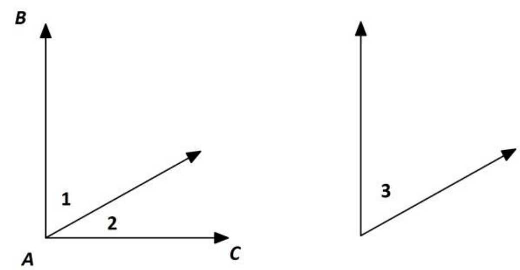
Name: ____ Period: _______ Date: __________

Gigantic Packet of Proofs!

Directions: In proofs 1-3, use the paragraph proof or plan to help you fill in the missing statements and reasons of the two-column proof. In proofs 4-5, use the word bank to help you fill in the missing statements and reasons. In proofs 6-7, there is no paragraph proof or word bank to help.

1

Use the given paragraph proof to write a two-column proof.



Given: $\angle BAC$ is a right angle. $\angle 1 \cong \angle 3$

Prove: $\angle 2$ and $\angle 3$ are complementary.

Paragraph proof:

Since $\angle BAC$ is a right angle, m$\angle BAC$ = 90° by the definition of a right angle. By the Angle Addition Postulate, m$\angle BAC$ = m$\angle 1$ + m$\angle 2$. By substitution, m$\angle 1$ + m$\angle 2$ = 90°. Since $\angle 1 \cong \angle 3$, m$\angle 1$ = m$\angle 3$ by the definition of congruent angles. Using substitution, m$\angle 3$ + m$\angle 2$ = 90°. Thus, by the definition of complementary angles, $\angle 2$ and $\angle 3$ are complementary.

Complete the proof. Choose the reasons for statements 3 and 5 from the Word Bank.

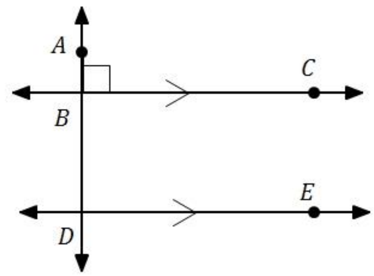
Two-column proof:

Statements	**Reasons**
1. $\angle BAC$ is a right angle. $\angle 1 \cong \angle 3$	1. Given
2. m$\angle BAC = 90°$	2. Definition of a right angle
3. m$\angle BAC$ = m$\angle 1$ + m$\angle 2$	3. Angle Addition Postulate
4. m$\angle 1$ + m$\angle 2 = 90°$	4. Substitution
5. m$\angle 1$ = m$\angle 3$	5. Definition of $\cong$ Angles
6. m$\angle 3$ + m$\angle 2 = 90°$	6. Substitution
7. $\angle 2$ and $\angle 3$ are complementary	7. Definition of complementary angles

Word Bank

Substitution	Definition of congruent angles
Angle Addition Postulate	Definition of equality

Given: $\overleftrightarrow{BC} \parallel \overleftrightarrow{DE}$, $\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$
Prove: $\overleftrightarrow{AB} \perp \overleftrightarrow{DE}$



Proof: It is given that $\overleftrightarrow{BC} \parallel \overleftrightarrow{DE}$, so $\angle ABC \cong \angle BDE$ by the Corresponding Angles Postulate. It is also given that $\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$, so $m\angle ABC = 90°$. By the definition of congruent angles, $m\angle ABC = m\angle BDE$, so $m\angle BDE = 90°$ by the Transitive Property of Equality. By the definition of perpendicular lines $\overleftrightarrow{AB} \perp \overleftrightarrow{DE}$.

Use the choices listed below to complete the two-column proof.

Proof:

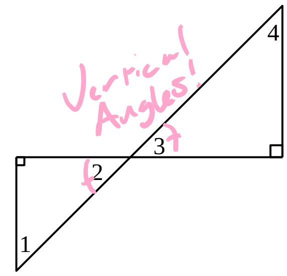
Statements	Reasons
1. $\overleftrightarrow{BC} \parallel \overleftrightarrow{DE}$	1. Given
2. $\angle ABC \cong \angle BDE$	2. Corresponding Angles Postulate
3. $\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$	3. Given
4. $m\angle ABC = 90°$	4. Definition of Perpendicular
5. $m\angle ABC = m\angle BDE$	5. Definition of Congruent Angles
6. $m\angle BDE = 90°$	6. Transitive Prop. of =
7. $\overleftrightarrow{AB} \perp \overleftrightarrow{DE}$	7. Def. of Perpendicular lines

Word Bank	
$\overleftrightarrow{AB} \perp \overleftrightarrow{DE}$	*If two parallel lines then corresponding angles are equal.
$m\angle ABC = m\angle BDE$	*Definition of Perpendicular Lines
*If alternate interior angles are equal then the lines are parallel.	Transitive Property of Equality
*If a transversal is perpendicular to one of two parallel lines then it is perpendicular to the other	$\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$

Use the given plan to write a two-column proof.

Given: m∠1 + m∠2 = 90°, m∠3 + m∠4 = 90°

Prove: m∠1 = m∠4



Plan: Since both pairs of angle measures add to 90°, use substitution to show that the sums of both pairs are equal. Since ∠2 ≅ ∠3 by Vertical Angles Theorem, use substitution again to show that sums of the other pairs are equal. Use the Subtraction Property of Equality to conclude that m∠1 = m ∠4.

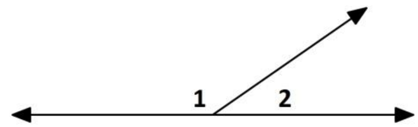
Complete the proof. Choose the answers from the Word Bank for the missing information in steps 2, 4, 5, and 6.

Proof:

Statements	**Reasons**
1. m∠1 + m∠2 = 90°	1. Given
2. m∠3 + m∠4 = 90	2. Given
3. m∠1 + m∠2 = m∠3 + m∠4	3. Substitution Property of Equality
4. ∠2 ≅ ∠3	4. Vertical Angles thm
5. m∠2 = m∠3	5. Def. of ≅ angles
6. m∠1 + m∠2 = m∠2 + m∠4	6. Substitution
7. m∠1 = m∠4	7. Subtraction Prop. of =

Word Bank	
m∠1 = m∠4	Substitution Property of Equality
m∠2 = m∠3	Definition of Congruent Angles
m∠3 + m∠4 = 90°	Subtraction Property of Equality
	Vertical Angles Theorem
m∠5 + m∠6 = 90°	Addition Property of Equality

Fill in the blanks to complete the two-column proof.



Given: $\angle 1$ and $\angle 2$ are supplementary. m$\angle 1 = 135°$

Prove: m$\angle 2 = 45°$. Choose the answers from the Word Bank for the missing information in steps 2, 3, 4, and 5.

Proof:

Statements	Reasons
1. $\angle 1$ and $\angle 2$ are supplementary.	1. Given
2. m$\angle$1 = 135°	2. Given
3. m$\angle 1$ + m$\angle 2 = 180°$	3. Def. of Supplementary $\angle$s
4. 135° + m$\angle$2 = 180°	4. Substitution Property
5. m$\angle 2 = 45°$	5. Subtraction Prop. of =

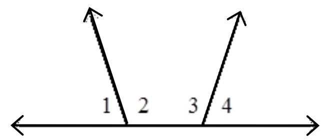
Word Bank	
m$\angle 2 = 135°$	Subtraction Property of Equality
$135°$ + m$\angle 2 = 180°$	Given
m$\angle 1 = 135°$	Substitution Property
Definition of supplementary angles	Definition of complementary angles

Fill in the two-column proof using the statements and reasons in the word bank.

5

Given: $\angle 1 \cong \angle 4$

Prove: $m\angle 2 = m\angle 3$



Two-column proof:

Statements	**Reasons**
1. $\angle 1 \cong \angle 4$	1. Given
2. $\angle 1$ and $\angle 2$ are supplementary. $\angle 3$ and $\angle 4$ are supplementary.	2. Linear Pairs are Supplementary
3. $\angle 2 \cong \angle 3$	3. If two angles are supplementary to the same angle then they are congruent.
4. $m\angle 2 = m\angle 3$	4. Definition of Congruent Angles

Word Bank	
$\angle 1$ and $\angle 2$ are supplementary. $\angle 3$ and $\angle 4$ are supplementary.	If two angles are supplementary to the same angle then they are congruent.
$m\angle 2 = m\angle 3$	Given
$\angle 1 \cong \angle 4$	Linear Pairs are Supplementary
$\angle 2 \cong \angle 3$	Definition of Congruent Angles

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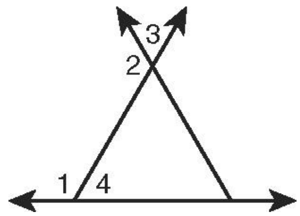
Given: $\angle 4 \cong \angle 3$

Prove: $m\angle 1 = m\angle 2$

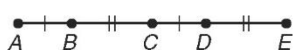


Statements	Reasons
1. $\angle 1$ and $\angle 4$ are supplementary, $\angle 2$ and $\angle 3$ are supplementary.	1. Linear Pairs are supplementary
2. $\angle 4 \cong \angle 3$	2. Given
3. $\angle 1 \cong \angle 2$	3. Congruent Supplements Thm
4. $m\angle 1 = m\angle 2$	4. Def. of $\cong$ Angles

7

Given: $AB = CD$, $BC = DE$

Prove: C is the midpoint of $\overline{AE}$.



Statements	Reasons
1. $AB = CD$, $BC = DE$	1. Given
2. $AB + BC = CD + DE$	2. Addition Property of =
3. $AB + BC = AC$, $CD + DE = CE$	3. Segment Addition Postulate
4. $AC = CE$	4. Substitution
5. $\overline{AC} \cong \overline{CE}$	5. Def. of $\cong$ Segments
6. C is the midpoint of $\overline{AE}$.	6. Def. of a midpoint