

Objectives

To identify the use of the transitive property, and to apply it in proofs

Review:

_____ reasoning uses facts, rules, definitions, properties and theorems to reach conclusions, and it can be used to prove things.

Examples of deductive reasoning:

- Given right triangle $\triangle ABC$ where \overline{AC} is the hypotenuse and $AB = 3$, $BC = 4$. Find AC .
- Solving an equation (using Algebraic properties to reach a conclusion)
- Determining whether or not you can vote in an election (using laws that say you must be 18 and registered in order to vote)
- Determining whether an angle is acute, obtuse, or right (using definitions)
- Determining paternity (using DNA facts)

There are two Laws of Geometry used in Deductive Reasoning

- *Law of Detachment*
- *Law of Syllogism*

Law of Detachment

If you have a true conditional statement and the hypothesis is true, then the conclusion is also true.

If $p \rightarrow q$ is true, and p is true, then q is true.

Example 1: What's the conclusion based on the given statements?

A) *If you live in Thousand Oaks, then you live in Ventura County.*

Barry lives in Thousand Oaks; therefore _____.

B) *If an angle's measure is greater than 90° , then it is obtuse.*

$m\angle CAT = 108^\circ$; therefore $\angle CAT$ _____.

C) *If you are over 15 $\frac{1}{2}$, then you can legally drive.*

James is 16, therefore _____.

Law of Syllogism

This law uses two true conditional statements to form a conclusion.

If $p \rightarrow q$ is true and $q \rightarrow r$ is true, then $p \rightarrow r$ is true.

Example 2: What's the conclusion that follows after the given statements using the Law of Syllogism?

A) If you give a mouse a cookie, then he will want some milk.

If a mouse wants milk, then he will want some cheese.

Conclusion: _____

- B) If $x = 10$, then $z = 85$.
If $z = 85$, then $w = 1000$.

Conclusion: _____

Practice 1: What's the conclusion that follows after the given statements using the Law of Syllogism?

- A) If you are athletic, then you are competitive.
If you are competitive, then you enjoy sports.

Conclusion: _____

- B) If you go to Thousand Oaks High School, then you are a lancer.
If you are a Lancer, then your school colors are white and green.

Conclusion: _____

- C) If a , then b .
If b , then c .

Conclusion: _____

What you just discovered is something called the _____ property.

Transitive Property

The transitive property of equality states that, for any real numbers, if _____ and _____, then _____. The transitive property can also be used for inequality and congruence. Since measures are considered real numbers, and we have inequalities and congruence in Geometry, we can use the transitive property for proofs in Geometry.

Example 3: Complete the statement using the transitive property.

- A) If $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then _____.
- B) If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then _____.
- C) If $AB = CD$ and $CD = EF$, then _____.

Practice 2: Complete the statement using the transitive property.

- A) If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then _____.
- B) If $m\angle A > m\angle B$ and $m\angle B > m\angle C$, then _____.
- C) If $AB \leq CD$ and $CD \leq EF$, then _____.

Example 4: Can you use the transitive property in these examples?

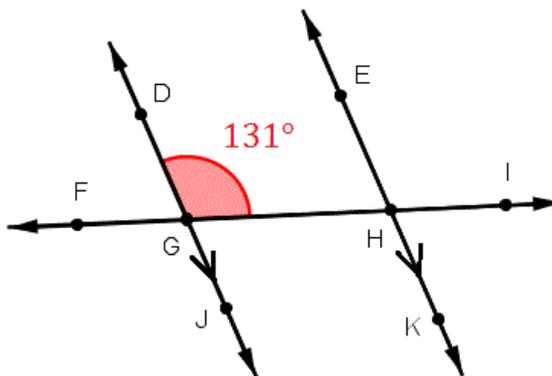
- A) $HI=LO$ and $HI=NO$; therefore, $LO=NO$. _____
- B) $m\angle X=m\angle Y$ and $m\angle Y=m\angle Z$; therefore, $m\angle X=m\angle Z$. _____
- C) $\angle A \cong \angle B$, $\angle B \cong \angle C$ and $\angle C \cong \angle D$; therefore $\angle A \cong \angle D$. _____
- D) $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, therefore, $\overline{EF} \cong \overline{AB}$. _____

Practice 3: Can you use the transitive property in these situations?

- A) $IK > EA$ and $EA > ID$; therefore, $IK > ID$. _____
- B) $m\angle M= m\angle T$ and $m\angle T=m\angle U$; therefore, $m\angle U=m\angle M$. _____
- C) $\angle U \cong \angle R$, $\angle R \cong \angle A$, $\angle A \cong \angle J$; therefore $\angle U \cong \angle J$. _____
- D) $\triangle EAT \cong \triangle SIP$ and $\triangle SIP \cong \triangle NOT$; therefore $\triangle SIP \cong \triangle AWE$. _____

Example 5: Complete the proof below.

Given: $m\angle DGH = 131$
Find: $m\angle GHK$

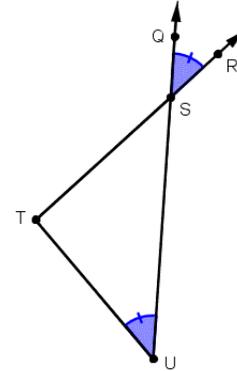


Statements	Reasons
1. $m\angle DGH = 131$	1. Given
2. $\angle DGH \cong \angle EHI$	2. _____
3. $\angle EHI \cong \angle GHK$	3. _____
4. $\angle DGH \cong \angle GHK$	4. _____
5. $m\angle DGH = m\angle GHK$	5. Definition of congruent angles
6. $131 = m\angle GHK$	6. Substitution

Practice 4: Complete the proofs below.

Given : $\angle TUS \cong \angle QSR$

A) **Prove :** $\overline{TS} \cong \overline{TU}$



Statements	Reasons
1. $\angle TUS \cong \angle QSR$	1. Given
2. $\angle QSR \cong \angle TSU$	2. _____
3. $\angle TUS \cong \angle TSU$	3. _____
4. $\overline{TS} \cong \overline{TU}$	4. Isosceles Triangle Theorem (converse)

B) Given: $\overline{HI} \cong \overline{LO}$; $\overline{LO} \cong \overline{YA}$; $\overline{YA} \cong \overline{KU}$

Prove: $\overline{HI} \cong \overline{KU}$

Draw a sketch:

Statement	Reason
1. $\overline{HI} \cong \overline{LO}$; $\overline{LO} \cong \overline{YA}$	1.
2.	2. Transitive Prop.
3. $\overline{YA} \cong \overline{KU}$	3.
4.	4.

Conclusion:

Summarize the transitive property in your own words.