TODOS LIVE

A Visual Approach to Proof:

Supporting *ALL* learners

By Melissa Hosten

The ideas, most slides, and most handouts come from ProofBlocks: A Visual Approach to Logic and Proof
By Jenni Dirksen & Jinna Hwang

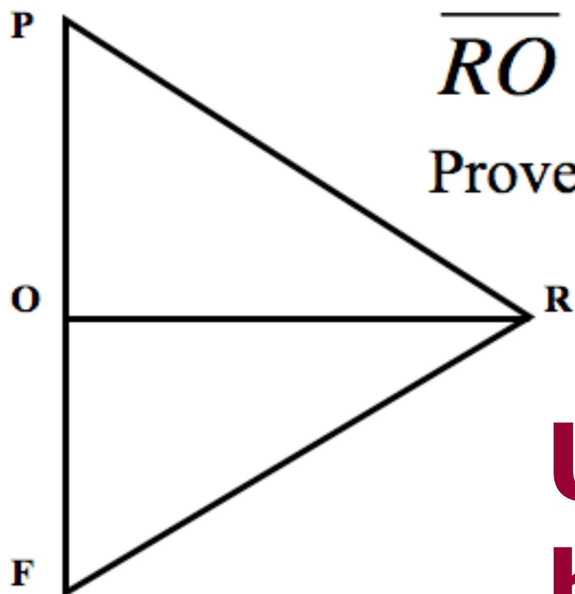
www.proofblocks.com

The Plan

- Why is proof hard for ELLs?
- Using Conditional Statements
- Learning the support
- Trying it yourself
- What are the benefits?

What makes proof tough?

Why is this hard for students?



Given: ΔPRF is equilateral

$\overline{RO}$ *bisects* $\angle PRF$

Prove: $\Delta PRO \cong \Delta FRO$

Use your chat bar to respond.

What makes it hard?

What if you started with the idea that not all students ***see*** three triangles?

Before even getting to the postulates, theorems, givens, and format--**HOW** can we support our visual or kinesthetic learner's and our ELL's ability to see all of the figures?

Let's go on a triangle hunt!

Can this work with **midpoints and bisectors?**

Conditional Statements

- Theorem: The sum of the interior angles of a triangle is 180º.
- Let's rewrite this as a conditional statement:
- **At home, rewrite this as a conditional statement.**
- **Use your control bar to raise your hand when you are done.**
- You probably wrote something like, **If a figure is a triangle, then the sum of the interior angles is 180º**

Conditional Statements

- **If a figure is a triangle, then the sum of the interior angles is 180º.**
- **What is the input?--respond by chat bar**
- **What is the output? --respond by chat bar**
- **Can we draw a picture of the input? The output?--Draw this at home on two opposite sides of a strip of paper.**

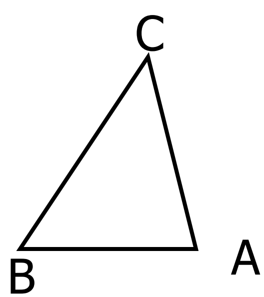
Conditional statements

- Did it look similar to the one below?

- Labeling is important, so if you missed labeling your angles and writing the equation, please go ahead and add this to your picture.
- If you want to try this with students or colleagues, you may want to use the **Basic Theorems and Postulates handout** and the **conditional block handout**.

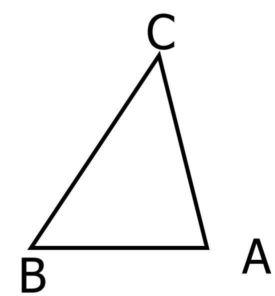
Conditional Statements

- Now, write the theorem in the center of the strip of paper.



Triangle Sum Theorem

The sum of the interior angles of a triangle is 180º.



$A+B+C = 180°$

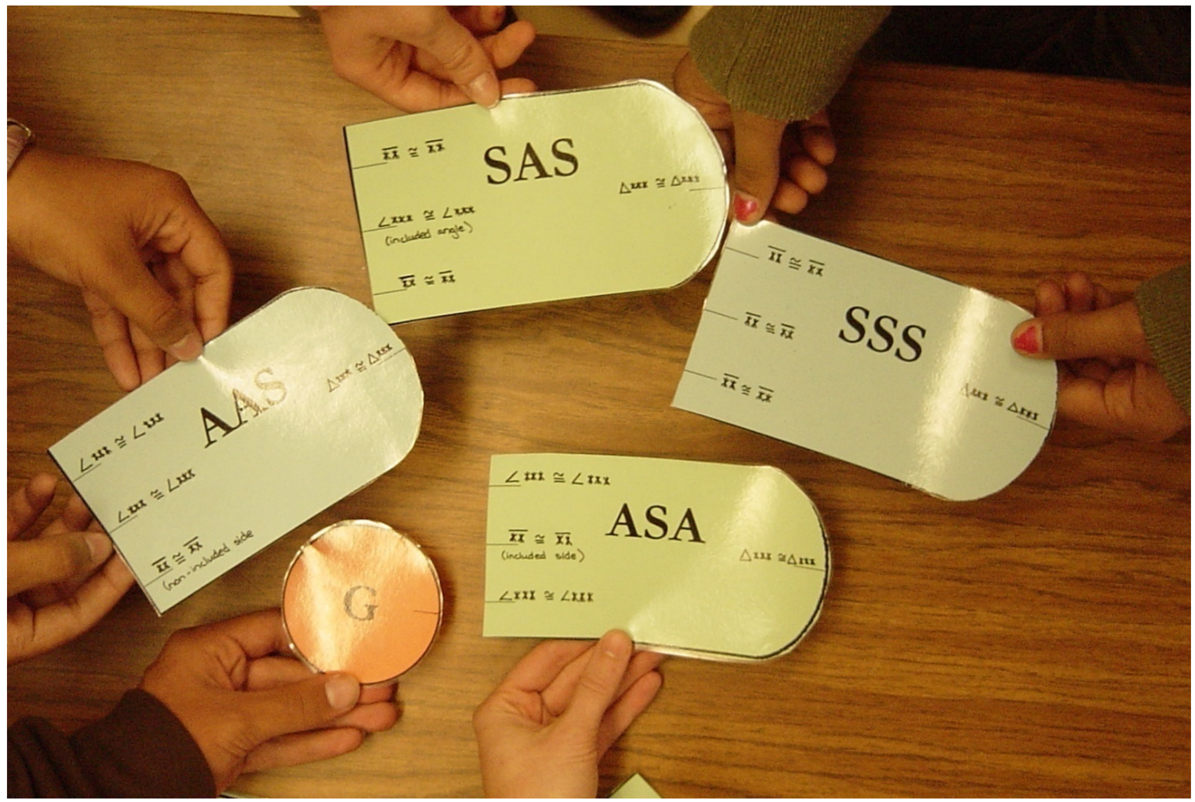
- How does this *support* understanding the theorem?
- **Take a minute and [look at the proofblocks including HL].**
- **What observations do you have? Share them in the chat bar.**

An option *and* an opportunity

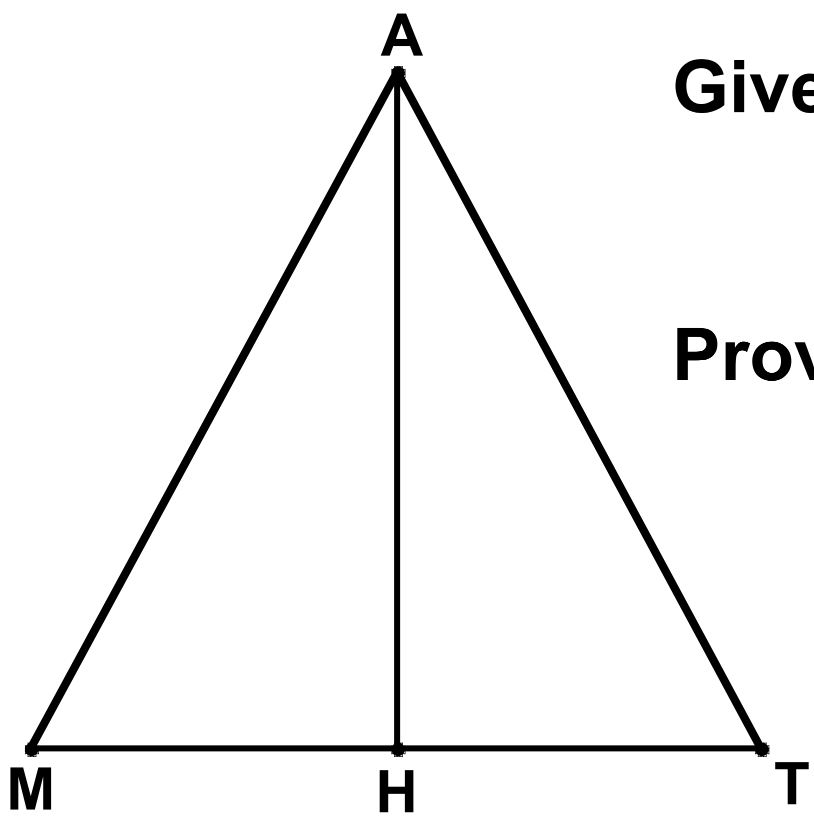
Proofblocks turn theorems, postulates, and definitions into *tools*, **manipulatives**.

The tools have a visual cue, symbolic information, and the text of the theorem, postulate, or definition once students make their set.

This supports students' **use** of theorems, postulates, and definitions as well as students' **understanding** that proof is a structured connection of inputs and outputs.



Proof Blocks



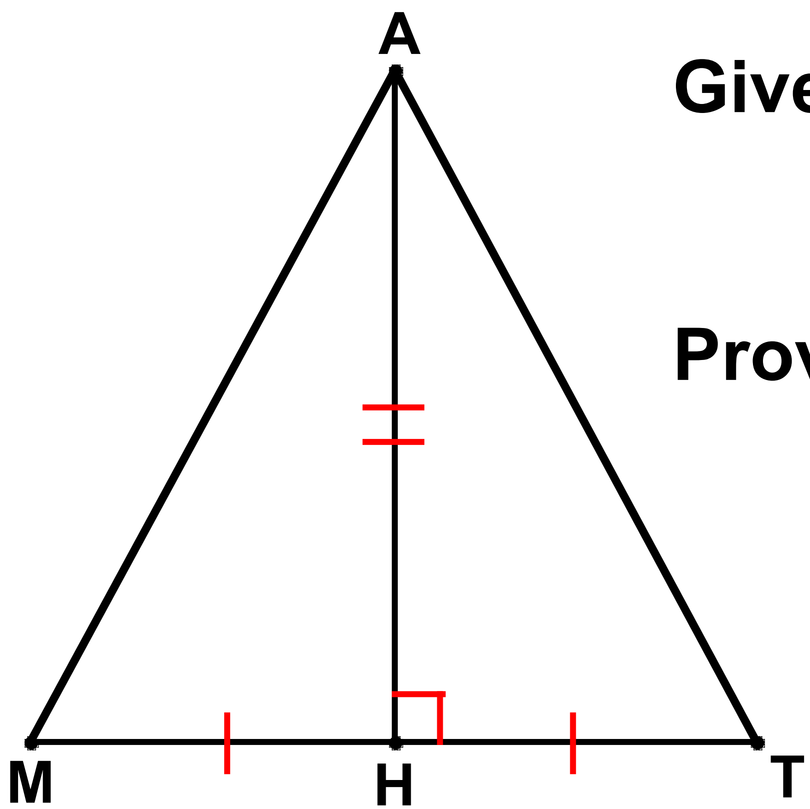
Given: $\overline{MT} \perp \overline{AH}$

H is the midpoint of $\overline{MT}$

Prove: $\Delta MAH \cong \Delta TAH$

First we will place the information on the picture as we did in the marking definitions activity.

Proof Blocks



Given: $\overline{MT} \perp \overline{AH}$

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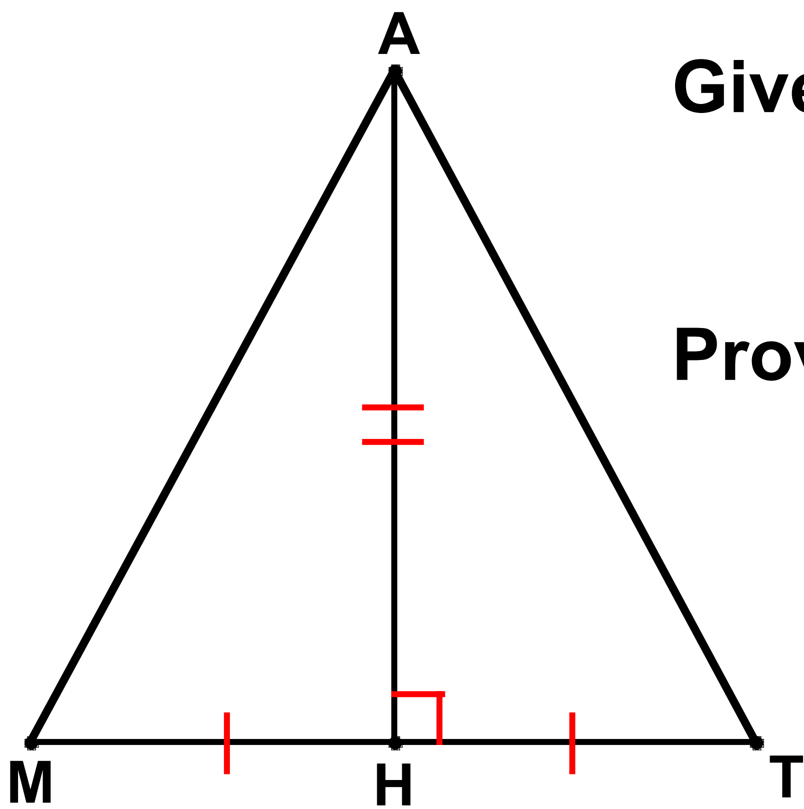
Prove: $\Delta MAH \cong \Delta TAH$

Now we have to find a proofblock that has these inputs.

Proof Blocks



Given: $\overline{MT} \perp \overline{AH}$

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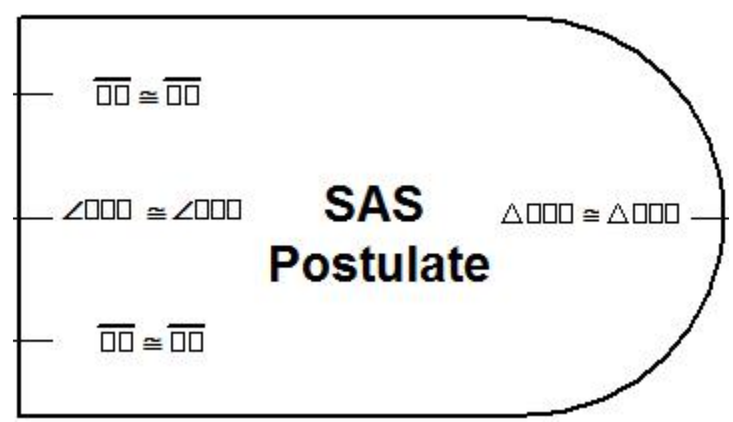
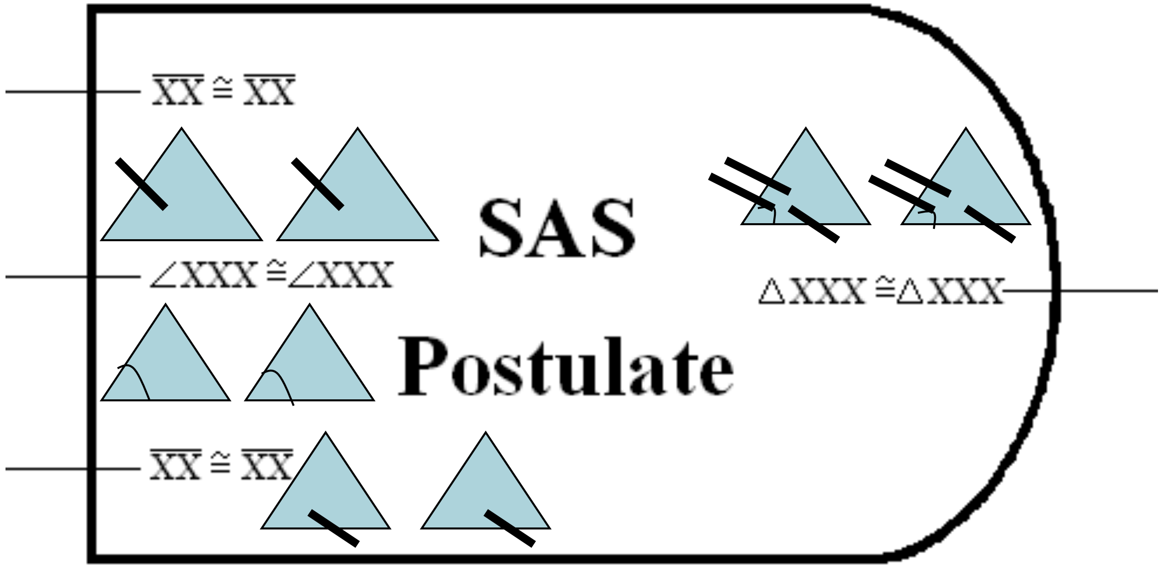
Prove: $\triangle MAH \cong \triangle TAH$

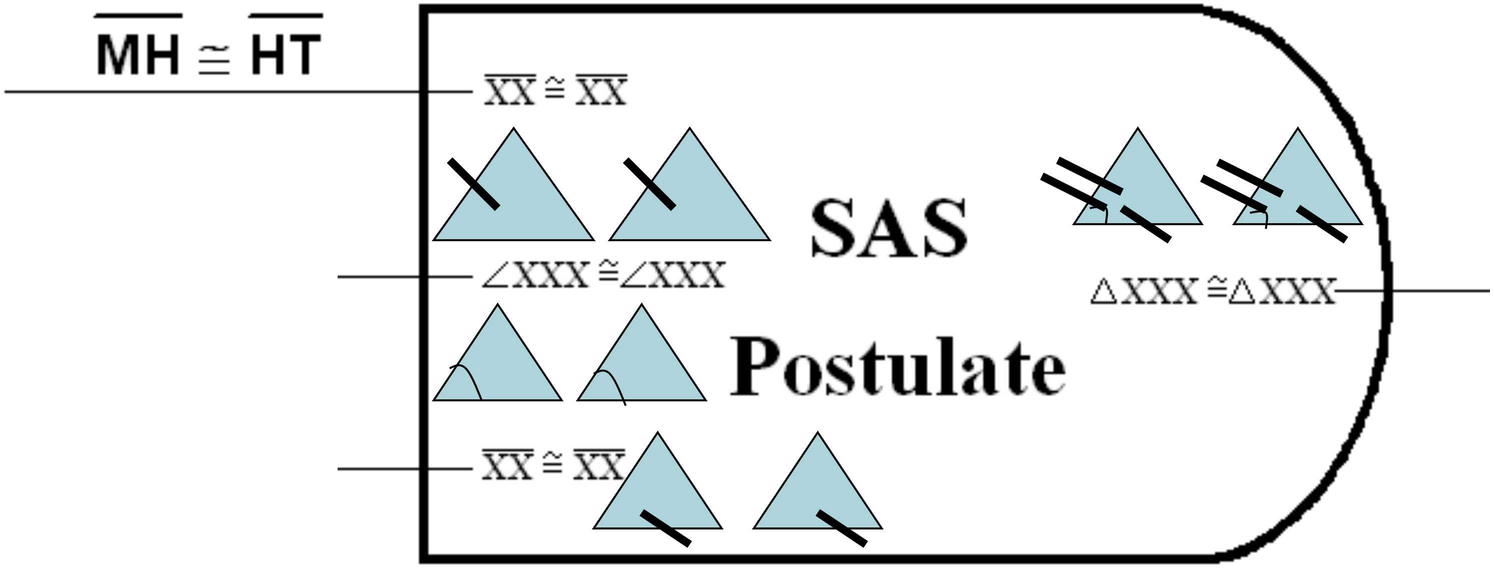


Proof Blocks

It really helps ELLs to make a picture on the block!



Proof Blocks



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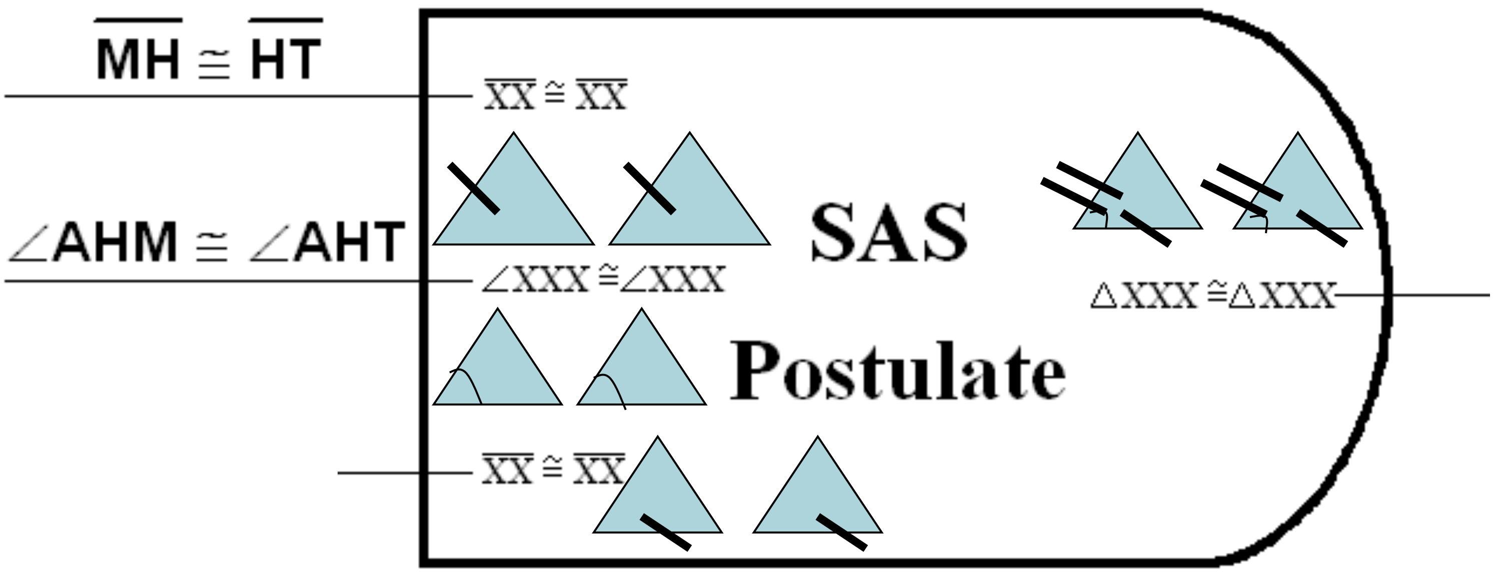

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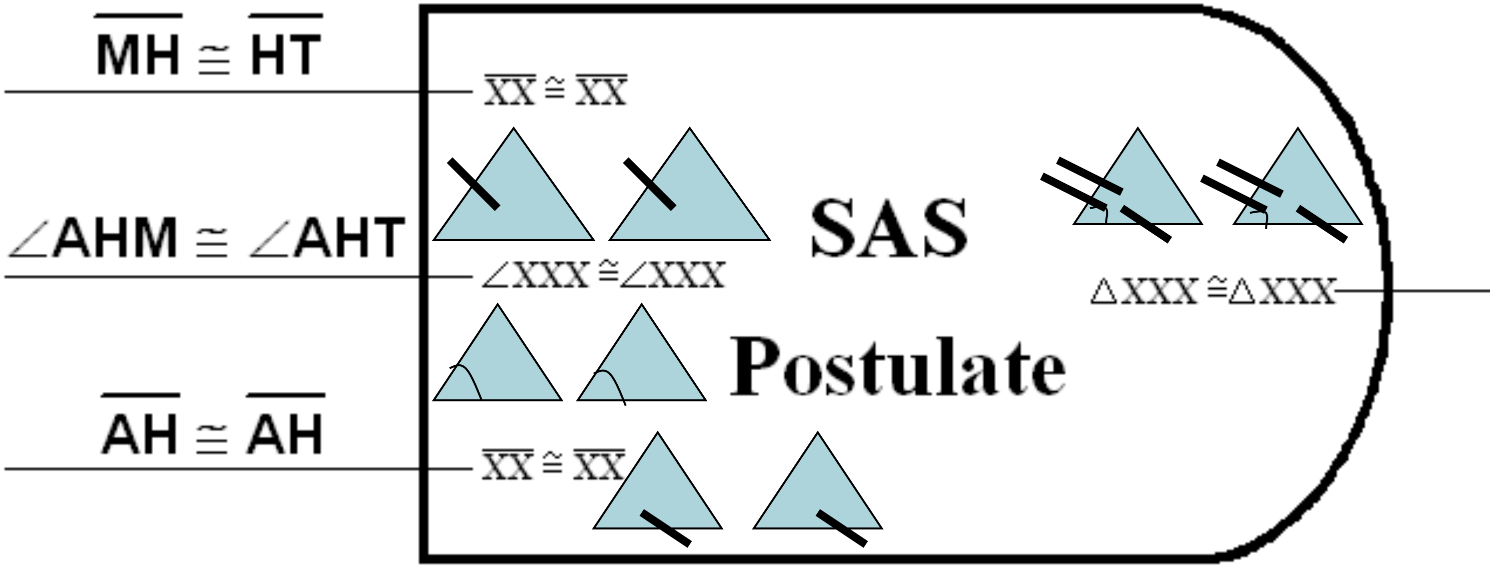

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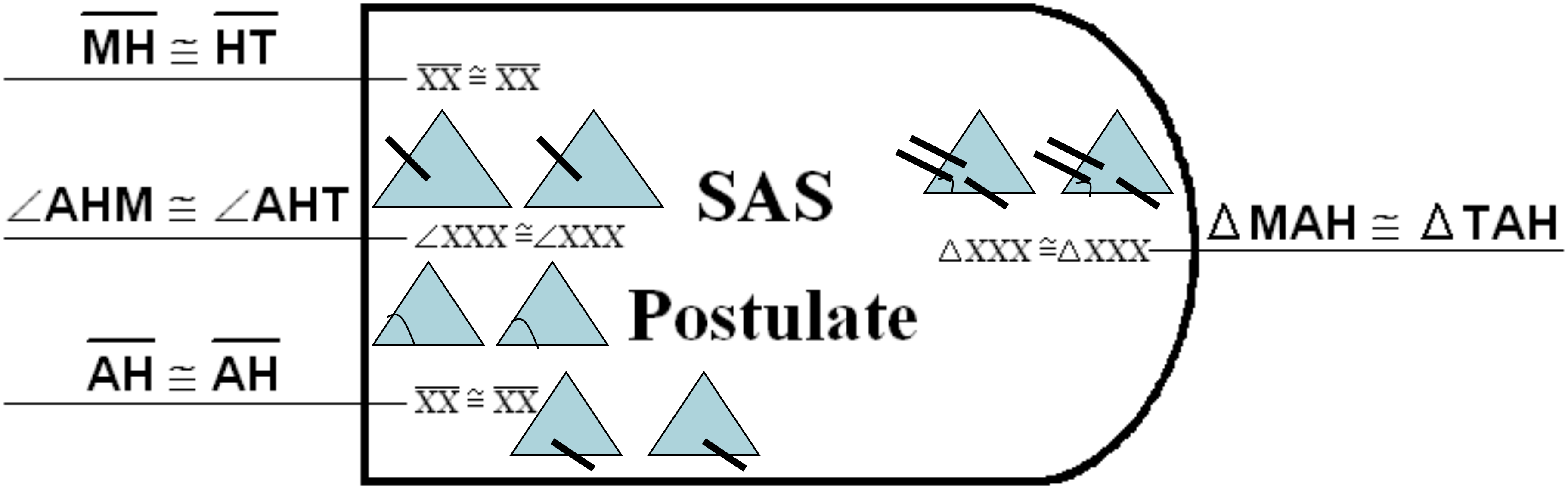
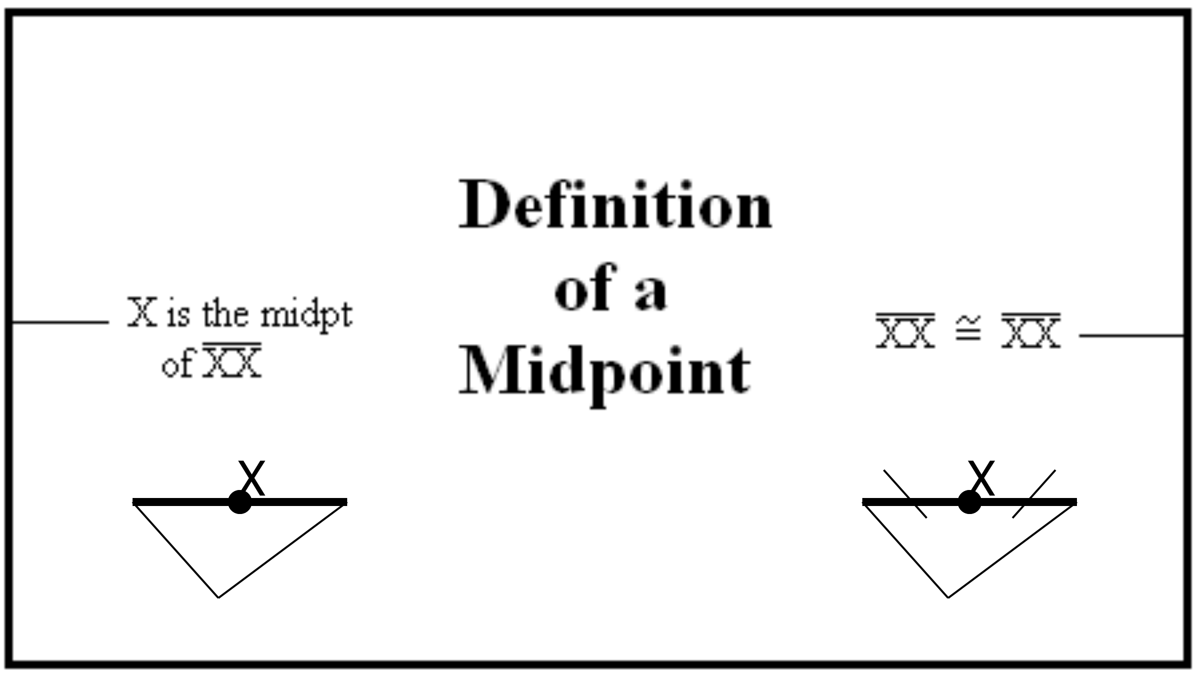


Definitions

H is the midpoint of $\overline{MT}$



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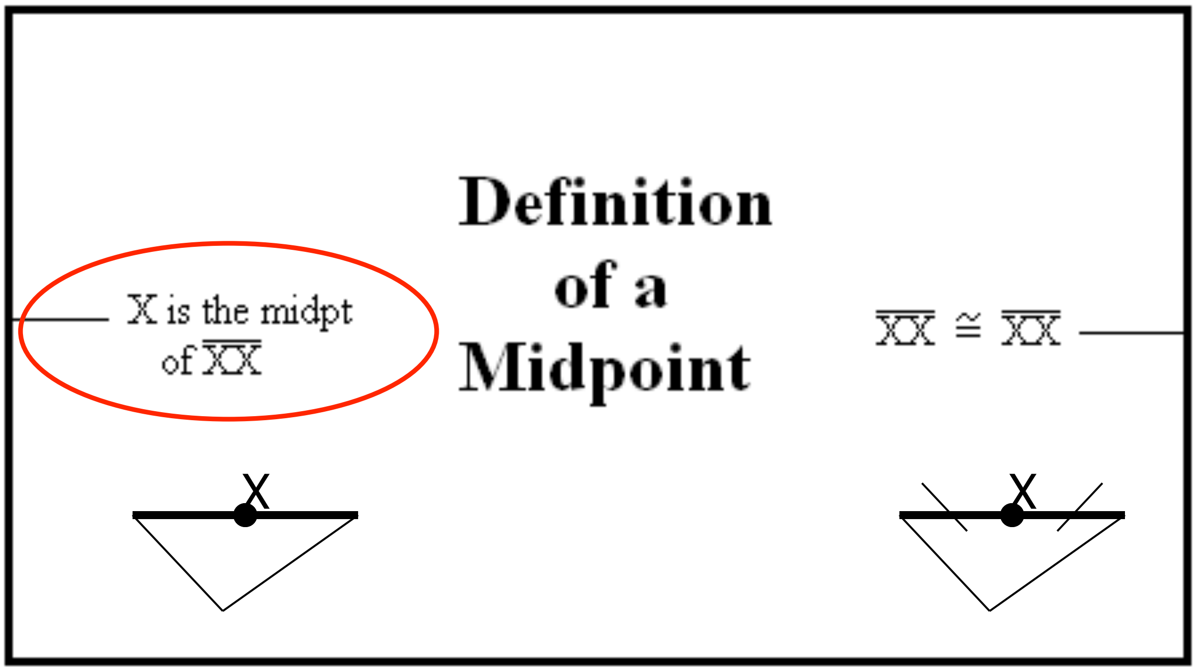
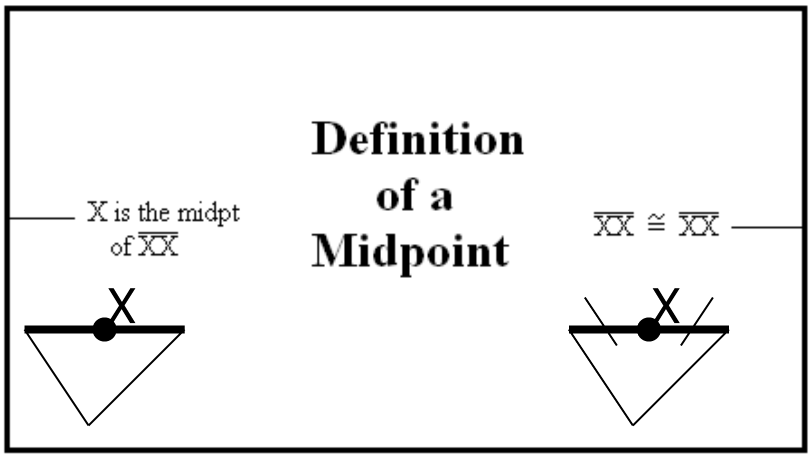
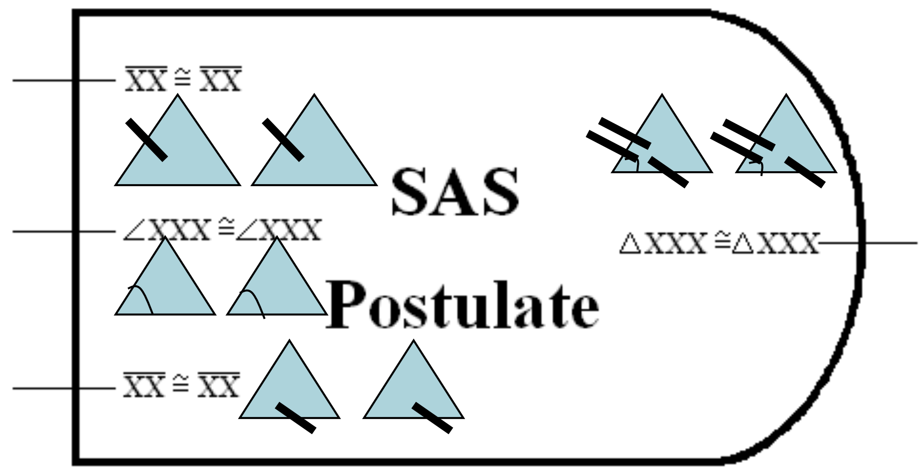


Connecting Blocks



$\overline{MH} \cong \overline{HT}$



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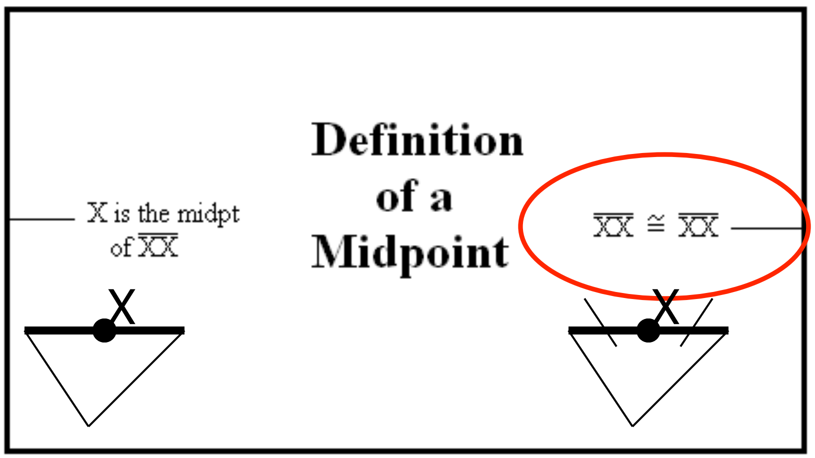

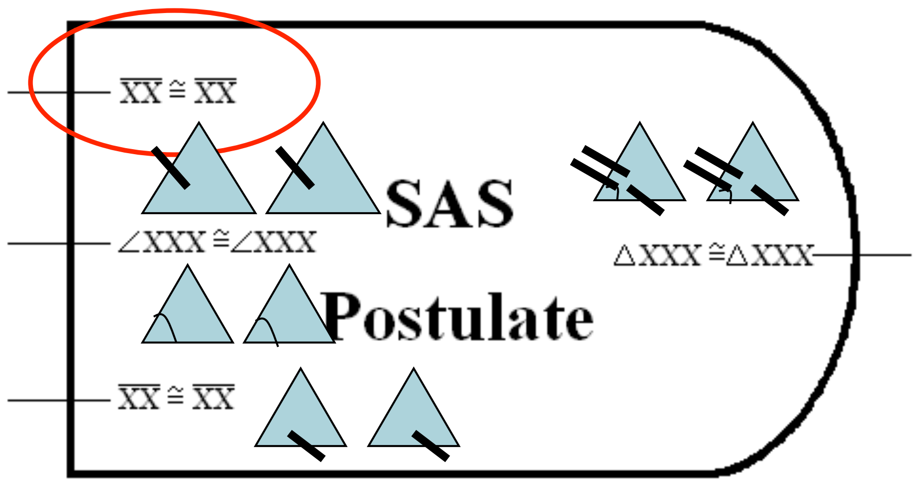

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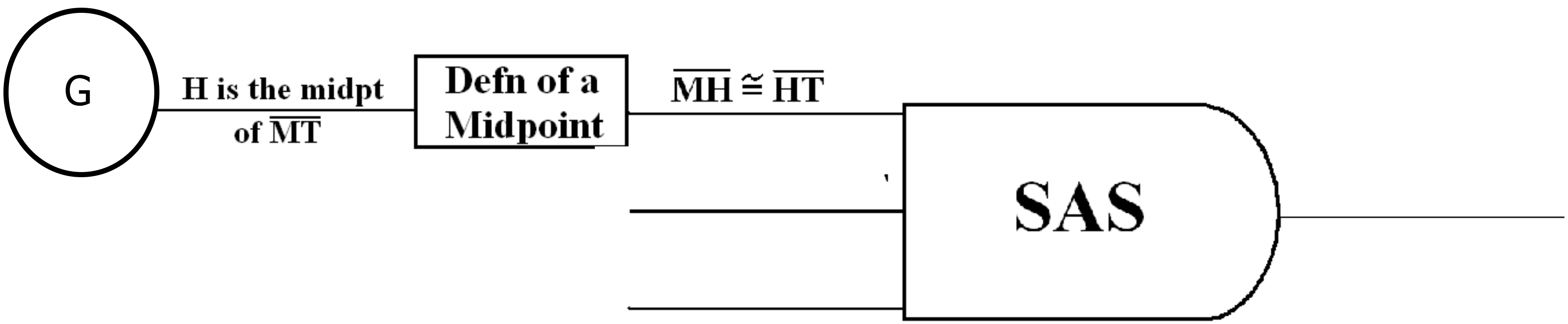
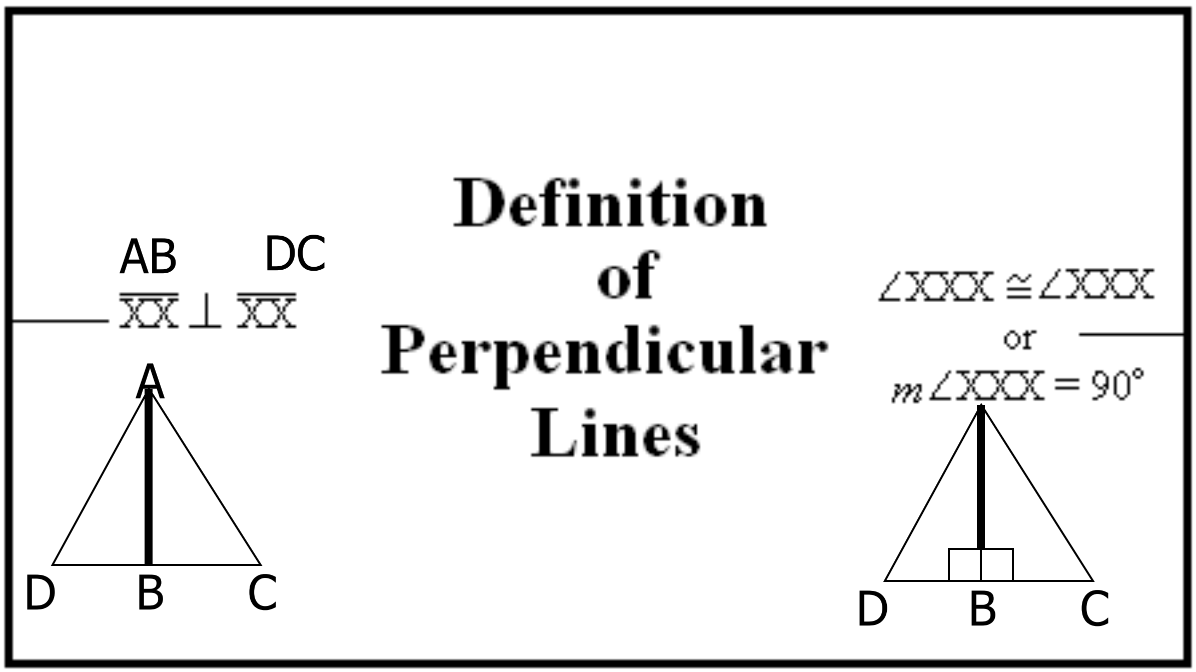
Proof Blocks



Definitions

$$\overline{MT} \perp \overline{AH}$$



Definitions

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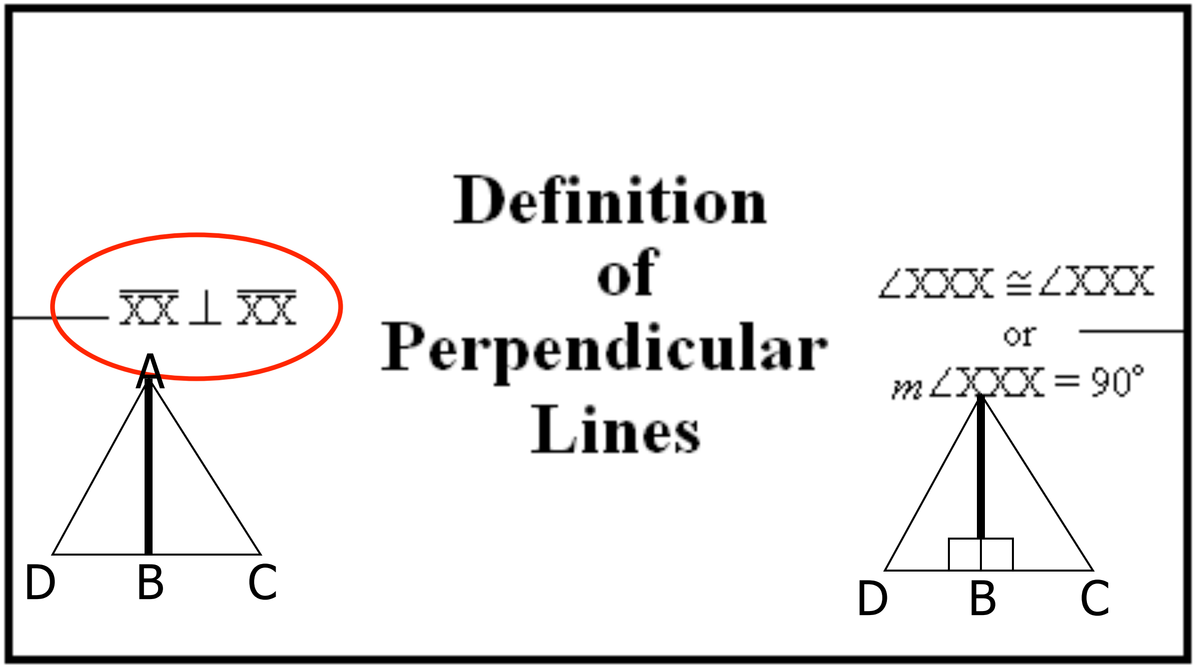
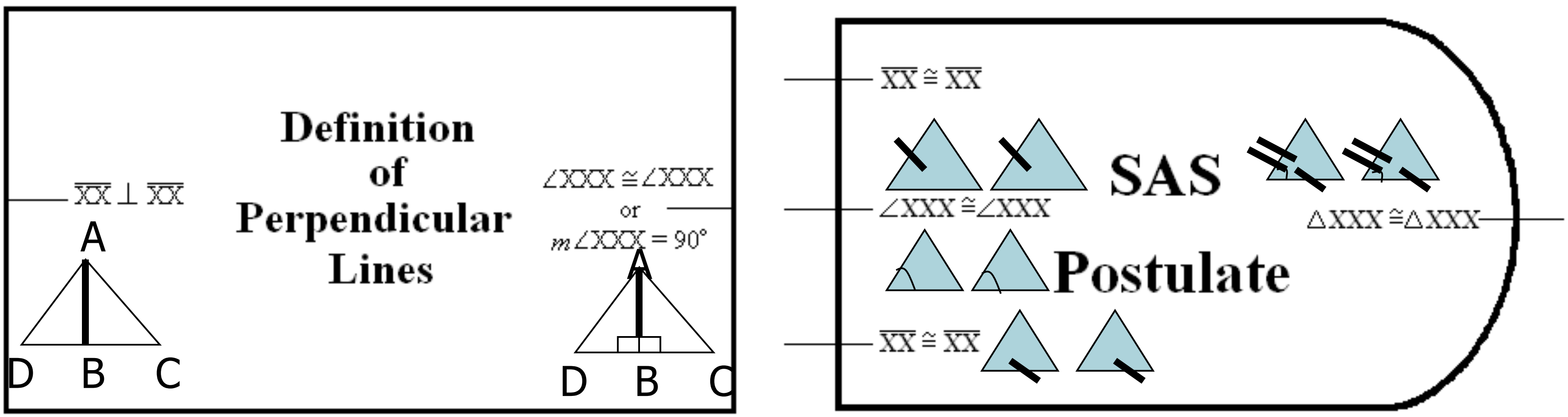
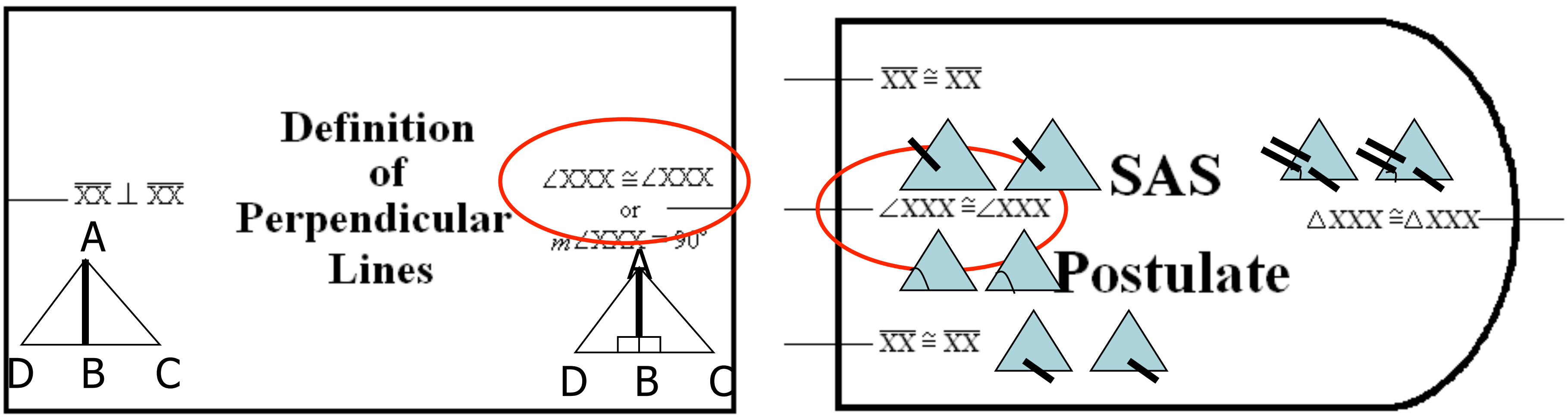


Connecting Blocks



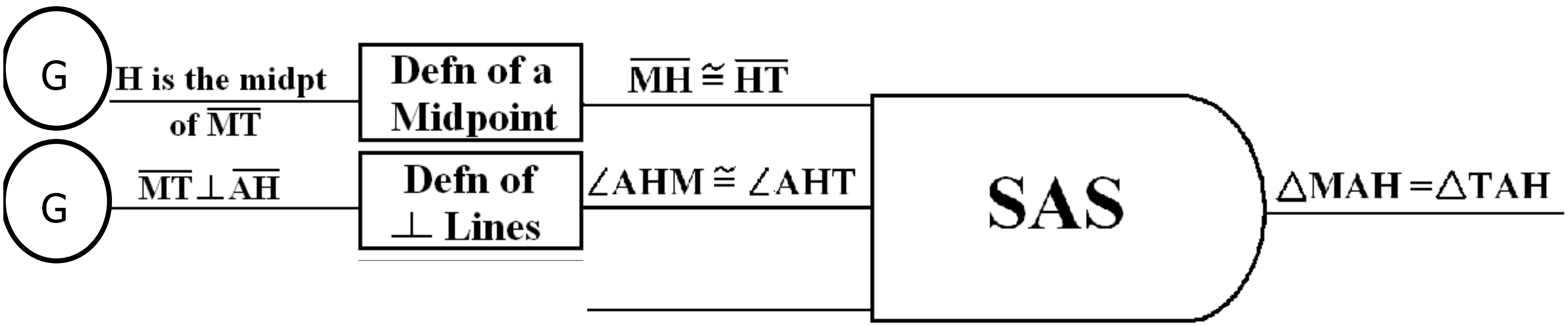
$\angle AHM \cong \angle AHT$

Connecting Blocks



$\angle AHM \cong \angle AHT$

Proof Blocks



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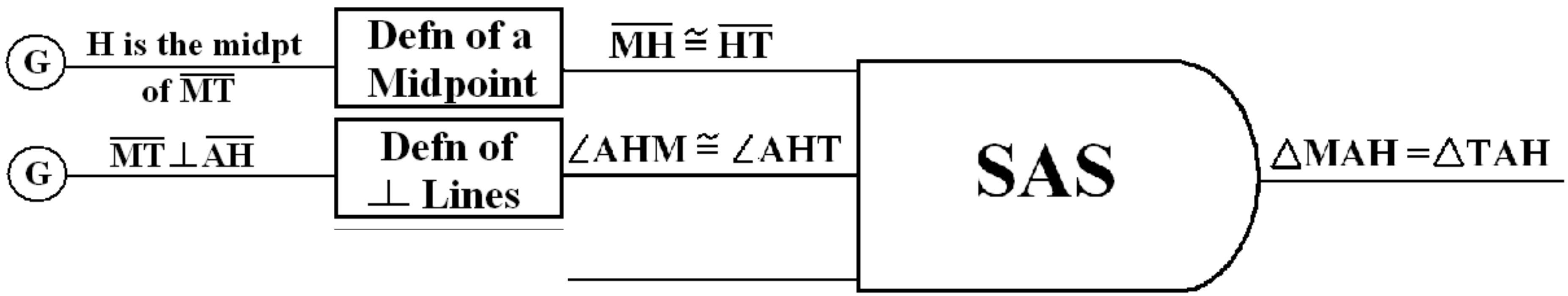

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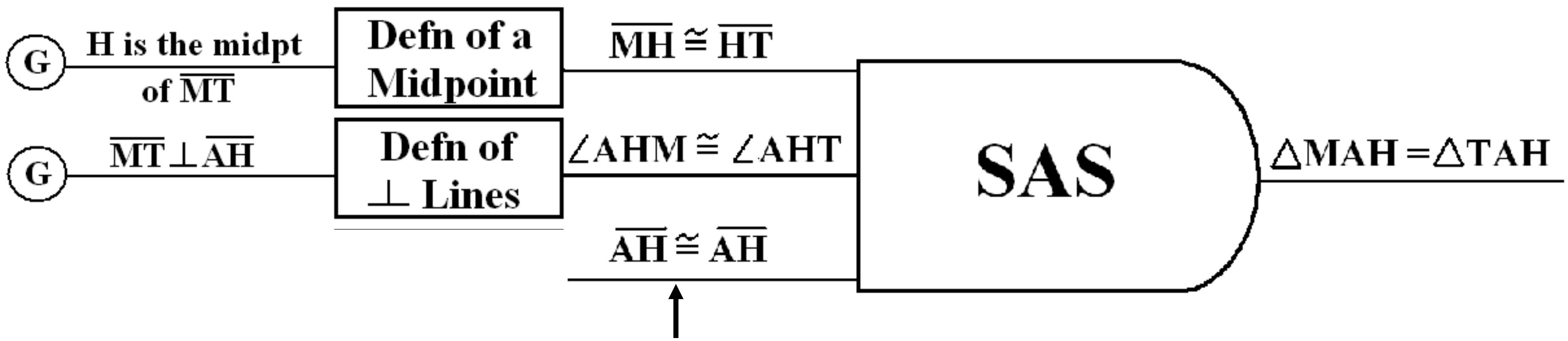
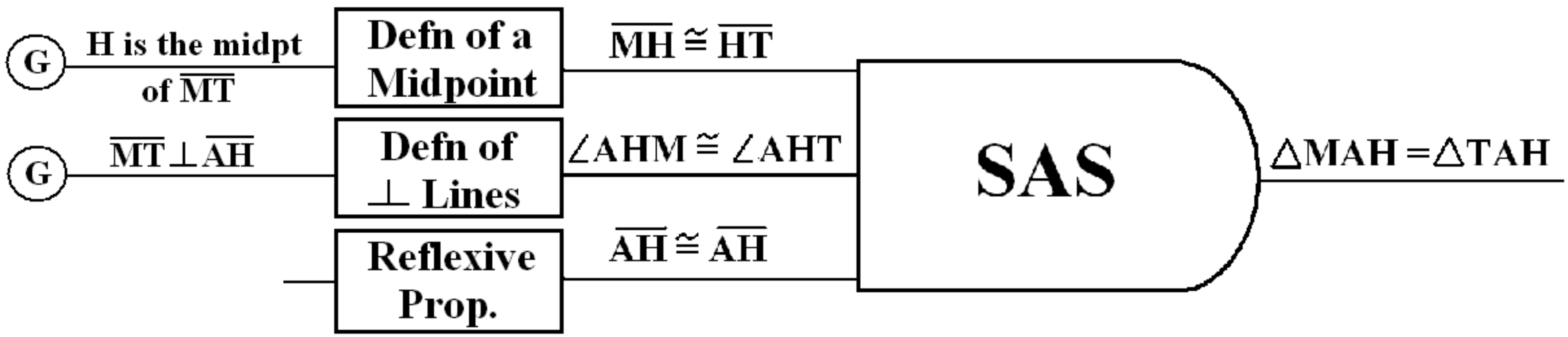


What block looks like this statement?

Where did we learn this?

Proof Blocks



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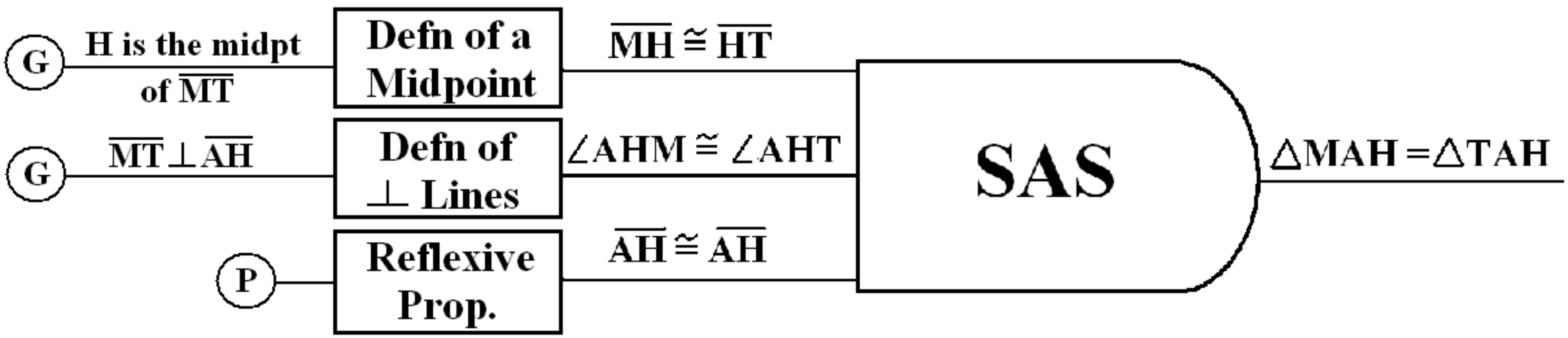
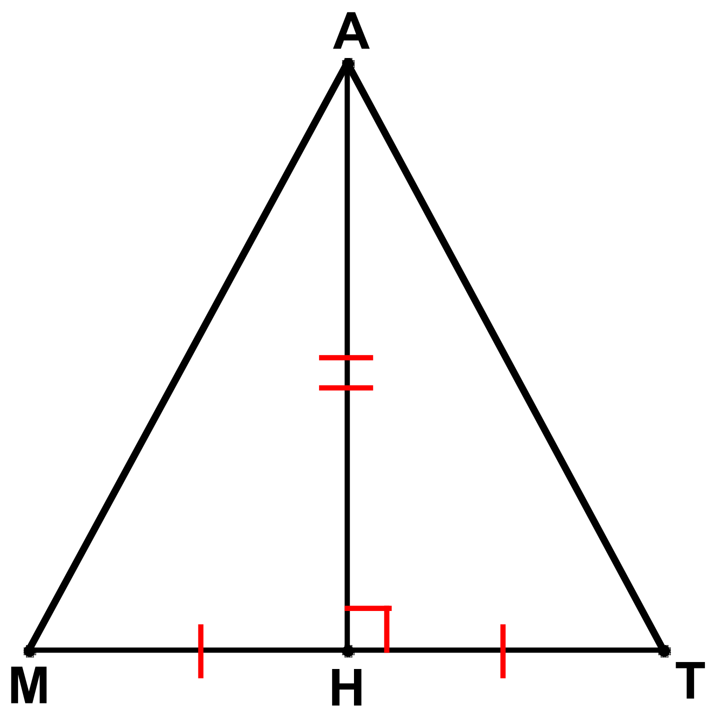


An Extension



Given: $\overline{MT} \perp \overline{AH}$

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Prove: $\overline{AM} \cong \overline{AT}$

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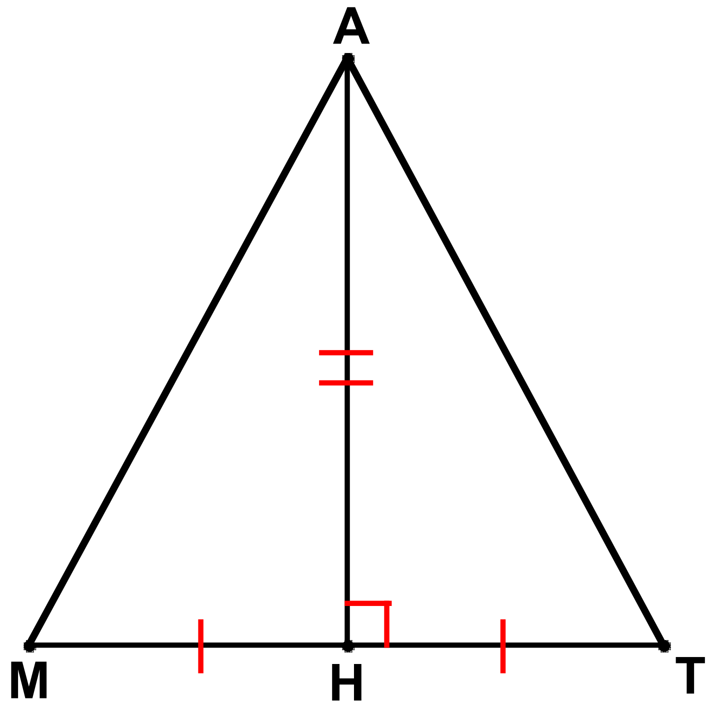

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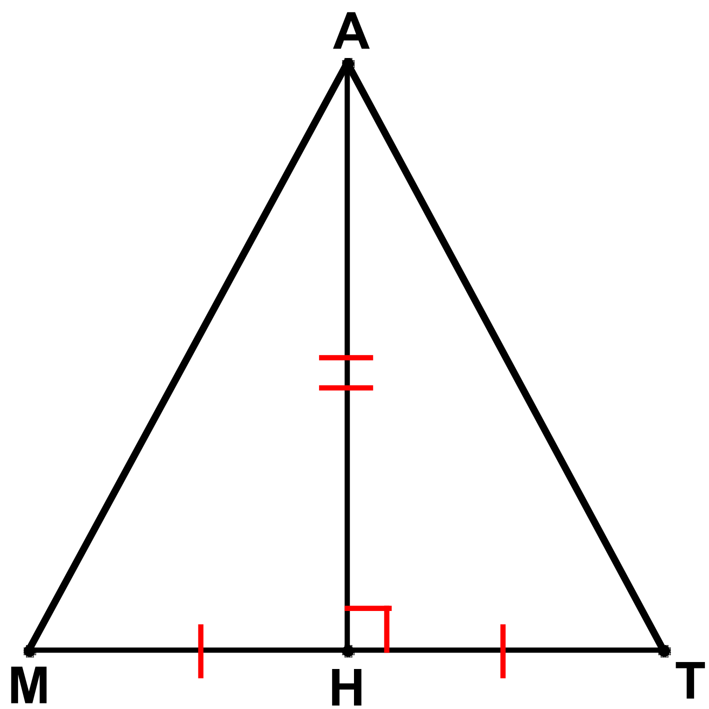


Given: $\overline{MT} \perp \overline{AH}$

H is the midpoint of $\overline{MT}$

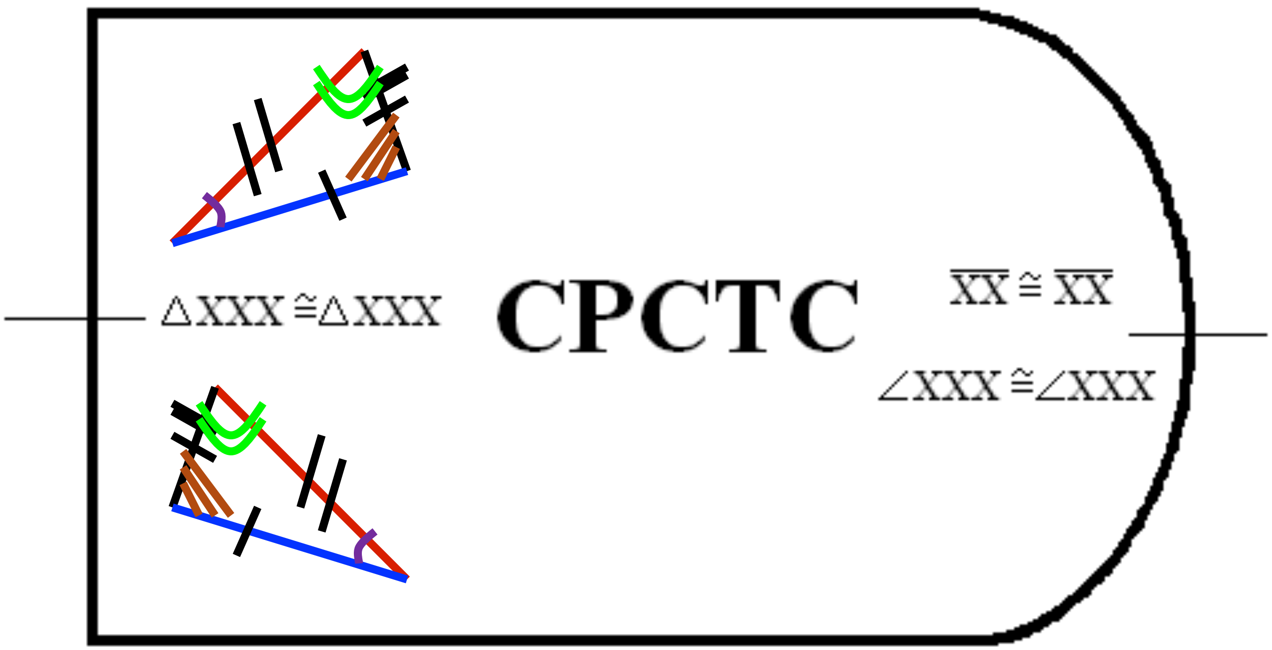
Prove: $\overline{AM} \cong \overline{AT}$

Corresponding **P**arts of **C**ongruent **T**riangles are **C**ongruent

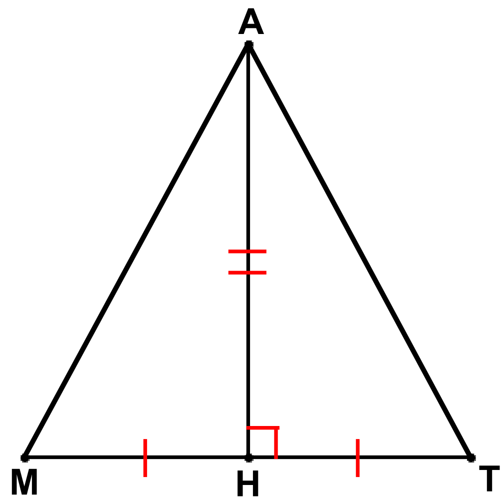
An Extension

I have found color pictures work well with this block.

Corresponding parts of congruent triangles are congruent



An Extension



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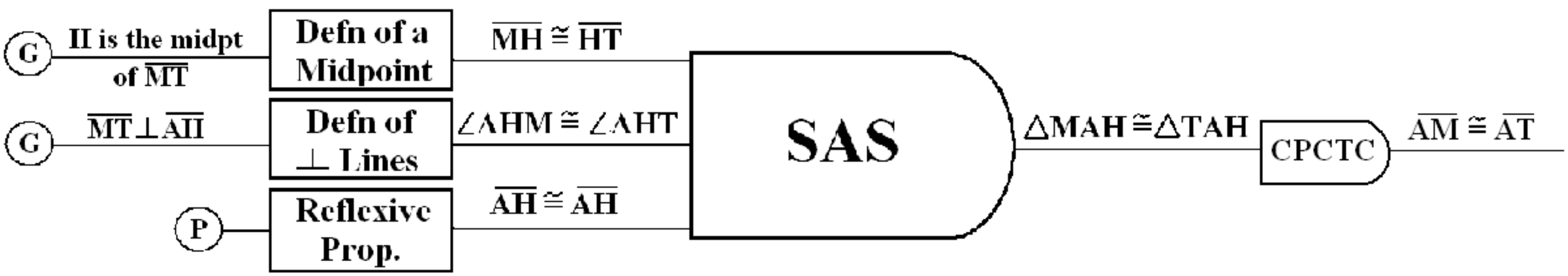
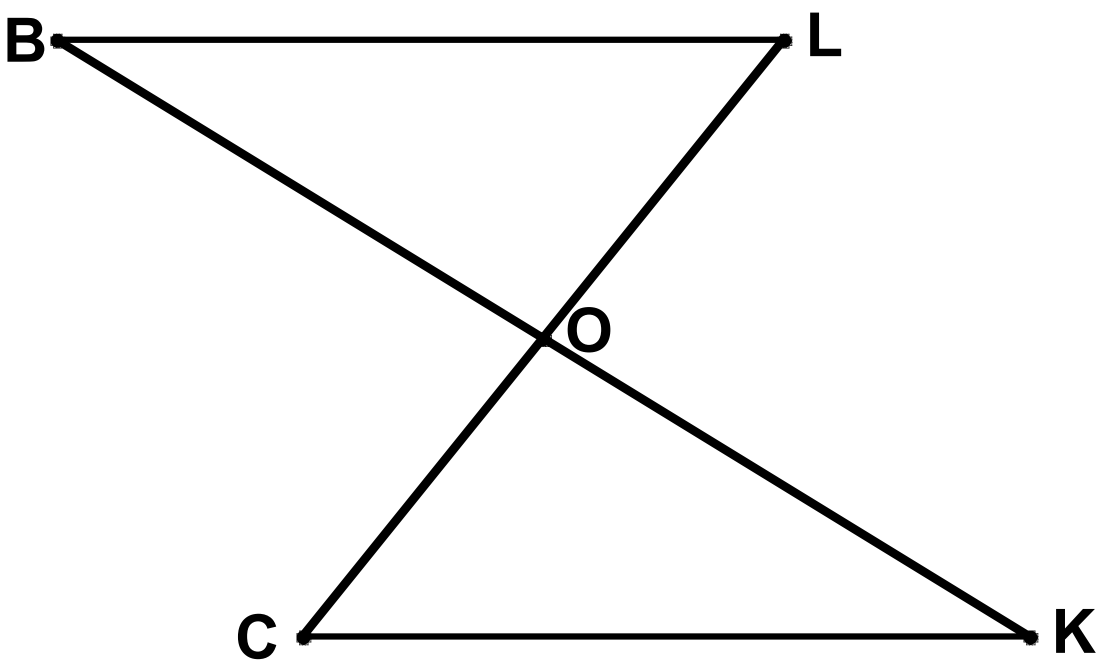
Prove: $\overline{AM} \cong \overline{AT}$



Try It Yourself!



Given: O is the midpoint of $\overline{BK}$

$\angle B \cong \angle K$

Prove $\overline{BL} \cong \overline{CK}$

Did you find the Definition of a Midpoint block?

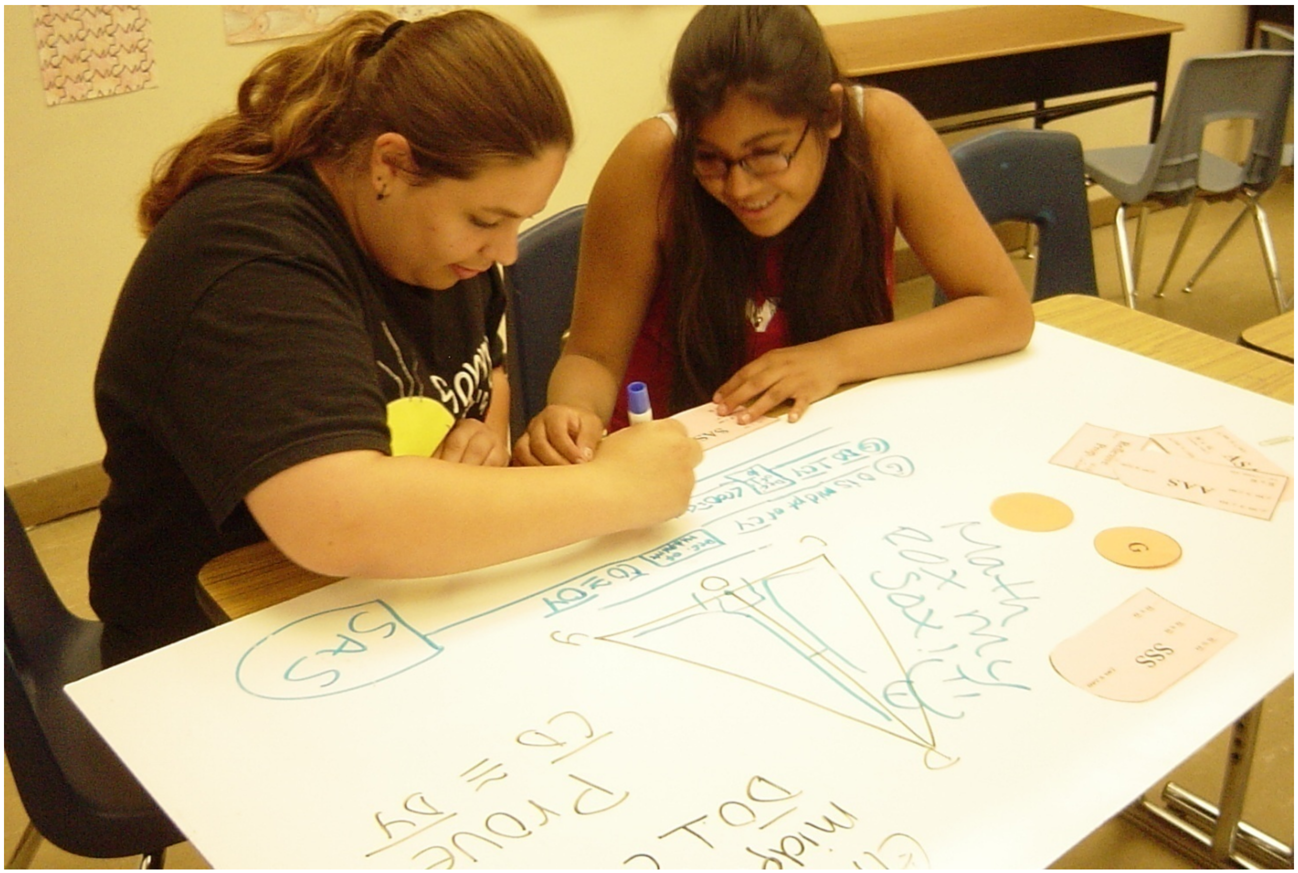
Did you find the vertical angles theorem?

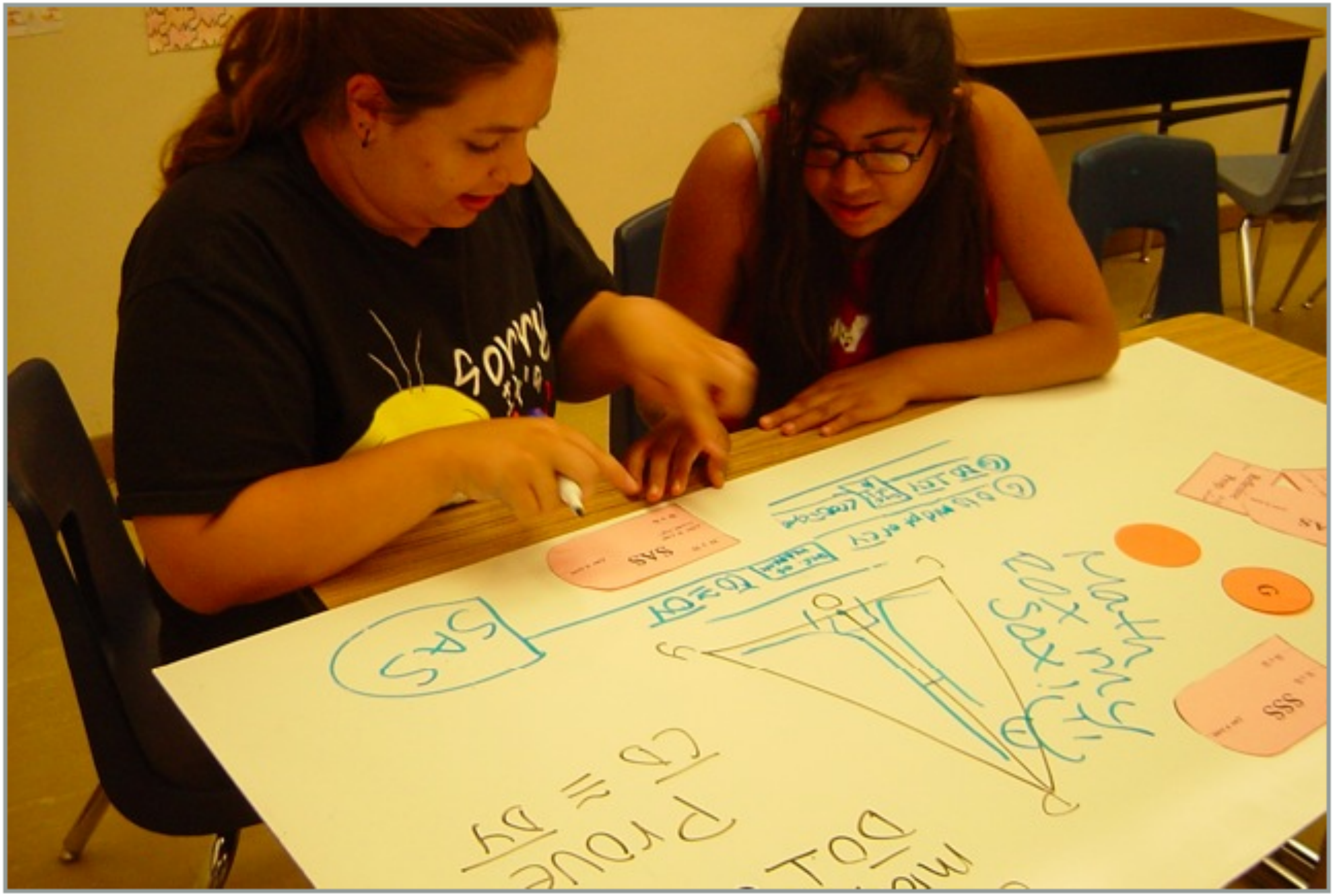
Did you use ASA?

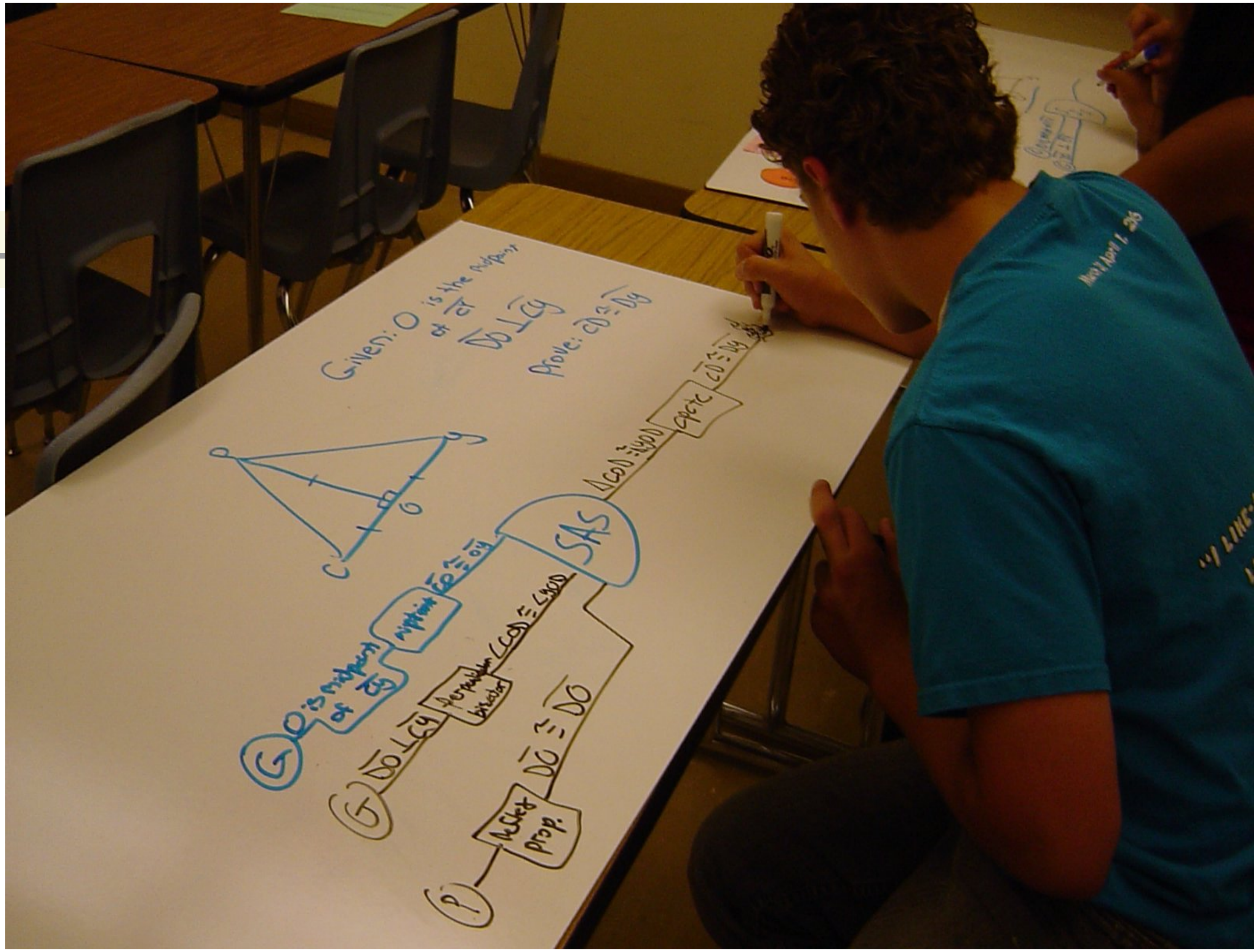
Did you use CPCTC?

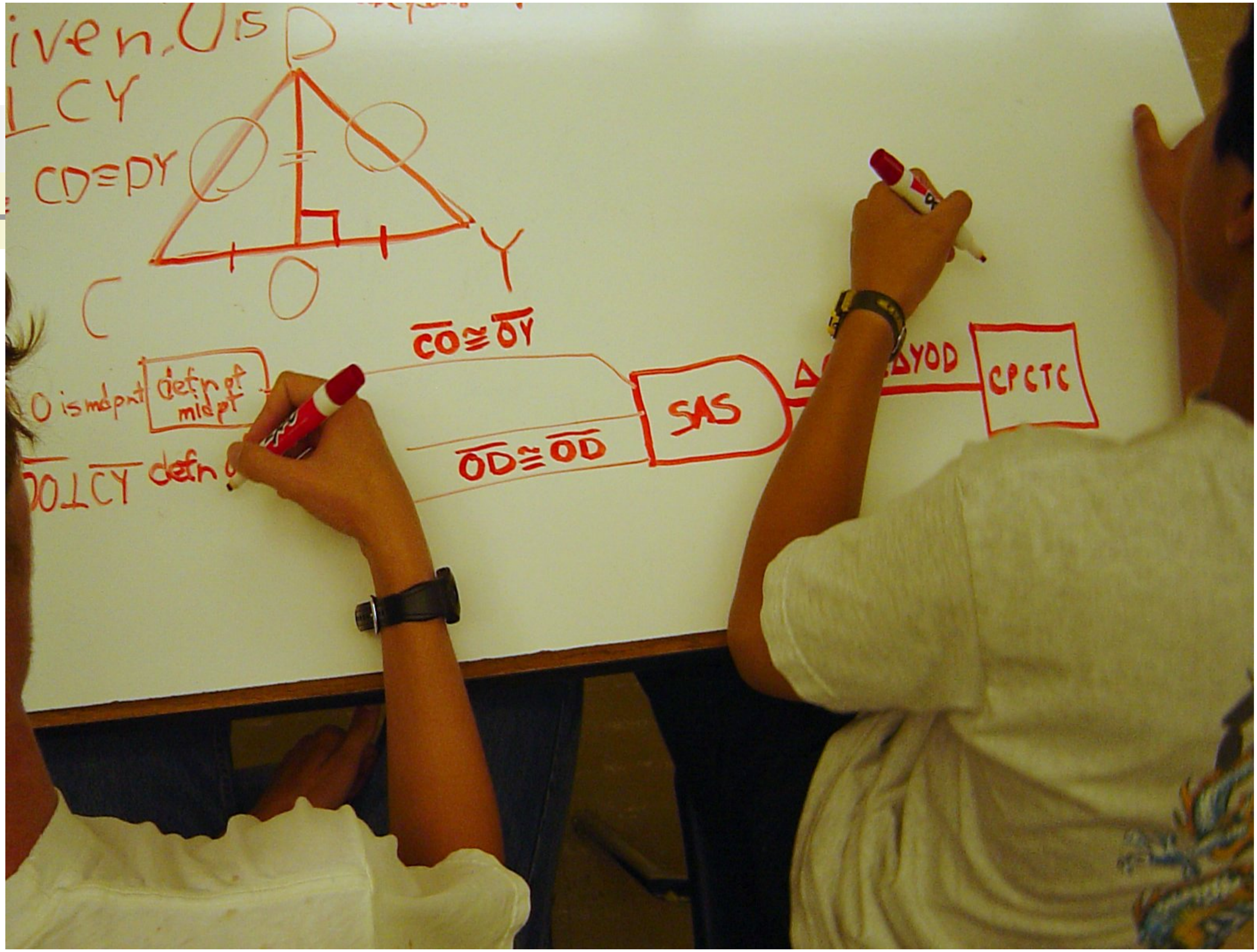
Did you mark vertical angles as a “P”?

Proof Blocks in Action




SAS
SSS


Given: O is the midpoint of CY
Prove: CD ≅ DY
SAS
CPCTC



CD≅DY
C
O
Y
D
CO≅OY
O is mdpnt
defn of midpt
SAS
OD≅OD
CY
defn
YOD
CPCTC

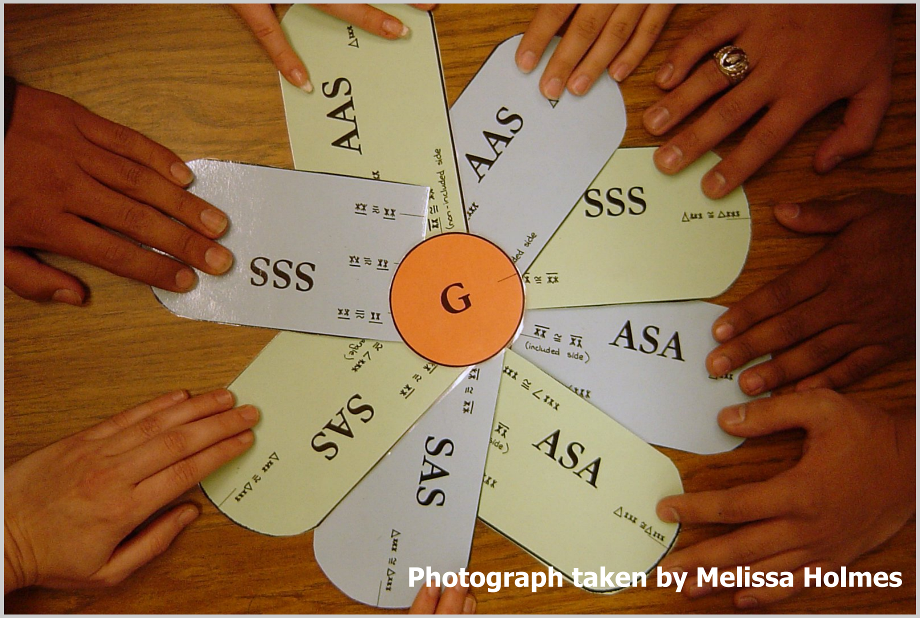
Benefits

- Theorems, postulates, and definitions *become* **manipulatives**
- Student focused
- Visual, kinesthetic, and ELL friendly
- Easily checked logic
- Flexible: Front to back, back to front, middle to ends
- An unexpected benefit is that students are able to discern information from a picture and information from given statements as different (not apparent in traditional instruction).

Questions?

I will stay and answer your questions, send them via your chat bar.

Thank you all for joining me this evening!



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