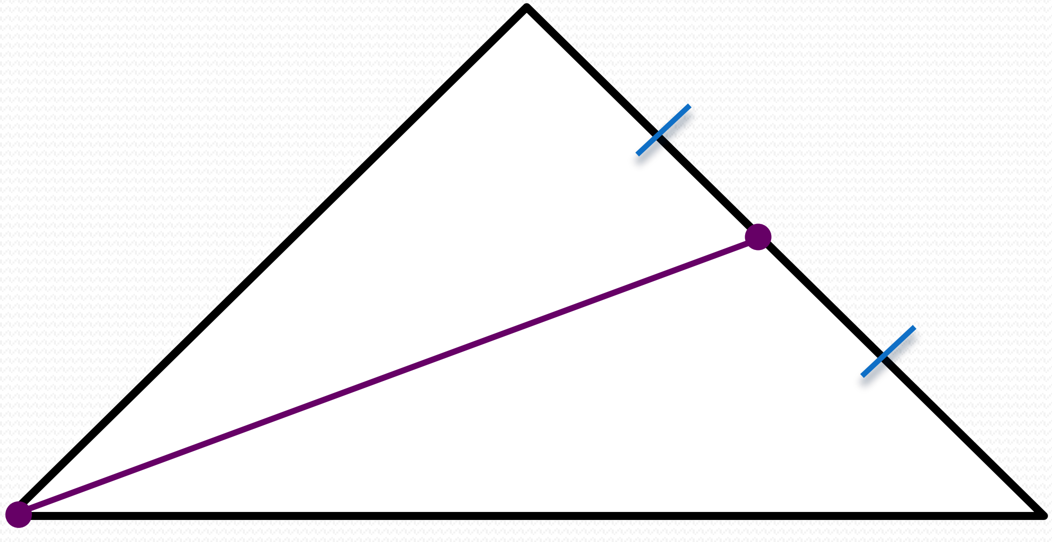


Find all angle measures.



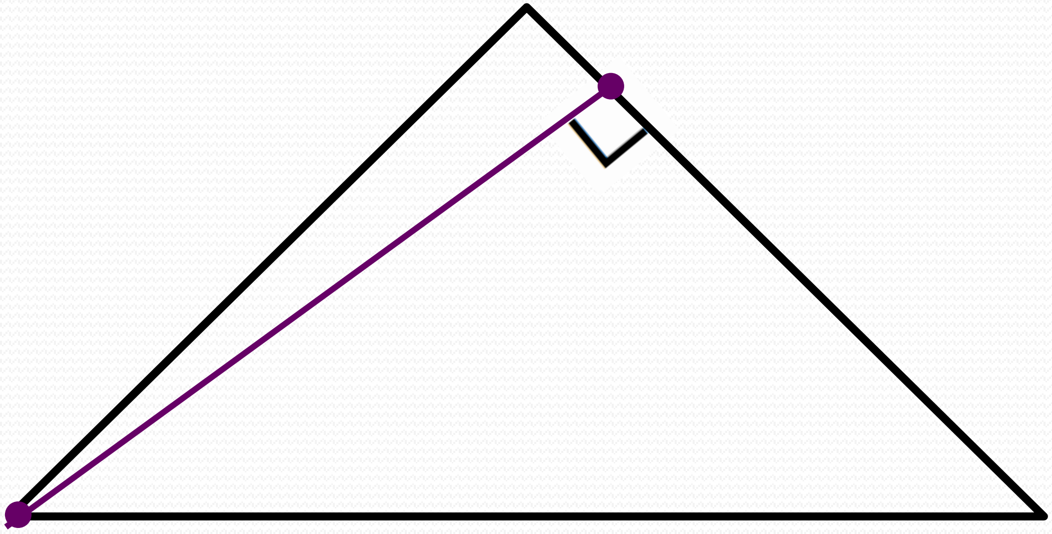
Check Homework

What kind of segment?



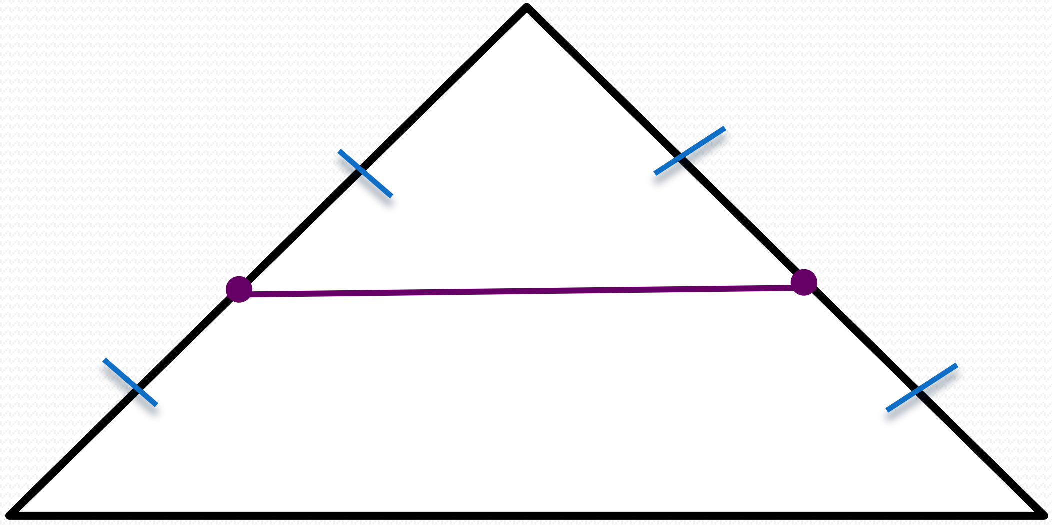
Median

What kind of segment?



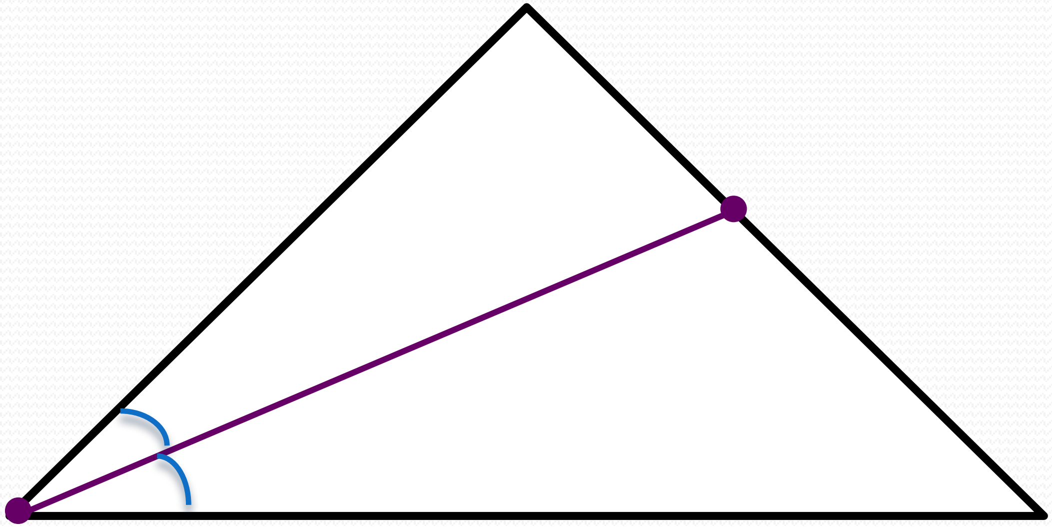
Altitude

What kind of segment?



Midsegment

What kind of segment?



Angle Bisector

Objective:

- Identify properties of parallelograms

What is a parallelogram?

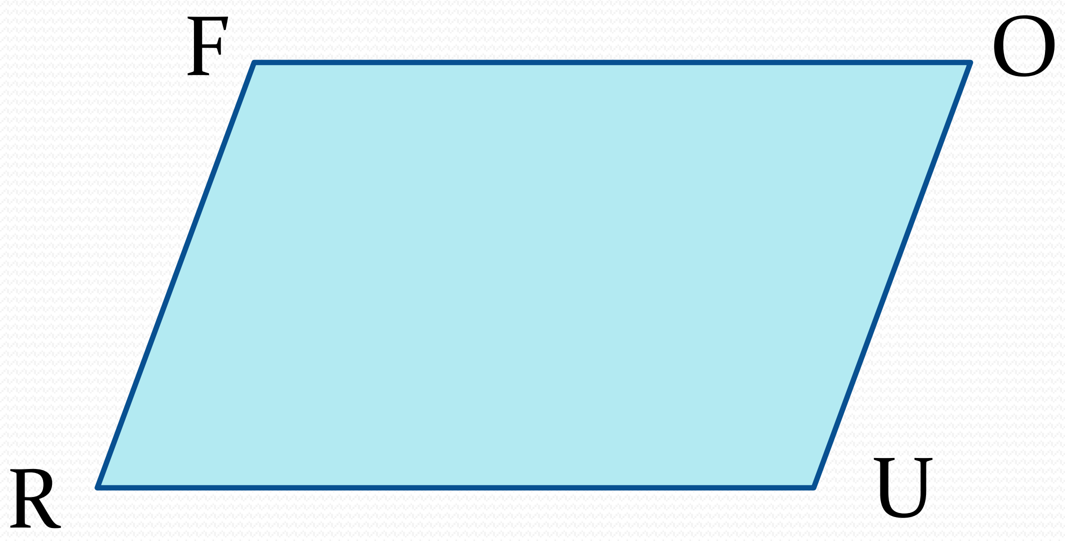
- a quadrilateral with opposite sides parallel

Exploration: Parallelograms

- Come up with a list of **as many additional properties as you can** about parallelograms.

- What is true about the **sides** of a parallelogram?
- What is true about the **angles** of a parallelogram?
- Did anyone draw the **diagonals** through the middle and look at those?

Which sides are opposite sides?
Which angles are opposite angles?
Which angles are consecutive angles?
What are diagonals?



- **<u>Parallelograms</u>**
  - Opposite sides parallel
  - Opposite sides congruent
  - Opposite angles congruent
  - Consecutive angles are supplementary
  - Diagonals bisect each other

- Let’s prove these properties!

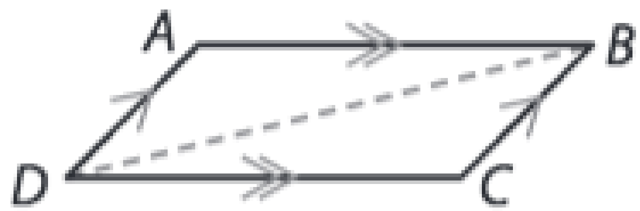
Given: $ABCD$ is a parallelogram.

Prove: $\overline{AB} \cong \overline{CD}$ and $\overline{AD} \cong \overline{CB}$

(Prove that opposite sides are congruent)

Given: *ABCD* is a parallelogram.

Prove: $\overline{AB} \cong \overline{CD}$ and $\overline{AD} \cong \overline{CB}$

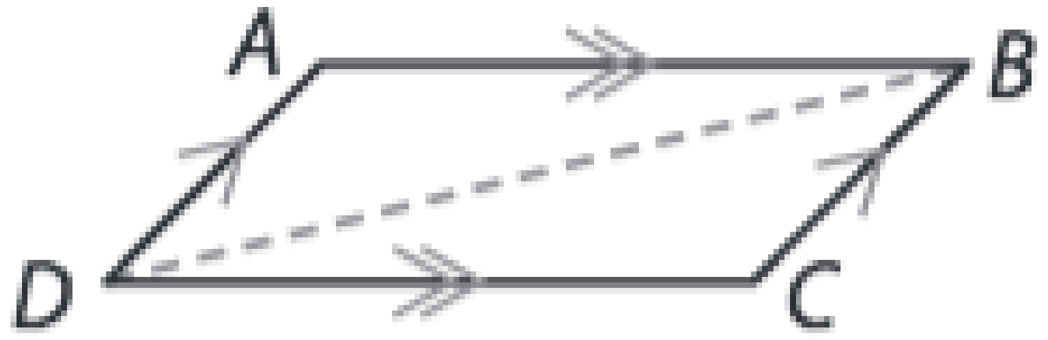


Statements	Reasons
1. *ABCD* is a parallelogram.	1. **Given**
2. Draw $\overline{DB}$.	2. Through any two points, there is exactly one line.
3. $\overline{AB} \parallel \overline{DC}$, $\overline{AD} \parallel \overline{BC}$	3.
4. $\angle ADB \cong \angle CBD$ $\angle ABD \cong \angle CDB$	4.
5. $\overline{DB} \cong \overline{DB}$	5.
6. $\triangle ABD \cong$	6. ASA Triangle Congruence Theorem
7. $\overline{AB} \cong \overline{CD}$ and $\overline{AD} \cong \overline{CB}$	7.

Given: $ABCD$ is a parallelogram.

Prove: $\angle A \cong \angle C$ (A similar proof shows that $\angle B \cong \angle D$.)

(Prove that opposite angles are congruent)



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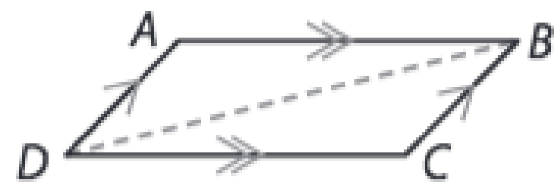
Prove: $\angle A \cong \angle C$ (A similar proof shows that $\angle B \cong \angle D$.)

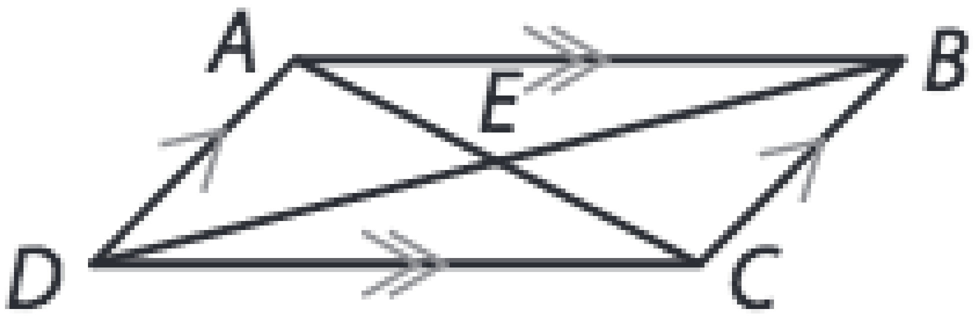


Statements	Reasons
1. $ABCD$ is a parallelogram.	1. **Given**
2. Draw $\overline{DB}$.	2. **Through any two points, there is exactly one line.**
3. $\overline{AB} \parallel \overline{DC}$, $\overline{AD} \parallel \overline{BC}$	3. **Definition of parallelogram**
4. $\angle ADB \cong \angle CBD$, $\angle ABD \cong \angle CDB$	4. Alternate Interior Angles Theorem
5. $\overline{DB} \cong \overline{DB}$	5. Reflexive Property of Congruence
6. $\triangle ABD \cong \triangle CDB$	6. ASA Triangle Congruence Theorem
7. $\angle A \cong \angle C$	7. **CPCTC**

Given: $ABCD$ is a parallelogram.

Prove: $\overline{AE} \cong \overline{CE}$ and $\overline{BE} \cong \overline{DE}$

(Prove that diagonals bisect each other)



Given: $ABCD$ is a parallelogram.

Prove: $\overline{AE} \cong \overline{CE}$ and $\overline{BE} \cong \overline{DE}$

$\overline{AB} \cong \overline{DC}$
Opposite sides of a parallelogram are congruent.

$\angle ABE \cong \angle CDE$
Alternate Interior Angles Theorem

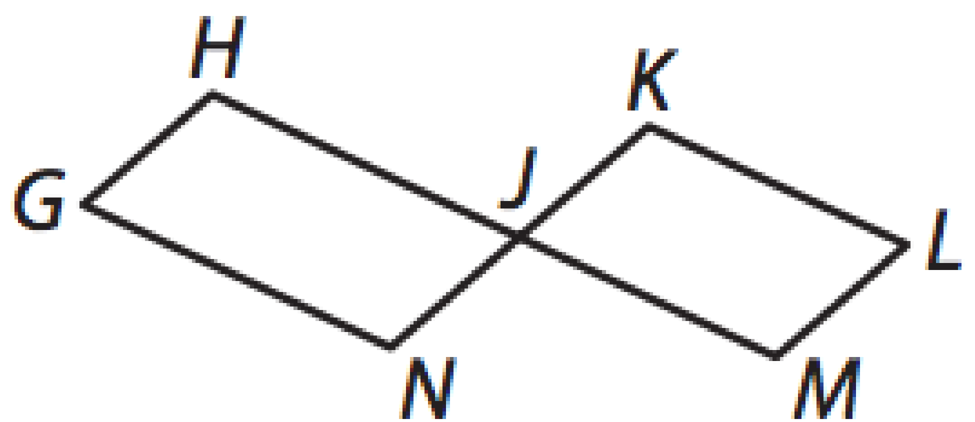
$\angle BAE \cong \angle DCE$
Alternate Interior Angles Theorem

$\triangle ABE \cong \triangle CDE$
ASA Triangle Congruence Theorem

$\overline{AE} \cong \overline{CE}$ and $\overline{BE} \cong \overline{DE}$
CPCTC

Given: *GHJN* and *JKLM* are parallelograms.

Prove: $\angle G \cong \angle L$



Given: *GHJN* and *JKLM* are parallelograms.

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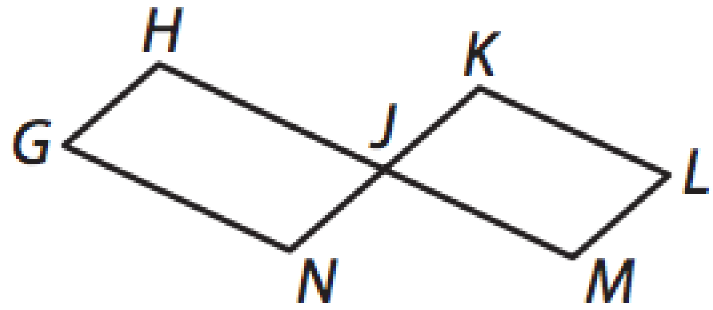
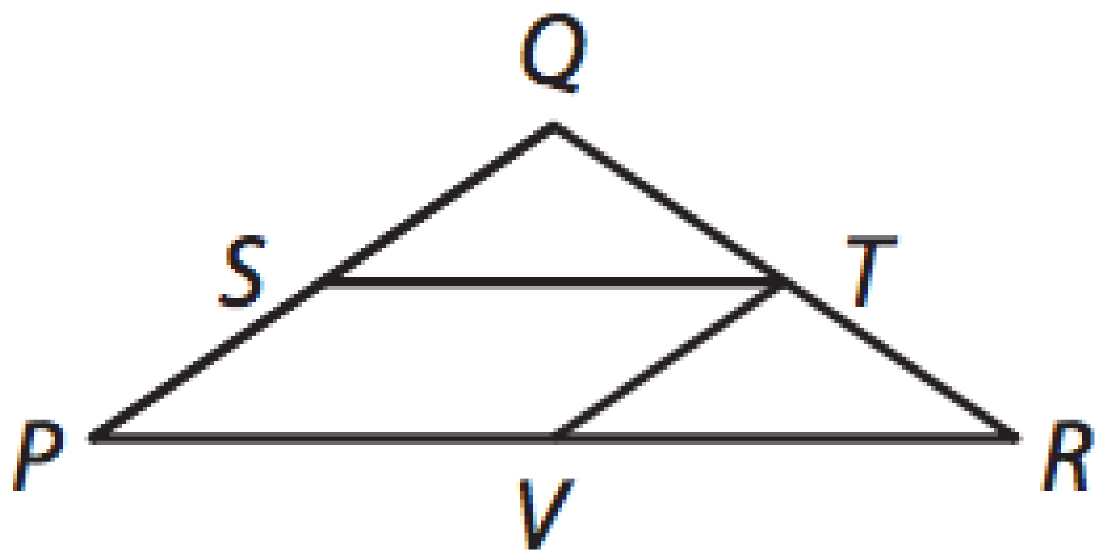


Statements	Reasons
1. *GHJN* and *JKLM* are parallelograms.	1. Given
2.	
3.	
4.	

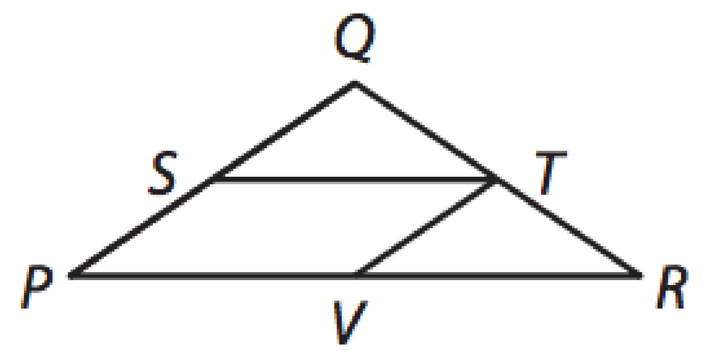
Given: $PSTV$ is a parallelogram. $\overline{PQ} \cong \overline{RQ}$

Prove: $\angle STV \cong \angle R$



Given: *PSTV* is a parallelogram. $\overline{PQ} \cong \overline{RQ}$

Prove: $\angle STV \cong \angle R$

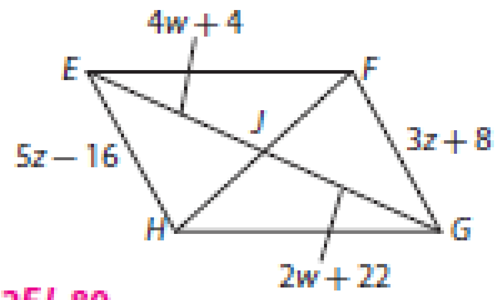


Statements	Reasons
1. *PSTV* is a parallelogram.	1. Given
2. $\angle STV \cong \angle P$	2. Opp. angles of a ▱ are congruent.
3. $\overline{PQ} \cong \overline{RQ}$	3. Given
4. $\triangle PQR$ is isosceles.	4. Definition of isosceles triangle
5. $\angle P \cong \angle R$	5. Isosceles Triangle Theorem
6. $\angle STV \cong \angle R$	6. Transitive Property of Congruence

Classwork

- pg. 1197 (6-9, 10 -15)

EFGH is a parallelogram. Find each measure.



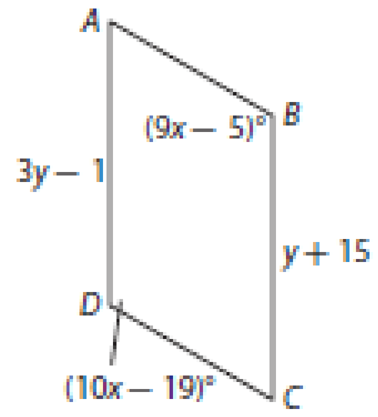
6. *FG*

$\overline{HE} \cong \overline{FG}$; $5z - 16 = 3z + 8$; $z = 12$; $FG = 44$

7. *EG*

$\overline{EJ} \cong \overline{GJ}$; $4w + 4 = 2w + 22$; $w = 9$; $EJ = 40$; $EG = 2EJ$, 80

ABCD is a parallelogram. Find each measure.



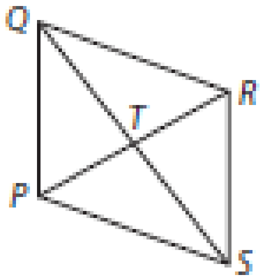
8. $m\angle B$

$\angle B \cong \angle D$; $9x - 5 = 10x - 19$; $14 = x$; $m\angle B = 121°$

9. *AD*

$\overline{AD} \cong \overline{CB}$; $3y - 1 = y + 15$; $y = 8$; $AD = 23$

A staircase handrail is made from congruent parallelograms. In ▱$PQRS$, $PQ = 17.5$, $ST = 18$, and $m\angle QRS = 110°$. Find each measure. Explain.



10. RS

Opp. sides of *PRQS* are congruent, so $RS = PQ = 17.5$.

11. QT

The diag. of *PRQS* bisect each other, so $QT = ST = 18$.

12. $m\angle PQR$

Consec. angles of *PRQS* are supplementary, so $m\angle PQR = 70°$.

13. $m\angle SPQ$

Opp. angles of *PRQS* are congruent, so $m\angle SPQ = m\angle QRS = 110°$.

Homework

- p.1198 (16-21, 24)