Name: ___________________________

Date: ___________________________

Period: _________________________

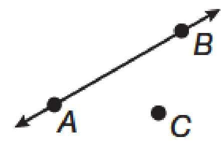
Geometry Lesson 27

Objective: TSW use a two-column proof.

In a proof, deductive reasoning is used to develop a logical argument from given information to prove a conclusion. Proofs in geometry must be done step by step, and each step must have a justification. These justifications can include the ___________________ information, definitions, _________________________, theorems, and _______________________, as seen in the two-column proofs in this lesson.

Example 1 Justifying Statements in a Two-Column Proof, Part 1

Fill in the justifying statements to support the proof of Theorem 4-2: If there is a line and a point not on the line, then exactly one plane contains them.



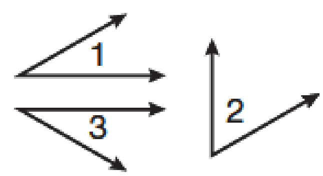
Given: Point C is not on $\overleftrightarrow{AB}$.

Prove: Exactly one plane contains $\overleftrightarrow{AB}$ and C.

Statements	Reasons
1. Point C is noncollinear with $\overleftrightarrow{AB}$.	1.
2. Exactly one plane contains points A, B, and C.	2.
3. Exactly one plane contains $\overleftrightarrow{AB}$ and C.	3.

Example 2 Justifying Statements in a Two-Column Proof, Part 2

Prove Theorem 6-1: If two angles are complementary to the same angle, then they are congruent.



Given: $\angle 1$ is complementary to $\angle 2$. $\angle 3$ is complementary to $\angle 2$.

Prove: $\angle 1 \cong \angle 3$

Statements	Reasons
1. $\angle 1$ is complementary to $\angle 2$. $\angle 3$ is complementary to $\angle 2$.	1. Given
2. $m\angle 1 + m\angle 2 = 90°$ $m\angle 3 + m\angle 2 = 90°$	2.
3. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$	3.
4. $m\angle 1 + m\angle 2 - m\angle 2 = m\angle 3 + m\angle 2 - m\angle 2$	4.
5. $m\angle 1 = m\angle 3$	5.
6. $\angle 1 \cong \angle 3$	6.

Two-column proofs have a format that is composed of five parts.

1. _________________ statement(s): The information that is provided.
2. _________________ statement: The statement indicating what is to be proved.
3. _________________: A sketch that summarizes the provided information. Sometimes you will need to draw the sketch yourself based on given information.
4. _________________: The specific steps that are written in the left-hand column.
5. _________________: Postulates, theorems, definitions, or properties written in the right-hand column, which justify each statement.

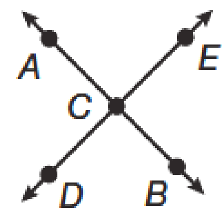
Example 3 Writing a Two-Column Proof, Part 1

Prove Theorem 6-4: If two angles are vertical angles, then they are congruent. (Vertical Angles Theorem)

Given: $\overleftrightarrow{AB}$ and $\overleftrightarrow{DE}$ intersect at point C

Prove: $\angle ACD \cong \angle BCE$

SOLUTION



Proof:

Statements	Reasons
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

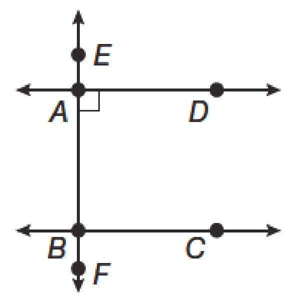
Example 4 Writing a Two-Column Proof, Part 2

Prove Theorem 5-3: If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other one.

Given: $\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$ and $\overleftrightarrow{EB} \perp \overleftrightarrow{AD}$

Prove: $\overleftrightarrow{EB} \perp \overleftrightarrow{BC}$

SOLUTION

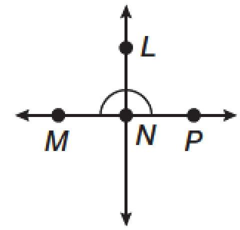


Proof:

Statements	Reasons
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

You Try!!!!!

a. If a triangle is obtuse, what can you conclude about the measures of its two non-obtuse angles? Justify your answer.

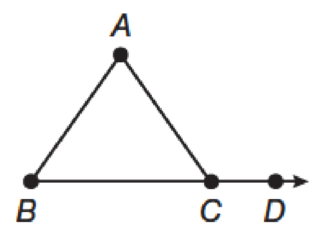


b. Fill in the reasons of the proof of Theorem 5-5: If two lines form congruent adjacent angles, then they are perpendicular.

Given: $\angle LNM \cong \angle LNP$

Prove: $LN \perp MP$

Statements	Reasons
1. $\angle LNM$ _ $\angle LNP$	1.
2. $m\angle LNM = m\angle LNP$	2.
3. $m\angle MNP = 180°$	3.
4. $m\angle LNM + m\angle LNP = m\angle MNP$	4.
5. $2m\angle LNM = 180°$	5.
6. $m\angle LNM = 90°$	6.
7. $LN \perp MP$	7.



c. Given ΔABC with exterior angle $\angle ACD$, write a two-column proof to prove the Exterior Angle Theorem.

Given: $\angle ACD$ is an exterior angle of ΔABC

Prove: $m\angle ACD = m\angle CAB + m\angle ABC$

1.

2.

3.

4.

5.

6.