Name: Kelly Date: ____________

UNIT 4 LESSON 7

AIM: HOW DO WE PROVE A QUADRILATERAL IS A RHOMBUS?

Do Now: A parallelogram will always be rhombus in all of the following scenarios ***except*** when:

a) Diagnols are perpendicular bisectors ✓

b) Diagonals are congruent → RECTANGLE!

c) Diagonals bisect opposite angles ✓

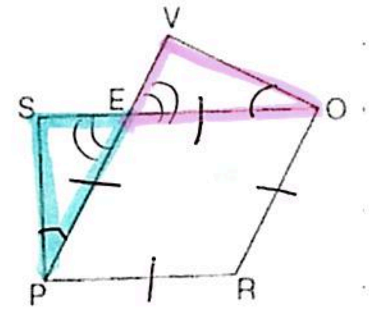
d) All sides are congruent ✓

USING PROPERTIES OF RHOMBI TO PROVE TRIANGLES ARE CONGRUENT

1. *Given: PROE* is a rhombus and $\measuredangle SPE \cong \measuredangle VOE$

   Prove: $\overline{SE} \cong \overline{EV}$ → CPCTC

   $\triangle SPE \cong \triangle VOE$ by ASA

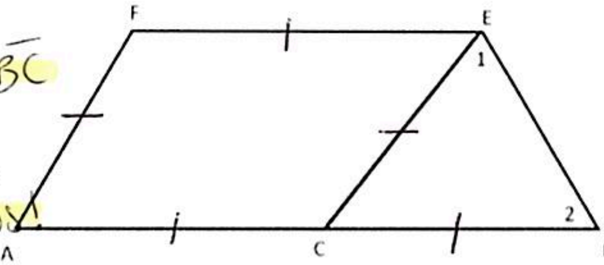


STATEMENT	**REASON**
① PROE is a rhombus $\measuredangle SPE \cong \measuredangle VOE$ ✓ A	① Given
② $\overline{PE} \cong \overline{EO}$ ✓ S	② All sides are $\cong$ in a rhombus
③ $\measuredangle SEP \cong \measuredangle VEO$ ✓ A	③ vertical $\measuredangle$'s are $\cong$
④ $\triangle SPE \cong \triangle VOE$	④ ASA $\cong$ ASA
⑤ $\overline{SE} \cong \overline{EV}$	⑤ CPCTC

2. *Given:* $ACEF$ is a rhombus; $\overline{AC} \cong \overline{BC}$
   Prove: $\measuredangle 1 \cong \measuredangle 2$

Plan: want ΔCEB to be isosceles! so base $\measuredangle$'s will be $\cong$

↳ therefore, $\overline{BC}$ is = to the side lengths of the rhombus!



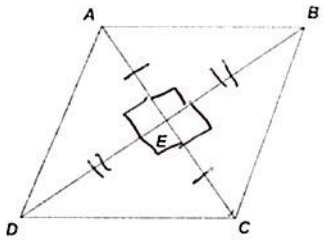
STATEMENT	REASON
1. $ACEF$ is a rhombus; $\overline{AC} \cong \overline{BC}$	1. Given
2. $\overline{AC} \cong \overline{CE}$	2. all sides are $\cong$ in a rhombus
3. $\overline{CE} \cong \overline{BC}$	3. substitution property
4. ΔCEB is an isosceles triangle	4. An isosceles Δ has 2 $\cong$ sides
5. $\measuredangle 1 \cong \measuredangle 2$	5. Base $\measuredangle$'s of an isosceles Δ are $\cong$

*B/C both $\overline{CE}$ and $\overline{BC}$ = $\overline{AC}$, they are also equal to each other!

REASONS TO PROVE THAT A QUADRILATERAL IS A RHOMBUS:

☆ **YOU ALWAYS HAVE TO HAVE A PARALLELOGRAM FIRST!** ☆ *Which means if you do not have a parallelogram given to you, you need to prove that first!*
1. A rhombus is a ▱ with consecutive sides $\cong$
2. A rhombus is a ▱ with $\perp$ diagonals
3. A rhombus is a ▱ with diagonals that bisect opposite $\measuredangle$'s

3. *Given:* Quadrilateral *ABCD*, $\overline{AC}$ and $\overline{BD}$ bisect each other and $\overline{AC} \perp \overline{BD}$
Prove: ABCD is a rhombus



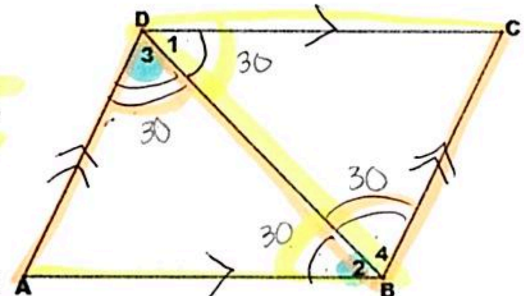
Plan: ① ▱ b/c diagonals bisect
② rhombus b/c diagonals ⊥

↓ right ∡'s!

STATEMENT	REASON
① Quad ABCD, $\overline{AC}$ + $\overline{BD}$ bisect each other and $\overline{AC} \perp \overline{BD}$	① Given
② $\overline{AE} \cong \overline{EC}$ $\overline{DE} \cong \overline{EB}$	② A bisector creates 2 ≅ seg.
③ ABCD is a ▱	③ Diagonals bisect each other
④ ABCD is a rhombus	④ A rhombus is a ▱ with ⊥ diagonals

4. *Given:* $\measuredangle 1 \cong \measuredangle 2$
$\measuredangle 3 \cong \measuredangle 4$
$\measuredangle 2 \cong \measuredangle 3$
Prove: ABCD is a rhombus

∴ $\measuredangle 1 \cong \measuredangle 2 \cong \measuredangle 3 \cong \measuredangle 4$! by SUBSTITUTION!



Plan: ① ▱ b/c opp. sides ∥
② Rhombus b/c diag. bisect ∡'s

↳ alt. int. ∡'s!

STATEMENT	REASON
① $\measuredangle 1 \cong \measuredangle 2$, $\measuredangle 3 \cong \measuredangle 4$, $\measuredangle 2 \cong \measuredangle 3$	① Given
② $\overline{DC} \parallel \overline{AB}$, $\overline{AD} \parallel \overline{CB}$	② alt. int. ∡'s are ≅
③ ABCD is a ▱	③ Both pairs opp. sides are ∥
④ $\measuredangle 1 \cong \measuredangle 4$ $\measuredangle 1 \cong \measuredangle 3$ $\measuredangle 2 \cong \measuredangle 4$	④ Substitution Property
⑤ ABCD is a rhombus	⑤ A rhombus is a ▱ with diagonals that bisect opp. ∡'s

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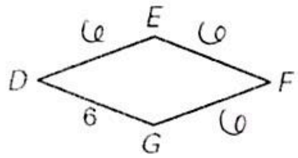
UNIT 4

LESSON 7 HOMEWORK

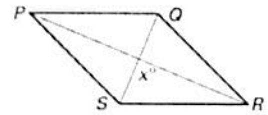
Directions: For #'s 1-3, given the following rhombi, find the missing pieces.

1.



DE = 6 EF = 6 GF = 6

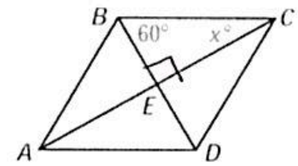
2.



x = 90°

($\perp$ diagonals)

3.



x = 30°

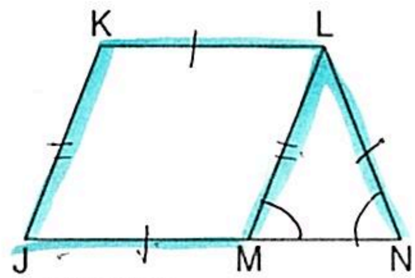
$180 - 60 - 90 = 30$

4. Given: *JKLM* is a parallelogram.

$\overline{JM} \cong \overline{LN}$

$\angle LMN \cong \angle LNM$

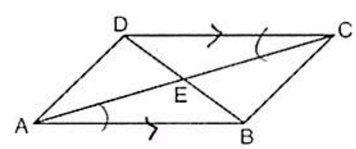
Prove: *JKLM* is a rhombus



STATEMENTS	**REASONS**
1. JKLM is a ▱ $JM \cong LN$, $\angle LMN \cong \angle LNM$	1. Given
2. Triangle LMN is an isosceles triangle	2. Base ∡'s are ≅
3. $LM \cong LN$	3. Isosceles triangles have two congruent sides
4. $\overline{JM} \cong \overline{ML}$	4. Substitution
5. JKLM is a rhombus	5. A parallelogram with consecutive sides congruent is a rhombus.

5. *Given*: Parallelogram *ABCD* shown below, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at *E*.

Prove: $\angle ACD \cong \angle CAB$



STATEMENTS	**REASONS**
1. Parallelogram *ABCD* shown below, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at *E*	1. Given
2. $\overline{AB} \parallel \overline{CD}$	2. Opp. sides of a ▱ are $\parallel$
3. $\angle ACD \cong \angle CAB$	3. alt. int. ∡'s are ≅