Geometry Proof Reasons

1) Given
* 2) A bisector divides an angle into 2 congruent angles
* 3) A bisector divides a segment into 2 congruent segments
4) Reflexive Property (<A ≅ <A)
5) All right angles are congruent
* 6) All vertical angles are congruent
* 7) A midpt divides a segment into 2 ≅ segments
* 8) Perpendiclular lines meet to form right angles
9) If 2 angles form a linear pair, then they are supp
10) SAS ≅ SAS
11) SSS ≅ SSS
12) ASA ≅ ASA
13) AAS ≅ AAS
14) Subtraction
15) Addition
16) A median of a Δ intersects the opposite side at its midpt
* 17) An altitude of a Δ is ⊥ to the side it intersects
18) CPCTC
→ 19) If 2 sides of a Δ are ≅ the angles opposite those sides are ≅
→ 20) If 2 angles of a Δ are ≅ the sides opposite those angles are ≅
→ 21) An isosceles Δ has 2 congruent sides
→ 22) Base angles of an isosceles Δ are ≅
23) If 2 lines are //, the alternate interior angles are ≅
24) If 2 lines are //, the corresponding angles are ≅
25) If alternate interior angles are ≅, then lines are //
26) If corresponding angles are ≅, then the lines are //

Postulates

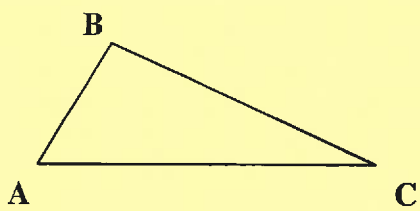
I. Postulate: A statement whose truth is accepted without proof.

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.

II. Equality Postulates (Properties)

A. Reflexive Postulate: a quantity is equal to itself



In ΔABC,

the length of a segment is equal to itself

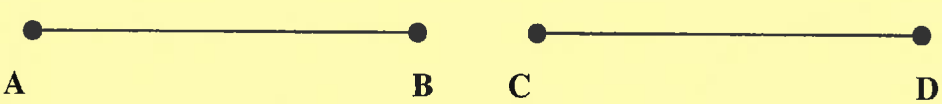
____________ ____________ ____________

the measure of an angle is equal to itself

____________ ____________ ____________

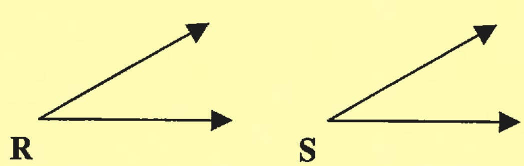
B. Symmetric Postulate: a quantity may be reversed

Ex)



If ____________________, then ____________________.

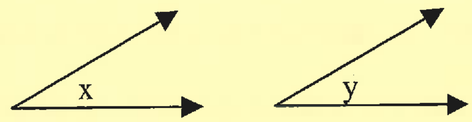
Ex)



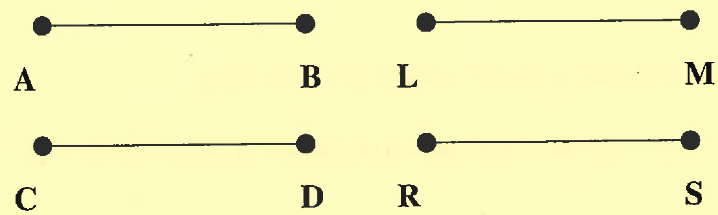
If ____________________, then ____________________.

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

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



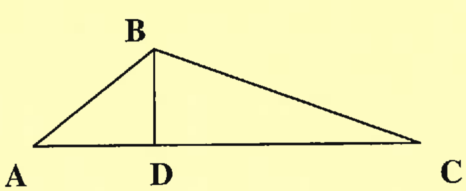
Ex) Given: $AB = LM$
$CD = RS$
$LM = RS$
$\therefore$



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

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

1.



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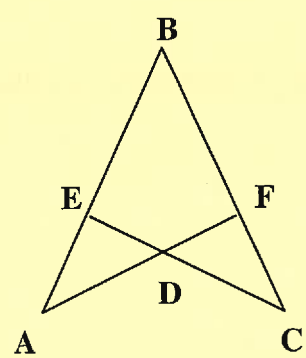

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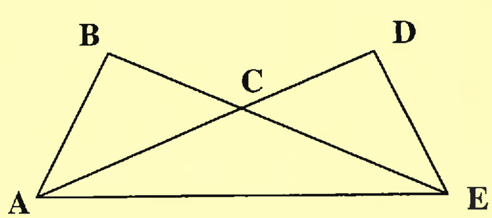

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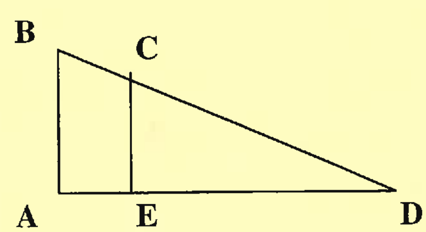
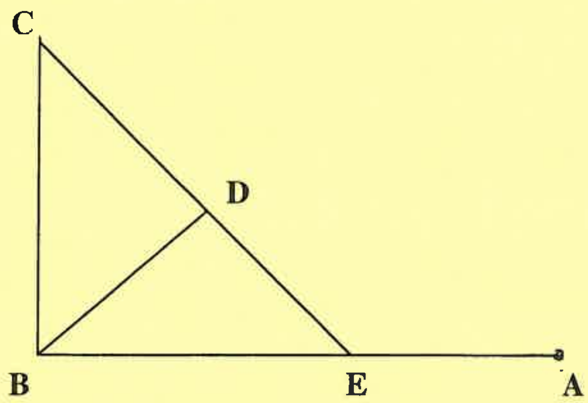


Making Conclusions: For each piece of given information make a valid conclusion based on the following diagram.



1. $\overline{BD}$ bisects $\angle CBE$

2. E is the midpoint of $\overline{BA}$

3. $\overline{BD}$ is an altitude of ΔCBE

4. $\overline{BD} \cong \overline{ED}$

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 are neither undefined terms **Postulates** nor definitions, and yet we know these are true statements. Some of these statements seem so

I. Postulate: A statement whose truth is accepted without proof. 'obvious' we accept them 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.

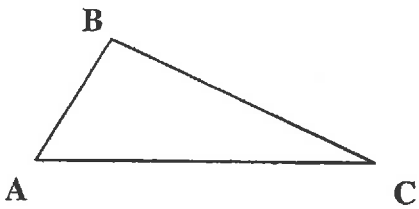
Theorems: A true statement that must be proved by deductive reasoning.

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 thm

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

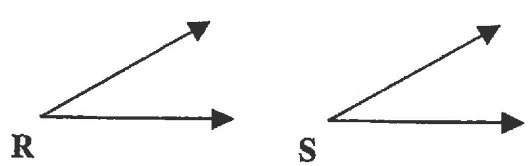
B. Symmetric Postulate: a quantity may be reversed

Draw

Ex)

If AB = CD, then CD = AB.

Ex)

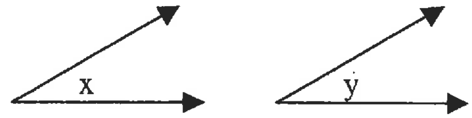


If m<R = m<S, then m<S = m<R.

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

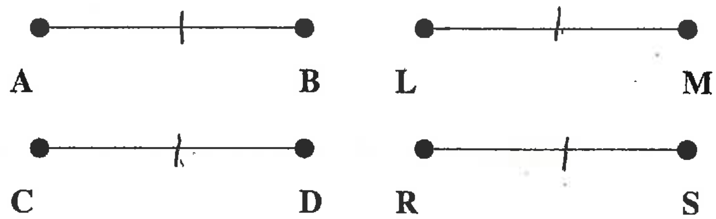
C. Transitive Postulate: If quantities are equal to the same quantity, then they are equal to each other.

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: $AB = LM$
$CD = RS$
$LM = RS$
$\therefore AB = CD$

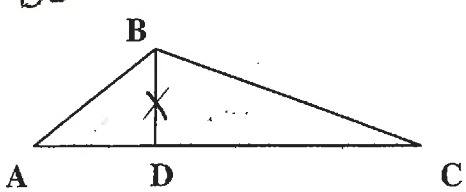


Ex) Given: $\angle A = \angle B$ (chain rule)
$\angle B = \angle C$
$\therefore \angle A = \angle C$

Draw in different colors

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

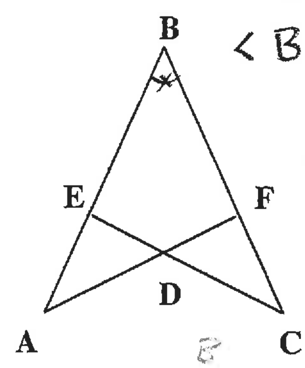
1. $\overline{BD}$ is in $\triangle ABD$ and $\overline{BD}$ is in $\triangle BCD$

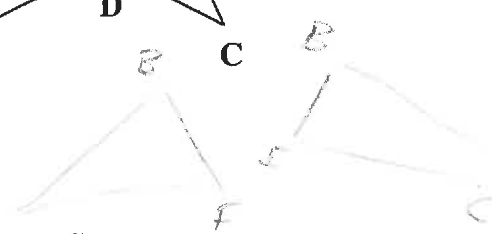


$BD = BD$

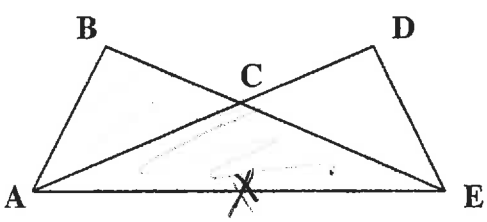
2. $\angle B$ is in $\triangle BCE$
$\angle B$ is in $\triangle BFA$

$\angle B = \angle B$



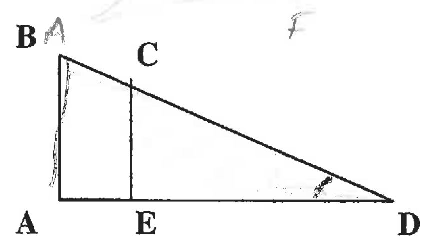


3.



$\overline{AE}$ is in $\triangle ABE$
$\overline{AE}$ is in $\triangle ADE$
$\overline{AE} = \overline{AE}$

4.



$\angle D$ is in $\triangle DEC$
$\angle D$ is in $\triangle ABD$
$\angle D = \angle D$

Substitution, Partition, Addition, and Subtraction Postulates

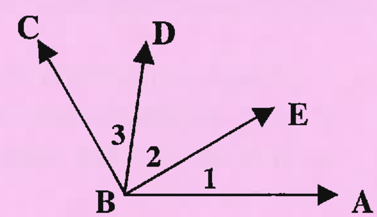
I. Substitution Postulate: A quantity may be substituted for its equal in any expression.

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

Prove: $XZ = 2YZ$

Statements	Reasons

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



$\overline{AD} =$ ______________________________

$m\angle ABC =$ ______________________________

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

- 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: $AB = DE$
$BC = EF$

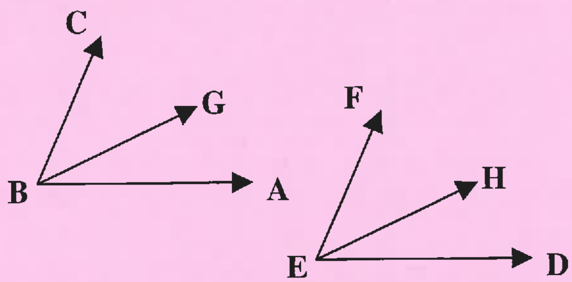
Prove: $AC = DF$

Statements	Reasons

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

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

Statements	Reasons



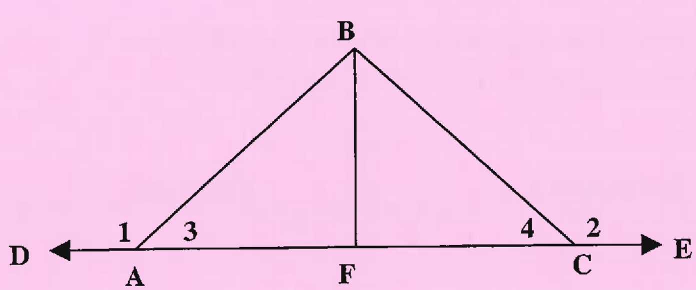
IV. Subtraction Postulate: If $a = b$ and $c = d$, then ________________________________.

- 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.

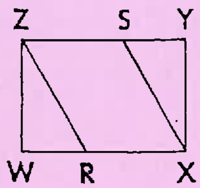
Given: $\angle DAC \cong \angle ECA$
$\angle 1 \cong \angle 2$

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

Statements	Reasons

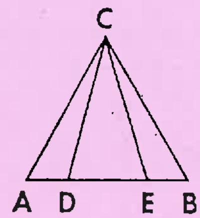


State the postulate that allows you to conclude what you are asked to prove.



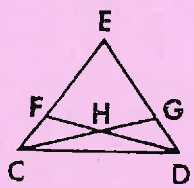
Given:
$\angle WZY \cong \angle WXY.$
$\angle RZY \cong \angle RXS.$

Prove:
$\angle WZR \cong \angle YXS.$



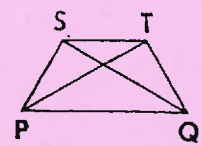
Given:
$AD + DE = AE.$
$AD = EB.$

Prove:
$EB + DE = AE.$



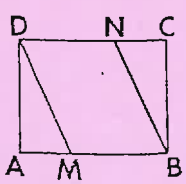
Given:
$\overline{FD} \cong \overline{GC}.$
$\overline{FH} \cong \overline{GH}.$

Prove:
$\overline{CH} \cong \overline{DH}.$



Given:
$\angle QST \cong \angle PTS.$
$\angle QSP \cong \angle PTQ.$

Prove:
$\angle PST \cong \angle QTS.$



Given:
$AM = CN.$
$MB = ND.$

Prove:
$AB = CD.$

Substitution, Partition, Addition, and Subtraction Postulates

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

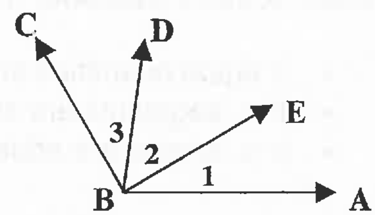
for $y = x + 7$ and $x = 3$ we can conclude that $y = 3 + 7$

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.



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

$m\angle ABC = m\angle ABE + m\angle EBD + m\angle DBC$

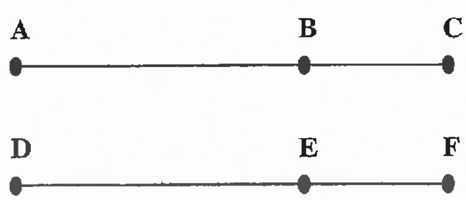
1 2 3

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: $AB = DE$
$BC = EF$

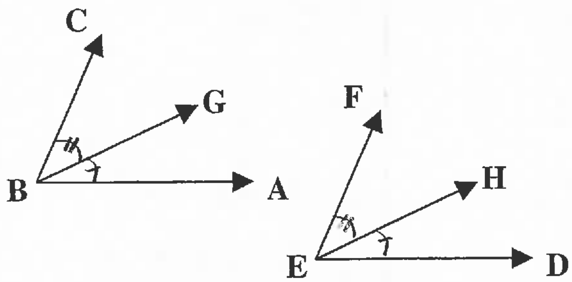
Prove: $AC = DF$



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: $\angle ABC \cong \angle DEF$



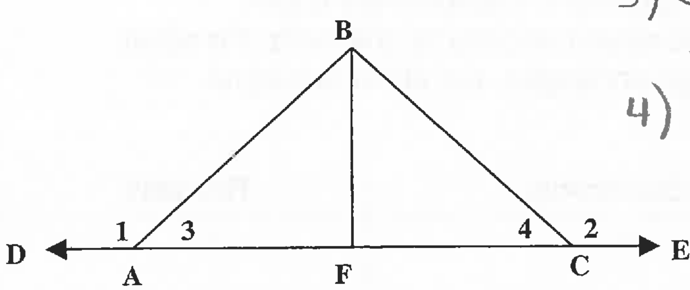
Statements	Reasons
1) ∠ABG ≅ ∠DEH	1) Given
2) ∠GBC ≅ ∠HEF	2) Given
3) ∠ABG + ∠GBC ≅ ∠DEH + ∠HEF	3) Addition Postulate
4) ∠ABG + ∠GBC = ∠ABC ∠DEH + ∠HEF = ∠DEF	4) Partition postulate
5) ∠ABC ≅ ∠DEF	5) Substitution postulate

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 ≅ segments are subtracted from ≅ segments, the differences are equal.
- If ≅ angles are added to ≅ 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) ∠DAC ≅ ∠ECA	1) given
2) ∠1 ≅ ∠2	2) given
3) ∠DAC − ∠1 ≅ ∠ECA − ∠2	3) subtraction postulate
4) ∠DAC − ∠1 = ∠3 ∠ECA − ∠2 = ∠4	4) Partition postulate
5) ∠3 ≅ ∠4	5) substitution postulate