### 2.6 Multiplication and Division Properties

After studying this section, you will be able to:

- Apply the multiplication and division properties of segments and angles in proofs and problem solving.

Thm 14: If segments or angles are congruent then their like multiples are congruent.
Thm 15: If segments or angles are congruent, then their like divisions are congruent. [i.e. If two congruent angles or segments are bisected (or trisected), then the parts of these angles or segments are congruent]

CAUTION! Be very careful that you don't confuse addition and subtraction properties with multiplication and division properties!

The key to recognizing that you have multiplication or division property in play is to make sure that you have two congruent angle or segments to start with and then look for the double use of the words midpoint, bisect, or trisect.

## EXAMPLE \# 1 (Division):



$$
\begin{aligned}
& \text { Given: } \angle G A F \cong \angle H C E \\
& \overrightarrow{A J} \text { bisects } \angle G A F, \overrightarrow{C I} \text { bisects } \angle H C E \\
& \text { Prove: } \angle G A J \cong \angle H C I
\end{aligned}
$$

1. $\angle G A F \cong \angle H C E$ 1. Given
2. $\overrightarrow{A J}$ bisects $\angle G A F \quad$ 2. Given
3. $\overrightarrow{C I}$ bisects $\angle H C E$ Given
4. $\angle G A J \cong \angle H C I \quad$ 4. Division (If $\Varangle$ s are $\cong$, then their like divisions are $\cong$ )

## With Division:

We start with large congruent angles (or segments) and are asked to prove smaller angles (or segments) congruent.

## EXAMPLE \#2 (Multiplication):

Given: $\overline{A D} \cong \overline{B E}$
$D$ and $E$ are midpoints of $\overline{A B}$ and $\overline{B C}$
Prove: $\overline{A B} \cong \overline{B C}$


## Statements

Reasons

1. $\overline{A D} \cong \overline{B E}$
2. D is $\mathbf{~ m d p t}$ of $\overline{A B}$
3. $E$ is mdpt of $\overline{B C}$
4. $\overline{A B} \cong \overline{B C}$
5. Given
6. Given
7. Given
8. (Multiplication) If segs are $\cong$, then their like multiples are $\cong$

## With Multiplication:

We start with small congruent segments (or angles) and are asked to prove larger segments (or angles) congruent!

BE ALPRT! Notice that division OR multiplication is used whenever there is a DOUBLE USE of the words bisect, trisect or midpoint (or as in the last example, whenever a double use can be inferred from a "given"!)

