2.1 Inductive Reasoning and Conjecture

Targets	○ I can make an educated guess based on inductive reasoning. ○ I can find counterexamples. ○ I can use algebra to write two-column proofs.

	Term	**Definition**
Vocabulary	**Inductive Reasoning**	• reasoning that uses several specific examples to arrive at a reasonable generalization or prediction
	Conjecture	

Instruction	*Example 1:* Make a conjecture based on the given information: $\angle ABC$ and $\angle DBE$ are vertical angles.	*Your turn:* Make a conjecture based on the given information: Point P is the midpoint of $\overline{NQ}$.

Vocab	**Counterexample**	

Instruction	*Example 2:* Determine whether each conjecture is true or false. Give a counterexample for any false conjecture.	
	a. **Conjecture:** The product of two positive integers is odd.	b. **Given:** $\angle 1$ and $\angle 2$ are adjacent angles. **Conjecture:** $\angle 1$ and $\angle 2$ are complementary.

	c. **Given:** $\overline{DE} \perp \overline{EF}$. **Conjecture:** $\angle DEF$ is a right angle.	d. **Given:** $\angle ABC$ and $\angle DEF$ are supplementary. **Conjecture:** $\angle ABC$ and $\angle DEF$ form a linear pair.

Vocabulary	**Term**	**Definition**
	<u>Proof</u>	• a _____ in which each statement you make is _____ by a statement that is accepted to be _____

Algebraic Statements Accepted to be True

<u>Properties of Equality for Real Numbers</u>		
Name of Property	**Property**	**Example**
Reflexive Property	For any number a,	
Symmetric Property	For all numbers a and b,	
Transitive Property	For all numbers a, b, and c,	
Addition Property	For all numbers a, b, and c,	
Subtraction Property	For all numbers a, b, and c,	

Properties of Equality for Real Numbers		
Name of Property	**Property**	**Example**
Multiplication Property	For all numbers *a*, *b*, and *c*,	
Division Property	For all numbers *a*, *b*, and *c*,	
Substitution Property	For all numbers *a* and *b*,	
Distributive Property	For all numbers *a*, *b*, and *c*,	

Vocabulary

Two-Column Proof

- a format used to prove conjectures and theorems
- contains 2 columns: _____ and _____
    - **statement:**
    - **reason:**

Writing Two-Column Proofs

Statements	Reasons (Justifications)
1.	**1.**
2.	**2.**
3.	**3.**
4.	**4.**

Tips:

- **Block 1 is ALWAYS your given statement!**
- **Never use the word PROVE to end your proof.**

Instruction

Example 3:
Given: $3x + 5 = 17$
Prove: $x = 4$

Statements	Reasons

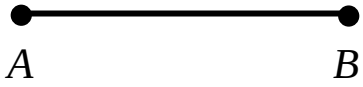
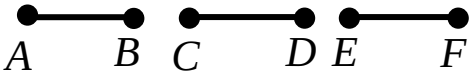
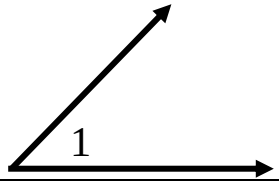
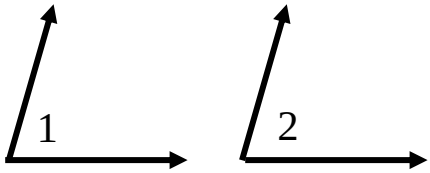
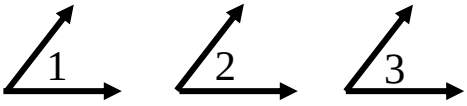
Instruction

Example 4:
Given: $6x - 3 = 4x + 1$
Prove: $x = 2$

Statements	Reasons

2.2 Geometric Proof with Congruence

Targets	
	○ I can write proofs involving segment congruence. ○ I can write proofs involving angle congruence.

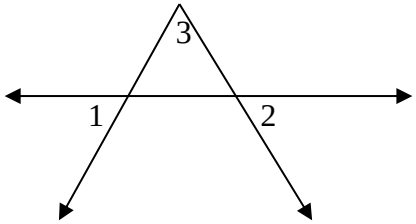
Geometric Properties for Segments and Angles		
Name of Property	**Property**	**Picture**
Reflexive Property		
Symmetric Property		
Transitive Property		
Reflexive Property		
Symmetric Property		
Transitive Property		

Instruction

Example 1:

Given: $m\angle 1 = m\angle 2$ and $m\angle 2 = m\angle 3$

Prove: $m\angle 1 = m\angle 3$



Statements	Reasons

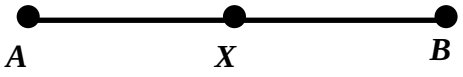
Vocabulary

Term	Definition
Theorem	• a conjecture proven to be true • can be used in proofs

Definition/Theorem

REVIEW: Definition of Midpoint

- the point _____ between the endpoints of a segment.



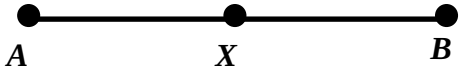
- **If *X* is the midpoint of $\overline{AB}$, then *AX* = *XB*.**

the line segment from *A* to *B*

the distance from *A* to *X*

the distance from *X* to *B*

Midpoint Theorem



- **If *X* is the midpoint of $\overline{AB}$, then $\overline{AX} \cong \overline{XB}$.**

the line segment from *A* to *B*

the line segment from *A* to *X*

the line segment from *X* to *B*

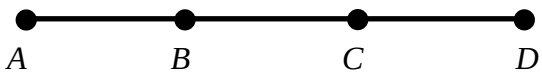
Instruction

Example 2:

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

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

Prove: $\overline{AB} \cong \overline{CD}$



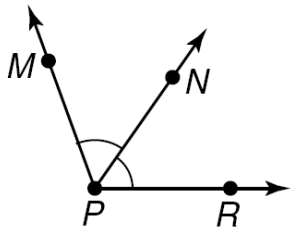
Statements	Reasons
1. B is the midpoint of $\overline{AC}$	
2. C is the midpoint of $\overline{BD}$	
3.	
4.	
5.	

Definition/Theorem

REVIEW: Definition of an Angle Bisector

- a ray that _____ an angle into _____

- **If** $\overrightarrow{PN}$ **bisects** $\angle MPR$ **then** $\angle MPN \cong \angle NPR$**.**

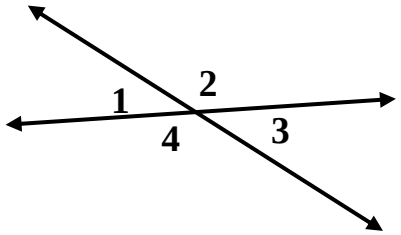


Theorem

Vertical Angles Theorem

- If two angles are vertical angles,

  then they are _____.



Instruction

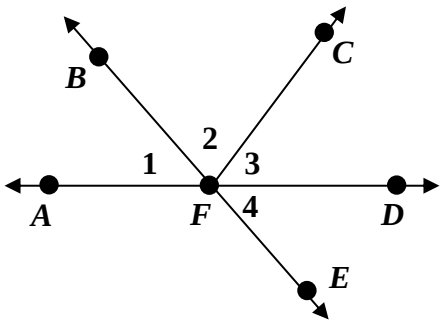
Example 3:

Given: $\overrightarrow{FB}$ bisects $\angle AFC$

$\overrightarrow{FD}$ bisects $\angle CFE$

$\angle 1 \cong \angle 3$

Prove: $\angle 2 \cong \angle 4$



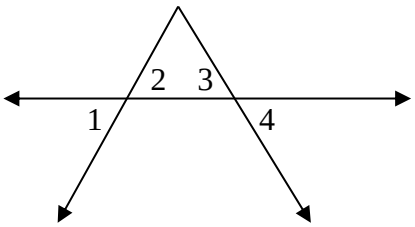
Statements	Reasons
1. $\overrightarrow{FB}$ bisects $\angle AFC$	
2. $\overrightarrow{FD}$ bisects $\angle CFE$	
3. $\angle 1 \cong \angle 3$	
4.	
5.	
6.	
7.	

Instruction

Example 4:

Given: $\angle 2 \cong \angle 3$

Prove: $\angle 1 \cong \angle 4$



Statements	Reasons
1. $\angle 2 \cong \angle 3$	
2.	
3.	
4.	

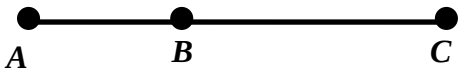
2.3 Geometric Proofs with Addition

Targets

- I can write proofs involving segment addition.
- I can write proofs involving angle addition.

Postulate

REVIEW: Segment Addition Postulate



- **If *B* is between *A* and *C*, then *AB* + *BC* = *AC***

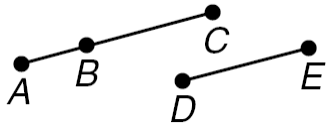
part + part = whole

Instruction

Example 1: **Complete the following proof.**

Given: *B* is between *A* and *C*
BC = *DE*

Prove: *AB* + *DE* = *AC*

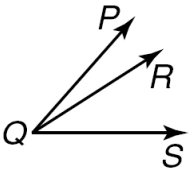


Statements	Reasons
1. *B* is between *A* and *C*	
2. *BC* = *DE*	
3. *AB* + *BC* = *AC*	
4. *AB* + *DE* = *AC*	

Postulate

REVIEW: Angle Addition Postulate

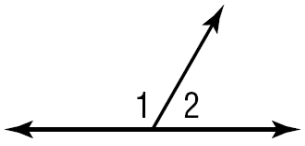
- **If *R* is in the interior of $\angle PQS$,**
  then $m\angle PQR + m\angle RQS =$ _____



Theorems

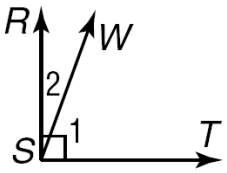
Supplement Theorem

If two angles form a _____,
then they are supplementary angles. (Sum = _____)



Complement Theorem

If the noncommon sides of two adjacent angles form a _____ angle, then the angles are complementary angles. (Sum = _____)

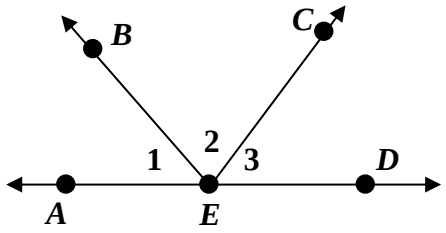


Instruction

Example 2:

Given: $\angle 1 \cong \angle 3$

Prove: $\angle AEC \cong \angle DEB$



Statements	Reasons
1. $\angle 1 \cong \angle 3$	
2.	
3.	
4.	
5.	