2.6 Prove Statements about Segments and Angles

G.CO.9 Prove theorems about lines/angles.
G.CO.10 Prove theorems about triangles. (preparation for)
G.C0.11 Prove theorems about parallelograms. (preparation for)

Before You used deductive reasoning.
Now You will write proofs using geometric theorems.
Why? So you can prove angles are congruent.

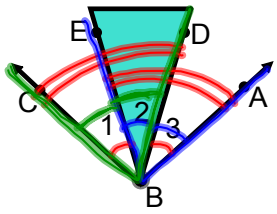
Proof - Logical argument that shows a statement is TRUE,

2-Column Proof - *Statements and corresponding reasons* that show an argument in a logical order.

Theorem - A statement that can be proven. (Proven by definitions, properties, postulates, and other theorems)

Write a two-column proof

GIVEN: $m\angle 1 = m\angle 3$
PROVE: $m\angle EBA = m\angle DBC$



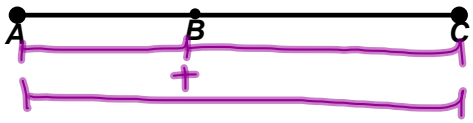
a=b, b=c → a=c

STATEMENTS	REASONS
$m\angle 1 = m\angle 3$	GIVEN
$m\angle EBA = m\angle 3 + m\angle 2$	∠ + Post.
$m\angle EBA = m\angle 1 + m\angle 2$	Subst. Prop of =.
$m\angle 1 + m\angle 2 = m\angle DBC$	∠ + Post.
$m\angle EBA = m\angle DBC$	Trans Prop of =. (Subst. Prop of =.)

a = b, b = c
b = c
a = c

TRY THIS:

GIVEN: AC = AB + AB
PROVE: AB = BC



a=b, b=c → a=c

STATEMENTS	REASONS
AC = AB + AB	GIVEN
AB + BC = AC	Seg + Post.
AB + AB = AB + BC	Trans. Prop of =.
AB = BC	Subtr. Prop of =.

b = a
c = b
a = c
−AB −AB

THEOREMS

REFLEXIVE PROPERTY OF CONGRUENCE.

Segment: For any segment AB, $\overline{AB} \cong \overline{AB}$

Angle: For any angle A, $\angle A \cong \angle A$

SYMMETRIC PROPERTY OF CONGRUENCE.

Segment: For any segments AB and CD, if $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$

Angle: For any angles A and B, if $\angle A \cong \angle B$, then $\angle B \cong \angle A$

TRANSITIVE PROPERTY OF CONGRUENCE.

Segment: For any segments AB, CD, and EF, if $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$

Angle: For any angles A, B, and C, if $\angle A \cong \angle B$ and $\angle B \cong \angle C$ $\rightarrow \angle A \cong \angle C$

NAME THE PROPERTY!

1. If $\angle R \cong \angle T$ and $\angle T \cong \angle P$, then $\angle R \cong \angle P$. Trans. Prop of $\cong$
2. If $\overline{NK} \cong \overline{BD}$, then $\overline{BD} \cong \overline{NK}$. Sym Prop. of $\cong$

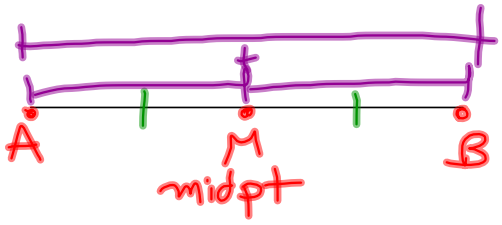
Write a 2-Column PROOF:

Prove this property of midpoints: If you know that M is the midpoint of $\overline{AB}$, prove that AB is two times AM and AM is one half of AB.

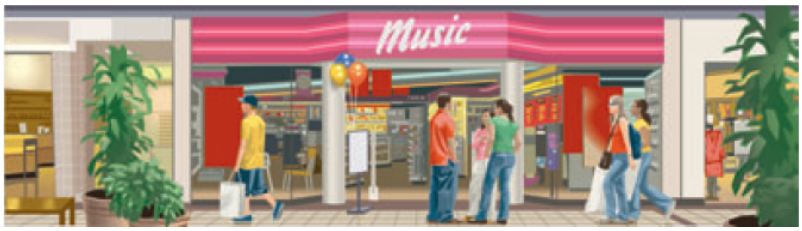
GIVEN: ***M*** is the midpoint of $\overline{AB}$

PROVE: a. $2 \cdot AM = AB$

b. $AM = \frac{1}{2} AB$



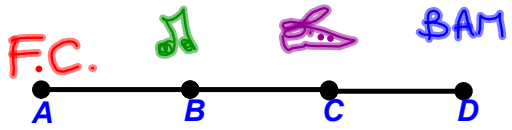
STATEMENTS	REASONS
M is the midpoint of $\overline{AB}$	Given
$\overline{AM} \cong \overline{MB}$	Def'n of midpt
$AM = MB$	Seg $\cong$ Post.
$AM + MB = AB$	Seg + Post.
$AM + AM = AB$	Subst. Prop of =.
$2 \cdot AM = AB$	Distrib. Prop.
$AM = \frac{1}{2} AB$	Div Prop of =.



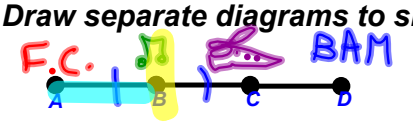
Walking down a hallway at the mall, you notice the music store is halfway between the food court and the shoe store. The shoe store is half way between the music store and the bookstore. Prove that the distance between the entrances of the food court and music store is the same as the distance between the entrances of the shoe store and bookstore.

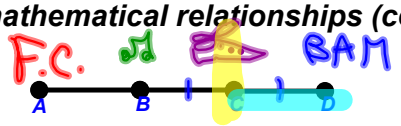
Solution

STEP 1 ***Draw and label a diagram***



STEP 2 ***Draw separate diagrams to show mathematical relationships (congruence).***





STEP 3 ***STATE what is given and what is to be proved for the situation then write a proof.***

GIVEN: **B** is the midpoint of $\overline{AC}$

C is the midpoint of $\overline{BD}$

PROVE: $AB = CD$

STATEMENTS	REASONS
B is the midpoint of $\overline{AC}$	Given
C is the midpoint of $\overline{BD}$	Given
$\overline{AB} \cong \overline{BC}$	Defn of midpt
$\overline{BC} \cong \overline{CD}$	Defn of midpt
$\overline{AB} \cong \overline{CD}$	Trans/Subst Prop of $\cong$
$AB = CD$	Seg $\cong$ Post.