As we study topics in geometry, we will learn many new terms / we will define them by referring to other terms we have

Geometry Terms

already defined. But there must be a starting point.

Geometry: The study of the properties and relationships of points, lines, planes, and solids.

I. **Undefined terms:** a set of terms we accept without referencing to previously defined terms.

A. **Point:** Has no length, width, or height. It merely indicates a position

P No dimension.

B. **Line:** An infinite set of points that extends endlessly in both directions.

one dimension length

Curved Line

Straight Line: This is what line will mean unless otherwise stated.

Symbolism:

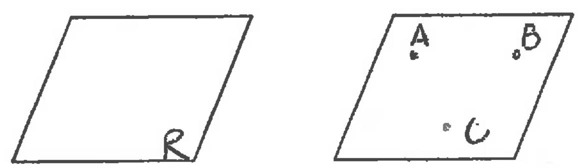
Label $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$

C. **Plane:** A set of points that extends infinitely across a flat surface in all directions.

* shape looks like table top or wall.

2 Dimensions - length - width

No thickness



* name a plane by using letters that identify 3 points on plane that do not all lie on the same line.

* use side of box for ex.

II. **Definitions:** Uses known words to describe a new word.

A. **Collinear Set of Points:** Set of points, all of which lie on the same line.

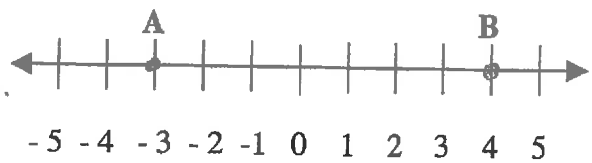
A B C

* Any 2 pts are collinear

B. **Non-Collinear Set of Points:** Set of 3 or more point that do not lie on the same line.

*C. **Distance between any two points on the real number line:** the absolute value of the difference of the coordinates of two points.

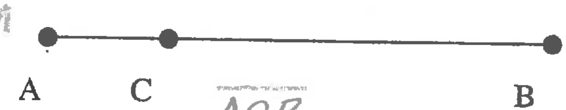
* Symbol for difference between A and B is AB.



$AB = |-3-4| = |-7| = 7$

D. **Line Segment:** Part of a line consisting of 2 endpoints and the all points on the line between them

* named by its endpts



$\overline{ACB}$

E. **Congruent Segments:** Segments that have the same measure.

$\cong$ $\overline{AB} \cong \overline{CD}$ * compares Segments indicates they have the same length.

* AB and CD lengths we write AB = CD to compare lengths
$\overline{AB}$ and $\overline{CD}$ are geometry figures. figures $\overline{AB} \cong \overline{CD}$

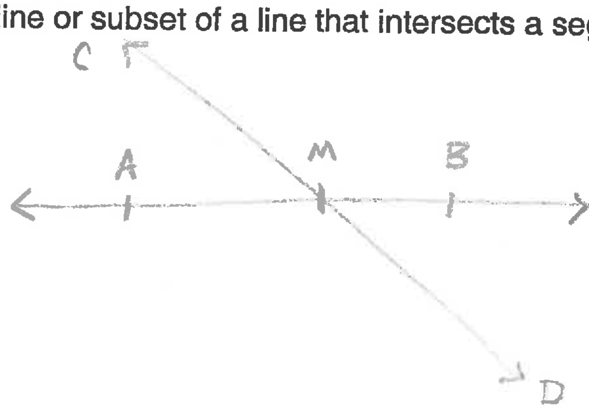
F. **Midpoint:** Point on the segment that divides it into 2 congruent Segments.

* D is the midpt of $\overline{BC}$.

$\overline{BD} \cong \overline{DC}$

and $BD = DC = \frac{1}{2} BC$

G. **Bisector:** A line or subset of a line that intersects a segment at its midpoint

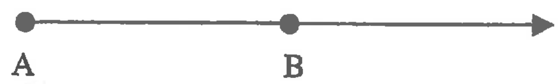


$\overline{CD}$ bisects $\overline{AB}$ at M.

Draw on board

H. **Ray:** Part of a line consisting of one endpoint and all the points on one side of the endpoint.

A ray is named by the endpt and any other pt of the ray.
Endpt A and ray passes through B, we refer to the figure as ray AB or $\overrightarrow{AB}$



I. **Opposite Rays:** Two rays of the same line with a common endpoint and no other point in common.

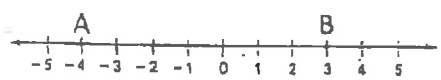
$\overrightarrow{BA}$ and $\overrightarrow{BC}$ opp rays

J. **Betweenness of Points on a Line:** *B* is between *A* and *C* if *A, B,* and *C* are distinct collinear points and $AB + BC = AC$

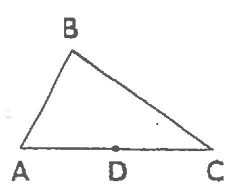
Examples:

$|-4-3| = |-7| = 7$

1. Find the distance between the points whose coordinates on the real number line are -4 and 3.



2. In the figure, *A*, *B*, and *C* are the vertices of a triangle, and *D* is a point on $\overline{AC}$.



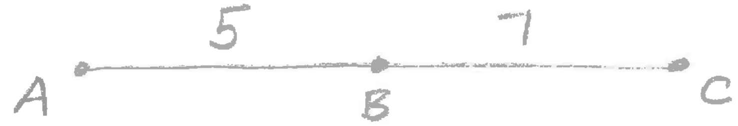
a. Name three collinear points. A, D, C
b. Name three noncollinear points. A, B, C
c. Which point is between *A* and *C*? D
d. If *D* is the midpoint of $\overline{AC}$, name two congruent segments in the figure. $\overline{AD} \cong \overline{DC}$

3. Use the figure shown:

a. Name a point between *s* and *n*. m

b. Name a point between *s* and *q* and also between *m* and *r*. n

c. Name two rays, each of which has point *m* as an endpoint. $\overrightarrow{ms}$ $\overrightarrow{mr}$

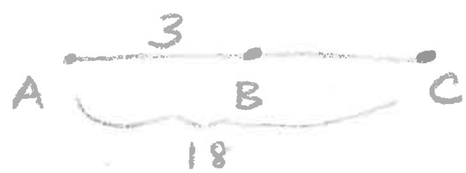


4. Find the required distance if A, B, and C are collinear points and point B is between A and C.

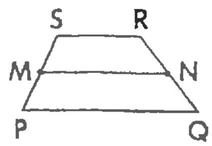
a. AB = 5, BC = 7, AC = ? $5+7=12$

$18-3=\boxed{15}$

b. AB = 3, AC = 18, BC = ?



5.



$\overline{MN}$ bisects $\overline{RQ}$

1. $\overline{SM} \cong \overline{RN}$

2. $\overline{PM} \cong \overline{QN}$

6. Use the figure in #5 to complete the following statements.

a. SP − SM = MP

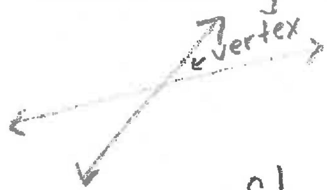
b. RN + NQ = RQ

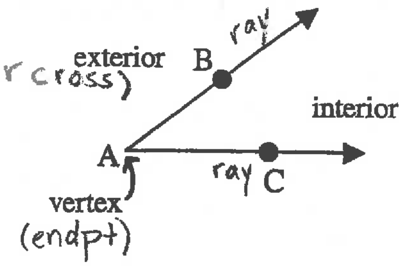
c. RQ − NQ = RN

Definitions Involving Angles

I. **Angle:** Set of all points that is the union of 2 rays having the same endpoint

* angles can also be formed by intersecting lines (lines that meet or cross)

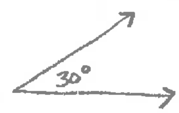




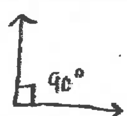
A. Straight Angle: **An angle that is the union of opposite rays (measures 180°).**

* lines measure 180°

B. Acute Angle: **An angle whose measure is greater than zero, but less than 90°.**

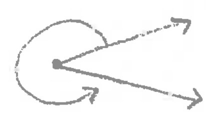


C. Right Angle: **An angle whose measure is 90°.**



D. Obtuse Angle: **An angle whose measure is greater than 90°, but less than 180°.**

E. Reflex Angle: **An angle whose measure is greater than 180°.** less than 360°



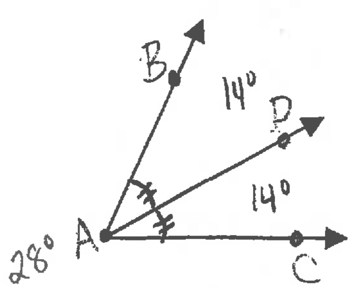
* goes all the way arour

Note: $\angle A \cong \angle B$ Congruence means same angle

$m\angle A = m\angle B$ Equality means the angles have the same measure.

* Angles measured by degrees

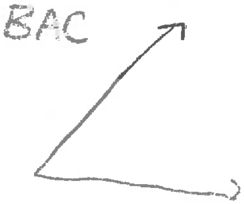
II. **Bisector of an Angle:** A ray whose endpoint is the vertex of the angle and divides that angle into 2 congruent parts



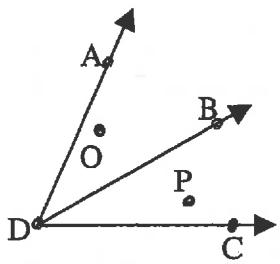
we can write

$\overrightarrow{AD}$ is the angle bisector of $\angle BAC$

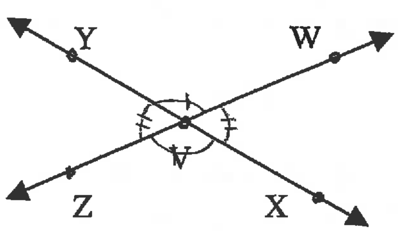
$\angle BAD \cong \angle DAC$



III. Adjacent Angles: Two angles in the same angle that have a common vertex and side, but do not have any common interior points.



IV. Vertical Angles: Two angles in which the sides of one angle are opposite rays to the sides of the second angle. (intersecting lines form vertical angles.)



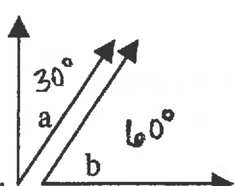
* vertical angles are ≅

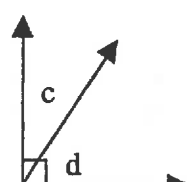
m∡YVW ≅ m∡ZVX

m∡YVZ ≅ m∡WVX

V. Complementary Angles: Two angles whose measures add up to 90°.

**Each angle is called the complement of the other.



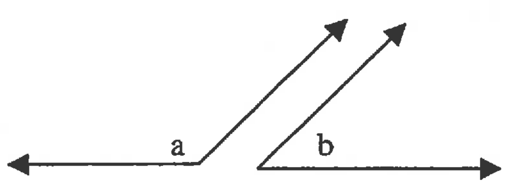


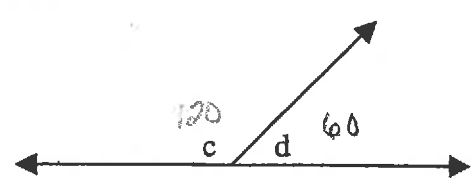
complementary non-adjacent complementary adjacent

** If an angle measures *x* degrees, what would the measure of its complement be? $90 - x$

VI. Supplementary Angles: Two angles whose measures add up to 180°.

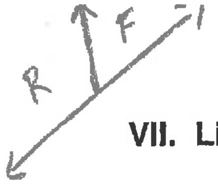
**Each angle is called the supplement of the other.



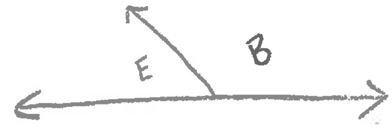


** If an angle measures *x* degrees, what would the measure of its supplement be?

$180 - x$



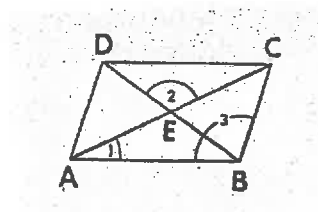
VII. Linear Pair: Two adjaacnt angles whose measure adds up to 180°.



* noncommon sides are opposite rays.

Examples:

1. For the figure shown:



   a. Name ∠1 in four other ways.

   <CAB <BAC <BAE <EAB

   b. Name ∠3 in two other ways.

   <CBE <EBC

   c. Name two straight angles each of which has its vertex at E.

   < AEC <DEB

2. The measure of two angles that are complementary are in the ratio of 7:2. Find the measure of each angle.

$$7x + 2x = 90°$$

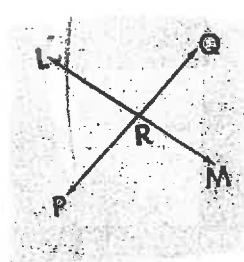
$$\frac{\cancel{9}x}{\cancel{9}} = \frac{90°}{9} \quad \boxed{x = 10°}$$

3. The degree measure of an angle and its supplement are equal. Find the measure of each angle.

$$x + x = 180$$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{180}{2} \quad \boxed{x = 90°}$$

4. In the figure $\overleftrightarrow{LM}$ and $\overleftrightarrow{PQ}$ intersect at *R*. Name two pairs of vertical angles.

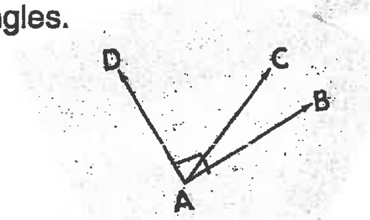


   <LRP, <QRM

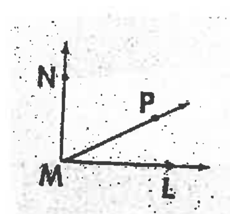
   <LRQ, <PRM

5. If ∠*BAD* is a right angle, name two complementary angles.

   < DAC and < BAC



6. Complete the following statements, which refer to the figure shown.



   a. $mLMN = m\angle LMP + m\angle$ PMN

   b. $mLMP = m\angle LMN - m\angle$ NMP

Name Key

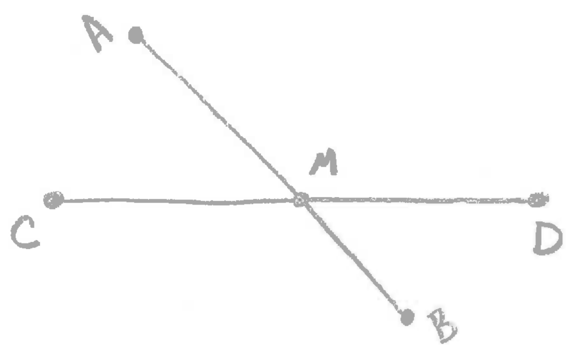
Geometry R: Deductive Reasoning

HW: Don't go over last sheet in class check for understand

Directions: Write a valid statement and reason for eac ... rmation.
Draw a picture for each. LOOK AT YOUR ...

1. Given: A is the midpoint of $\overline{XY}$

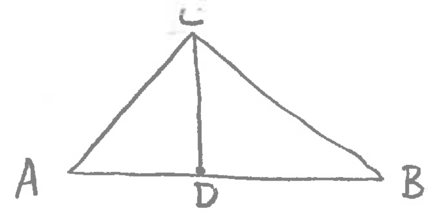
Statements	Reasons
1. A is the midpoint of $\overline{XY}$	1. Given
2. $\overline{XA} \cong \overline{AY}$	2. If a point is a midpt, then it divides the segment into 2 $\cong$ segments



2. Given: $\overline{AB}$ bisects $\overline{CD}$

Statements	Reasons
1. $\overline{AB}$ bisects $\overline{CD}$	1. Given
2. $\overline{CM} \cong \overline{MD}$	2. If a segment bisects another segment, it divides the segment into 2 congruent segments.

3. Given: In ΔABC, altitude $\overline{CD}$ is drawn to side $\overline{AB}$

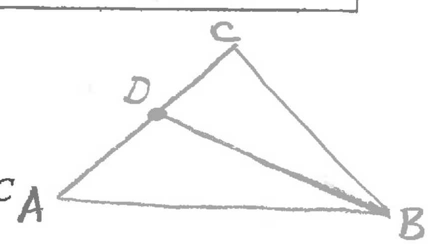


Statements	Reasons
1. In ΔABC, $\overline{CD}$ is the altitude to $\overline{AB}$	1. Given
2. $\overline{CD} \perp \overline{AB}$	2. If a segment is an altitude in a Δ, then it is $\perp$ to the opposite side.

4. Given: <XYZ and <TYS are vertical angles

Statements	Reasons
1. $\angle XYZ$ and $\angle TYS$ are vertical $\angle$'s	1. Given
2. $\angle XYZ \cong \angle TYS$	2. If 2 $\angle$'s are vertical $\angle$'s, then they are $\cong$

3. Given: In ΔABC, D is a point on $\overline{AC}$ and $\overline{DB}$ bisects $\angle ABC$



Statements	Reasons
1. $\overline{DB}$ bisects $\angle ABC$	1. Given
2. $\angle CBD \cong \angle DBA$	2. If a segment bisects an angle, it divides the angle into 2 congruent $\angle$'s

we listed undefined terms and definitions that we accept as being true. we used the undefined terms and definitions to draw conclusions. At time statements are made in geometry tha[t] are neither undefined terms Postulates nor definitions, and yet we know these are true statements. Some of these statements 'seem so obuious' we accept them without proof.

I. **Postulate:** A statement whose truth is accepted without proof.

A postulational system is made up of undefined terms, defined terms, and postulates. We use all of these together with the laws of reasoning to prove the truth of theorems.

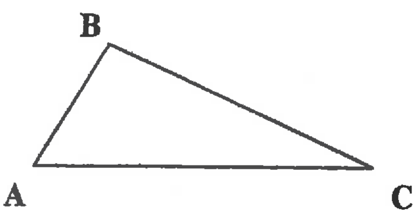
Theorems: A true statement that must be proved by deductive reasoning.

The entire body of knowledge that we know as geometry consits of undefined terms, defined terms, postulates, and thms we use to prove other thms and justify applications of these thn

II. **Equality Postulates (Properties)**

A. Reflexive Postulate: a quantity is equal to itself

In ΔABC,



the length of a segment is equal to itself

AB = AB   BC = BC   AC = AC

the measure of an angle is equal to itself

m<A = m<A   m<B = m<B   m<C = m<C

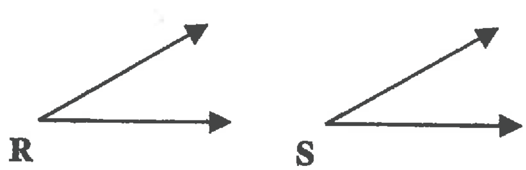
B. Symmetric Postulate: a quantity may be reversed

Draw

Ex)

If AB = CD, then CD = AB.

Ex)

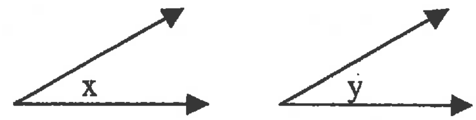


If m<R = m<S, then m<S = m<R.

If $a=b$ and $b=c$, then $a=c$

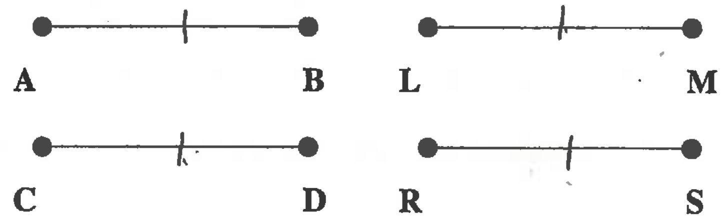
C. Transitive Postulate: If quantities are equal to the same quantity, then they are equal to each other.

Ex) Given: $m\angle x = 40°$
$m\angle y = 40°$
$\therefore \angle x \cong \angle y$



*segments equal to the same segment are equal to each other

Ex) Given: $AB = LM$
$CD = RS$
$LM = RS$
$\therefore AB = CD$

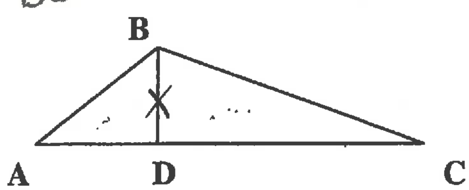


Ex) Given: $\angle A = \angle B$ (chain rule)
$\angle B = \angle C$
$\therefore \angle A = \angle C$

Reflexive Postulate in Proofs: Use when a segment or angle belongs to 2 geometric figures which overlap or share a common side.

Draw in different colors

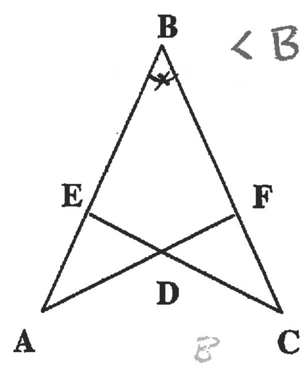
1. $\overline{BD}$ is in ΔABD and $\overline{BD}$ is in ΔBCD

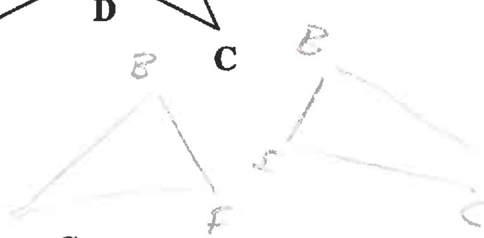


$BD = BD$

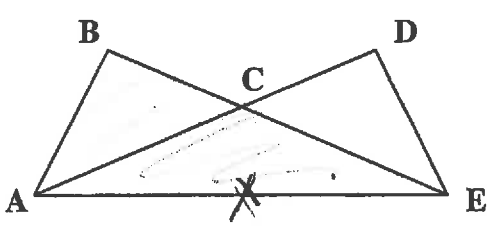
2. $\angle B$ is in ΔBCE
$\angle B$ is in ΔBFA

$\angle B = \angle B$





3.

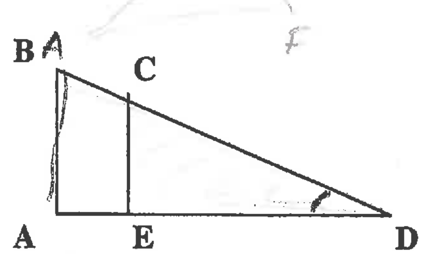


$\overline{AE}$ is in ΔABE

$\overline{AE}$ is in ΔADE

$\overline{AE} = \overline{AE}$

4.



$\angle D$ is in ΔDEC

$\angle D$ is in ΔABD

$\angle D = \angle D$

Substitution, Partition, Addition, and Subtraction Postulates

I. Substitution Postulate: A quantity may be substituted for its equal in any expression.

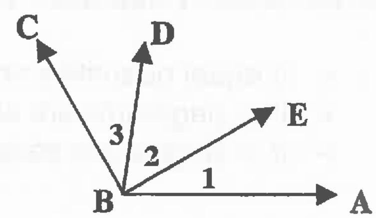
fr!
$y = x + 7$
and $x = 3$
we can
conclude
that $y = 3 + 7$

Given: $XZ = 2XY$
$XY = YZ$

Prove: $XZ = 2YZ$

Statements	Reasons
1) $XZ = 2XY$	1) Given
2) $XY = YZ$	2) Given
3) $XZ = 2YZ$	3) substitution (a quantity may be substituted for its equal in any expression of equality.)

II. Partition Postulate: A whole is equal to the sum of its parts.



$\overline{AD} = \overline{AB} + \overline{BC} + \overline{CD}$

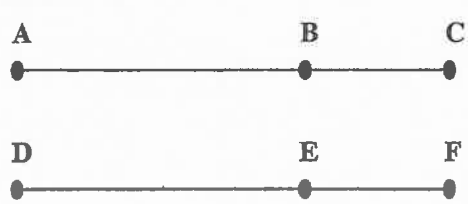
$m\angle ABC = m\angle ABE + m\angle EBD + m\angle DBC$
1 2 3

III. Addition Postulate: If $a = b$ and $c = d$, then $a + c = b + d$.

- If equal quantities are added to equal quantities, the sums are equal.
- If congruent segments are added to congruent segments, the sums are equal.
- If congruent angles are added to congruent angles, the sums are equal.

Given: $AB = DE$
$BC = EF$

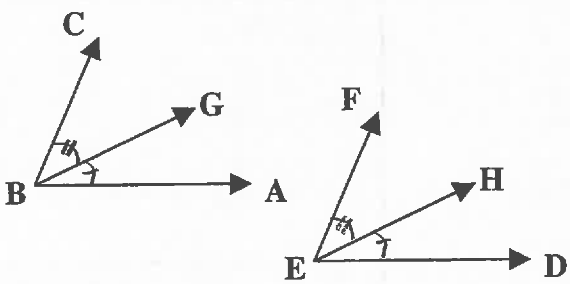
Prove: $AC = DF$



Statements	Reasons
1) $AB = DE$	1) Given
2) $BC = EF$	2) Given
3) $AB + BC = DE + EF$	3) Addition postulate
4) $AB + BC = AC$ $DE + EF = DF$	4) Partition postulate
5) $AC = DF$	5) Substitution Postulate

Given: $\angle ABG \cong \angle DEH$
$\angle GBC \cong \angle HEF$

Prove: $\angle ABC \cong \angle DEF$



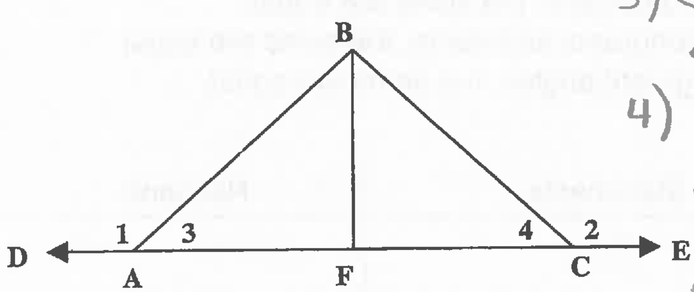
Statements	Reasons
1) $\angle ABG \cong \angle DEH$	1) Given
2) $\angle GBC \cong \angle HEF$	2) Given
3) $\angle ABG + \angle GBC \cong \angle DEH + \angle HEF$	3) Addition Postulate
4) $\angle ABG + \angle GBC = \angle ABC$ $\angle DEH + \angle HEF = \angle DEF$	4) Partition postulate
5) $\angle ABC \cong \angle DEF$	5) Substitution postulate

IV. Subtraction Postulate: If $a = b$ and $c = d$, then $a - c = b - d$.

- If equal quantities are subtracted from equal quantities, the differences are equal.
- If $\cong$ segments are subtracted from $\cong$ segments, the differences are equal.
- If $\cong$ angles are added to $\cong$ angles, the differences are equal.

Given: $\angle DAC \cong \angle ECA$
$\angle 1 \cong \angle 2$

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



Statements	Reasons
1) $\angle DAC \cong \angle ECA$	1) given
2) $\angle 1 \cong \angle 2$	2) given
3) $\angle DAC - \angle 1 \cong \angle ECA - \angle 2$	3) subtraction postulate
4) $\angle DAC - \angle 1 = \angle 3$ $\angle ECA - \angle 2 = \angle 4$	4) Partition postulate
5) $\angle 3 \cong \angle 4$	5) substitution postulate