

LessonTitle: Proving Supplementary and Complementary		Geo 2.6
Utah State Core Standard and Indicators Geometry Standard 2, 3 Process Standards 2, 3		
Summary		
This activity uses students' prior knowledge of algebra to introduce geometric proof. Students prove a solution to an equation using algebraic properties, and write their own statements to be proved. After they understand the two-column method of organizing proof for algebra, they are given several examples of geometric proof to work on.		
Enduring Understanding	Essential Questions	
You can use previously proven properties to justify each step in solving algebraic equations or geometric proofs as well as in everyday logic.	Why do we use proof in geometry? How does it help us?	
Skill Focus	Vocabulary Focus	
<ul style="list-style-type: none"> • Problem solving • Algebraic and geometric proof using logic principles 		
Assessment		
Materials		
Launch		
Explore		
Summarize		
Apply		

Directions: Most students have never encountered two-column proofs. To introduce students to the idea of proof, watch the first few minutes of Nova's "The Proof" video (up to the 'Mathematicians began abandoning Fermat' part). After the video discuss "what is a proof" with the students.

Then do the first algebraic proof below supplying reasons for each step. Students can then try it themselves.

Use the Mixed-up Proof below before or after the students do proofs themselves.

Extension: Have students prove theorems.

Geo 2.6a

Proving What We Know

Name _____

You have discovered and discussed many properties of geometry. You are aware of the many properties of algebra. You are now ready to logically justify your reasons for solving problems and making conjectures.

Complete the proof by supplying the reasons for each statement.

- 1) Given: $9x - 7 = 2(5x + 12)$
Prove: $x = -31$

Statements	Reasons
a. $9x - 7 = 2(5x + 12)$	a.
b. $9x - 7 = 10x + 24$	b.
c. $-7 = 1x + 24$	c.
d. $-31 = 1x$	d.
e. $x = -31$	e.

- 2) Now it's your turn to supply the statements in the first problem and create a problem in the second problem below. Complete the proofs.

Given: $2x + 10 = 40$
Prove: $x = 15$

Statements	Reasons
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Given:
Prove:

Statements	Reasons
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- 3) Draw a line segment with points A, B, C, and D such that A and D are the endpoints and points B and C are between A and D with point B between A and C. Complete the following two-column proof. Draw a picture to help you.

Given: $AD = BC + 2AB$

Given: $AB = CD$

Prove: $AC = BD$

Statements	Reasons
a. $AD = BC + 2AB$	a.
b. $AB = CD$	b.
c. $AD = AB + BC + CD$	c.
d. $AC = AB + BC$	d.
e. $BD = BC + CD$	e.
f. $AC = BD$	f.

- 4) Study the proof below which proves that **angles supplementary to the same angle or to congruent angles are congruent**. Then using that proof as a guide prove the theorem that **angles complementary to the same angle or congruent angles are congruent**.

Given: $\angle 1$ and $\angle 3$ are supplementary
 $\angle 2$ and $\angle 3$ are supplementary
 Prove: $\angle 1 \cong \angle 2$

Statements	Reasons
a. $\angle 1$ and $\angle 3$ are supplementary $\angle 2$ and $\angle 3$ are supplementary	a. Given
b. $m\angle 1 + m\angle 3 = 180$ $m\angle 2 + m\angle 3 = 180$	b. Definition of Supplementary
c. $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3 = 180$	c. Substitution Property
d. $m\angle 1 = m\angle 2$	d. Subtraction Property
e. $\angle 1 \cong \angle 2$	e. Definition of congruent angles

- 5) Now it's your turn. Prove that **Angles complementary to the same angle or congruent angles are congruent**.

Given:

Prove:

Statements	Reasons

Geo 2.6b

Mixed-up Proofs

1) Rearrange the statements and reasons below so they are in the proper order.

Statements	Reasons
$\angle ABC$ is a right angle.	Substitution
$m\angle ABD + m\angle DBC = m\angle ABC$	Given
$m\angle ABC = 90$ degrees	Definition of complementary angles
$m\angle ABD + m\angle DBC = 90$ degrees	Angle addition postulate
$\angle ABD$ and $\angle DBC$ are complementary	Definition of a right angle

2) Create your own mixed up proof for another group to solve.

Statements	Reasons

