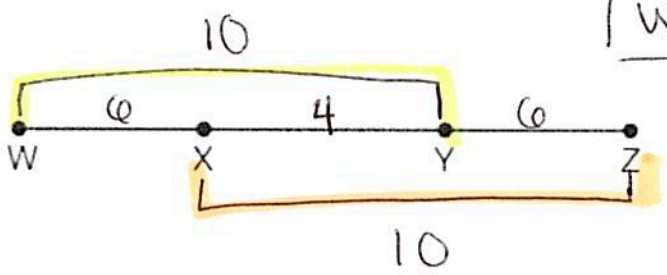
Name: Key Date: _____

**UNIT 3** **LESSON 12**

**AIM: HOW DO WE PROVE TRIANGLES CONGRUENT USING THE SUBTRACTION PROPERTY?**

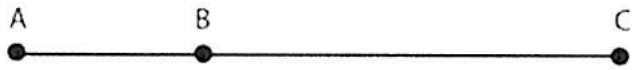
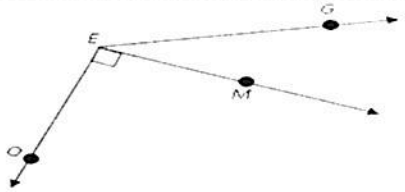
*Do Now*: If $\overline{WY} = \overline{XZ} = 10$ and $\overline{XY} = 4$, what can you conclude about $\overline{WX}$ and $\overline{YZ}$ ?

$\overline{WX} = \overline{YZ} = 6$




$\overline{XY}$ is reflexive!

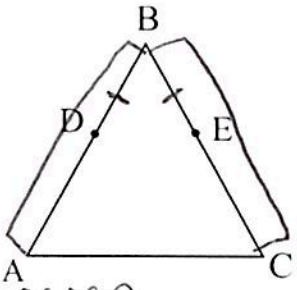
**WHAT IS THE SUBTRACTION PROPERTY?**

| SEGMENT | ANGLE |
|---|---|
|   $\overline{AB} = \overline{AC} - \overline{BC}$ $\overline{BC} = \overline{AC} - \overline{AB}$ |   $\measuredangle GEM = \measuredangle GEO - \measuredangle MEO$ $\measuredangle MEO = \measuredangle GEO - \measuredangle GEM$ |

**WHAT CAN YOU CONCLUDE?**

Given: $AB = CB$
$BD = EB$

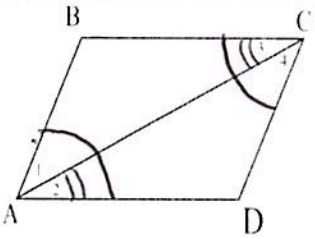
Prove: $AD = EC$




| Statement | Reason |
|---|---|
| $\overline{DA} = \overline{EC}$ | subtraction property |
| $\overline{DA} = \overline{AB} - \overline{BD}$ | |
| $\overline{EC} = \overline{CB} - \overline{BE}$ | |

Given: $m\angle BAD = m\angle BCD$
$m\angle 2 = m\angle 3$

Prove: $m\angle 1 = m\angle 4$




| Statement | Reason |
|---|---|
| $\measuredangle 1 \cong \measuredangle 4$ | subtraction property |
| $\measuredangle 1 = \measuredangle BAD - \measuredangle 2$ | |
| $\measuredangle 4 = \measuredangle BCD - \measuredangle 3$ | |

**EXAMPLE #1:**

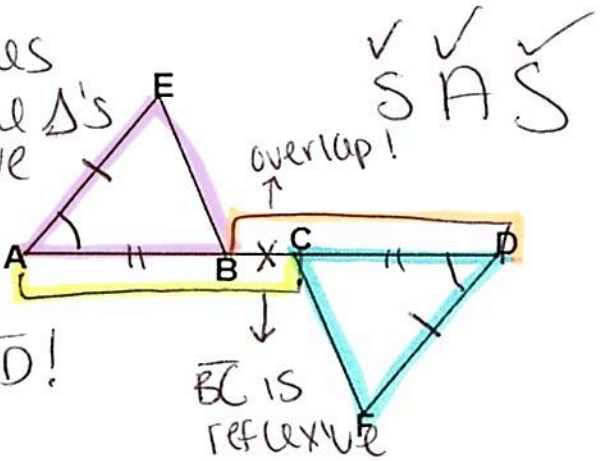
Given: $\overline{AE} \cong \overline{DF}$

$\overline{AC} \cong \overline{DB}$

$\measuredangle A \cong \measuredangle D$

Prove: $\Delta AEB \cong \Delta DFC$

★ we need sides/angles that are part of the Δ's we are trying to prove are ≅! $\overline{AC}$, $\overline{DB}$ are NOT part of Δ but we can use subtraction property to get $\overline{AB} = \overline{CD}$!




✓ ✓ ✓ SAS

| (S) STATEMENT | REASON |
|---|---|
| ① $\overline{AE} \cong \overline{DF}$, $\overline{AC} \cong \overline{DB}$, $\measuredangle A \cong \measuredangle D$ ✓(A) | ① Given |
| ② $\overline{BC} \cong \overline{BC}$ | ② Reflexive Property |
| ③ $\overline{AB} \cong \overline{CD}$ ✓(S). $\overline{AB} = \overline{AC} - \overline{BC}$, $\overline{CD} = \overline{BD} - \overline{BC}$ | ③ subtraction property |
| ④ $\Delta AEB \cong \Delta DFC$ | ④ SAS ≅ SAS |

**EXAMPLE #2:**

Given: $\overline{DC} \cong \overline{AB}$

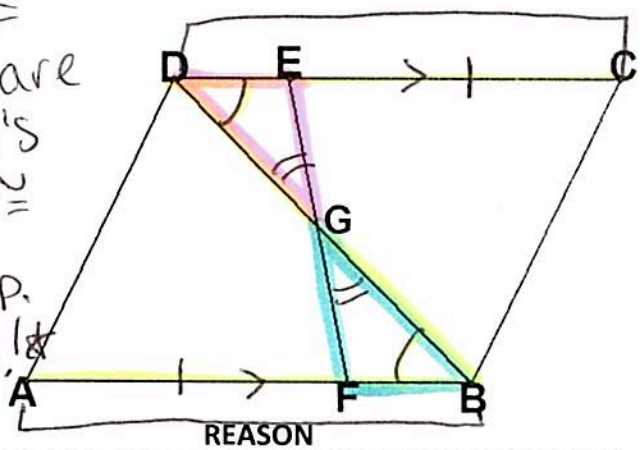
$\overline{EC} \cong \overline{AF}$

$\overline{AB} \parallel \overline{DC}$ → Z!

Prove: $\Delta EGD \cong \Delta FGB$

★ $\overline{DC}$, $\overline{AB}$, $\overline{EC}$ & $\overline{AF}$ are ≅ side but are NOT part of Δ's we are proving ≅ we need to use subtraction prop. to say $\overline{ED} \cong \overline{FB}$. !★

AAS




| STATEMENT | REASON |
|---|---|
| ① $\overline{DC} \cong \overline{AB}$, $\overline{EC} \cong \overline{AF}$ $\overline{AB} \parallel \overline{DC}$ | ① Given |
| ② ∠EDG ≅ ∠FBG ✓(A) | ② Alternate int. ∠'s are ≅ |
| ③ ∠DGE ≅ ∠BGF ✓(A) | ③ Vertical ∠'s are ≅ |
| ④ $\overline{ED} \cong \overline{FB}$ ✓(S) | ④ subtraction property |
| $\overline{ED} = \overline{DC} - \overline{EC}$ $\overline{FB} = \overline{AB} - \overline{AF}$ | |
| ⑤ $\Delta EGD \cong \Delta FGB$ | ⑤ AAS ≅ AAS |

Name: Key

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**UNIT 3**

**LESSON 12**

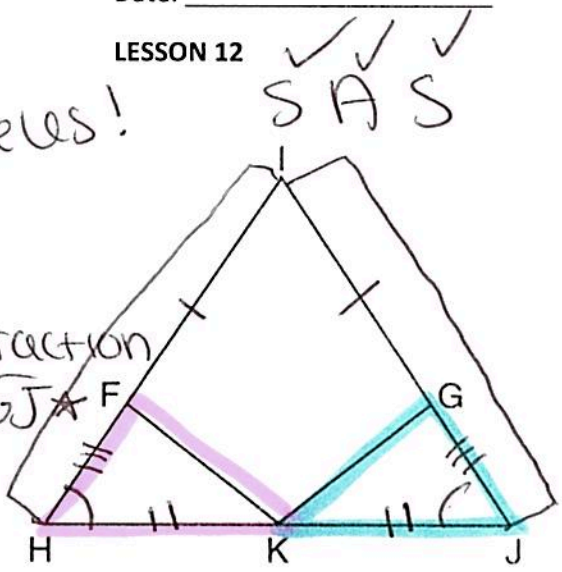
**HOMEWORK**

1. Given: $\overline{IH} \cong \overline{IJ}$
   $\overline{IF} \cong \overline{IG}$
   $K$ *is the midpoint of* $\overline{HJ}$

   Prove: $\Delta HFK \cong \Delta JGK$

$\Delta HIJ$ is isosceles!
$\therefore \angle H \cong \angle J$

* Need to use subtraction prop. to say $\overline{FH} \cong \overline{GJ}$ *




***HINT: Look for an isosceles triangle***

| STATEMENT | REASON |
|---|---|
| ① $\overline{IH} \cong \overline{IJ}$, $\overline{IF} \cong \overline{IG}$<br>K is midpoint of HJ | ① Given |
| ② $\overline{HK} \cong \overline{KJ}$ ✓(S) | ② a midpoint creates 2 ≅ segments |
| ③ $\Delta HIJ$ is isosceles | ③ isosceles Δ's have 2 ≅ sides |
| ④ $\angle H \cong \angle J$ ✓(A) | ④ isosceles Δ's have 2 ≅ base ∠'s |
| ⑤ $\overline{FH} \cong \overline{GJ}$ ✓(S)<br>$\overline{FH} = \overline{IH} - \overline{IF}$<br>$\overline{GJ} = \overline{IJ} - \overline{IG}$ | ⑤ subtraction property |
| ⑥ $\Delta HFK \cong \Delta JGK$ | ⑥ SAS ≅ SAS |

right ↑ ⊥s  cut in 2 ↑

2. In $\triangle ABC$, $\overline{BD}$ is the perpendicular bisector of $\overline{ADC}$. Based upon this information, which statements below can be proven? *(HINT: Sketch it out and mark diagram!)*

I. $\overline{BD}$ is a median. ✓

II. $\overline{BD}$ bisects $\angle ABC$. ✓

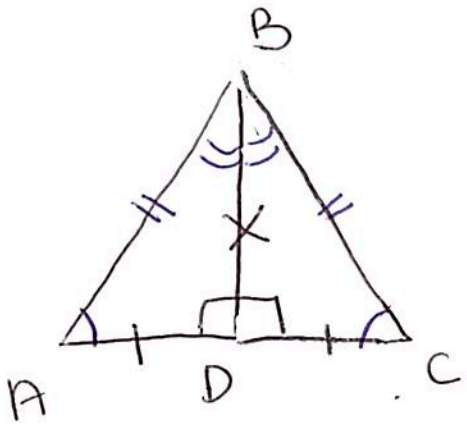
III. $\triangle ABC$ is isosceles. ✓

(1) I and II, only

(2) I and III, only

(3) II and III, only

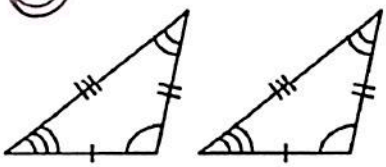
(4) I, II, and III



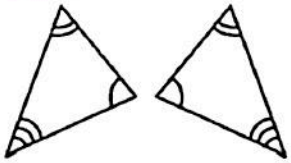

$\triangle ABD \cong \triangle CBD$ by SAS
∴ all sides & ∠'s are ≅ by CPCTC

3. Based on the triangle markings, which pair of triangles is congruent?

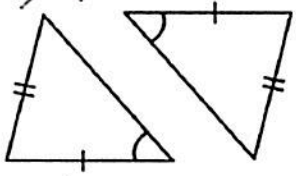
(A)



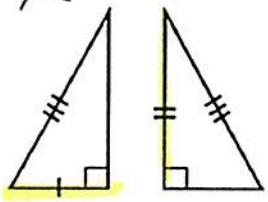
(B) ~~AAA~~



(C) ~~SSA~~



(D)



NOT HL!
need legs to be corresponding!