PROVING STATEMENTS ON TRIANGLE CONGRUENCE

At the end of the lesson the students will be able to....

- ✓ Recall the different triangle congruence postulates and theorems
- ✓ Identify statements on triangle congruence
- ✓ Apply the postulates and theorems on triangle congruence to prove statements

Activity:

FIND MY MATCH!

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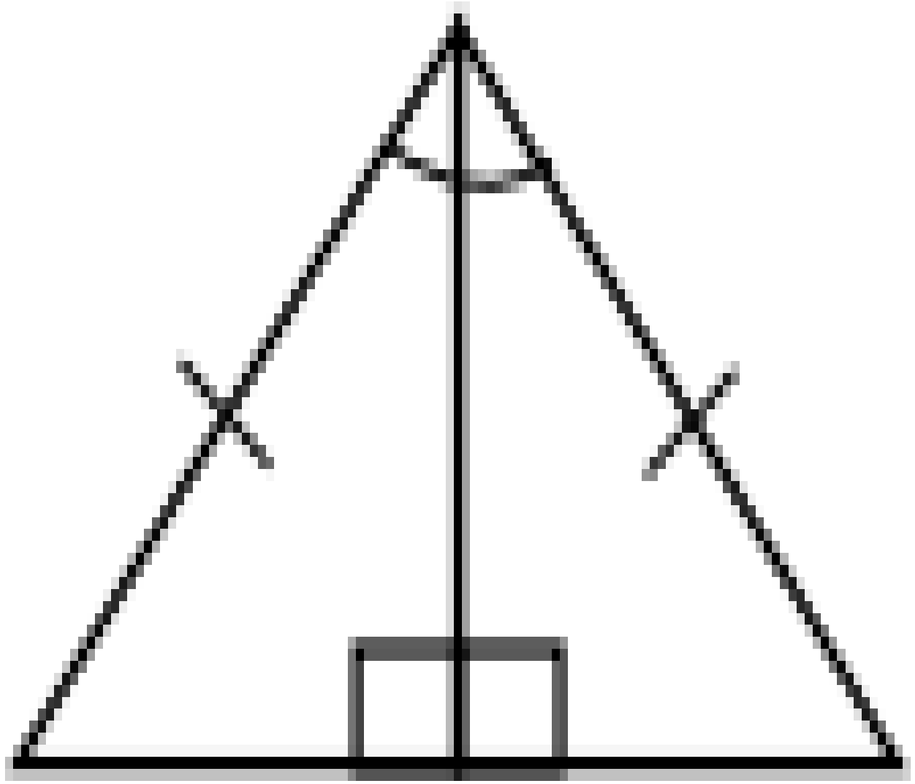

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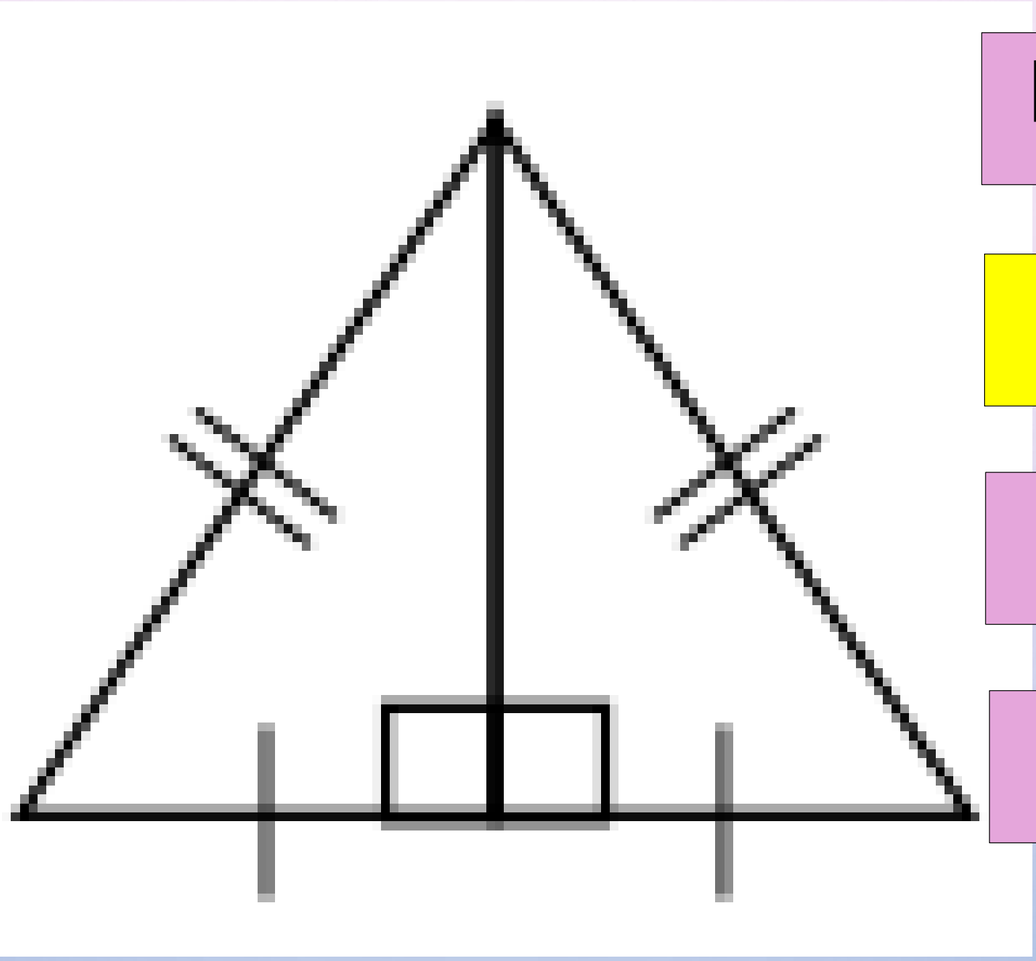

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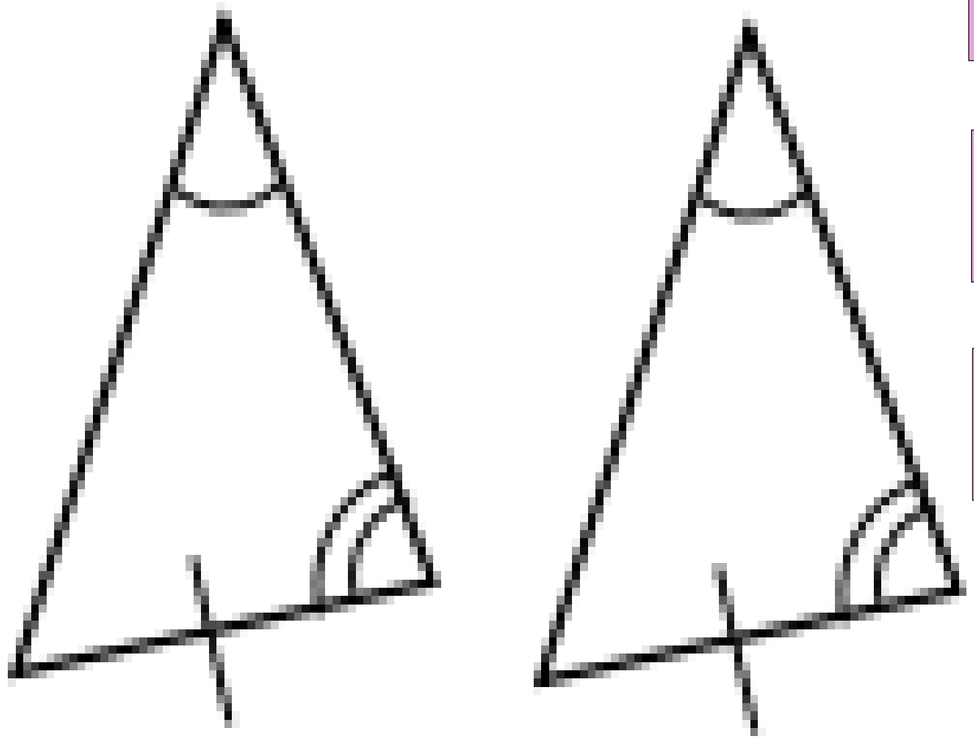

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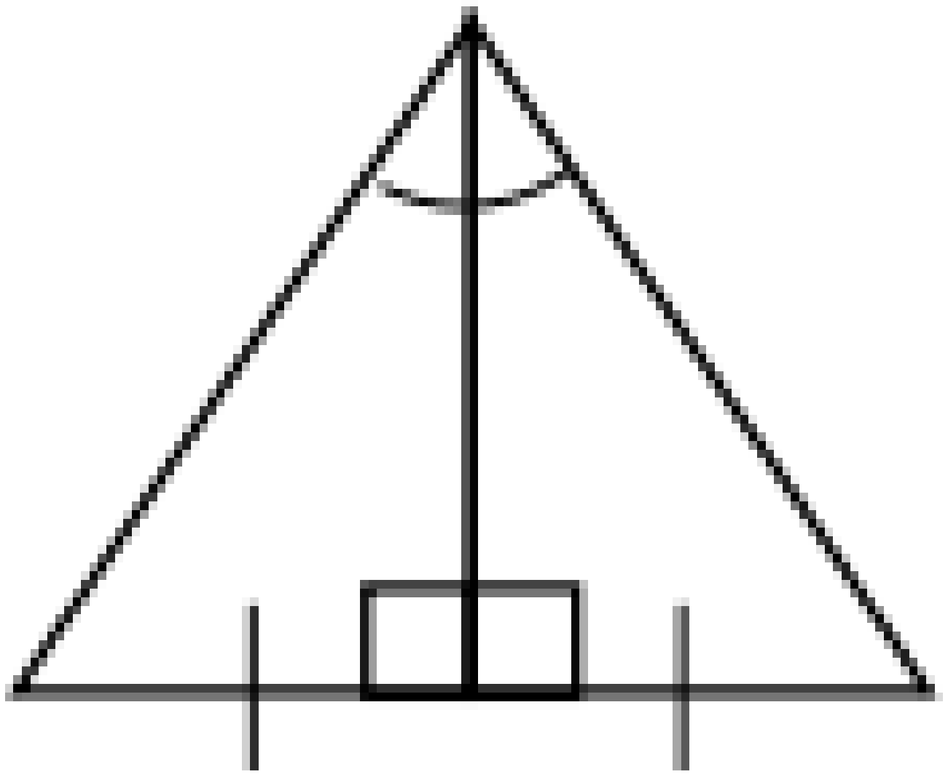

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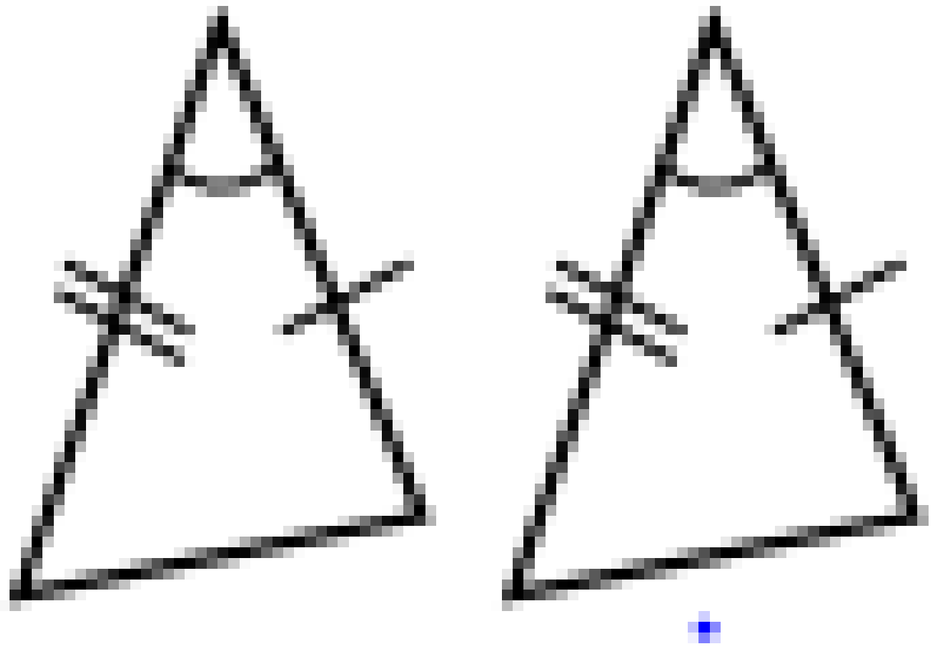

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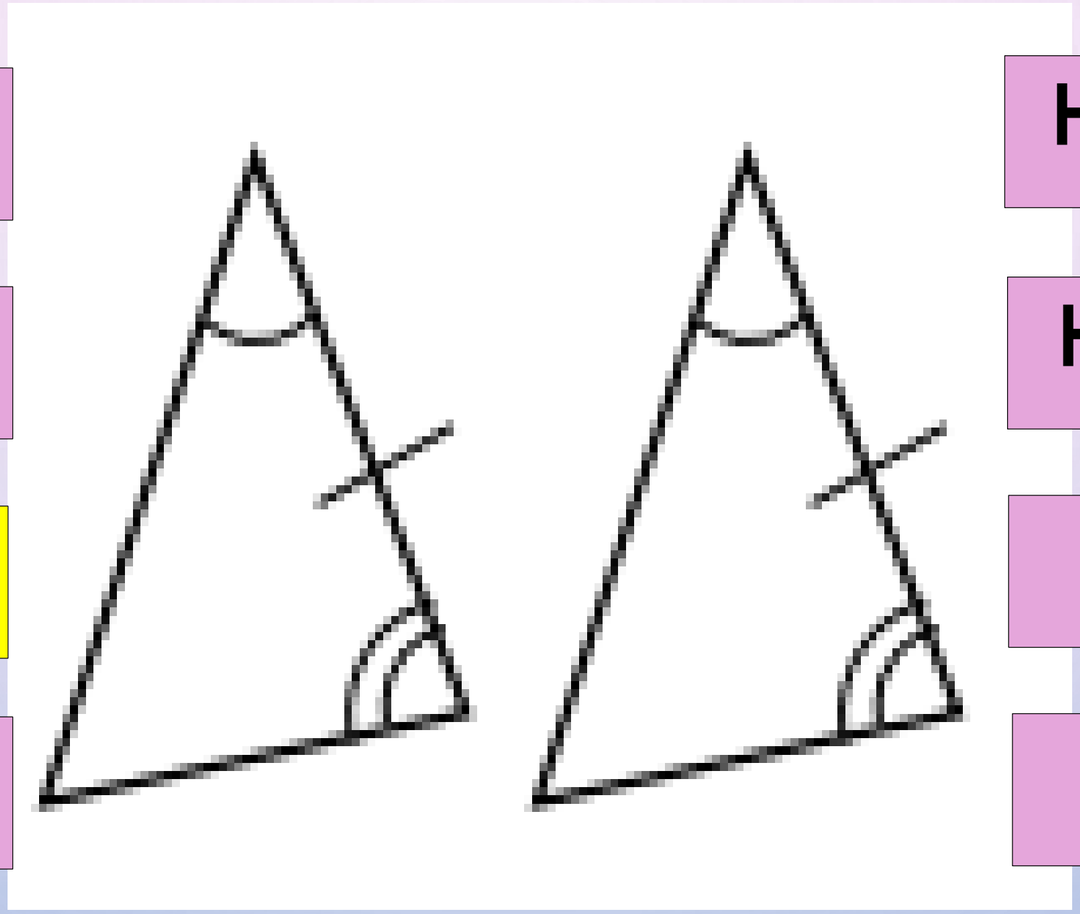

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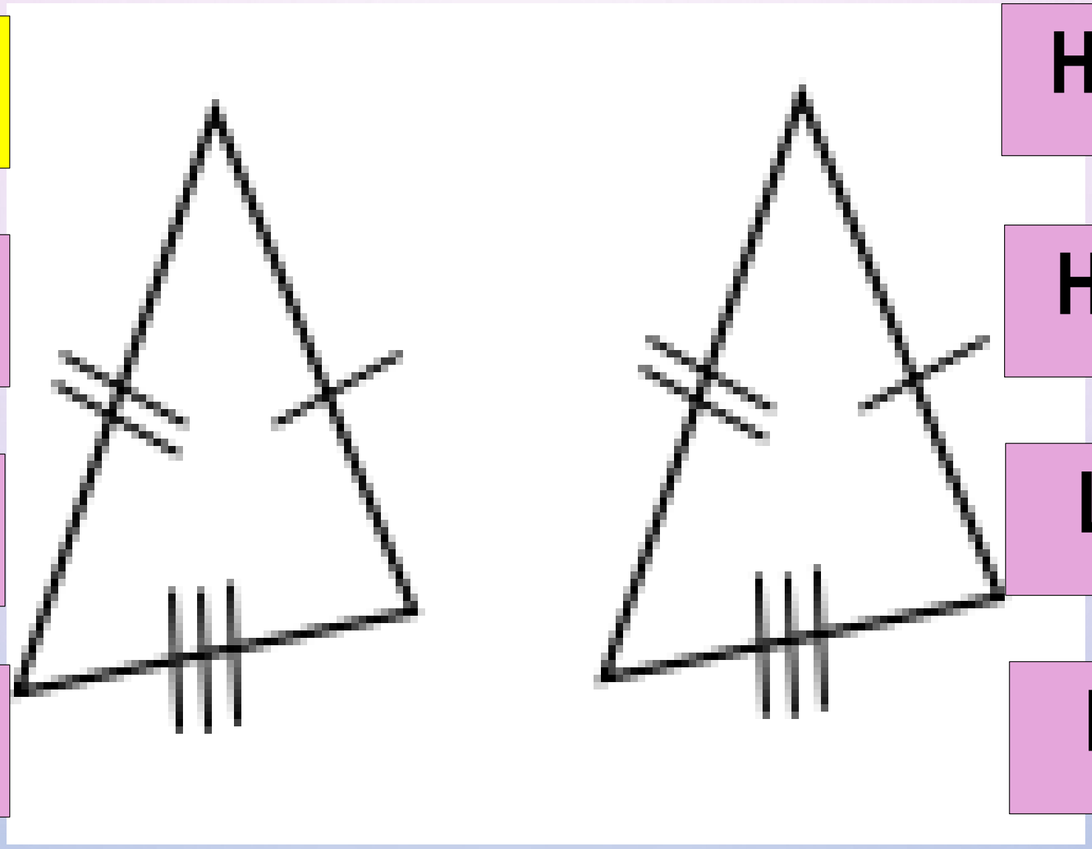

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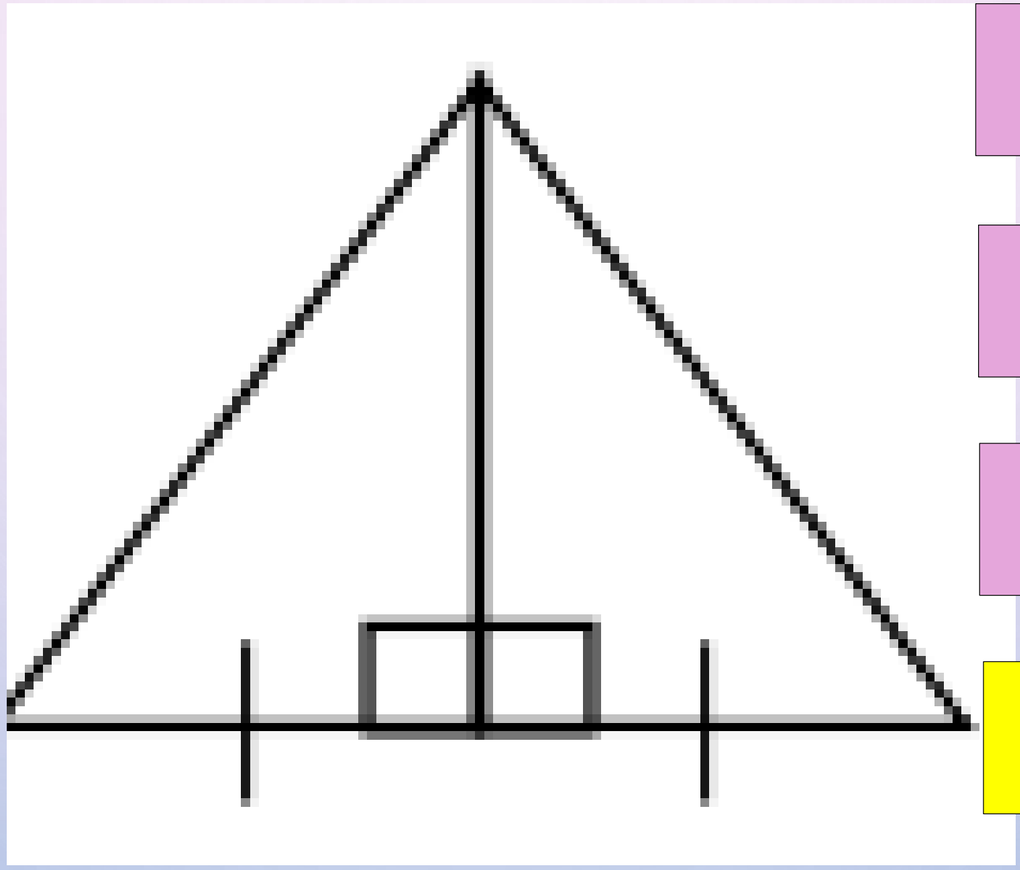

HyA CONGRUENCE

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LA CONGRUENCE

LL CONGRUENCE

Were you able to identify the illustrations of the different postulates and theorems?

How did you identify the illustration of the given theorem or postulate?

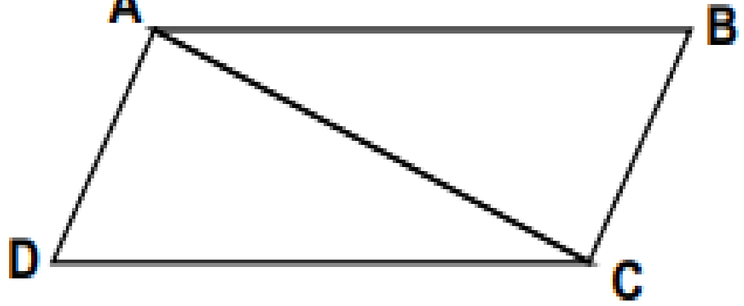
PROVING STATEMENTS ON TRIANGLE CONGRUENCE

1. Given: $\angle D \cong \angle B$

$\angle DAC \cong \angle BCA$

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

Proof:



Statements	Reasons
1. _____ *(What are the given statements?)*	1. Given
2. $\overline{AC} \cong \overline{AC}$	2. Reflexive Property
3. $\Delta ADC \cong \Delta CBA$	3. _____ *(Based on the statements, what theorem can justify $\Delta ADC \cong \Delta CBA$?)*
4. $\angle ACD \cong \angle CAB$	4. _____ *(What can justify the congruence of the corresponding parts of congruent triangles?)*

Example No. 1

Solution: (Complete Proof)

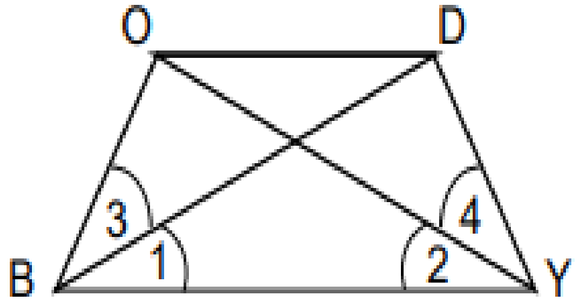
Statements	Reasons
1. $\angle D \cong \angle B$ $\angle DAC \cong \angle BCA$	1. Given
2. $\overline{AC} \cong \overline{AC}$	2. Reflexive Property
3. $\Delta ADC \cong \Delta CBA$	**3. AAS Congruence Theorem**
4. $\angle ACD \cong \angle CAB$	**4. CPCTC**

Example No. 1

Given: $\overline{DB} \cong \overline{OY}$

$\angle 1 \cong \angle 2$

Prove: $\overline{OB} \cong \overline{DY}$



Proof:

Statements	Reasons
1. _____ *(What are the given statements?)*	1. Given
2. _____ *(Which side of ΔBOY and ΔYDB is common?)*	2. Reflexive Property
3. _____ *(What are the congruent triangles based on the previous statements?)*	3. SAS Congruence Postulate
4. _____ *(What is to be proven?)*	4. CPCTC

Example No. 2

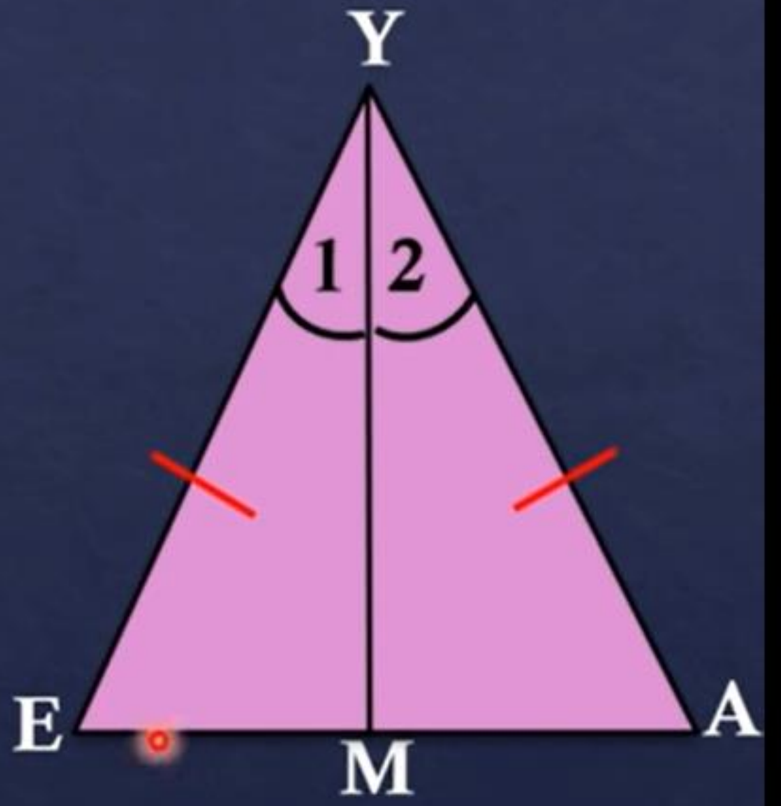
Solution: (Complete Proof)

Statements	Reasons
1. $\overline{DB} \cong \overline{OY}$ $\angle 1 \cong \angle 2$	1. Given
2. $\overline{BY} \cong \overline{BY}$	2. Reflexive Property
3. $\Delta BOY \cong \Delta YDB$	3. SAS Congruence Postulate
4. $\overline{OB} \cong \overline{DY}$	4. CPCTC

Example No. 2

Given: $\overline{EY} \cong \overline{AY}$; $\angle 1 \cong \angle 2$

Prove: *M is the midpoint of* $\overline{EA}$



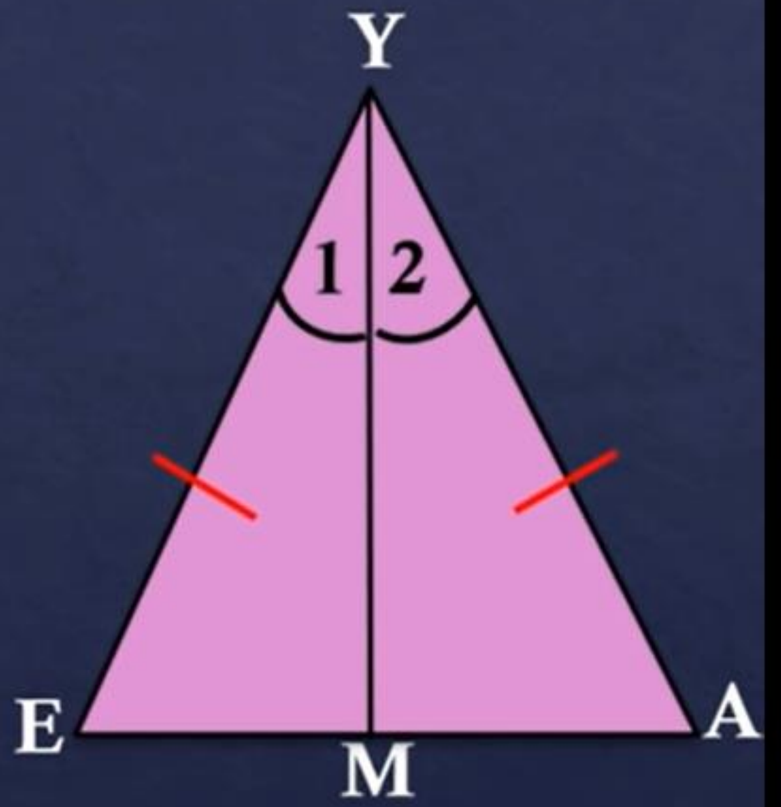
Example No. 3

Given: $\overline{EY} \cong \overline{AY}$; $\angle 1 \cong \angle 2$

Prove: *M is the midpoint of* $\overline{EA}$

Proof:

Statements	Reasons
1. $\overline{EY} \cong \overline{AY}$; $\angle 1 \cong \angle 2$	1. Given
2.	2.
3.	3.
4.	4.
5.	5.



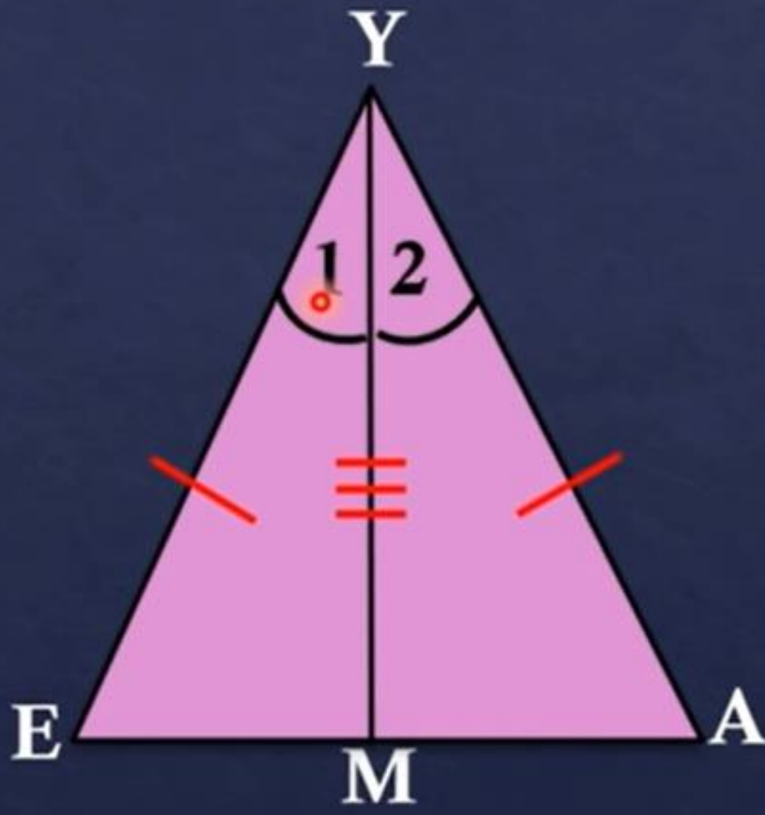
Example No. 3

Given: $\overline{EY} \cong \overline{AY}$; $\angle 1 \cong \angle 2$

Prove: *M is the midpoint of* $\overline{EA}$

Proof:

Statements	Reasons
1. $\overline{EY} \cong \overline{AY}$; $\angle 1 \cong \angle 2$	1. Given
2. $\overline{MY} \cong \overline{MY}$	2. Reflexive Property of Congruence
3. $\Delta YEM \cong \Delta YAM$	3. SAS Congruence Post.
4.	4.
5.	5.



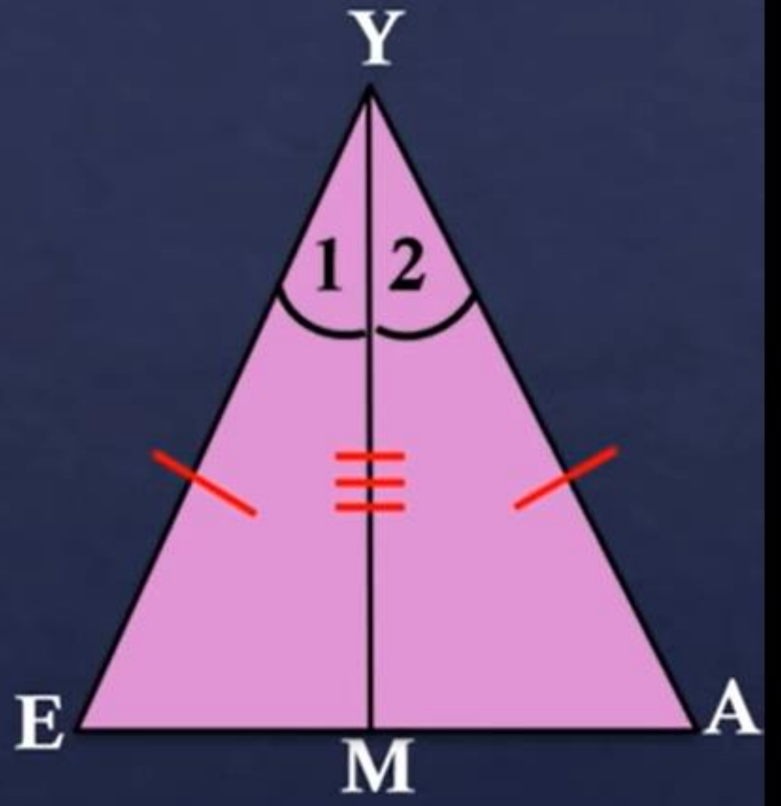
Example No. 3

Given: $\overline{EY} \cong \overline{AY}$; $\angle 1 \cong \angle 2$

Prove: *M is the midpoint of* $\overline{EA}$

Proof:

Statements	Reasons
1. $\overline{EY} \cong \overline{AY}$; $\angle 1 \cong \angle 2$	1. Given
2. $\overline{MY} \cong \overline{MY}$	2. Reflexive Property of Congruence
3. $\Delta YEM \cong \Delta YAM$	3. SAS Congruence Post.
4. $\overline{EM} \cong \overline{AM}$	4. CPCTC
5. *M is the midpoint of* $\overline{EA}$	5. Midpoint Theorem



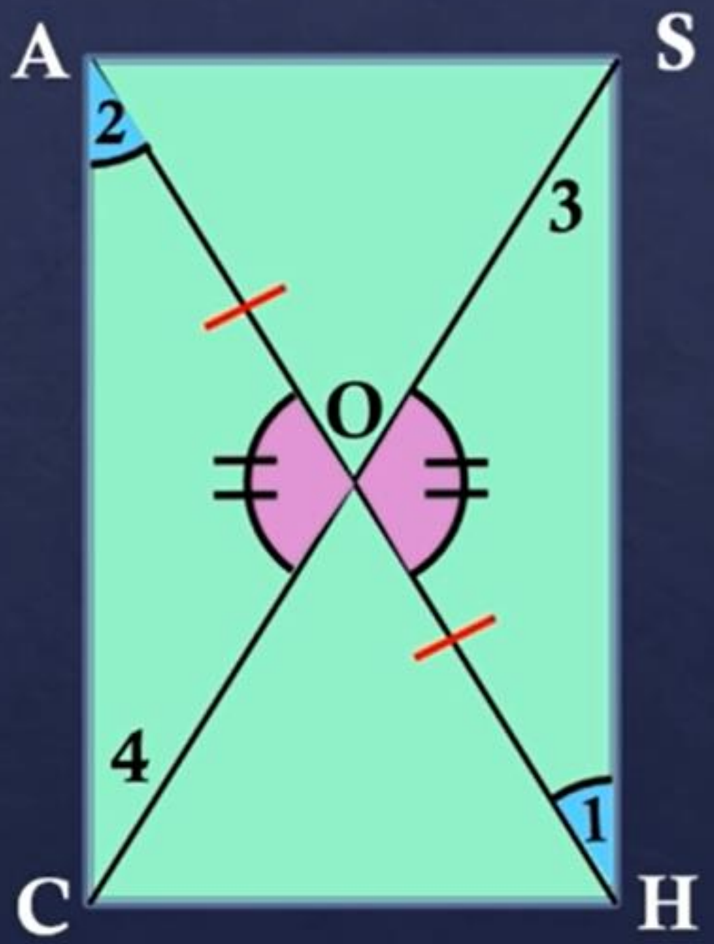
Example No. 3

Given: O *is the midpoint of* $\overline{HA}$; $\angle 1 \cong \angle 2$

Prove: $\angle 3 \cong \angle 4$

Proof:

Statements	Reasons
1. O *is the midpoint of* $\overline{HA}$	1. Given



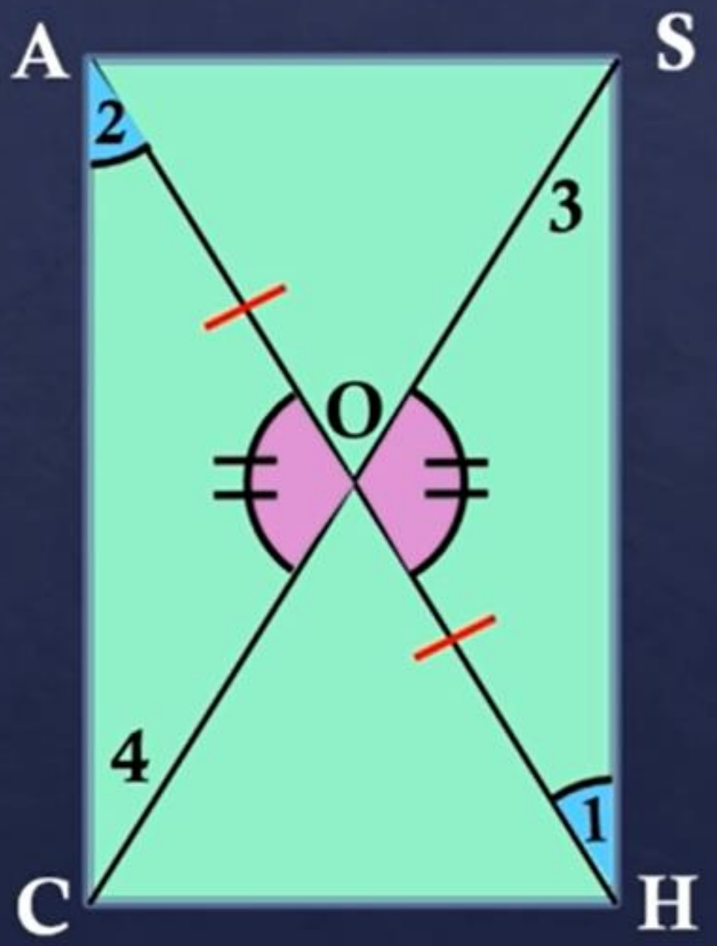
Example No. 4

Given: O *is the midpoint of* $\overline{HA}$; $\angle 1 \cong \angle 2$

Prove: $\angle 3 \cong \angle 4$

Proof:

Statements	Reasons
1. O *is the midpoint of* $\overline{HA}$	1. Given
2. $\overline{HO} \cong \overline{AO}$	2. Midpoint Theorem



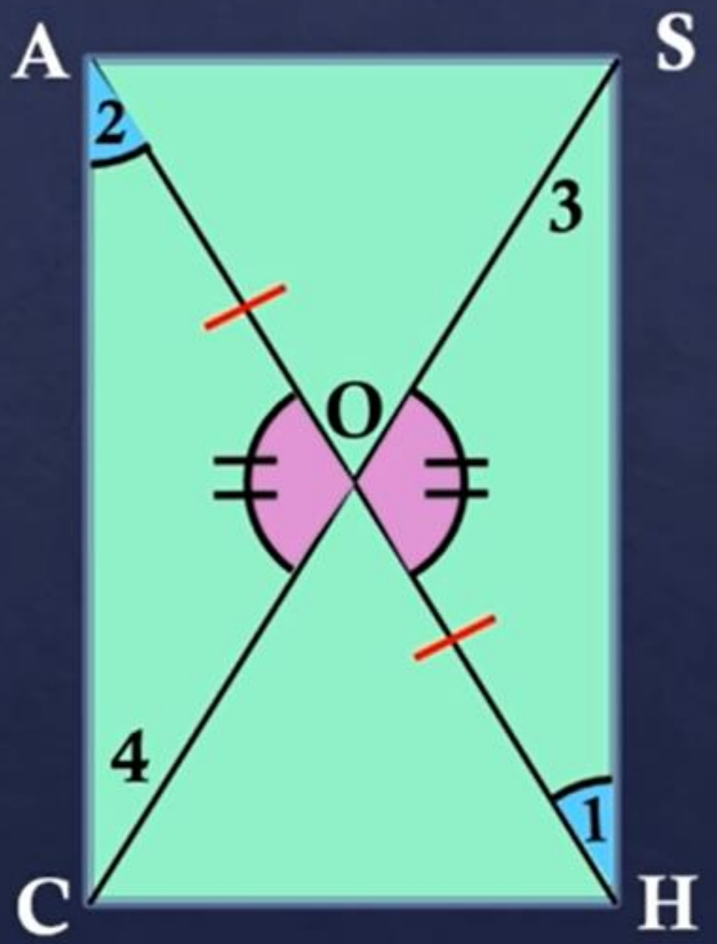
Example No. 4

Given: O *is the midpoint of* $\overline{HA}$; $\angle 1 \cong \angle 2$

Prove: $\angle 3 \cong \angle 4$

Proof:

Statements	Reasons
1. O *is the midpoint of* $\overline{HA}$	1. Given
2. $\overline{HO} \cong \overline{AO}$	2. Midpoint Theorem
3.	3. Given



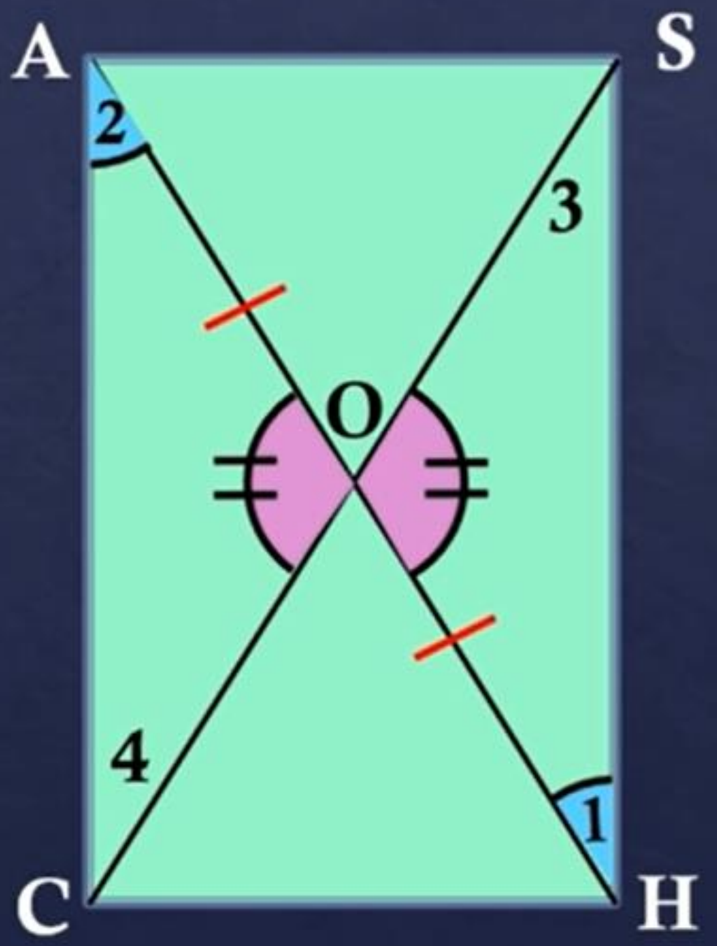
Example No. 4

Given: O *is the midpoint of* $\overline{HA}$; $\angle 1 \cong \angle 2$

Prove: $\angle 3 \cong \angle 4$

Proof:

Statements	Reasons
1. O *is the midpoint of* $\overline{HA}$	1. Given
2. $\overline{HO} \cong \overline{AO}$	2. Midpoint Theorem
3. $\angle 1 \cong \angle 2$	3. Given
4. $\angle COA \cong \angle SOH$	4. Vertical angles are congruent
5. $\Delta COA \cong \Delta SOH$	5. ASA Congruence Post.



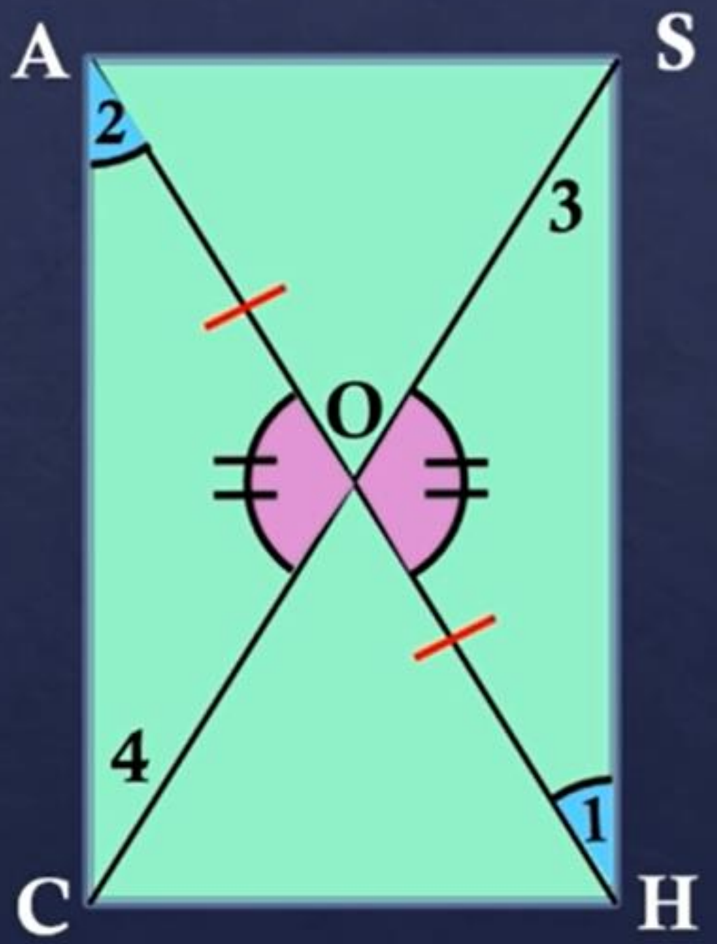
Example No. 4

Given: O *is the midpoint of* $\overline{HA}$; $\angle 1 \cong \angle 2$

Prove: $\angle 3 \cong \angle 4$

Proof:

Statements	Reasons
1. O *is the midpoint of* $\overline{HA}$	1. Given
2. $\overline{HO} \cong \overline{AO}$	2. Midpoint Theorem
3. $\angle 1 \cong \angle 2$	3. Given
4. $\angle COA \cong \angle SOH$	4. Vertical angles are congruent
5. $\Delta COA \cong \Delta SOH$	5. ASA Congruence Post.
6. $\angle 3 \cong \angle 4$	6. CPCTC



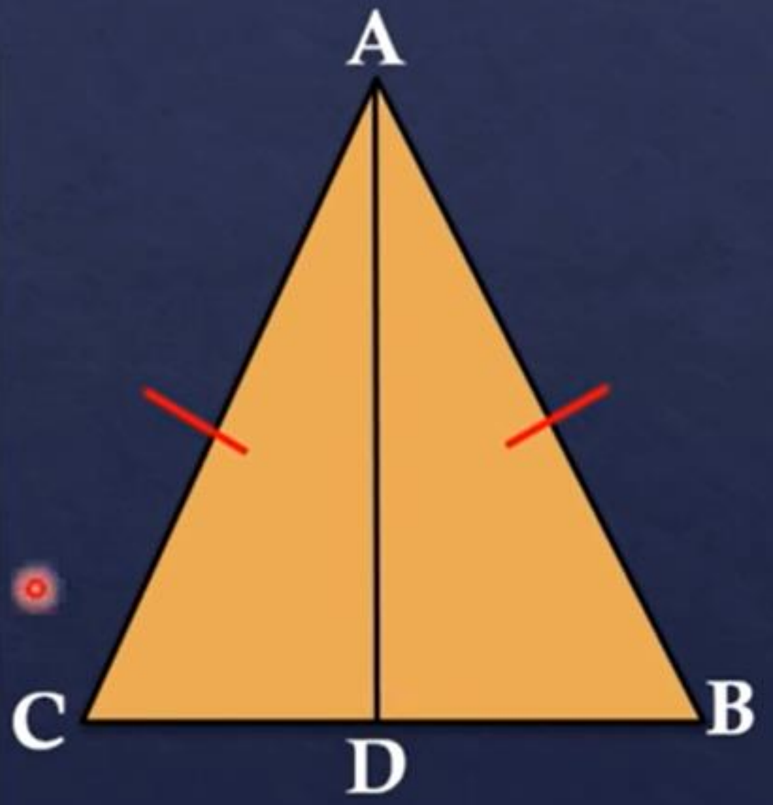
Example No. 4

Given: ABC *is an isosceles triangle,* $\overline{AD}$ *is the median of* ΔABC

Prove: $\angle CAD \cong \angle BAD$

Proof:

Statements	Reasons
1. ABC *is an isosceles* Δ	1. Given
2. $\overline{AB} \cong \overline{AC}$	2. Definition of Isosceles Δ
3. $\overline{AD}$ *is the median of* ΔABC	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.



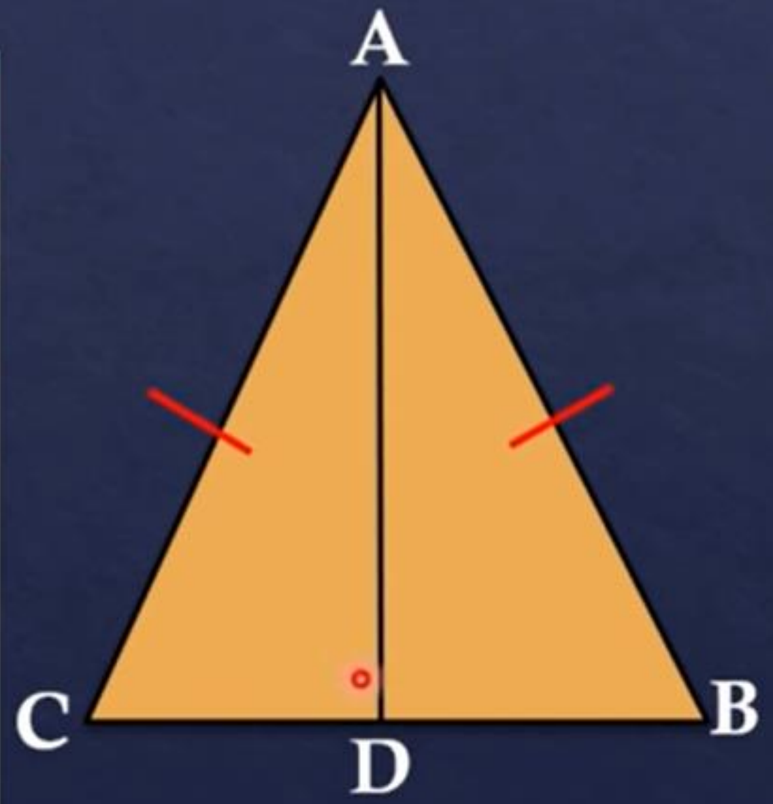
Example No. 5

Given: ABC *is an isosceles triangle,* $\overline{AD}$ *is the median of* ΔABC

Prove: $\angle CAD \cong \angle BAD$

Proof:

Statements	Reasons
1. ABC *is an isosceles* Δ	1. Given
2. $\overline{AB} \cong \overline{AC}$	2. Definition of Isosceles Δ
3. $\overline{AD}$ *is the median of* ΔABC	3. Given
4. D *is the midpoint of* $\overline{BC}$	4. Definition of Median of a Triangle
5.	5.
6.	6.
7.	7.
8.	8.



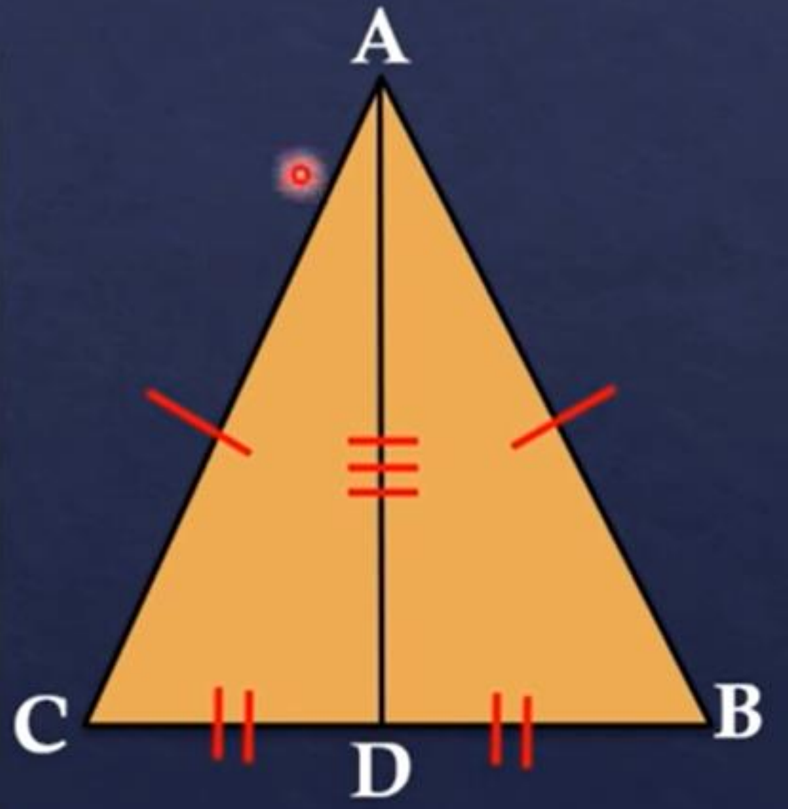
Example No. 5

Given: ABC is an isosceles triangle, $\overline{AD}$ is the median of ΔABC

Prove: $\angle CAD \cong \angle BAD$

Proof:

Statements	Reasons
1. ABC is an isosceles Δ	1. Given
2. $\overline{AB} \cong \overline{AC}$	2. Definition of Isosceles Δ
3. $\overline{AD}$ is the median of ΔABC	3. Given
4. D is the midpoint of $\overline{BC}$	4. Definition of Median of a Triangle
5. $\overline{BD} \cong \overline{CD}$	5. Midpoint Theorem
6. $\overline{AD} \cong \overline{AD}$	6. Reflexive Property of Congruence
7.	7.
8.	8.



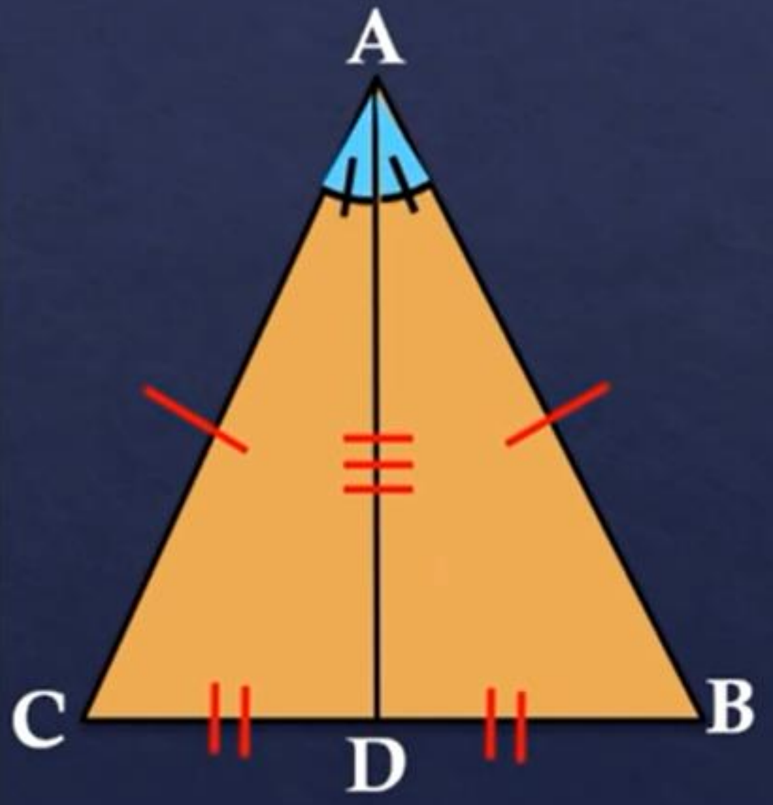
Example No. 5

Given: ABC *is an isosceles triangle,* $\overline{AD}$ *is the median of* ΔABC

Prove: $\angle CAD \cong \angle BAD$

Proof:

Statements	Reasons
1. ABC *is an isosceles* Δ	1. Given
2. $\overline{AB} \cong \overline{AC}$	2. Definition of Isosceles Δ
3. $\overline{AD}$ *is the median of* ΔABC	3. Given
4. D *is the midpoint of* $\overline{BC}$	4. Definition of Median of a Triangle
5. $\overline{BD} \cong \overline{CD}$	5. Midpoint Theorem
6. $\overline{AD} \cong \overline{AD}$	6. Reflexive Property of Congruence
7. $\Delta CAD \cong \Delta BAD$	7. SSS Congruence Post.
8. $\angle CAD \cong \angle BAD$	8. CPCTC



Example No. 5

Given: $\overline{EN} \perp \overline{NB}$; $\overline{EA} \perp \overline{AR}$
$\angle 1 \cong \angle 2$; $\overline{EB} \cong \overline{ER}$

Prove: ΔENA *is isosceles*

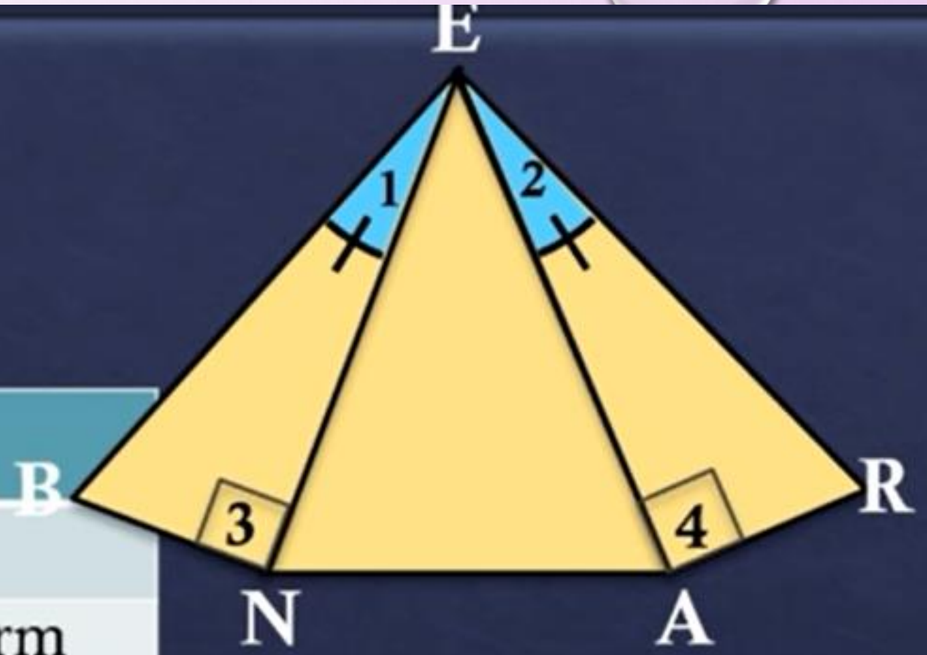
Proof:

Statements	Reasons
1. $\overline{EN} \perp \overline{NB}$; $\overline{EA} \perp \overline{AR}$	1. Given
2. $\angle 3$ *and* $\angle 4$ *are right angles*	2. Perpendicular lines form right angles
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.

Example No. 6

Given: $\overline{EN} \perp \overline{NB}$; $\overline{EA} \perp \overline{AR}$
$\angle 1 \cong \angle 2$; $\overline{EB} \cong \overline{ER}$

Prove: ΔENA *is isosceles*



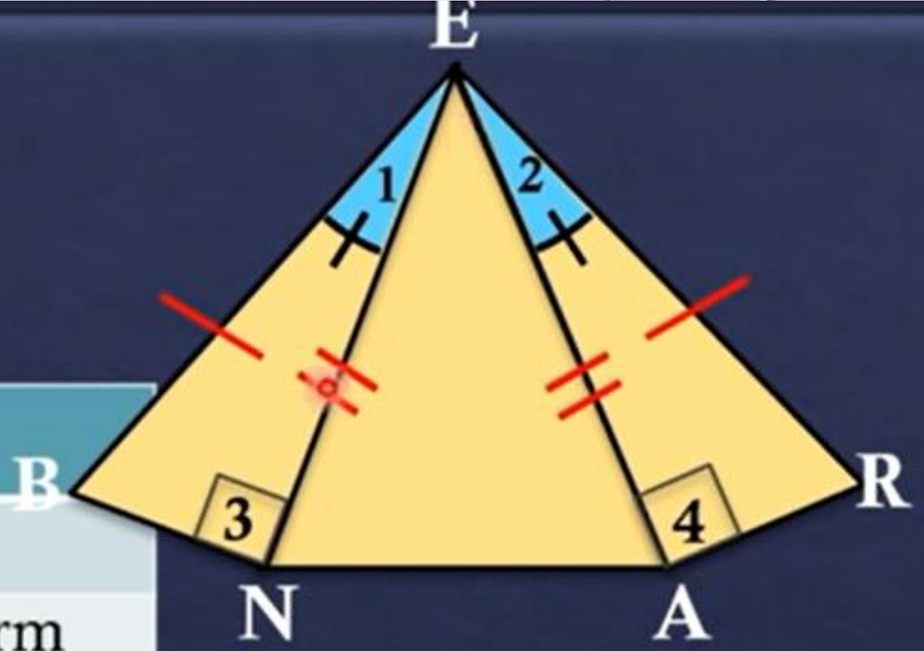
Proof:

Statements	Reasons
1. $\overline{EN} \perp \overline{NB}$; $\overline{EA} \perp \overline{AR}$	1. Given
2. $\angle 3$ *and* $\angle 4$ *are right angles*	2. Perpendicular lines form right angles
3. ΔBNE *and* ΔRAE *are right triangles*	3. Definition of right triangles
4.	4.
5.	5.
6.	6.
7.	7.

Example No. 6

Given: $\overline{EN} \perp \overline{NB}$; $\overline{EA} \perp \overline{AR}$
$\angle 1 \cong \angle 2$; $\overline{EB} \cong \overline{ER}$

Prove: ΔENA *is isosceles*



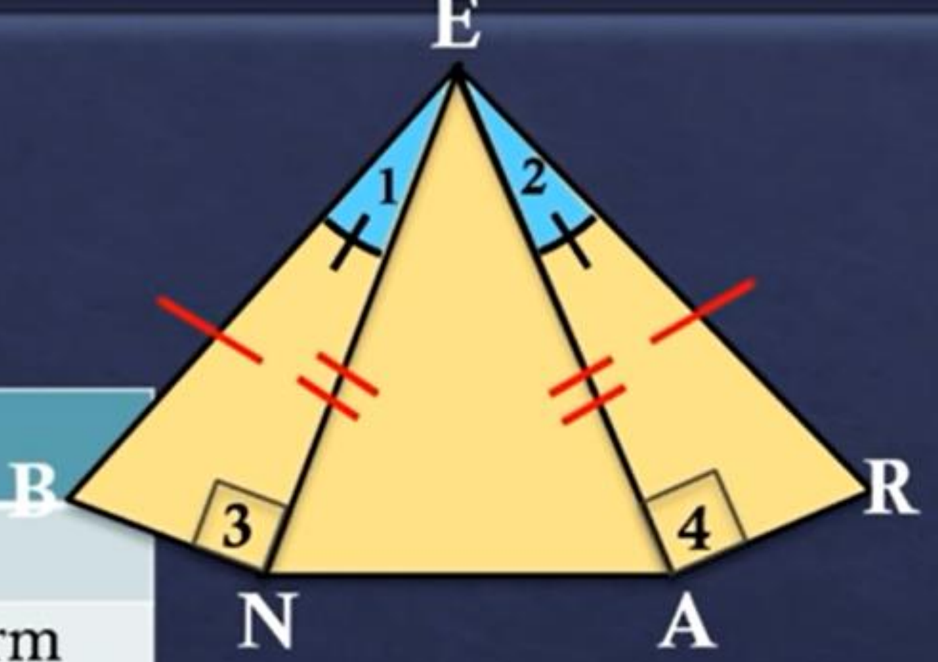
Proof:

Statements	Reasons
1. $\overline{EN} \perp \overline{NB}$; $\overline{EA} \perp \overline{AR}$	1. Given
2. $\angle 3$ *and* $\angle 4$ *are right angles*	2. Perpendicular lines form right angles
3. ΔBNE *and* ΔRAE *are right triangles*	3. Definition of right triangles
4. $\angle 1 \cong \angle 2$; $\overline{EB} \cong \overline{ER}$	4. Given
5. $rt.\Delta BNE \cong rt.\Delta RAE$	5. HA Congruence Theorem
6. $\overline{EN} \cong \overline{EA}$	6. CPCTC
7.	7.

Example No. 6

Given: $\overline{EN} \perp \overline{NB}$; $\overline{EA} \perp \overline{AR}$
$\angle 1 \cong \angle 2$; $\overline{EB} \cong \overline{ER}$

Prove: ΔENA *is isosceles*



Proof:

Statements	Reasons
1. $\overline{EN} \perp \overline{NB}$; $\overline{EA} \perp \overline{AR}$	1. Given
2. $\angle 3$ *and* $\angle 4$ *are right angles*	2. Perpendicular lines form right angles
3. ΔBNE *and* ΔRAE *are right triangles*	3. Definition of right triangles
4. $\angle 1 \cong \angle 2$; $\overline{EB} \cong \overline{ER}$	4. Given
5. $rt.\Delta BNE \cong rt.\Delta RAE$	5. HA Congruence Theorem
6. $\overline{EN} \cong \overline{EA}$	6. CPCTC
7. ΔENA *is isosceles*	7. Def. of Isosceles Triangle

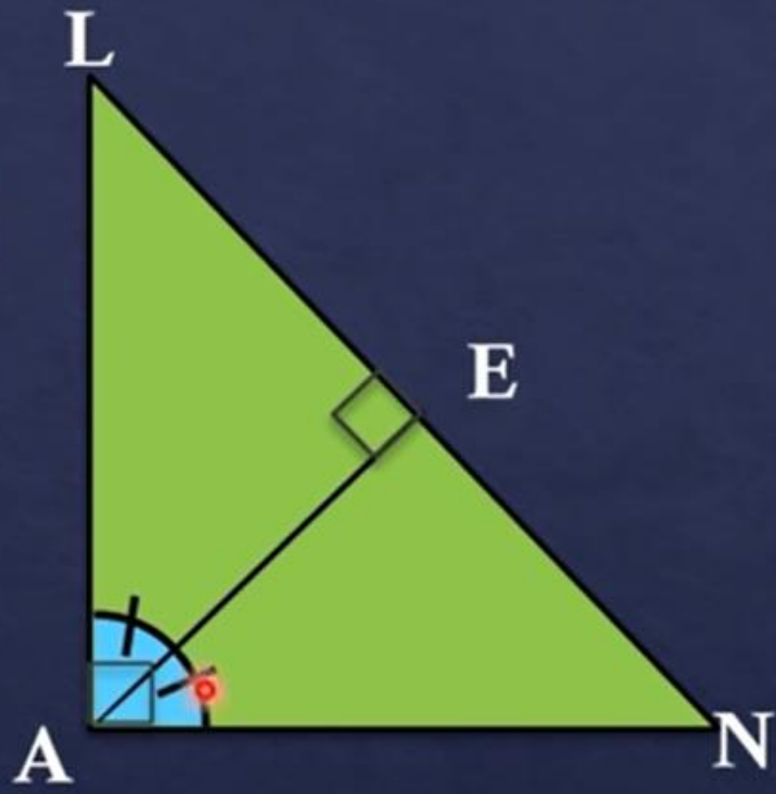
Example No. 6

Given: $\overline{EA}$ *bisects* $\angle LAN$; $\overline{AE} \perp \overline{LN}$

Prove: ΔLAN *is isosceles*

Proof:

Statements	Reasons
1. $\overline{EA}$ *bisects* $\angle LAN$	1. Given
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.



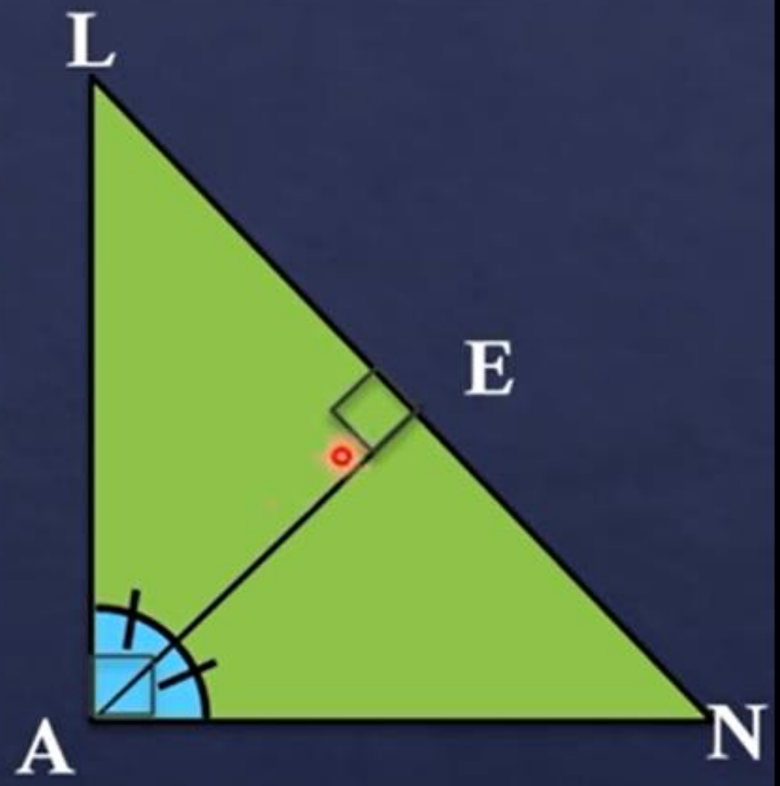
Example No. 7

Given: $\overline{EA}$ *bisects* $\angle LAN$; $\overline{AE} \perp \overline{LN}$

Prove: ΔLAN *is isosceles*

Proof:

Statements	Reasons
1. $\overline{EA}$ *bisects* $\angle LAN$	1. Given
2. $\angle LAE \cong \angle NAE$	2. Definition of $\angle$ Bisector
3. $\overline{AE} \perp \overline{LN}$	3. Given
4. $\angle LEA$ *and* $\angle NEA$ *are right angles*	4. Perpendicular lines form right angles
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.



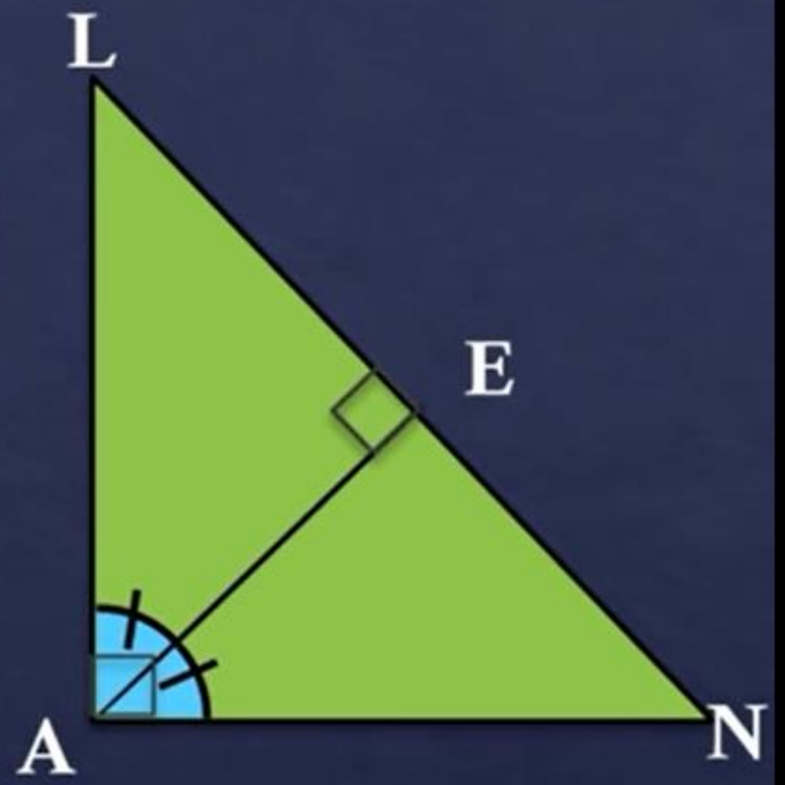
Example No. 7

Given: $\overline{EA}$ *bisects* $\angle LAN$; $\overline{AE} \perp \overline{LN}$

Prove: ΔLAN *is isosceles*

Proof:

Statements	Reasons
1. $\overline{EA}$ *bisects* $\angle LAN$	1. Given
2. $\angle LAE \cong \angle NAE$	2. Definition of $\angle$ Bisector
3. $\overline{AE} \perp \overline{LN}$	3. Given
4. $\angle LEA$ *and* $\angle NEA$ *are right angles*	4. Perpendicular lines form right angles
5. ΔLEA *and* ΔNEA *are right* $\Delta's$	5. Def. of right triangles
6.	6.
7.	7.
8.	8.
9.	9.



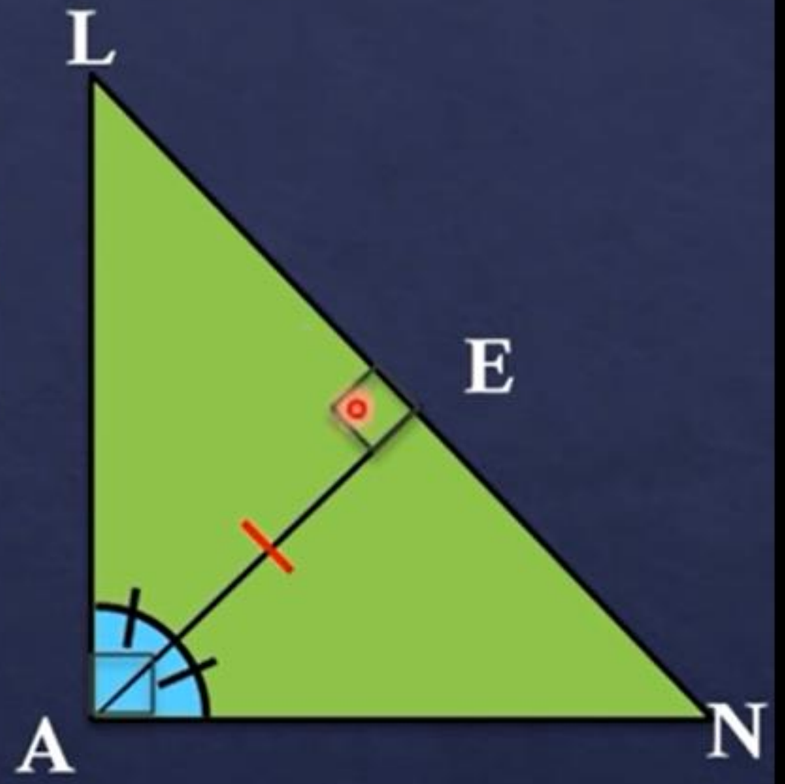
Example No. 7

Given: $\overline{EA}$ *bisects* $\angle LAN$; $\overline{AE} \perp \overline{LN}$

Prove: ΔLAN *is isosceles*

Proof:

Statements	Reasons
1. $\overline{EA}$ *bisects* $\angle LAN$	1. Given
2. $\angle LAE \cong \angle NAE$	2. Definition of $\angle$ Bisector
3. $\overline{AE} \perp \overline{LN}$	3. Given
4. $\angle LEA$ *and* $\angle NEA$ *are right angles*	4. Perpendicular lines form right angles
5. ΔLEA *and* ΔNEA *are right* $\Delta's$	5. Def. of right triangles
6. $\overline{AE} \cong \overline{AE}$	6. Reflexive Property of Congruence
7.	7.
8.	8.
9.	9.



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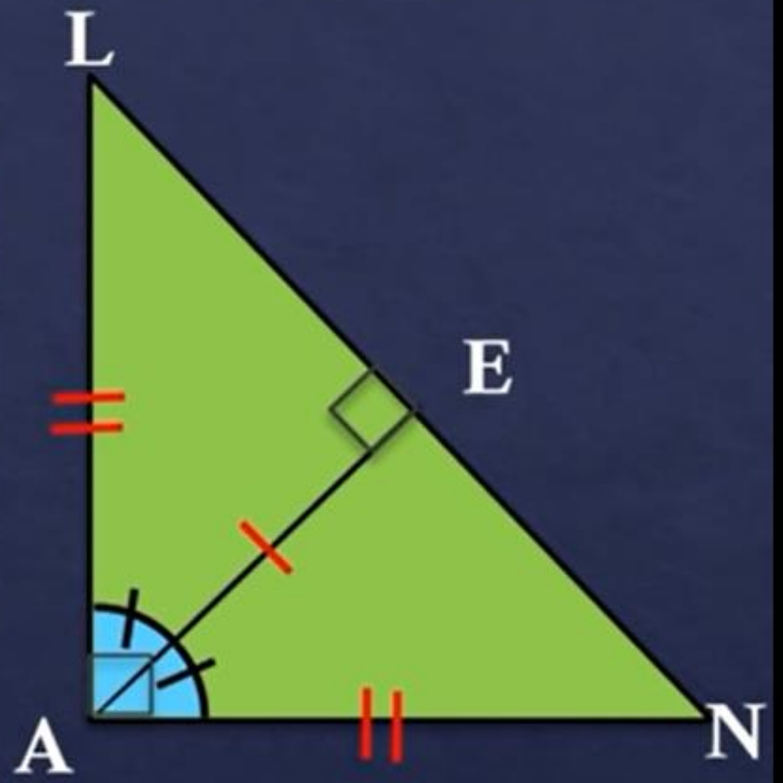
5. ΔLEA *and* ΔNEA *are right* $\Delta's$	5. Def. of right triangles
6. $\overline{AE} \cong \overline{AE}$	6. Reflexive Property of Congruence
7. $rt.\Delta LEA \cong rt.\Delta NEA$	7. LA Congruence Theorem
8. $\overline{LA} \cong \overline{NA}$	8. CPCTC
9. ΔLAN *is isosceles*	9. Def. of Isosceles Triangle

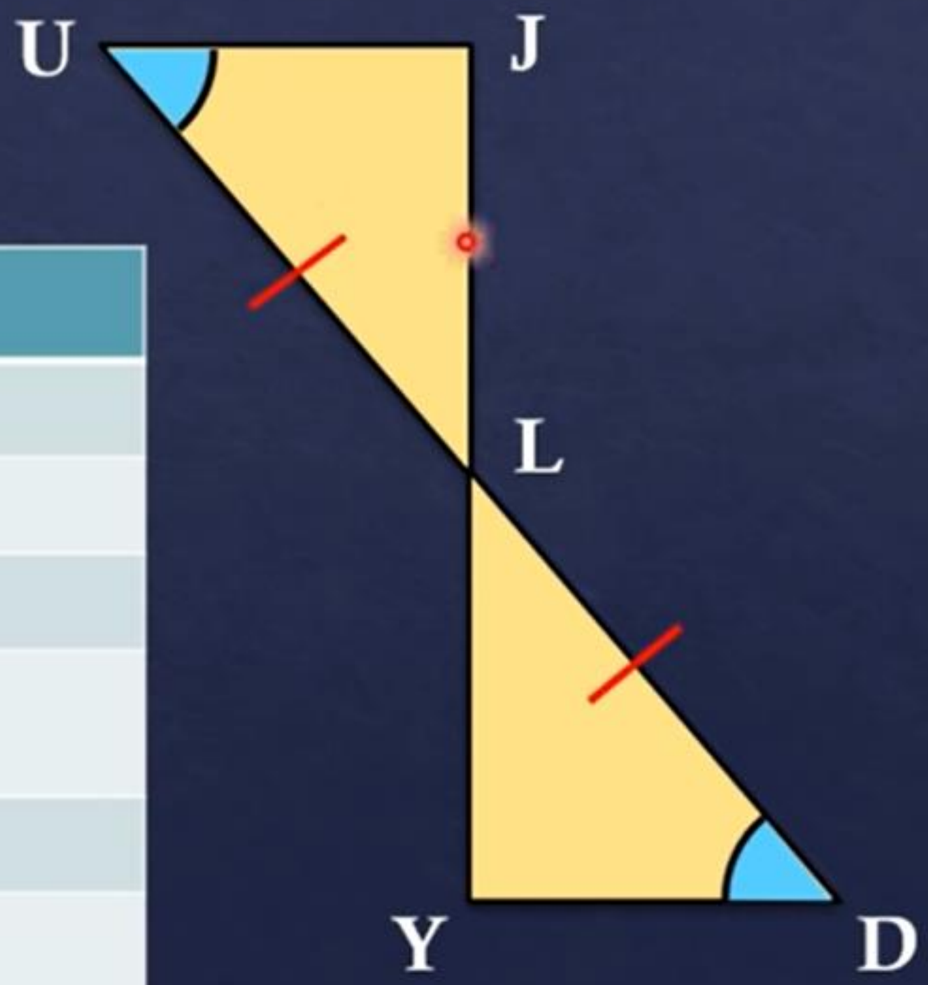


Example No. 7

GROUP ACTIVITY: COMPLETE ME

Given: L *is the midpoint of* $\overline{UD}$; $\angle U \cong \angle D$

Prove: $\angle J \cong \angle Y$

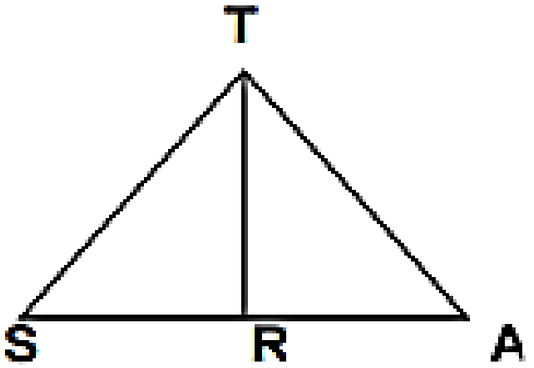


Proof:

Statements	Reasons
1. L *is the midpoint of* $\overline{UD}$	1. Given
2. $\overline{UL} \cong \overline{DL}$	2. Midpoint Theorem
3.	3.
4.	4.
5.	5.
6.	6.

Given: Isosceles ΔSTA with respect to the vertex $\angle T$, $\overline{AR} \cong \overline{SR}$

Prove: $\angle ATR \cong \angle STR$



Proof:

Statements	Reasons
1. _____ *(Which of the given statement will help the next statements)*	1. Given
2. _____ *(Which parts of the given triangle are congruent as defined by the isosceles triangle?)*	2. Definition of Isosceles Triangle
3. _____ *(Which side of ΔATR and ΔSTR is common?)*	3. Reflexive Property

4. _____ *(What other statement is given?)*	4. Given
5. _____ *(What are the congruent triangles based on the previous statements)*	5. SSS Congruence Postulate
6. _____ *(What other corresponding parts of the two triangles are to be proven congruent?)*	6. CPCTC

THANK YOU