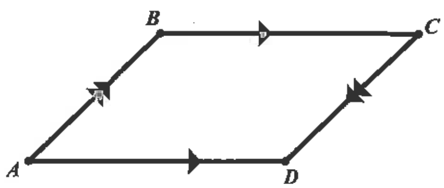
Geometry R – Mr. Bo
Unit 7 – Day 1 notes

Name: notes
Date: ____________

Parallelograms

Parallelogram: <u>A quadrilateral with 2 pairs of sides parallel.</u>

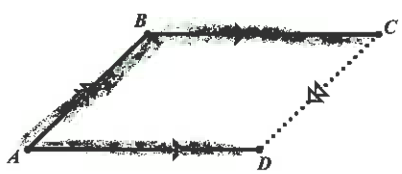


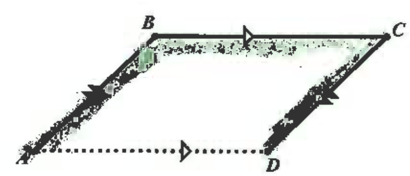
Properties of the Parallelogram:

1. Every pair of consecutive angles is supplementary.
2. The opposite sides of a parallelogram are congruent.
3. The opposite angles of a parallelogram are congruent.
4. The diagonals of a parallelogram bisect each other.

Justifying and Using the Properties:

1. Every pair of consecutive angles is supplementary.

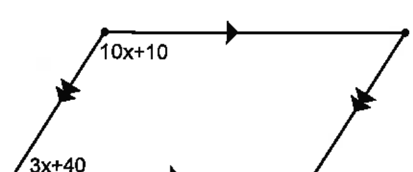




Given: Parallelogram ABCD
Explain why ∠A is sup to ∠B and why ∠B is sup to ∠C.

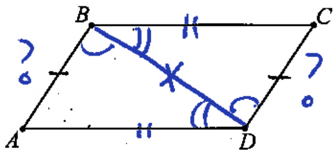
$\overline{BC} \parallel \overline{AD}$ so, ∠A and ∠B are same side int.
2 ∥ lines cut by trans have same side int ∠'s supp.
(same argument for ∠B and ∠C)

Example: Solve for x.



$$3x+40+10x+10=180$$
$$13x+50=180$$
$$13x=130$$
$$x=10$$

2. The Opposite Sides are congruent.



Given: Parallelogram ABCD with diagonal $\overline{BD}$

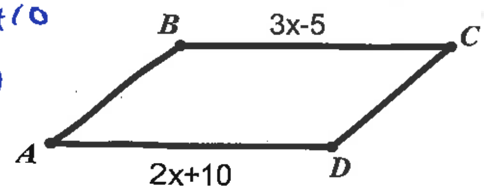
Explain why $\overline{AB} \cong \overline{CD}$.

$\triangle ABD \cong \triangle CDB$ by ASA (Alt. int $\angle$'s $\cong$ for the $\angle$'s)

$\overline{AB} \cong \overline{CD}$ by CPCTC

(Similar argument for $\overline{BC} \cong \overline{AD}$

Example: Solve for x.

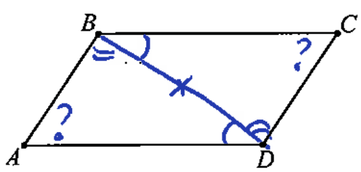


$3x-5 = 2x+10$

$x = 15$

---

3. The Opposite Angles are congruent.



Given: Parallelogram ABCD with diagonal $\overline{BD}$

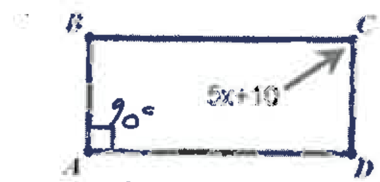
Explain why $\angle A \cong \angle C$.

$\triangle ABD \cong \triangle CDB$ by ASA

$\angle A \cong \angle C$ by CPCTC

(Similar argument for $\angle B \cong \angle D$)

Example: Solve for x.



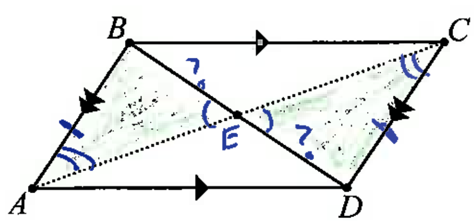
$5x + 10 = 90$

$5x = 80$

$x = 16$

---

4. The Diagonals bisect each other.



Given: Parallelogram ABCD with diagonals $\overline{BD}$ and $\overline{AC}$ intersecting at E

Explain why $\overline{BE} \cong \overline{DE}$.

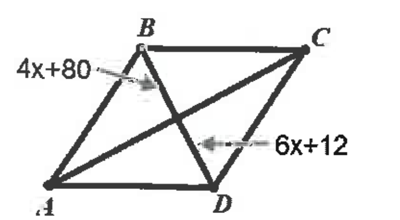
$\triangle ABE \cong \triangle CDE$ by AAS

$\overline{BE} \cong \overline{DE}$ by CPCTC

(this makes E midpt of $\overline{BD}$ and thus $\overline{AC}$ bisects $\overline{BD}$).

Similar argument for the other diagonal.

Example: Solve for x.



$4x + 80 = 6x + 12$

$68 = 2x$

$x = 34$

Proofs Involving Parallelograms:

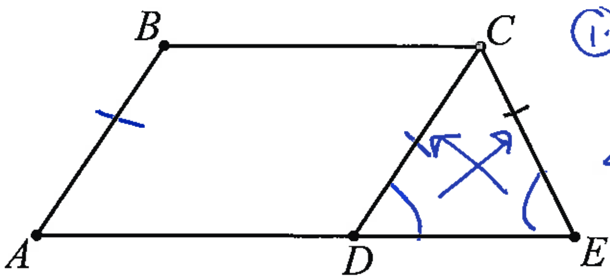
Example:

Given: Parallelogram ABCD

$\overline{ADE}$

$\angle CDE \cong \angle CED$

Prove: $\overline{BA} \cong \overline{CE}$



S	R.
① //-ogram ABCD $\overline{ADE}$ $\angle CDE \cong \angle CED$	① Given
② $\overline{CD} \cong \overline{CE}$	② in a Δ, sides opp. $\cong$ <'s are $\cong$.
③ $\overline{AB} \cong \overline{CD}$	③ opp. sides //-ogram are $\cong$.
④ $\overline{AB} \cong \overline{CE}$	④ transitive.

What type of quadrilateral is ABCE? How do you know?

Isosceles trapezoid.
has 1 pair of // - sides ($\overline{BC} \parallel \overline{AE}$)
and the non - // sides are $\cong$. ($\overline{AB} \cong \overline{CE}$)