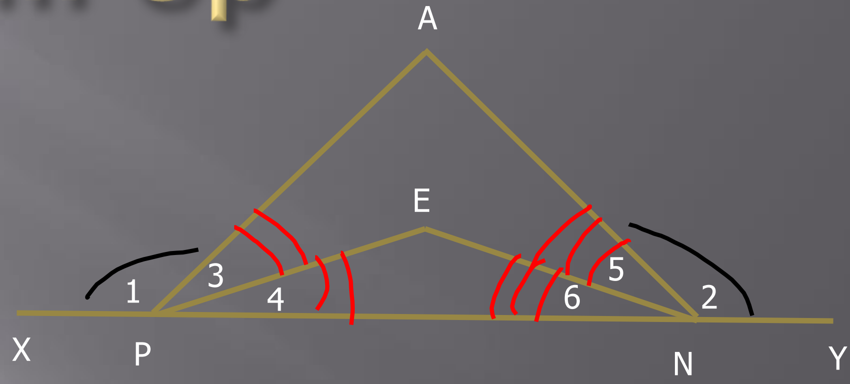
Warm Up

p. 94 #16

Given: Angle 1 congruent to Angle 2
PE bisects Angle APN
NE bisects Angle ANP
Prove: Angle XPE congruent to Angle ENY



S	R
① $\angle 1 \cong \angle 2$	① Given
② $\overline{PE}$ bis $\angle APN$	② Given
③ $\overline{NE}$ bis $\angle ANP$	③ Given
④ $\angle XPY$ is a straight $\angle$	④ Assumed
⑤ $\angle PNY$ is a straight $\angle$	⑤ Assumed
⑥ $\angle 3 \cong \angle 4$	⑥ If a line bis an angle, it cuts into 2 $\cong$ parts
⑦ $\angle 5 \cong \angle 6$	⑦ Same as 6
⑧	⑧

ADVANCED GEOMETRY SECTION 2.5 AND 2.6

Addition, Subtraction, Multiplication, and Division Properties

Addition, Subtraction, Multiplication and Division Properties

I CAN…

- Use the addition, subtraction, multiplication and division properties
- Write proofs involving the addition, subtraction, multiplication and division properties

Quick Review

- Define *complementary angles*
- Define *supplementary angles*
- Define *congruent segments*
- Define *congruent angles*

- Two angles are complementary if their sum is 90°
- Two angles are supplementary if their sum is 180°
- Two segments are congruent if their measures are equal.
- Two angles are congruent if they have the same measure.

Theorems

If a segment is added to two congruent segments, the sums are congruent. (Addition Property) and angles

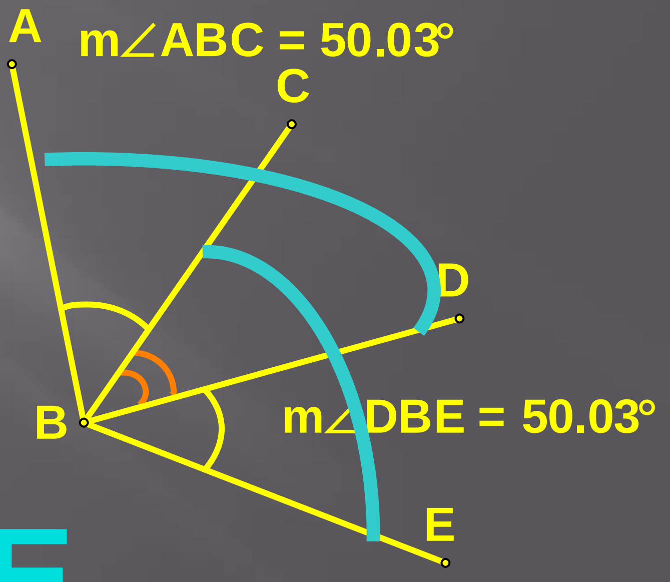
AB + BC = CD + BC

AC = BD, so $\overline{AC} \cong \overline{BD}$

Theorems

If an angle is added to two congruent angles, the sums are congruent (Addition Property)

- Note that we first need to know that we have 2 congruent angles, then that we are adding the same angle to both



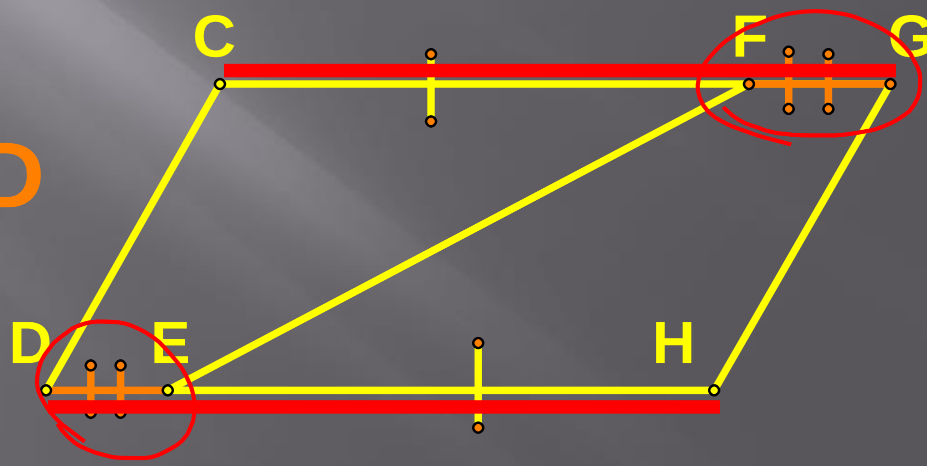
m∠ABC + m∠CBD = m∠DBE + m∠CBD

m∠ABD = m∠CBE, so

∠ABD ≅ ∠CBE

Theorems

If congruent segments are added to congruent segments, the sums are congruent. (Addition Property)



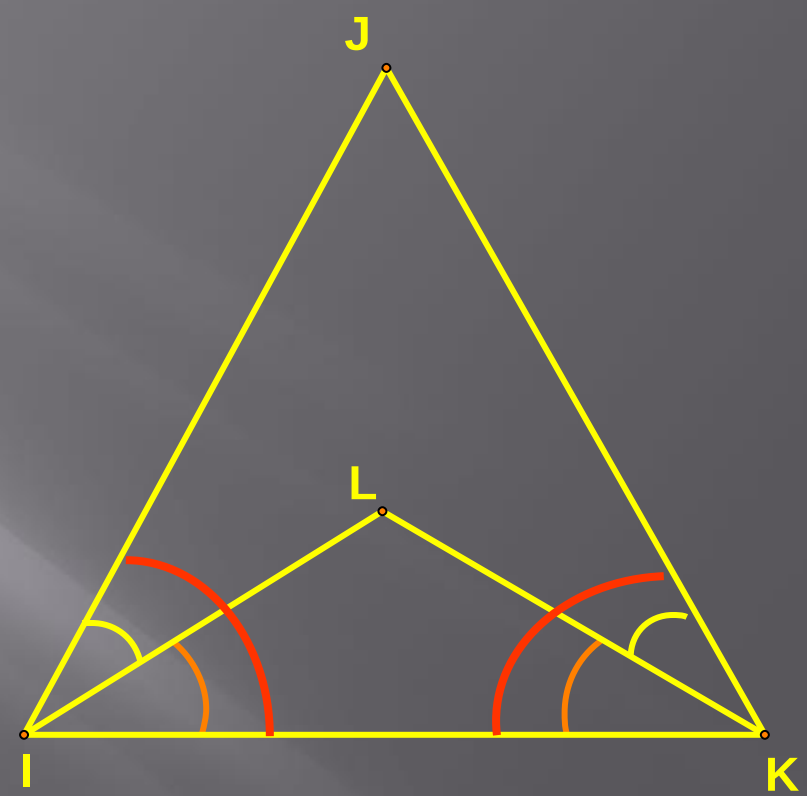
CF + FG = HE + ED

CG = HD , so

$\overline{CG} \cong \overline{HD}$

Theorems

If congruent angles are added to congruent angles, the sums are congruent. (Addition Property)

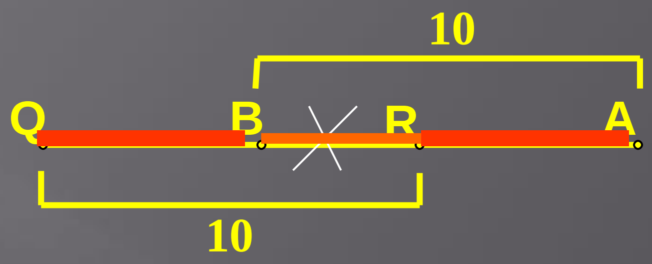


m∠JIL + m∠LIK = m∠JKL + m∠LKI

∠JIK ≅ ∠JKI

Theorems

If a segment (or angle) is subtracted from congruent segments (or angles), the differences are congruent. (Subtraction Property)

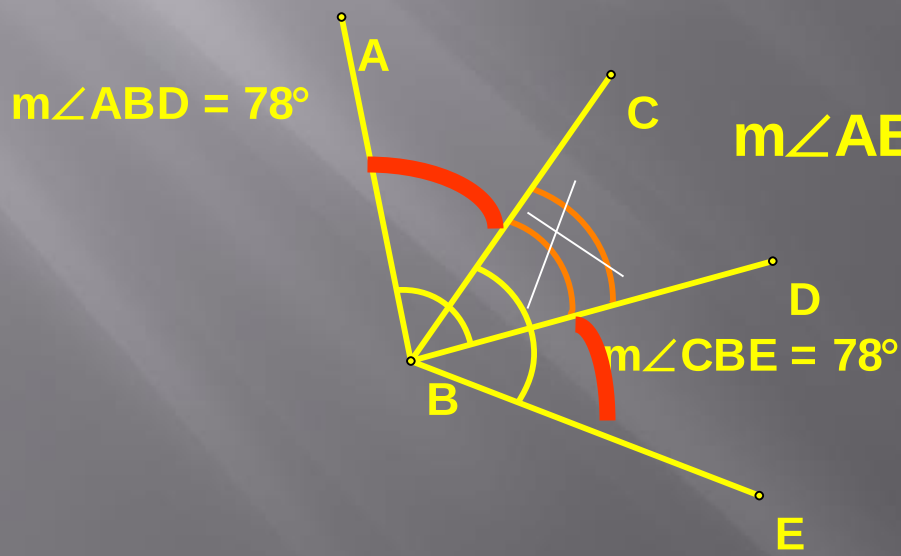


QR - BR = BA - BR

$\overline{QB} \cong \overline{BR}$

Theorems

If a segment (or angle) is subtracted from congruent segments (or angles), the differences are congruent. (Subtraction Property)



m∠ABD - m∠CBD = m∠CBE - m∠CBD

∠ABC ≅ ∠DBE

Using the Addition and Subtraction Properties

- An addition property is used when the segments or angles in the conclusion are *greater than* those in the given information
- A subtraction property is used when the segments or angles in the conclusion are *smaller than* those in the given information.

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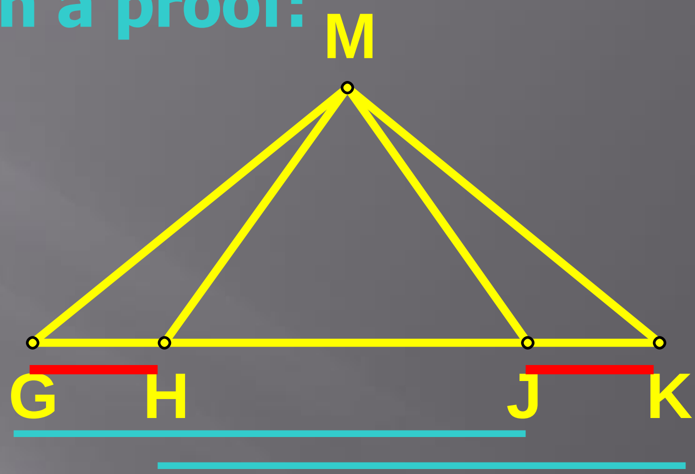
How to use this theorem in a proof:



Given: $\overline{GJ} \cong \overline{HK}$

Conclusion: $\overline{GH} \cong \overline{JK}$

Statements	Reasons
1. $\overline{GJ} \cong \overline{HK}$	1. Given
2. $\overline{GH} \cong \overline{JK}$	**2. Subtraction**

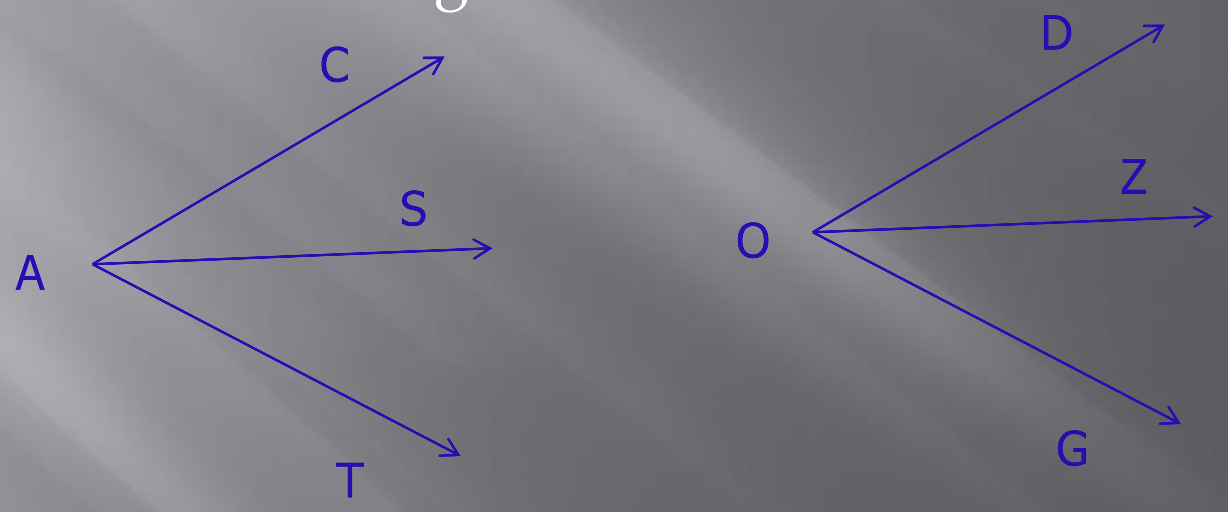
Multiplication Property

- If segments (or angles) are congruent, then their like multiples are congruent.

- If B, C, F, and G are trisection points and $\overline{AB} \cong \overline{EF}$, then $\overline{AD} \cong \overline{EH}$ by the Multiplication Property.

Division Property

- If segments (or angles) are congruent, then their like divisions are congruent.



- If $\angle CAT \cong \angle DOG$, and $\overrightarrow{AS}$ and $\overrightarrow{OZ}$ are angle bisectors, then $\angle CAS \cong \angle DOZ$ by the division property.

Using the Multiplication and Division Properties in Proofs

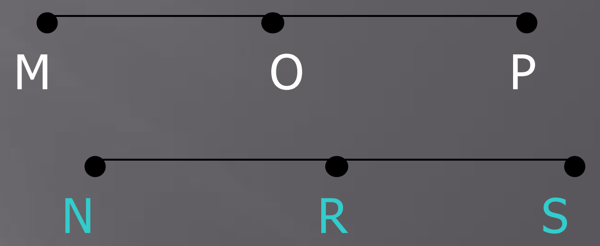
- Look for a double use of the word midpoint, trisects, or bisects in the "Given."
- Use multiplication if what is Given < the Conclusion
- Use division if what is Given > the Conclusion

Example

- Given: $\overline{MP} \cong \overline{NS}$

  O is the midpoint of $\overline{MP}$

  R is the midpoint of $\overline{NS}$



- Prove: $\overline{MO} \cong \overline{NR}$

Statements	Reasons
(1) $\overline{MP} \cong \overline{NS}$	(1) Given
(2) O is mdpt of $\overline{MP}$	(2) Given
(3) R is midpt of $\overline{NS}$	(3) Given
(4) $\overline{MO} \cong \overline{NR}$	(4) Division Property

More Examples and Homework

- Read Sample Problems 2 through 4 on pages 90 and 91.
- HW: p. 86 #4-6, 11;
  p. 91 #1, 3, 4, 11, 12

Don't forget to draw all the diagrams!!!!!