Notes: BASIC PROOFS OF GEOMETRY

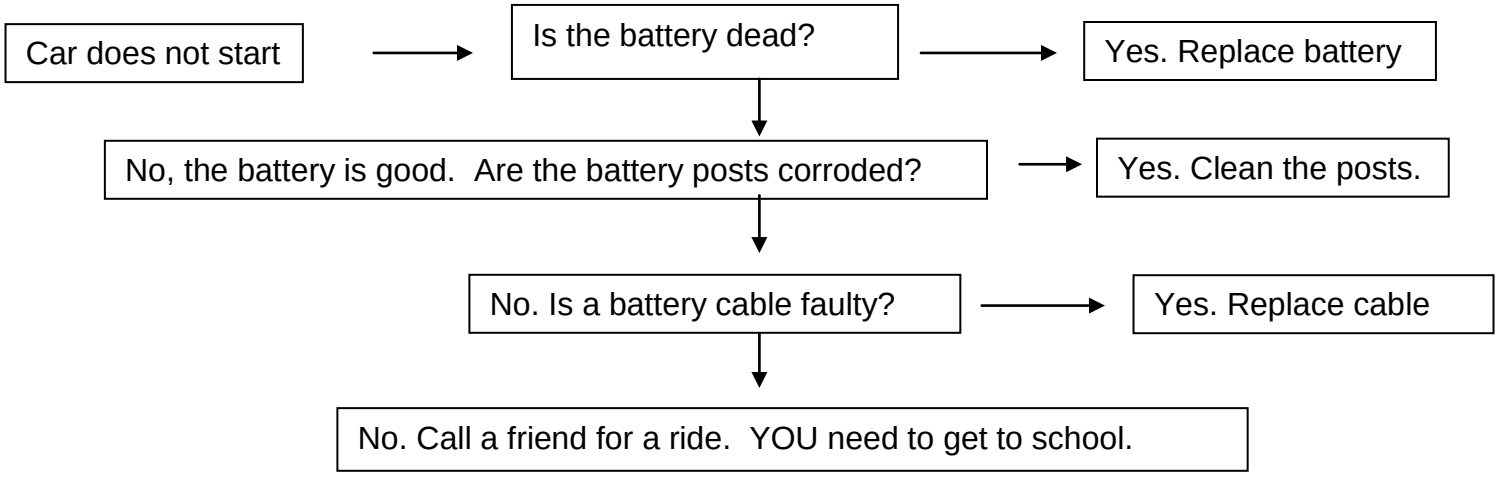
Content Objective: ***I will write proofs to prove angles and segments congruent using deductive reasoning.***

TERM	DESCRIPTION
PROOF	Is a logical argument that shows a statement is true. This can be in the form of a two column proof using _____ and corresponding reasons to show the statements are true.
POSTULATE	Is a statement that does not need to be _____.
THEOREM	Is a statement that has to be _____.

Logical reasoning can be applied to the following situation:

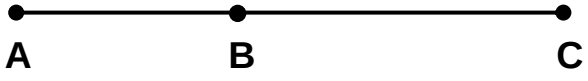
You are going to school and your car does not start. What is wrong with your car?

Flow chart:

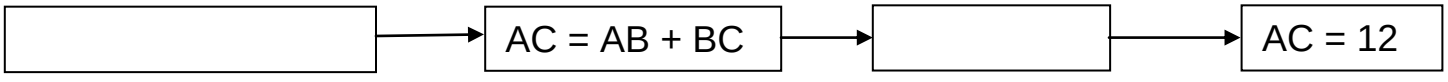


EXAMPLE 1:

Given: AB = 5, BC = 7
Prove: AC = 12



Flow Chart:



Given

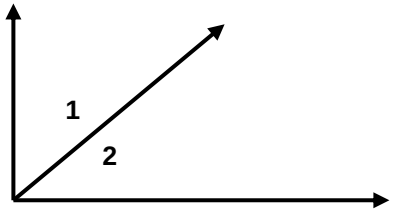
Substitution

QUICK CHECK: COLUMN PROOF

Fill in the Reasons of the proofs below choosing from the set of reasons in the box below.

Subtraction Property of Equality	Given	Substitution Property of Equality
Simplify	Definition of Angle Bisector	Transitive Property of Equality

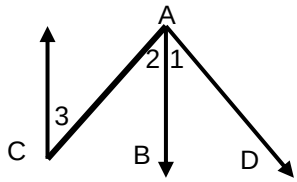
Given: $m\angle 1 + m\angle 2 = 90°$
$m\angle 2 = 48°$
Prove: $m\angle 1 = 42°$



Statements	Reasons
1) $m\angle 1 + m\angle 2 = 90°$; $m\angle 2 = 48°$	1)
2) $m\angle 1 = 90° - m\angle 2$	2)
3) $m\angle 1 = 90° - 48°$	3)
4) $m\angle 1 = 42$	4)

EXAMPLE 2:

Given: $\overrightarrow{AB}$ **bisects** $\angle CAD$
$\angle 2 \cong \angle 3$
Prove: $\angle 1 \cong \angle 3$



Statements	Reasons
1) $\overrightarrow{AB}$ *bisects* $\angle CAB$	1)
2) $\angle 1 \cong \angle 2$	2)
3) $\angle 2 \cong \angle 3$	3)
4) $\angle 1 \cong \angle 3$	4)

Choices for Reasons Column:

- ***All Definitions***
- ***Algebraic Properties***
- ***Simplify (means to add or subtract like terms)***
- ***All Postulates***
- ***Given***

The givens are located after the word "Given" (Of course).

Given: $\overline{BD}$ bisects ∠ABC
∠A is complementary to ∠ABD
∠C is complementary to ∠CBD

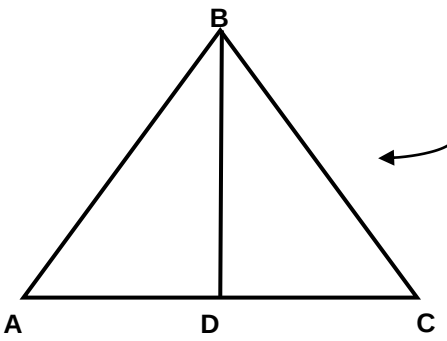


Diagram. This is obviously very helpful when you do the proof.

Prove: ∠A ≅ ∠C

Here is your goal. This is where you want to go.

STATEMENTS	REASONS
This column is where the statements are written.	**EACH STATEMENT HAS TO HAVE A REASON.**
1) $\overrightarrow{BD}$ bisects ∠ABC	1) Given
This is where you start!	
2) $\angle ABD \cong \angle CBD$	2) Definition of Angle Bisector
Usually it is a good idea to use a statement reflecting what is going on in the statement before. In this case, use the angle bisector to get two congruent angles.	**Reason for the statement.**
3) ∠A is complementary to ∠ABD	3) Given
.	
.	
.	
.	
.	
You can put the "Given" statements anywhere. When you have nothing else to deduce from the current "Given," use the next "Given" to continue until you reach the "Prove."	**Again, another "Given". They are always easy to put into a proof.**
Last) ∠A ≅ ∠C	Last) Complements of congruent angles are congruent.
Last statement. What you are trying to prove.	**Justification for your last statement goes here.**

COMPONENTS OF A PROOF

THE DIAGRAM

- The shape that is the subject matter of your proof.
- The diagrams are not always drawn to scale.
- Don't assume many things from the diagram, except for vertical angles etc.

THE GIVENS

- The givens are true facts about the diagram that you build upon to achieve your goal.
- Always begin a proof with a "given".

THE PROVE

- The prove statement is the end result of your logical deductions.
- It is the goal of your proof.

THE STATEMENT COLUMN

- This is the column where you put all of your facts that you have deduced to get to the "prove" statement.
- You put in specific facts about specific geometric objects.

THE REASON COLUMN

- This is the column where you put a justification for each of your statements that you have deduced.
- It is made up givens, theorems, postulates, definitions and corollaries.
- Every statement must have a reason!