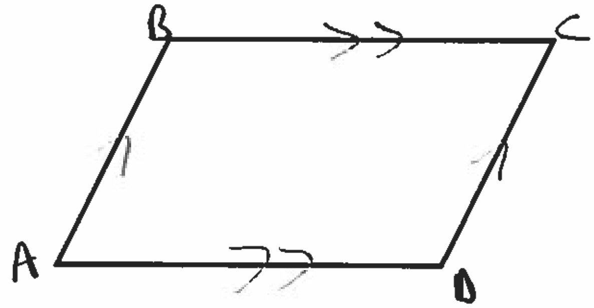
What are the properties of parallelograms?

▱ ABCD - "Parallelogram ABCD"

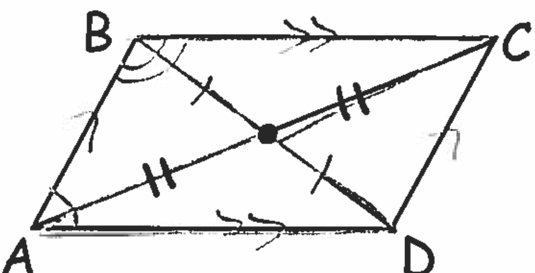
Definition: A parallelogram is a quadrilateral with both pairs of opposite sides parallel.



▱ABCD [Given]

$\overline{AB} \parallel \overline{CD}$, $\overline{BC} \parallel \overline{DA}$ [Def. of ▱]

If ABCD is a parallelogram, what properties does it have?

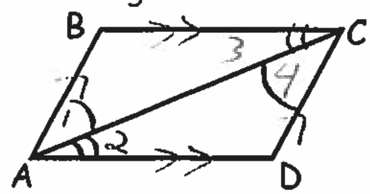


1. opposite sides // [Def of ▱]
2. Consecutive ∠s are supplementary [Thrm]
3. opposite ∠s are ≅ [Thrm]
4. opposite sides are ≅ [Thrm]
5. Diagonals bisect each other [Thrm]

Theorem 1: Opposite sides of a parallelogram are congruent.

Given: ▱ ABCD

Prove: $\overline{AB} \cong \overline{CD}, \overline{BC} \cong \overline{DA}$

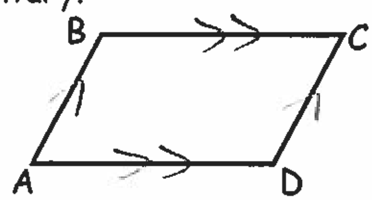


	Statements	Reasons
1	▱ ABCD	Given
2	Draw $\overline{AC}$	Through any 2 pts ∃ exactly 1 line.
3	$\overline{AB} \parallel \overline{DC}$, $\overline{BC} \parallel \overline{DA}$	Def. of ▱
4	$\angle 1 \cong \angle 4$, $\angle 2 \cong \angle 3$	Alt. Int. ∠s Thm
5	$\overline{AC} \cong \overline{AC}$	Refl. Prop. of ≅
6	$\triangle ABC \cong \triangle CDA$	ASA ≅ Post
7	$\overline{AB} \cong \overline{CD}, \overline{BC} \cong \overline{DA}$	CPCTC

Theorem 2: Consecutive angles are supplementary.

Given: ▱ ABCD

Prove: $\angle A$ is supplementary to $\angle B$
$\angle A$ is supplementary to $\angle D$

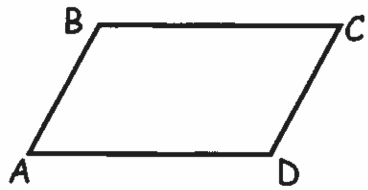


	Statements	Reasons
1	▱ ABCD	Given
2	$\overline{AB} \parallel \overline{CD}$, $\overline{BC} \parallel \overline{AD}$	Def. of ▱
3	$\angle A$ is supplementary to $\angle B$ $\angle A$ is supplementary to $\angle D$	S.S. Int. ∠s Thm

Theorem 3: Opposite angles are congruent.

Given: ▱ ABCD

Prove: $\angle A \cong \angle C, \angle B \cong \angle D$

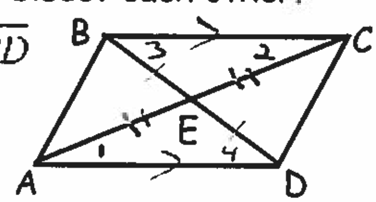


Statements	Reasons
1 ▱ ABCD	Given
2 $\angle A$ is supplementary to $\angle B$ $\angle A$ is supplementary to $\angle D$ $\angle C$ is supplementary to $\angle B$	Consec. ∠s of a ▱ are Supp.
3 $\angle A \cong \angle C, \angle B \cong \angle D$	≅ Supp. Thrm

Theorem 4: Diagonals of a parallelogram bisect each other.

Given: ▱ABCD with diagonals $\overline{AC}$ and $\overline{BD}$

Prove: $\overline{AC}$ and $\overline{BD}$ bisect each other.

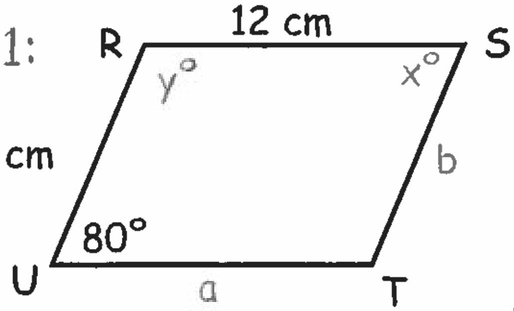


Statements	Reasons
1 ▱ ABCD with diagonals $\overline{AC}$ and $\overline{BD}$	Given
2 $\overline{AD} \parallel \overline{BC}$	Def. of ▱
3 $\angle 1 \cong \angle 2$, $\angle 3 \cong \angle 4$	Alt. Int. ∠s Thrm
4 $\overline{BC} \cong \overline{AD}$	opp. sides of a ▱ are ≅
5 $\triangle AED \cong \triangle CEB$	ASA ≅ Post
6 $\overline{AE} \cong \overline{CE}$, $\overline{BE} \cong \overline{DE}$	CPCTC
7 E is the midpt. of $\overline{AC}$ and $\overline{BD}$	Def. of Midpt.
8 $\overline{AC}$ and $\overline{BD}$ bisect each other.	Def. of seg. bisector

Using Properties of Parallelograms

Given ▱RSTU, find the values of x, y, a, and b. Provide reasons!

Ex 1:

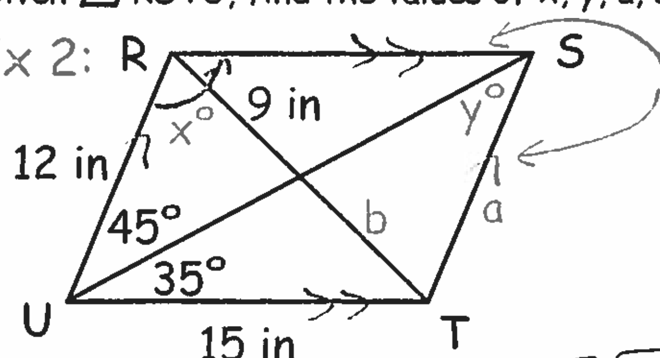


1. $\boxed{b = 10\text{ cm}, \; a = 12\text{ cm}}$ [Opp. sides of a ▱ are ≅.]
2. $\boxed{x = 80}$ [Opp. ∠s of a ▱ are ≅]
3. $y + 80 = 180$ [Consec. ∠s of a ▱ are supp.]

   $\boxed{y = 100}$

Given ▱RSTU, find the values of x, y, a, and b. Provide reasons!

Ex 2:



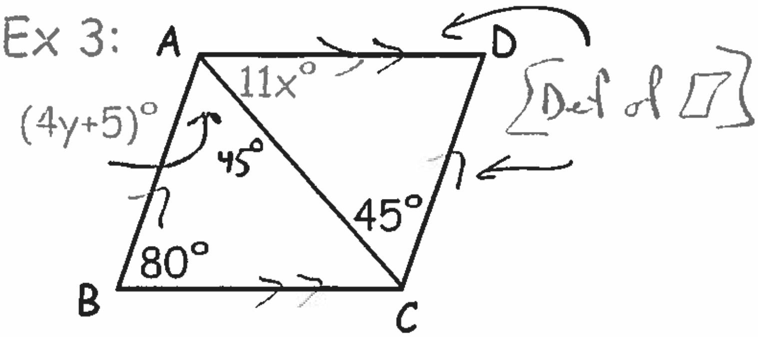
[O.S. of ▱]

1. $\boxed{a = 12\text{ in}}$ [opp. sides of a ▱ are ≅]
2. $\boxed{b = 9\text{ in}}$ [Diagonals of a ▱ bisect each other]
3. $\boxed{y = 45}$ [Alt. Int. ∠s Thm]
4. $x + 45 + 35 = 180$ [Consec. ∠s of a ▱ are supp.]

   $\boxed{x = 100}$

Given ▱ABCD, find the values of x and y. Provide reasons!

Ex 3:



① $4y+5=45$ [Alt. Int. ∠s Thm]

$4y=40$

$\boxed{y=10}$

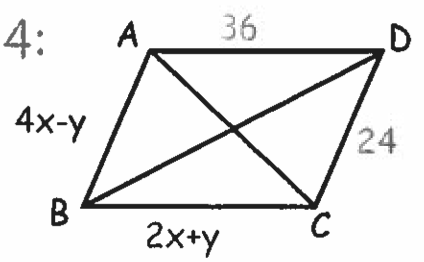
② $45+11x+80=180$ [Consec. ∠s of a ▱ are Supp.]

$11x=55$

$\boxed{x=5}$

Given ▱ABCD, find the values of x and y. Provide reasons!

Ex 4:



① $2x+y=36$
$4x-y=24$ [opp. sides of a ▱ are ≅]

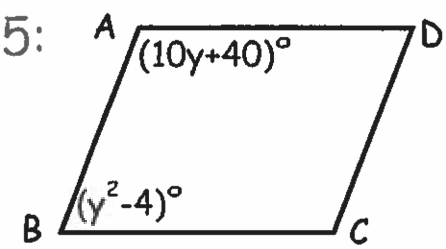
$6x=60$

$\boxed{x=10}$

$2(10)+y=36$

$\boxed{y=16}$

Ex 5:



① $10y+40+y^2-4=180$ [Consec. ∠s of a ▱ are Supp.]

$y^2+10y-144=0$

$(y-8)(y+18)=0$

X(-144)	+10
(12)(-12)	X
(18)(-8)	✓

$y=-18, 8$

$m\angle A=-140$ X No neg. measures

$m\angle A=120°$, $m\angle B=60°$ ✓

$\boxed{y=8}$

Assignment #40

Part I: Proof Packet on Properties of Parallelograms
p. 168-169 CE #1-2 and WE #5-10

PartII: p. 169-170 WE #16, 22-24, 27-28, 30-31