PROOFS

Two-Column Proofs Full Unit: Printables

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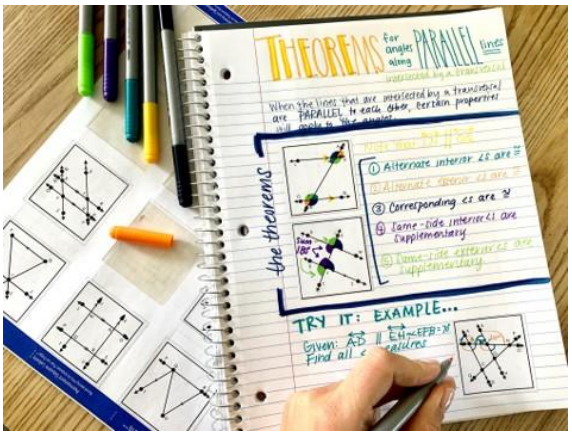

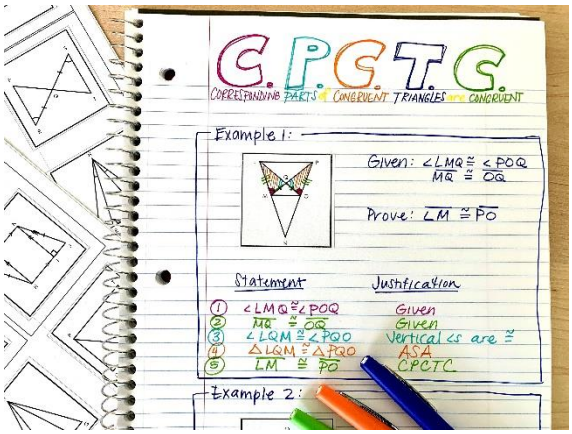

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Graphic Organizer: Properties of Equality and Congruence

Name: _____
Date: _____ Class: _____

Addition Property of Equality

If a = b, then
a + x = b + x

Subtraction Property of Equality

If a = b, then
a – x = b – x

Multiplication Property of Equality

If a = b, then
ax = bx

Division Property of Equality

If a = b, then
$\frac{a}{x} = \frac{b}{x}$

Basic Properties of Equality

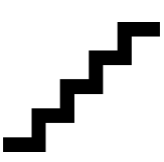
(For all nonzero real numbers)

Reflexive Property

Equality	a = a
Congruence	$\angle A \cong \angle A$ Or $\overline{AB} \cong \overline{AB}$

Symmetric Property

Equality	If a = b, Then b = a
Congruence	If $\angle A \cong \angle B$, then $\angle B \cong \angle A$ Or If $\overline{AB} \cong \overline{CD}$, Then $\overline{CD} \cong \overline{AB}$



Transitive Property

Equality	If a =b and b = c, Then a = c
Congruence	If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$ Or If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$

Substitution Property

Equality	If a = b, then a can replace b in an equation.
Congruence	If $\angle A \cong \angle B$, then $\angle A$ can replace $\angle B$ in a congruency statement. Or If $\overline{AB} \cong \overline{CD}$, then $\overline{AB}$ can replace $\overline{CD}$ in a congruency statement.

Properties of Equality and Congruence

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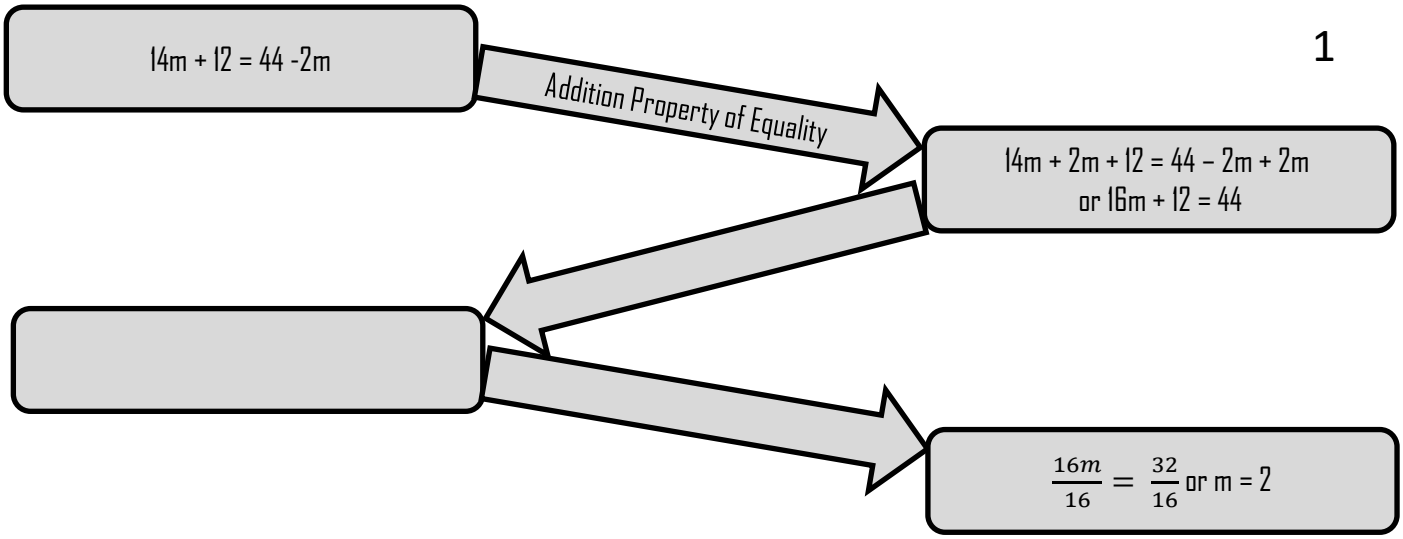
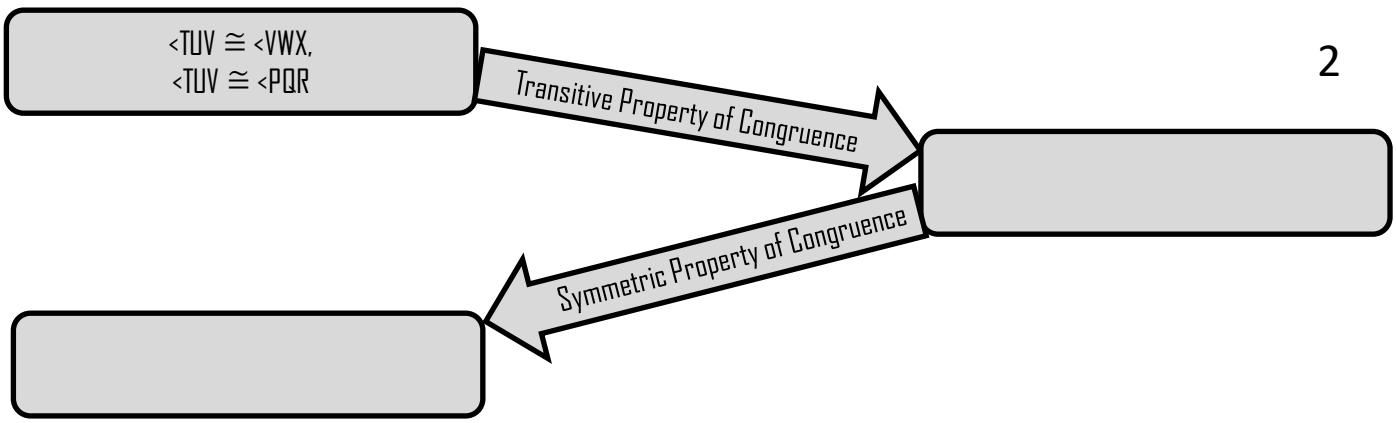
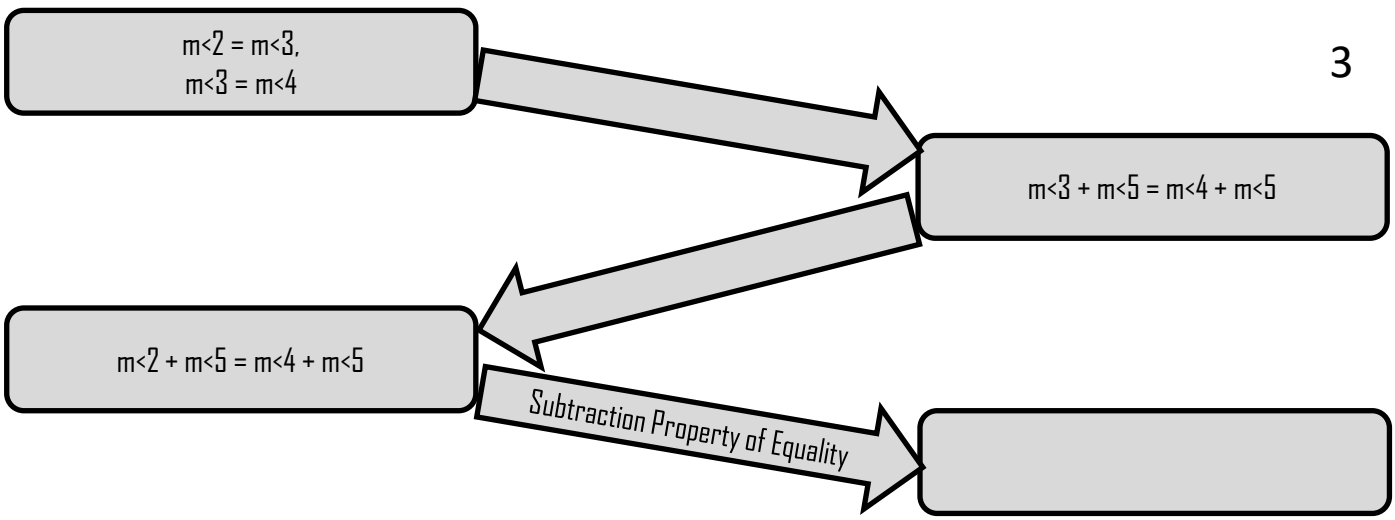
PROPERTIES OF EQUALITY AND CONGRUENCE

Name: _____
Date: _____ Class: _____

Complete the diagrams. The boxes should be filled in with equations and congruency statements. The arrows should be filled in with the properties needed to get from one step to another.







In diagram 3, which property could get from the first step to the last more quickly? _____

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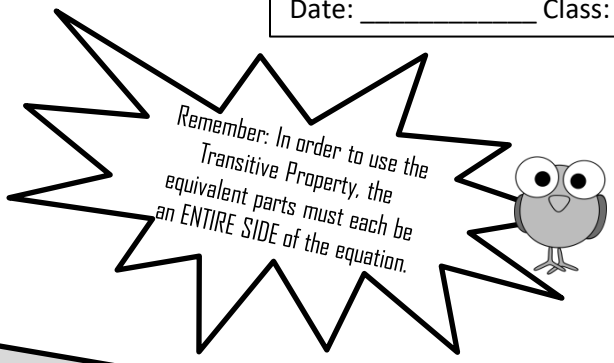
Properties of Equality and Congruence

Name: _____
Date: _____ Class: _____



4

$m\angle 1 + m\angle 2 = m\angle 5$,
$m\angle 2 = m\angle 3$

$m\angle 1 + m\angle 3 = m\angle 5$

Transitive Property of Equality

$m\angle 2 = m\angle 3$

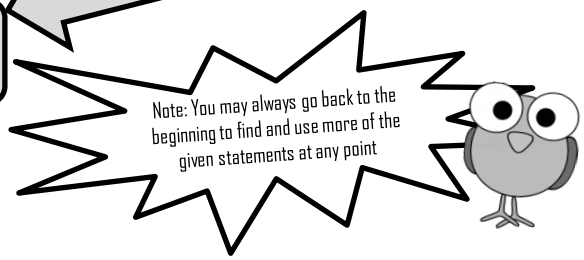
$m\angle 2 + m\angle 7 = m\angle 3 + m\angle 7$

Symmetric Property of Equality

5

$\angle DGF \cong \angle FHK$,
$\angle FEC \cong \angle ABD$,
$\angle FHK \cong \angle FEC$

$\angle DGF \cong \angle ABD$



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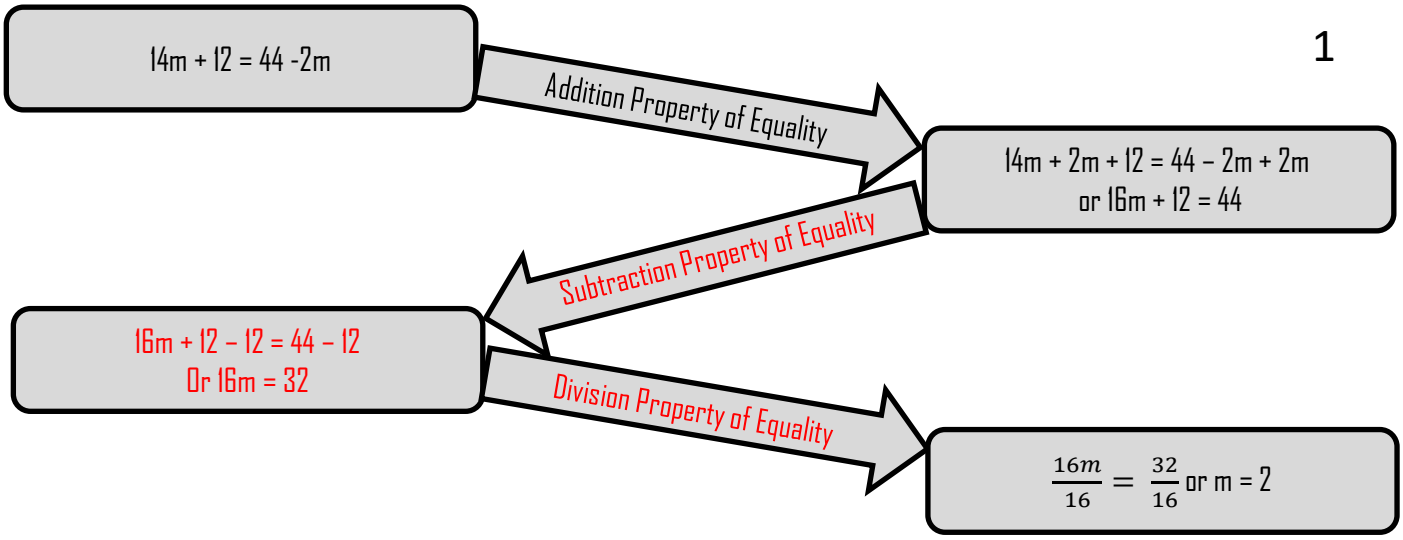
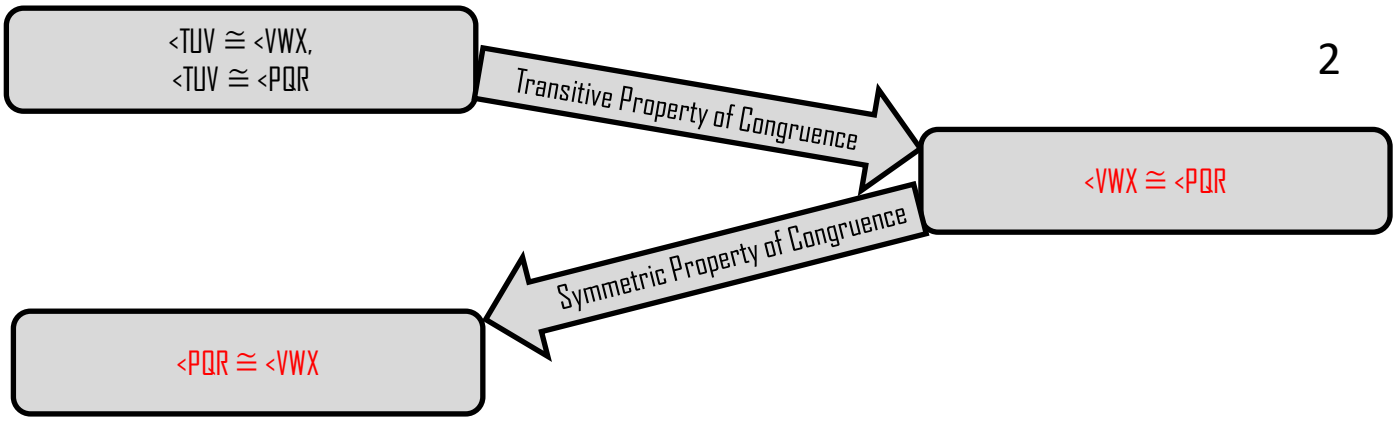
Properties of Equality and Congruence

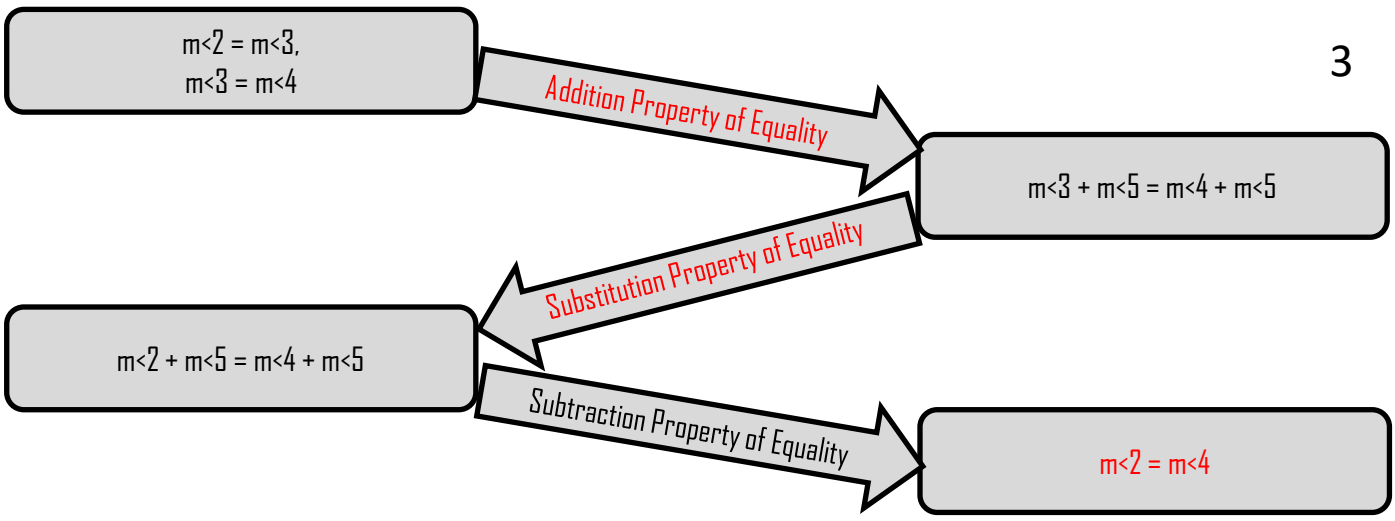
Answer Key

Name: _____
Date: _____ Class: _____

Complete the diagrams. The boxes should be filled in with equations and congruency statements. The arrows should be filled in with the properties needed to get from one step to another.







In diagram 3, which property could get from the first step to the last more quickly? __Transitive Property of Equality__

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Properties of Equality and Congruence

Name: _____
Date: _____ Class: _____

Remember: In order to use the Transitive Property, the equivalent parts must each be an ENTIRE SIDE of the equation.

4

$m\angle 1 + m\angle 2 = m\angle 5$, $m\angle 2 = m\angle 3$

Substitution Property of Equality

$m\angle 1 + m\angle 3 = m\angle 5$

Transitive Property of Equality

$m\angle 1 + m\angle 2 = m\angle 1 + m\angle 3$

Subtraction Property of Equality

$m\angle 2 = m\angle 3$

Addition Property of Equality

$m\angle 2 + m\angle 7 = m\angle 3 + m\angle 7$

Note: In a real proof, it would not really be very helpful to end up back where we started, but we are just practicing using the properties to justify each step.

Symmetric Property of Equality

$m\angle 3 + m\angle 7 = m\angle 2 + m\angle 7$

5

$\angle DGF \cong \angle FHK$, $\angle FEC \cong \angle ABD$, $\angle FHK \cong \angle FEC$

Transitive Property of Congruence

$\angle DGF \cong \angle FEC$

Transitive Property of Congruence

$\angle DGF \cong \angle ABD$

Note: You may always go back to the beginning to find and use more of the given statements at any point

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Properties of Equality and Congruence Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Identify the property.

1. Given that m<BCA = m<DBC and m<BCA = m<ADB, we can conclude that m<DBC = m<ADB. _____
2. Given that $\overline{PQ} \cong \overline{TU}$, we can conclude that $\overline{TU} \cong \overline{PQ}$. _____
3. ΔABC ≅ ΔABC _____
4. Given that x = 3y, we can conclude that x - 13 = 3y - 13. _____
5. Given that m<2 = m<6, we can conclude that m<2 + m<4 = m<6 + m<4. _____
6. Given that <MNO ≅ <LPR, we can rewrite the statement <MNO ≅ <DEF as <LPR ≅ <DEF. _____
7. Given that c = a, we can conclude that 7c = 7a _____
8. Given that $\overline{GH} \cong \overline{VW}$ and $\overline{TU} \cong \overline{GH}$, we can conclude that $\overline{VW} \cong \overline{TU}$. _____
9. Given that XY = MN and XY + YZ = XZ, we can state that MN + YZ = XZ. _____
10. If 4k = 18 then 18 = 4k. _____

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Properties of Equality and Congruence Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Explain the difference between using Substitution and the Transitive Property. Give one example in which either method can be used to reach the same conclusion and one example in which the Substitution cannot be accomplished using the Transitive Property.

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Properties of Equality and Congruence Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Answer Key

Identify the property.

1. Given that m<BCA = m<DBC and m<BCA = m<ADB, we can conclude that m<DBC = m<ADB. ___Transitive Property of Equality_____
2. Given that $\overline{PQ} \cong \overline{TU}$, we can conclude that $\overline{TU} \cong \overline{PQ}$. __Symmetric Property of Congruence___
3. ΔABC ≅ ΔABC __Reflexive Property of Congruence_____
4. Given that x = 3y, we can conclude that x - 13 = 3y - 13. __Subtraction Property of Equality_____
5. Given that m<2 = m<6, we can conclude that m<2 + m<4 = m<6 + m<4. ____Addition Property of Equality_____
6. Given that <MNO ≅ <LPR, we can rewrite the statement <MNO ≅ <DEF as <LPR ≅ <DEF. __Substitution Property of Congruence__
7. Given that c = a, we can conclude that 7c = 7a ___Multiplication Property of Equality____
8. Given that $\overline{GH} \cong \overline{VW}$ and $\overline{TU} \cong \overline{GH}$, we can conclude that $\overline{VW} \cong \overline{TU}$. ____Transitive Property of Congruence__
9. Given that XY = MN and XY + YZ = XZ, we can state that MN + YZ = XZ. __Substitution Property of Equality_____
10. If 4k = 18 then 18 = 4k. ____Symmetric Property of Equality_____

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Properties of Equality and Congruence Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Explain the difference between using Substitution and the Transitive Property. Give one example in which either method can be used to reach the same conclusion and one example in which the Substitution cannot be accomplished using the Transitive Property.

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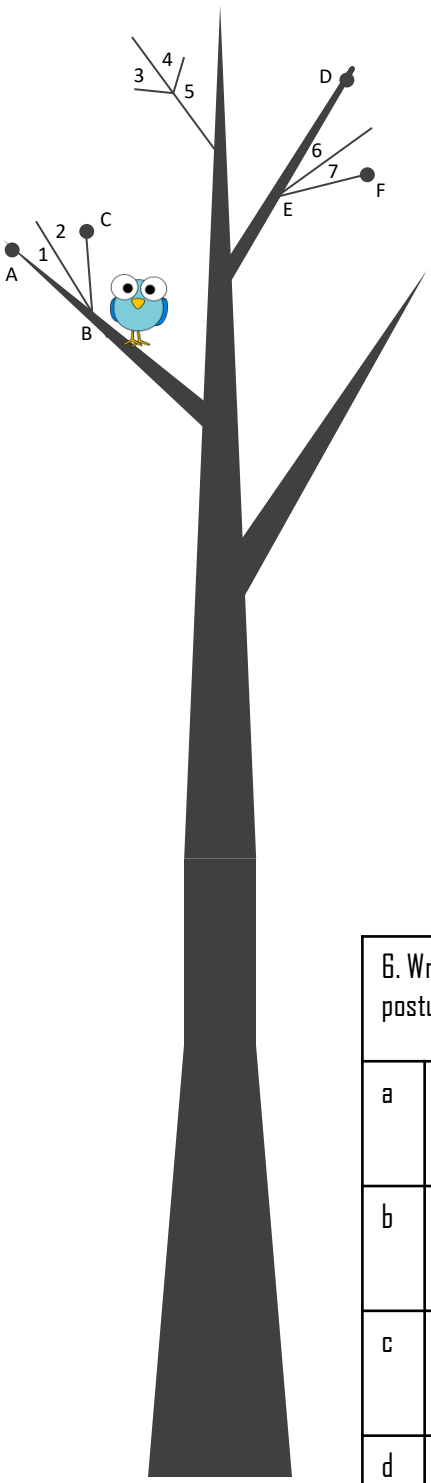
Segment Addition Postulate and Angle Addition Postulate

Name: _____
Date: _____ Class: _____



1. Given that the distance from the ground to the lowest branch is 39 meters and the distance from the ground to the branch with the bird is 46 meters, find the distance between the lowest branch and the branch with the bird.

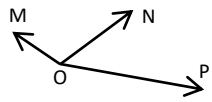
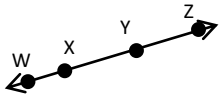
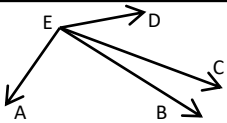
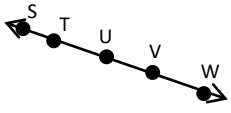
2. Given that the distance from the branch with the bird to the top of the tree is 15 meters, find the height of the tree.

3. Given that the measure of angle 1 is 28 degrees and the measure of angle 2 is 55 degrees, find the measure of angle ABC.

4. Given that the measure of angle DEF is 62 degrees and angle 6 is congruent to angle 7, find the measure of angle 6.

5. Given that the measure of angle 3 is 23 degrees, the measure of angle 5 is 134 degrees, and the measure of the large angle made up of all three angles 3, 4, and 5 is 221 degrees, Find the measure of angle 4.

6. Write an equation that can be used to find the requested measure and identify which postulate you used.

a		Find m<MOP.	Equation: _____	Postulate: _____
b		Find XZ.	Equation: _____	Postulate: _____
c		Find m<AED.	Equation: _____	Postulate: _____
d		Find SW.	Equation: _____	Postulate: _____

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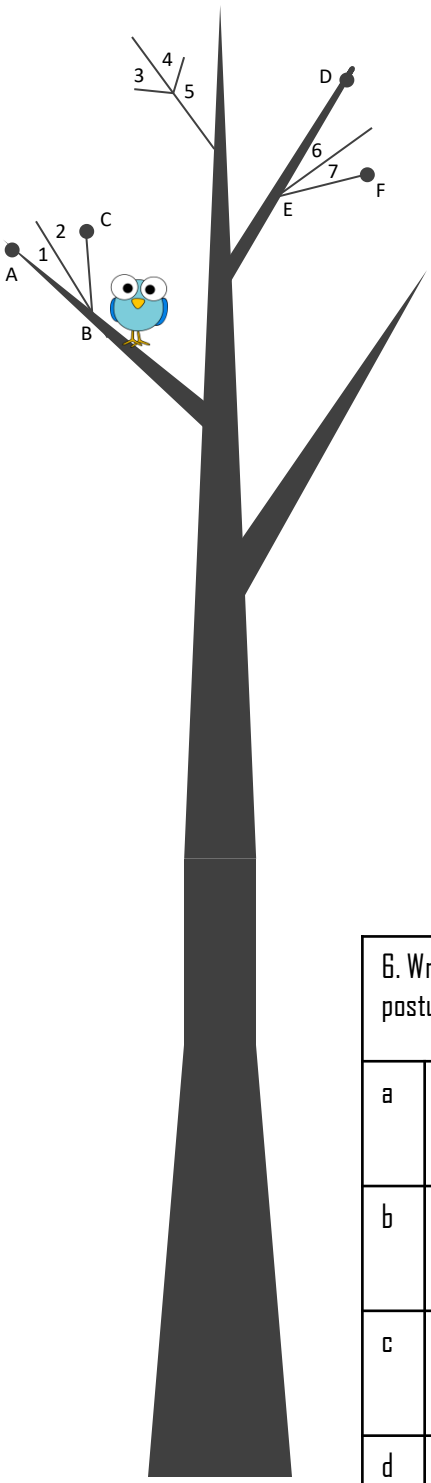
Segment Addition Postulate and Angle Addition Postulate

Name: _____
Date: _____ Class: _____

Answer Key



1. Given that the distance from the ground to the lowest branch is 39 meters and the distance from the ground to the branch with the bird is 46 meters, find the distance between the lowest branch and the branch with the bird.

   7 meters

2. Given that the distance from the branch with the bird to the top of the tree is 15 meters, find the height of the tree.

   61 meters

3. Given that the measure of angle 1 is 28° and the measure of angle 2 is 55°, find the measure of angle ABC.

   83°

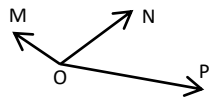
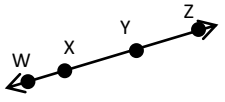
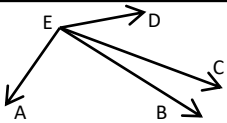
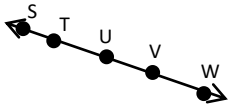
4. Given that the measure of angle DEF is 62 degrees and angle 6 is congruent to angle 7, find the measure of angle 6.

   31°

5. Given that the measure of angle 3 is 23 degrees, the measure of angle 5 is 134 degrees, and the measure of the large angle made up of all three angles 3, 4, and 5 is 221 degrees, Find the measure of angle 4.

   64°

6. Write an equation that can be used to find the requested measure and identify which postulate you used.

a		Find m<MOP.	Equation: m<MON + m<NOP = m<MOP	Postulate: Angle Addition Postulate
b		Find XZ.	Equation: XY + YZ = XZ	Postulate: Segment Addition Postulate
c		Find m<AED.	Equation: m<AEB + m<BEC + m<CED = m<AED	Postulate: Angle Addition Postulate
d		Find SW.	Equation: ST + TU + UV + VW = SW	Postulate: Segment Addition Postulate

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Two- Column Structure for Proofs: Algebra Proofs

Name: _____
Date: _____ Class: _____

Fill in the missing justifications in each proof.

1. **Given:** $a = 2b + 6$
$a = 9b - 8$

Prove: $b = 2$

	Statement	Justification
1	$a = 2b + 6$	
2	$a = 9b - 8$	
3	$2b + 6 = 9b - 8$	
4	$6 = 7b - 8$	
5	$14 = 7b$	
6	$2 = b$	
7	$b = 2$	
8		

2. **Given:** $\frac{x}{2} = y + 5$
$y = 3x$

Prove: $x = -2$

	Statement	Justification
1	$\frac{x}{2} = y + 5$	
2	$y = 3x$	
3	$\frac{x}{2} = 3x + 5$	
4	$x = 6x + 10$	
5	$-5x = 10$	
6	$x = -2$	
7		
8		

3. **Given:** $3w = t$
$2r = s$
$t = 2r$

Prove: $3w = s$

	Statement	Justification
1	$3w = t$	
2	$2r = s$	
3	$t = 2r$	
4	$3w = 2r$	
5	$3w = s$	
6		
7		
8		

4. **Given:** $3b + d = f$
$d = 2b$
$f = g$

Prove: $g = 5b$

	Statement	Justification
1	$3b + d = f$	
2	$d = 2b$	
3	$f = g$	
4	$3b + 2b = f$	
5	$5b = f$	(simplified step 5)
6	$5b = g$	
7	$g = 5b$	
8		

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TWO- COLUMN STRUCTURE FOR PROOFS: ALGEBRA PROOFS

Name: _____
Date: _____ Class: _____

Complete each proof.

5. Given: $5c + 1 = 2c - 8$

Prove: $c = -3$

	STATEMENT	JUSTIFICATION
1		
2		
3		
4		
5		
6		
7		
8		

6. Given: $m = n + 5$
$2m = n$

Prove: $m = -5$

	STATEMENT	JUSTIFICATION
1		
2		
3		
4		
5		
6		
7		
8		

7. Given: $g = 2h$
$g + h = k$
$k = m$

Prove: $m = 3h$

	STATEMENT	JUSTIFICATION
1		
2		
3		
4		
5		
6		
7		
8		

8. Given: $ab = 8a$
$b + d = 20$

Prove: $d = 12$

	STATEMENT	JUSTIFICATION
1		
2		
3		
4		
5		
6		
7		
8		

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Two- Column Structure for Proofs: Algebra Proofs

Name: _____
Date: _____ Class: _____

Answer Key

Fill in the missing justifications in each proof.

1. **Given:** $a = 2b + 6$
$a = 9b - 8$

Prove: $b = 2$

	Statement	Justification
1	$a = 2b + 6$	Given
2	$a = 9b - 8$	Given
3	$2b + 6 = 9b - 8$	Transitive Prop. (1, 2)
4	$6 = 7b - 8$	Subtraction Prop. of Eq.
5	$14 = 7b$	Addition Prop. of Eq.
6	$2 = b$	Division Prop. Of Eq.
7	$b = 2$	Symmetric Prop.
8		

2. **Given:** $\frac{x}{2} = y + 5$
$y = 3x$

Prove: $x = -2$

	Statement	Justification
1	$\frac{x}{2} = y + 5$	Given
2	$y = 3x$	Given
3	$\frac{x}{2} = 3x + 5$	Substitution (1, 2)
4	$x = 6x + 10$	Multiplication Prop. of Eq.
5	$-5x = 10$	Subtraction Prop. Of Eq.
6	$x = -2$	Division Prop. Of Eq.
7		
8		

3. **Given:** $3w = t$
$2r = s$
$t = 2r$

Prove: $3w = s$

	Statement	Justification
1	$3w = t$	Given
2	$2r = s$	Given
3	$t = 2r$	Given
4	$3w = 2r$	Transitive Prop. (1, 3)
5	$3w = s$	Transitive Prop. (2, 4)
6		
7		
8		

4. **Given:** $3b + d = f$
$d = 2b$
$f = g$

Prove: $g = 5b$

	Statement	Justification
1	$3b + d = f$	Given
2	$d = 2b$	Given
3	$f = g$	Given
4	$3b + 2b = f$	Substitution (1, 2)
5	$5b = f$	(simplified step 5)
6	$5b = g$	Transitive Prop. (3, 5)
7	$g = 5b$	Symmetric Prop.
8		

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Two- Column Structure for Proofs: Algebra Proofs

Name: _____
Date: _____ Class: _____

Answer Key

Complete each proof.

5. **Given:** $5c + 1 = 2c - 8$

Prove: $c = -3$

	Statement	Justification
1	$5c + 1 = 2c - 8$	Given
2	$3c + 1 = -8$	Subtraction Prop. of Eq.
3	$3c = -9$	Subtraction Prop. of Eq.
4	$c = -3$	Division Prop. of. Eq.
5		
6		
7		
8		

6. **Given:** $m = n + 5$
$2m = n$

Prove: $m = -5$

	Statement	Justification
1	$m = n + 5$	Given
2	$2m = n$	Given
3	$m = 2m + 5$	Substitution (1, 2)
4	$-m = 5$	Subtraction Prop. of Eq.
5	$m = -5$	Division Prop. of Eq.
6		
7		
8		

7. **Given:** $g = 2h$
$g + h = k$
$k = m$

Prove: $m = 3h$

	Statement	Justification
1	$g = 2h$	Given
2	$g + h = k$	Given
3	$k = m$	given
4	$2h + h = k$	Substitution (1, 2)
5	$3h = k$	(Simplified line 4)
6	$3h = m$	Transitive Prop. (3, 5)
7	$m = 3h$	Symmetric Prop.
8		

8. **Given:** $ab = 8a$
$b + d = 20$

Prove: $d = 12$

	Statement	Justification
1	$ab = 8a$	Given
2	$b + d = 20$	Given
3	$b = 8$	Division Prop. of Eq.
4	$8 + d = 20$	Substitution (2, 3)
5	$d = 12$	Subtraction Prop. of Eq.
6		
7		
8		

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Algebra Proofs
Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Given: $w + 4 = 7w - 2$
$v = w$

Prove: $v = 1$

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

Algebra Proofs
Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Given: $c + d = f$
$f = k$
$c = d$

Prove: $k = 2c$

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

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Algebra Proofs
Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Answer Key

Given: $w + 4 = 7w - 2$
$v = w$

Prove: $v = 1$

	Statement	Justification
1	$w + 4 = 7w - 2$	Given
2	$v = w$	Given
3	$4 = 6w - 2$	Subtraction Prop. of Eq.
4	$6 = 6w$	Addition Prop. of Eq.
5	$1 = w$	Division Prop. of Eq.
6	$1 = v$	Substitution (2, 5)
7	$v = 1$	Symmetric Prop. of Eq.
8		

Algebra Proofs
Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Answer Key

Given: $c + d = f$
$f = k$
$c = d$

Prove: $k = 2c$

	Statement	Justification
1	$c + d = f$	Given
2	$f = k$	Given
3	$c = d$	Given
4	$c + c = f$	Substitution (1, 3)
5	$2c = f$	(simplified line 4)
6	$2c = k$	Transitive Prop. (2, 5)
7	$k = 2c$	Symmetric Prop. Of Eq.
8		

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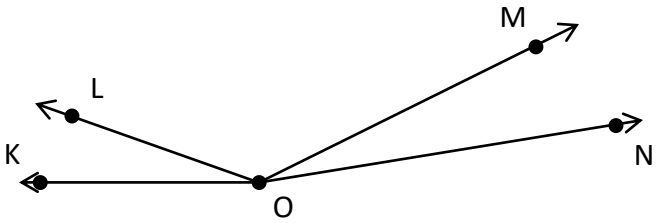
Geometry Proofs Using Definitions and Postulates

Name: _____
Date: _____ Class: _____

1

Given: $m\angle KOL = m\angle MON$

Prove: $m\angle KOM = m\angle LON$



	Statement	Justification
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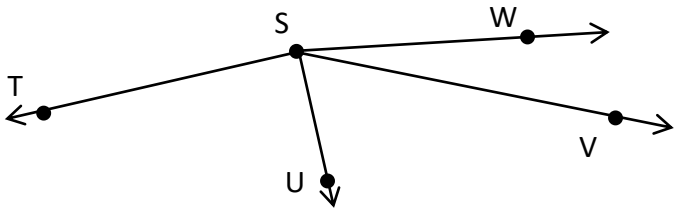
2

Given: $\overrightarrow{SU}$ bisects $\angle TSW$

Prove: $m\angle USV + m\angle VSW = m\angle TSU$



	Statement	Justification
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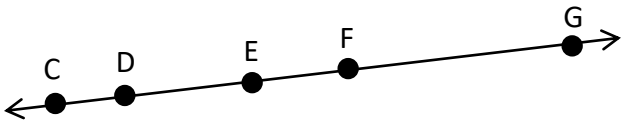
Geometry Proofs Using Definitions and Postulates

Name: _____
Date: _____ Class: _____

3

Given: $\overline{CD} \cong \overline{EF}$, $\overline{DE} \cong \overline{FG}$

Prove: $\overline{CE} \cong \overline{EG}$



	Statement	Justification
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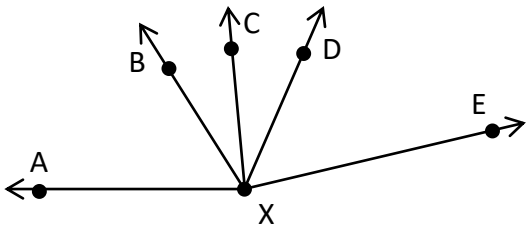
4

Given: $\overrightarrow{XB}$ bisects ∠AXC
$\overrightarrow{XD}$ bisects ∠CXE

Prove: m∠DXE + m∠AXB = m∠BXD



	Statement	Justification
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Geometry Proofs Using Definitions and Postulates

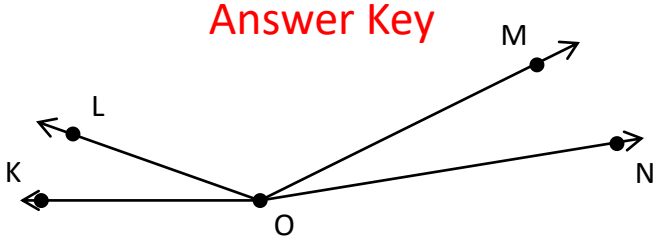
Name: _____
Date: _____ Class: _____

Answer Key

1

Given: $m\angle KOL = m\angle MON$

Prove: $m\angle KOM = m\angle LON$

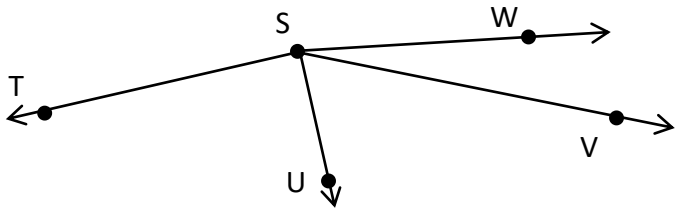


	Statement	Justification
1	$m\angle KOL = m\angle MON$	Given
2	$m\angle KOL + m\angle LOM = m\angle KOM$	Angle Addition Postulate
3	$m\angle MON + m\angle LOM = m\angle LON$	Angle Addition Postulate
4	$m\angle KOL + m\angle LOM = m\angle LON$	Substitution (1, 3)
5	$m\angle KOM = m\angle LON$	Transitive Prop. (2, 4)
6		
7		
8		
9		
10		

2

Given: $\overrightarrow{SU}$ bisects $\angle TSW$

Prove: $m\angle USV + m\angle VSW = m\angle TSU$



	Statement	Justification
1	$\overrightarrow{SU}$ bisects $\angle TSW$	Given
2	$m\angle TSU = m\angle USW$	Defn. bisector
3	$m\angle USV + m\angle VSW = m\angle USW$	Angle Addition Postulate
4	$m\angle USV + m\angle VSW = m\angle TSU$	Substitution (2, 3)
5		
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10		

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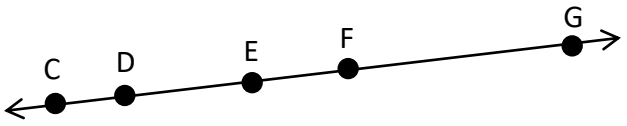
Geometry Proofs using Definitions and Postulates

Name: _____
Date: _____ Class: _____

3

Given: $\overline{CD} \cong \overline{EF}$, $\overline{DE} \cong \overline{FG}$

Prove: $\overline{CE} \cong \overline{EG}$

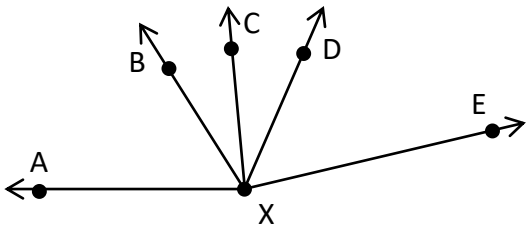


	Statement	Justification
1	$\overline{CD} \cong \overline{EF}$	Given
2	$\overline{DE} \cong \overline{FG}$	Given
3	CD = EF	Defn. Congruent
4	DE = FG	Defn. congruent
5	CD + DE = CE	Segment Addition Postulate
6	EF + FG = EG	Segment Addition Postulate
7	CD + FG = EG	Substitution (3, 6)
8	CD + DE = EG	Substitution (4, 7)
9	CE = EG	Transitive Prop. (5, 8)
10	$\overline{CE} \cong \overline{EG}$	Defn. congruent

4

Given: $\overrightarrow{XB}$ bisects ∠AXC
$\overrightarrow{XD}$ bisects ∠CXE

Prove: m∠DXE + m∠AXB = m∠BXD



	Statement	Justification
1	$\overrightarrow{XB}$ bisects ∠AXC	Given
2	$\overrightarrow{XD}$ bisects ∠CXE	Given
3	m∠AXB = m∠BXC	Defn. bisector
4	m∠CXD = m∠DXE	Defn. bisector
5	m∠CXD + m∠BXC = m∠BXD	Angle Addition Postulate
6	m∠DXE + m∠BXC = m∠BXD	Substitution (4, 5)
7	m∠DXE + m∠AXB = m∠BXD	Substitution (3, 6)
8		
9		
10		

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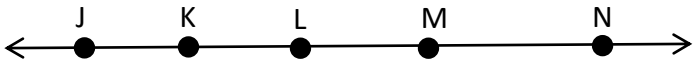
Geometry Proofs Using Definitions and Postulates Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Given: $\overline{JM} \cong \overline{KN}$

Prove: $\overline{JK} \cong \overline{MN}$



	Statement	Justification
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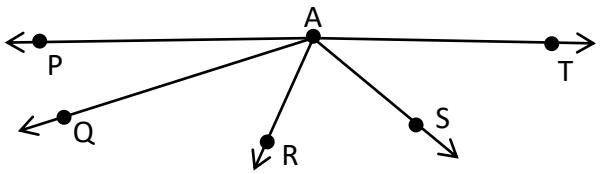
Geometry Proofs Using Definitions and Postulates Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Given: $\angle PAQ \cong \angle RAS$, $\angle RAS \cong \angle SAT$

Prove: $\angle PAS \cong \angle QAT$



	Statement	Justification
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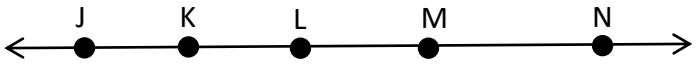
Geometry Proofs Using Definitions and Postulates Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Answer Key

Given: $\overline{JM} \cong \overline{KN}$

Prove: $\overline{JK} \cong \overline{MN}$



	Statement	Justification
1	$\overline{JM} \cong \overline{KN}$	Given
2	JM = KN	Defn. congruent
3	JK + KL + LM = JM	Segment Addition Postulate
4	KL + LM + MN = KN	Segment Addition Postulate
5	KL + LM + MN = JM	Substitution (2, 4)
6	JK + KL + LM = KL + LM + MN	Transitive Prop. (3, 5)
7	JK = MN	Subtraction Property of Eq.
8	$\overline{JK} \cong \overline{MN}$	Defn. congruent
9		
10		

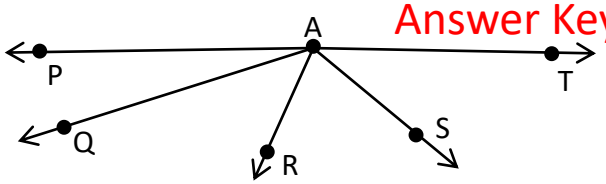
Geometry Proofs Using Definitions and Postulates Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Answer Key

Given: $\angle PAQ \cong \angle RAS$, $\angle RAS \cong \angle SAT$

Prove: $\angle PAS \cong \angle QAT$



	Statement	Justification
1	$\angle PAQ \cong \angle RAS$	Given
2	$\angle RAS \cong \angle SAT$	Given
3	$m\angle PAQ = m\angle RAS$	Defn. congruent
4	$m\angle RAS = m\angle SAT$	Defn. congruent
5	$m\angle PAQ = m\angle SAT$	Transitive Prop. (3, 4)
6	$m\angle PAQ + m\angle QAR + m\angle RAS = m\angle PAS$	Angle Addition Postulate
7	$m\angle QAR + m\angle RAS + m\angle SAT = m\angle QAT$	Angle Addition Postulate
8	$m\angle QAR + m\angle RAS + m\angle PAQ = m\angle QAT$	Substitution (5, 7)
9	$m\angle PAS = m\angle QAT$	Transitive Prop. (6, 8)
10	$\angle PAS \cong \angle QAT$	Defn. congruent

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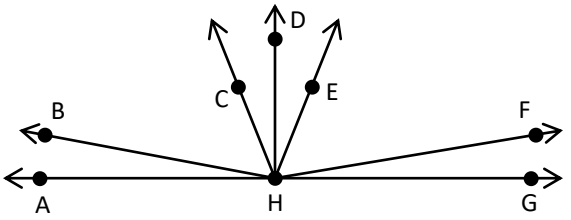
Name: _____

PROOF PUZZLE: CUT OUT STATEMENTS AND JUSTIFICATIONS AND SEE IF YOU CAN ARRANGE THEM TO DEVELOP A TWO COLUMN PROOF. YOU MIGHT NOT USE ALL OF THE PIECES. THERE MAY BE MORE THAN ONE CORRECT FINISHED PROOF.

Given: $m\angle AHB = m\angle FHG$, $m\angle CHD = m\angle DHE$, $m\angle BHD = m\angle DHF$

Prove: $m\angle CHF = m\angle BHE$



	STATEMENT	JUSTIFICATION
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13		

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Statements and Justifications to Cut Out for Proof Puzzle

Transitive Property (,)	Given
m<DHE + m<EHF = m<DHF	m<BHC + m<CHD = m<BHD
Given	Substitution (,)
Angle Addition Postulate	m<CHF = m<BHE
m<AHB = m<FHG	m<CHD + m<EHF = m<BHD
m<CHD + m<DHE + m<EHF = m<CHF	Transitive Property (,)
Angle Addition Postulate	Angle Addition Postulate
Transitive Property (,)	m<EHF + m<CHD + m<DHE = m<BHE
m<BHC + m<CHD = m<CHD + m<EHF	m<CHD = m<DHE
Substitution (,)	m<BHC = m<EHF
m<BHD = m<DHF	Substitution (,)
Given	Substitution (,)
Subtraction Property of Equality	Angle Addition Postulate
m<AHB = m<EHF	m<BHC + m<CHD + m<DHE = m<BHE
Substitution (,)	Given
m<CHD + m<EHF = m<DHF	Addition Property of Equality

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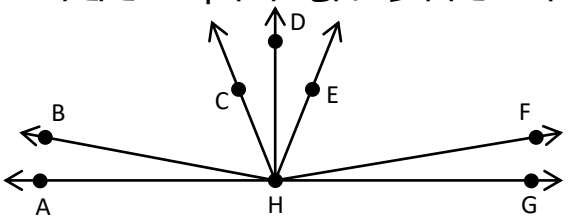
Name: _____

PROOF PUZZLE: CUT OUT STATEMENTS AND JUSTIFICATIONS AND SEE IF YOU CAN ARRANGE THEM TO DEVELOP A TWO COLUMN PROOF. YOU MIGHT NOT USE ALL OF THE PIECES. THERE MAY BE MORE THAN ONE CORRECT FINISHED PROOF.

Given: m<AHB = m<FHG, m<CHD = m<DHE, m<BHD = m<DHF

Prove: m<CHF = m<BHE



	STATEMENT	JUSTIFICATION
1	m<AHB = m<FHG	Given
2	m<CHD = m<DHE	Given
3	m<BHD = m<DHF	Given
4	m<BHC + m<CHD = m<BHD	Angle Addition Postulate
5	m<DHE + m<EHF = m<DHF	Angle Addition Postulate
6	m<CHD + m<EHF = m<DHF	Substitution (2, 5)
7	m<CHD + m<EHF = m<BHD	Substitution (3, 6)
8	m<BHC + m<CHD = m<CHD + m<EHF	Transitive Property (4, 7)
9	m<BHC = m<EHF	Subtraction Property of Equality
10	m<CHD + m<DHE + m<EHF = m<CHF	Angle Addition Postulate
11	m<BHC + m<CHD + m<DHE = m<BHE	Angle Addition Postulate
12	m<EHF + m<CHD + m<DHE = m<BHE	Substitution (9, 11)
13	m<CHF = m<BHE	Transitive Property (10, 12)

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Quiz: Writing Two-Column Proofs

Name: _____
Date: _____ Class: _____

Complete each proof.

1. Given: $a + c = 3f$
   $c = d$
   $a = 2d$

   Prove: $d = f$

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

2. Given: $x = y$
   $z = y$
   $w = x$
   $w = t$

   Prove: $t = z$

	Statement	Justification
1		
2		
3		
4		
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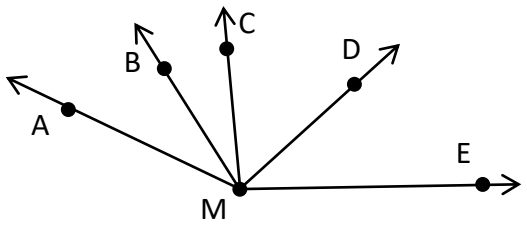
8		

3. Given: $\overrightarrow{MD}$ bisects $\angle CME$, $\angle AMB \cong \angle BMC$

   Prove: $m\angle BMD = m\angle AMB + m\angle DME$



	Statement	Justification
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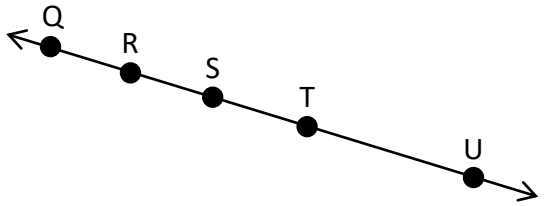
4. Given: QT = SU

Prove: QS = TU



	Statement	Justification
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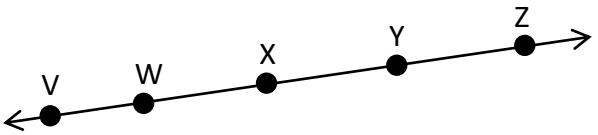
5. Given: X is the midpoint of $\overline{VZ}$ and of $\overline{WY}$
W is the midpoint of $\overline{VX}$
Y is the midpoint of $\overline{XZ}$

Prove: VY = WZ



	Statement	Justification
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QUIZ: WRITING TWO-COLUMN PROOFS

Name: _____
Date: _____ Class: _____

Complete each proof.

Answer Key

1. Given: $a + c = 3f$, $c = d$, $a = 2d$

   Prove: $d = f$

	STATEMENT	JUSTIFICATION
1	$a + c = 3f$	Given
2	$c = d$	Given
3	$a = 2d$	Given
4	$2d + c = 3f$	Substitution (1, 3)
5	$2d + d = 3f$	Substitution (2, 4)
6	$3d = 3f$	Simplified line 5
7	$d = f$	Division Prop. of Eq.
8		

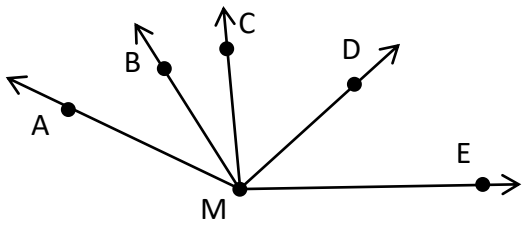
2. Given: $x = y$, $z = y$, $w = x$, $w = t$

   Prove: $t = z$

	STATEMENT	JUSTIFICATION
1	$x = y$	Given
2	$z = y$	Given
3	$w = x$	Given
4	$w = t$	Given
5	$t = x$	Transitive Prop. (3, 4)
6	$t = y$	Transitive Prop. (1, 5)
7	$t = z$	Transitive Prop. (2, 6)
8		

3. Given: $\overrightarrow{MD}$ bisects $\angle CME$, $\angle AMB \cong \angle BMC$

   Prove: $m\angle BMD = m\angle AMB + m\angle DME$



	STATEMENT	JUSTIFICATION
1	$\overrightarrow{MD}$ bisects $\angle CME$	Given
2	$\angle AMB \cong \angle BMC$	Given
3	$m\angle CMD = m\angle DME$	Defn. bisector
4	$m\angle AMB = m\angle BMC$	Defn. congruent
5	$m\angle BMC + m\angle CMD = m\angle BMD$	Angle Addition Postulate
6	$m\angle AMB + m\angle CMD = m\angle BMD$	Substitution (4, 5)
7	$m\angle AMB + m\angle DME = m\angle BMD$	Substitution (3, 6)
8	$m\angle BMD = m\angle AMB + m\angle DME$	Symmetric Prop. of Eq.
9		
10		

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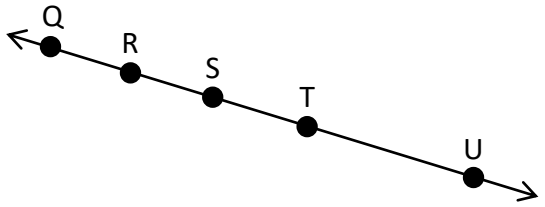
4. Given: QT = SU

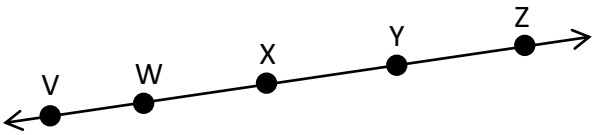
Prove: QS = TU



	Statement	Justification
1	QT = SU	Given
2	QS + ST = QT	Segment Addition Postulate
3	ST + TU = SU	Segment Addition Postulate
4	ST + TU = QT	Substitution (1, 3)
5	QS + ST = ST + TU	Transitive Prop. (2, 4)
6	QS = TU	Subtraction Prop. of Eq.
7		
8		
9		
10		

5. Given: X is the midpoint of $\overline{VZ}$ and of $\overline{WY}$
W is the midpoint of $\overline{VX}$
Y is the midpoint of $\overline{XZ}$

Prove: VY = WZ



	Statement	Justification
1	X is the midpoint of $\overline{VZ}$ and of $\overline{WY}$	Given
2	W is the midpoint of $\overline{VX}$	Given
3	Y is the midpoint of $\overline{XZ}$	Given
4	VX = XZ	Defn. midpoint
5	WX = XY	Defn. midpoint
6	VW = WX	Defn. midpoint
7	XY = YZ	Defn. midpoint
8	VW + WX + XY= VY	Segment Addition Postulate
9	WX + XY + YZ = WZ	Segment Addition Postulate
10	VW = XY	Transitive Prop. (5, 6)
11	VW = YZ	Transitive Prop (7, 10)
12	WX + XY + VW = WZ	Substitution (9, 11)
13	VY = WZ	Transitive Prop. (8, 12)

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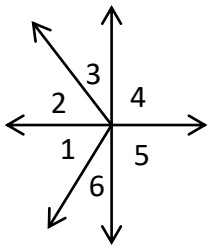
PROOFS USING SPECIAL ANGLE PAIRS

Name: _____
Date: _____ Class: _____

1. Given: $\angle 4$ is a right angle, $\angle 1 \cong \angle 2$

Prove: $\angle 2$ and $\angle 6$ are complementary.



	STATEMENT	JUSTIFICATION
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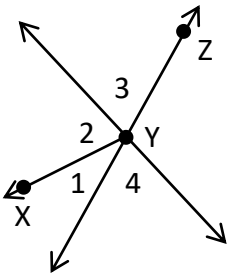
2. Given: $\angle 2$ is a right angle, $m\angle 4 = 60°$

Prove: $m\angle XYZ = 150°$



	STATEMENT	JUSTIFICATION
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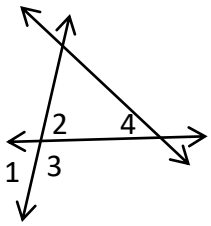
3. Given: $\angle 3$ and $\angle 4$ are supplements.

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



	STATEMENT	JUSTIFICATION
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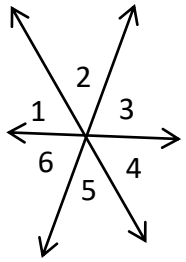
4. Given: $\angle 1 \cong \angle 2$

Prove: $\angle 5 \cong \angle 4$



	STATEMENT	JUSTIFICATION
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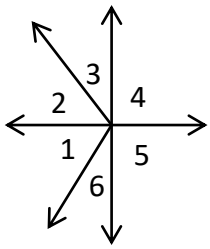
PROOFS USING SPECIAL ANGLE PAIRS

Name: _____
Date: _____ Class: _____

Answer Key

1. Given: $\angle 4$ is a right angle, $\angle 1 \cong \angle 2$

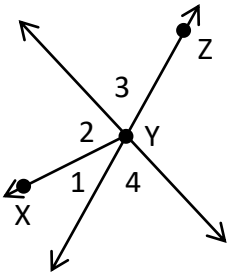
Prove: $\angle 2$ and $\angle 6$ are complementary.



	STATEMENT	JUSTIFICATION
1	$\angle 4$ is a right angle	Given
2	$\angle 1 \cong \angle 2$	Given
3	$m\angle 4 = 90$	Defn. right angle
4	$m\angle 1 = m\angle 2$	Defn. congruent
5	$m\angle 1 + m\angle 6 = m\angle 4$	Vertical Angles Theorem
6	$m\angle 1 + m\angle 6 = 90$	Substitution (3, 5)
7	$m\angle 2 + m\angle 6 = 90$	Substitution (4, 6)
8	$\angle 2$ and $\angle 6$ are complementary	Defn. complementary

2. Given: $\angle 2$ is a right angle, $m\angle 4 = 60°$

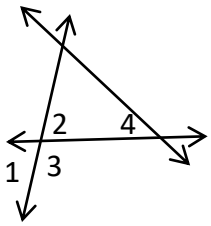
Prove: $m\angle XYZ = 150°$



	STATEMENT	JUSTIFICATION
1	$\angle 2$ is a right angle	Given
2	$m\angle 4 = 60$	Given
3	$m\angle 2 = 90$	Defn. right angle
4	$m\angle 2 + m\angle 3 = m\angle XYZ$	Angle Addition Post.
5	$m\angle 3 = m\angle 4$	Vertical Angles Theorem
6	$m\angle 2 + m\angle 4 = m\angle XYZ$	Substitution (4, 5)
7	$90 + 60 = m\angle XYZ$	Substitution (2, 3, 6)
8	$150 = m\angle XYZ$	Simplified line 7
9	$m\angle XYZ = 150$	Symmetric Prop. Of Eq.

3. Given: $\angle 3$ and $\angle 4$ are supplements.

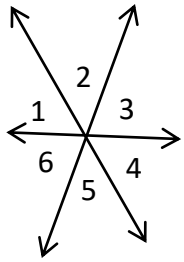
Prove: $\angle 2 \cong \angle 4$



	STATEMENT	JUSTIFICATION
1	$\angle 3$ and $\angle 4$ are suppl.	Given
2	$m\angle 3 + m\angle 4 = 180$	Defn. suppl.
3	$m\angle 2 + m\angle 3 = 180$	Linear Pair Theorem
4	$m\angle 2 + m\angle 3 = m\angle 3 + m\angle 4$	Transitive Prop. (2, 3)
5	$m\angle 2 = m\angle 4$	Subtraction Prop. Of Eq.
6	$\angle 2 \cong \angle 4$	Defn. congruent
7		
8		

4. Given: $\angle 1 \cong \angle 2$

Prove: $\angle 5 \cong \angle 4$



	STATEMENT	JUSTIFICATION
1	$\angle 1 \cong \angle 2$	Given
2	$\angle 2 \cong \angle 5$	Vertical Angles Theorem
3	$\angle 1 \cong \angle 4$	Vertical Angles Theorem
4	$\angle 1 \cong \angle 5$	Transitive Prop. (1, 2)
5	$\angle 5 \cong \angle 4$	Transitive Prop. (3, 4)
6		
7		
8		

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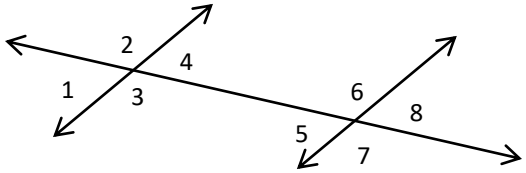
Geometry Proofs Using Special Angle Pairs Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Given: $\angle 4 \cong \angle 8$

Prove: $\angle 4 \cong \angle 5$



	Statement	Justification
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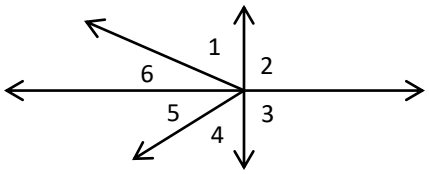
Geometry Proofs Using Special Angle Pairs Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Given: $\angle 2$ is a right angle, $\angle 4 \cong \angle 6$

Prove: $\angle 5$ and $\angle 6$ are complementary.



	Statement	Justification
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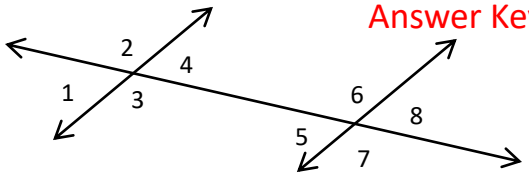
Geometry Proofs Using Special Angle Pairs Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Answer Key

Given: $\angle 4 \cong \angle 8$

Prove: $\angle 4 \cong \angle 5$



	Statement	Justification
1	$\angle 4 \cong \angle 8$	Given
2	$\angle 5 \cong \angle 8$	Vertical Angles Theorem
3	$\angle 4 \cong \angle 5$	Transitive Prop. (1, 2)
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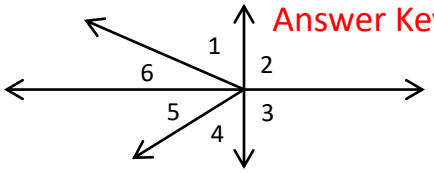
Geometry Proofs Using Special Angle Pairs Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Answer Key

Given: $\angle 2$ is a right angle, $\angle 4 \cong \angle 6$

Prove: $\angle 5$ and $\angle 6$ are complementary.



	Statement	Justification
1	$\angle 2$ is a right angle	Given
2	$\angle 4 \cong \angle 6$	Given
3	$m\angle 2 = 90$	Defn. right angle
4	$m\angle 4 = m\angle 6$	Defn. congruent
5	$m\angle 4 + m\angle 5 = m\angle 2$	Vertical Angles Theorem
6	$m\angle 4 + m\angle 5 = 90$	Substitution (4, 5))
7	$m\angle 6 + m\angle 5 = 90$	Substitution (4, 6)
8	$\angle 5$ and $\angle 6$ are complementary	Defn. complementary
9		
10		

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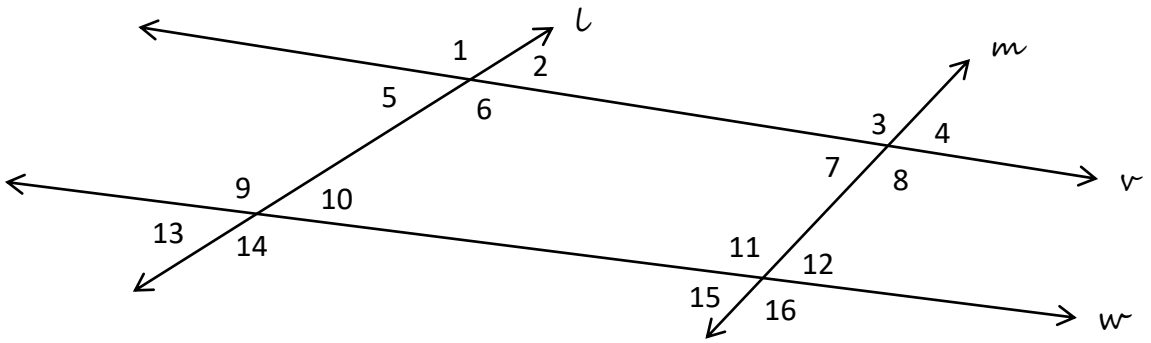
PROOFS WITH SPECIAL ANGLES ALONG TRANSVERSALS

Name: _____
Date: _____ Class: _____



1. Given: $\angle 2 \cong \angle 7$

Prove: $\angle 14 \cong \angle 16$

	STATEMENT	JUSTIFICATION
1		
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8		

2. Given: $v \parallel w$, $\angle 7 \cong \angle 11$

Prove: $m\angle 16 = 90°$

	STATEMENT	JUSTIFICATION
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3. Given: $l \parallel m$, $v \parallel w$

Prove: $\angle 1 \cong \angle 16$

	STATEMENT	JUSTIFICATION
1		
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5		
6		
7		
8		

4. Given: $\angle 13 \cong \angle 4$, $l \parallel m$

Prove: $v \parallel w$

	STATEMENT	JUSTIFICATION
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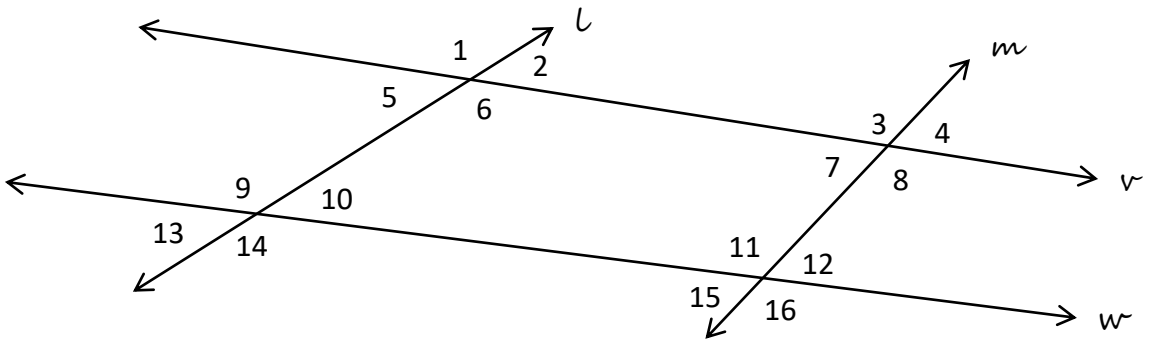
PROOFS WITH SPECIAL ANGLES ALONG TRANSVERSALS

Name: _____
Date: _____ Class: _____



1. Given: $\angle 2 \cong \angle 7$

Prove: $\angle 14 \cong \angle 16$

	STATEMENT	JUSTIFICATION
1	$\angle 2 \cong \angle 7$	Given
2	$l \parallel m$	Converse of Alt. Int. Angles Thm.
3	$\angle 14 \cong \angle 16$	Corresp. Angles Post.
4		
5		
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7		
8		

2. Given: $v \parallel w$, $\angle 7 \cong \angle 11$

Prove: $m\angle 16 = 90°$

	STATEMENT	JUSTIFICATION
1	$v \parallel w$	Given
2	$\angle 7 \cong \angle 11$	Given
3	$m\angle 7 = m\angle 11$	Defn. congruent
4	$m\angle 7 + m\angle 11 = 180$	Same-Side Int. Angles Thm.
5	$m\angle 11 + m\angle 11 = 180$	Substitution (3, 4)
6	$2(m\angle 11) = 180$	Simplified line 5
7	$m\angle 11 = 90$	Division Prop. Of Eq.
8	$m\angle 11 = m\angle 16$	Vertical Angles Thm.
9	$m\angle 16 = 90$	Substitution (7, 8)

3. Given: $l \parallel m$, $v \parallel w$

Prove: $\angle 1 \cong \angle 16$

	STATEMENT	JUSTIFICATION
1	$l \parallel m$	Given
2	$v \parallel w$	Given
3	$\angle 1 \cong \angle 3$	Corresp. Angles Post.
4	$\angle 3 \cong \angle 16$	Alt. Ext. Angles Thm.
5	$\angle 1 \cong \angle 16$	Transitive Prop. (3, 4)
6		
7		
8		

4. Given: $\angle 13 \cong \angle 4$, $l \parallel m$

Prove: $v \parallel w$

	STATEMENT	JUSTIFICATION
1	$\angle 13 \cong \angle 4$	Given
2	$l \parallel m$	Given
3	$\angle 13 \cong \angle 15$	Corresp. Angles Post.
4	$\angle 4 \cong \angle 15$	Transitive Prop. (1, 3)
5	$v \parallel w$	Converse of Alt. Ext. Angles Thm.
6		
7		
8		

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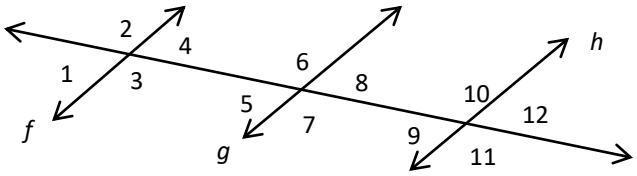
Geometry Proofs Using Transversals
Warm-Up / Exit Ticket A

Name: _____
Date: _____ Class: _____

Given: **<11 and <1 are supplementary.**

Prove: **<3 ≅ <10**



	Statement	Justification
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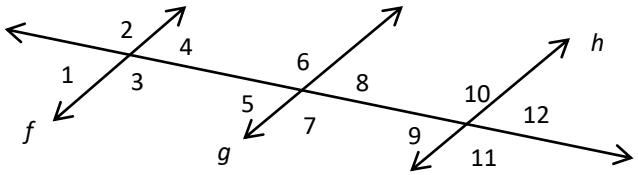
Geometry Proofs Using Transversals
Warm-Up / Exit Ticket B

Name: _____
Date: _____ Class: _____

Given: **<12 ≅ <4, <12 ≅ <5**

Prove: **m<3 + m<5 = 180°**



	Statement	Justification
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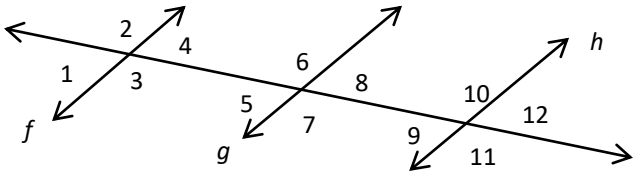
Geometry Proofs Using Transversals
Warm-Up / Exit Ticket A

Answer Key

Name: _____
Date: _____ Class: _____

Given: $\angle 11$ and $\angle 1$ are supplementary.

Prove: $\angle 3 \cong \angle 10$



	Statement	Justification
1	$\angle 11$ and $\angle 1$ are supplementary	Given
2	f ∥ h	Converse of Same-Side Exterior Angles Theorem
3	$\angle 3 \cong \angle 10$	Alternate Interior Angles Theorem
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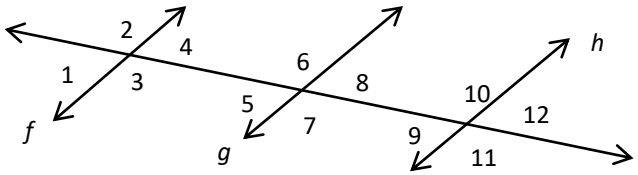
Geometry Proofs Using Transversals
Warm-Up / Exit Ticket B

Answer Key

Name: _____
Date: _____ Class: _____

Given: $\angle 12 \cong \angle 4$, $\angle 12 \cong \angle 5$

Prove: $m\angle 3 + m\angle 5 = 180°$



	Statement	Justification
1	$\angle 12 \cong \angle 4$	Given
2	$\angle 12 \cong \angle 5$	Given
3	$\angle 4 \cong \angle 5$	Transitive Property (1, 2)
4	f ∥ g	Converse of Alternate Interior Angles Theorem
5	$m\angle 3 + m\angle 5 = 180$	Same-Side Interior Angles Theorem
6		
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9		
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PROOFS WITH TRIANGLES

Name: _____
Date: _____ Class: _____

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

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

	STATEMENT	JUSTIFICATION
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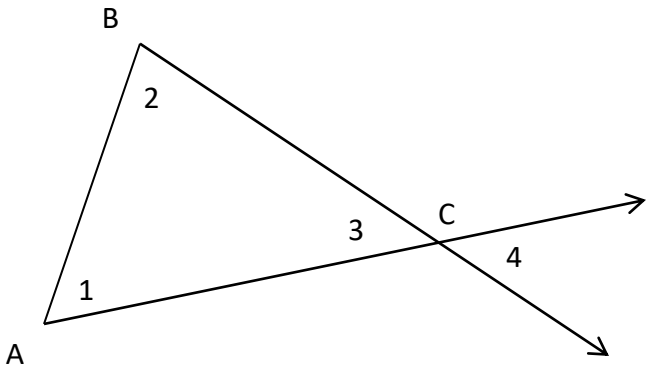

2. Given: $m\angle 1 + m\angle 2 = 140°$

Prove: $m\angle 4 = 40°$

	STATEMENT	JUSTIFICATION
1		
2		
3		
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6		

3. Given: $AC = AB$

Prove: $m\angle 2 = m\angle 4$

	STATEMENT	JUSTIFICATION
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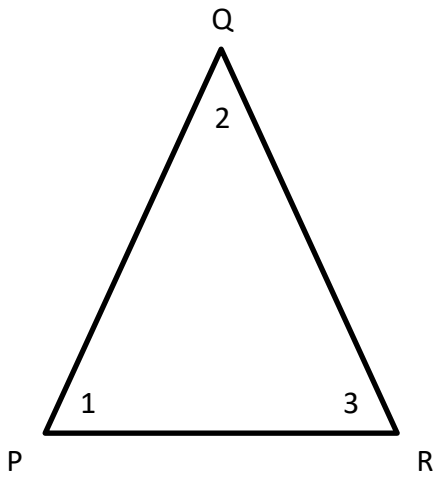

4. Given: $\angle 1 \cong \angle 3$, $\angle 1 \cong \angle 2$

Prove: $\overline{PQ} \cong \overline{PR}$

	STATEMENT	JUSTIFICATION
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5		
6		

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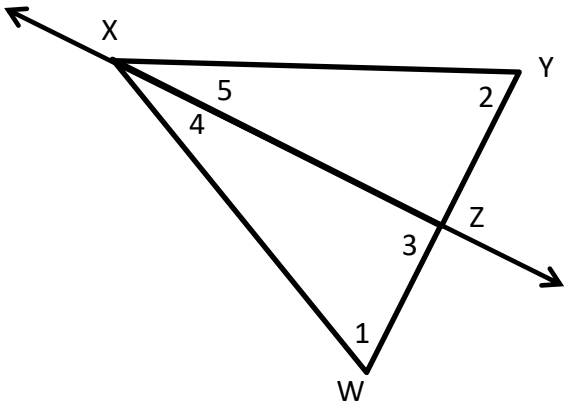
Name: _____
Date: _____ Class: _____



5. Given: $\angle 1 \cong \angle 2$, $XW = WY$

Prove: $WY = XY$

	Statement	Justification
1		
2		
3		
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8		

6. Given: $WY = XW$

Prove: $m\angle 4 + m\angle 5 = m\angle 2$

	Statement	Justification
1		
2		
3		
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5		
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7		
8		

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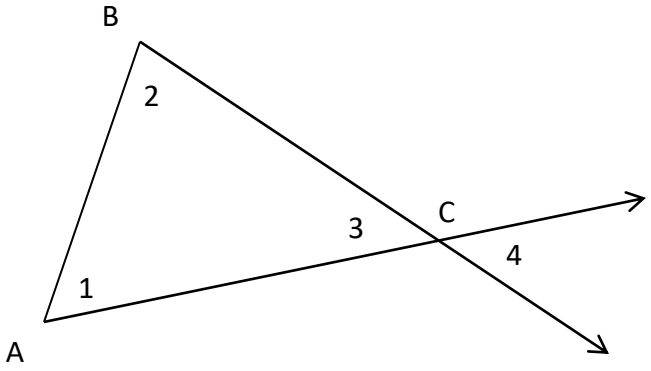
PROOFS WITH TRIANGLES

Name: _____
Date: _____ Class: _____

Answer Key

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

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



	STATEMENT	JUSTIFICATION
1	$\angle 1 \cong \angle 4$	Given
2	$\angle 3 \cong \angle 4$	Vertical Angles Theorem
3	$\angle 1 \cong \angle 3$	Transitive Prop. (1, 2)
4	$\overline{AB} \cong \overline{BC}$	Converse of Base Angles of Isos. Triangle Thm.
5		
6		

2. Given: $m\angle 1 + m\angle 2 = 140°$

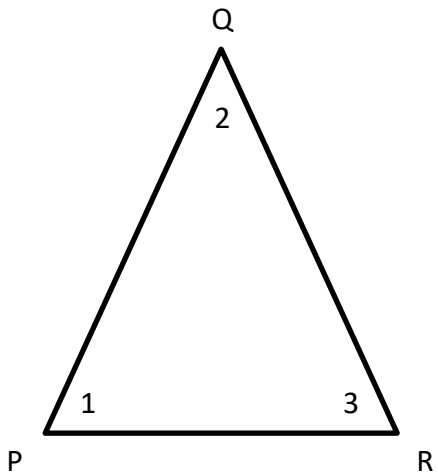
Prove: $m\angle 4 = 40°$

	STATEMENT	JUSTIFICATION
1	$m\angle 1 + m\angle 2 = 140$	Given
2	$m\angle 1 + m\angle 2 + m\angle 3 = 180$	Triangle Sum Theorem
3	$140 + m\angle 3 = 180$	Substitution (1, 2)
4	$m\angle 3 = 40$	Subtraction Prop. of Eq.
5	$m\angle 3 = m\angle 4$	Vertical Angles Theorem
6	$m\angle 4 = 40$	Substitution (4, 5)

3. Given: $AC = AB$

Prove: $m\angle 2 = m\angle 4$

	STATEMENT	JUSTIFICATION
1	$AC = AB$	Given
2	$m\angle 2 = m\angle 3$	Base Angles of Isos. Triangle Thm.
3	$m\angle 3 = m\angle 4$	Vertical Angles Theorem
4	$m\angle 2 = m\angle 4$	Transitive Prop. (2, 3)
5		
6		



4. Given: $\angle 1 \cong \angle 3$, $\angle 1 \cong \angle 2$

Prove: $\overline{PQ} \cong \overline{PR}$

	STATEMENT	JUSTIFICATION
1	$\angle 1 \cong \angle 3$	Given
2	$\angle 1 \cong \angle 2$	Given
3	$\angle 2 \cong \angle 3$	Transitive Prop. (1, 2)
4	$\overline{PQ} \cong \overline{PR}$	Converse of Base Angles of Isos. Triangle Thm.
5		
6		

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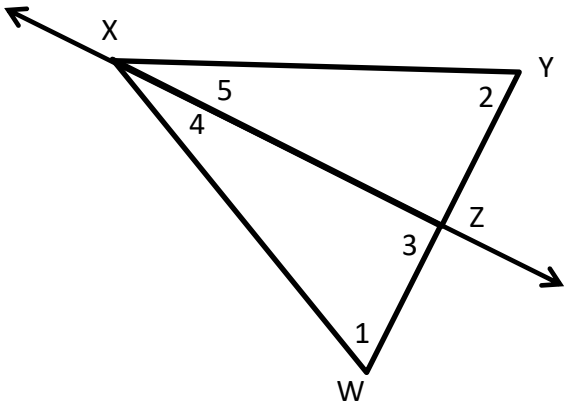
Name: _____
Date: _____ Class: _____



5. Given: $\angle 1 \cong \angle 2$, $XW = WY$

Prove: $WY = XY$

	STATEMENT	JUSTIFICATION
1	$\angle 1 \cong \angle 2$	Given
2	$XW = WY$	Given
3	$XW = XY$	Converse of Base Angles of Isos. Triangle Thm.
4	$WY = XY$	Transitive Prop. (2, 3)
5		
6		
7		
8		

6. Given: $WY = XW$

Prove: $m\angle 4 + m\angle 5 = m\angle 2$

	STATEMENT	JUSTIFICATION
1	$WY = XW$	given
2	$m\angle WXY = m\angle 2$	Base Angles of Isos. Triangle Thm.
3	$m\angle 4 + m\angle 5 = m\angle WXY$	Angle Addition Post.
4	$m\angle 4 + m\angle 5 = m\angle 2$	Substitution (2, 3)
5		
6		
7		
8		

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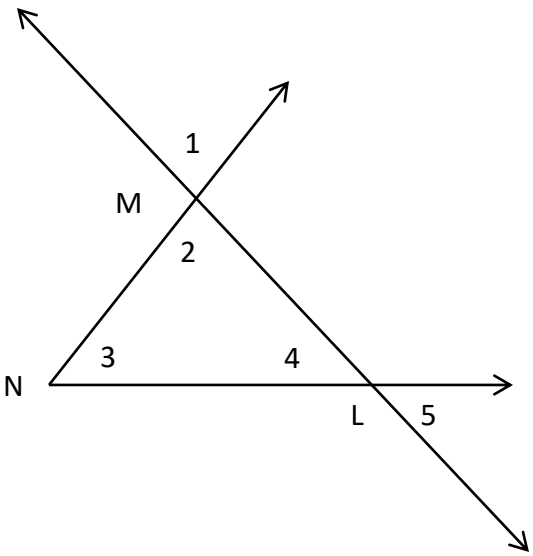
Quiz: Proofs Using Special Angle Pairs and Triangles

Complete each proof.

Name: _____
Date: _____ Class: _____



1. Given: $\angle 1 \cong \angle 5$

Prove: $\overline{MN} \cong \overline{NL}$

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

2. Given: $\overline{MN} \cong \overline{ML}$

Prove: $\angle 3 \cong \angle 5$

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

3. Given: $m\angle 2 = 90°$, $m\angle 4 = 60°$

Prove: $m\angle 3 = 30°$

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

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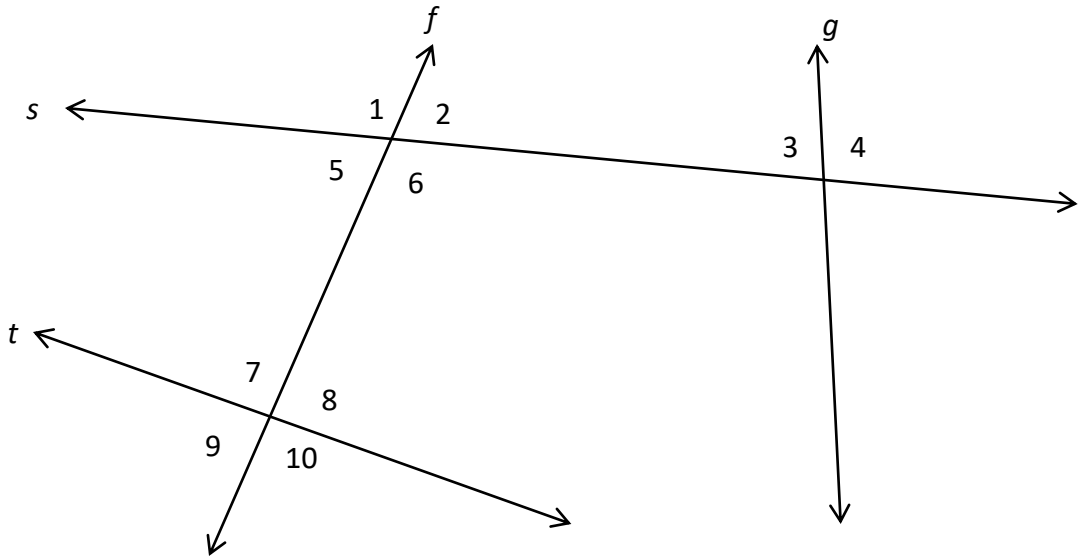

4. **Given:** f ∥ g, ∠3 ≅ ∠7

Prove: s ∥ t

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		
9		

5. **Given:** ∠8 ≅ ∠6, s ∥ t

Prove: m∠2 = 90°

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		
9		

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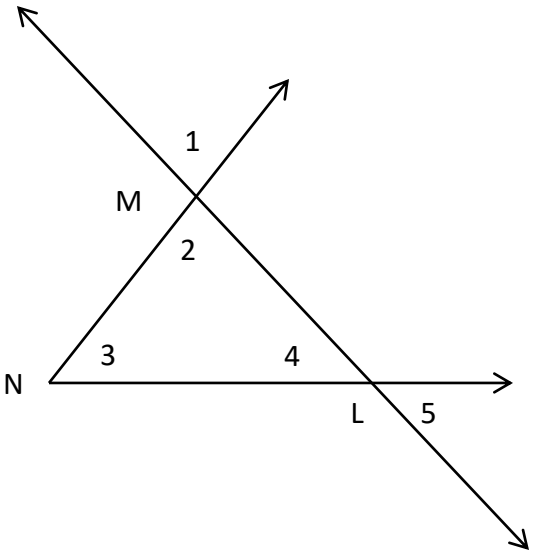
Quiz: Proofs Using Special Angle Pairs and Triangles

Complete each proof.

Name: _____
Date: _____ Class: _____

Answer Key



1. Given: ∠1 ≅ ∠5

Prove: $\overline{MN} \cong \overline{NL}$

	Statement	Justification
1	∠1 ≅ ∠5	Given
2	∠1 ≅ ∠2	Vertical Angles Theorem
3	∠4 ≅ ∠5	Vertical Angles Theorem
4	∠2 ≅ ∠5	Transitive Prop. (1, 2)
5	∠2 ≅ ∠4	Transitive Prop. (3, 4)
6	$\overline{MN} \cong \overline{NL}$	Converse of Base Angles of Isos. Triangle Thm.
7		
8		

2. Given: $\overline{MN} \cong \overline{ML}$

Prove: ∠3 ≅ ∠5

	Statement	Justification
1	$\overline{MN} \cong \overline{ML}$	Given
2	∠3 ≅ ∠4	Base Angles of Isos. Triangle. Thm.
3	∠4 ≅ ∠5	Vertical Angles Theorem
4	∠3 ≅ ∠5	Transitive Prop. (2, 3)
5		
6		
7		
8		

3. Given: m∠2 = 90°, m∠4 = 60°

Prove: m∠3 = 30°

	Statement	Justification
1	m∠2 = 90	Given
2	m∠4 = 60	Given
3	m∠2 + m∠4 + m∠3 = 180	Triangle Sum Theorem
4	90 + 60 + m∠3 = 180	Substitution (1, 2, 3)
5	150 + m∠3 = 180	Simplified line 4
6	m∠3 = 30	Subtraction Prop. of Eq.
7		
8		

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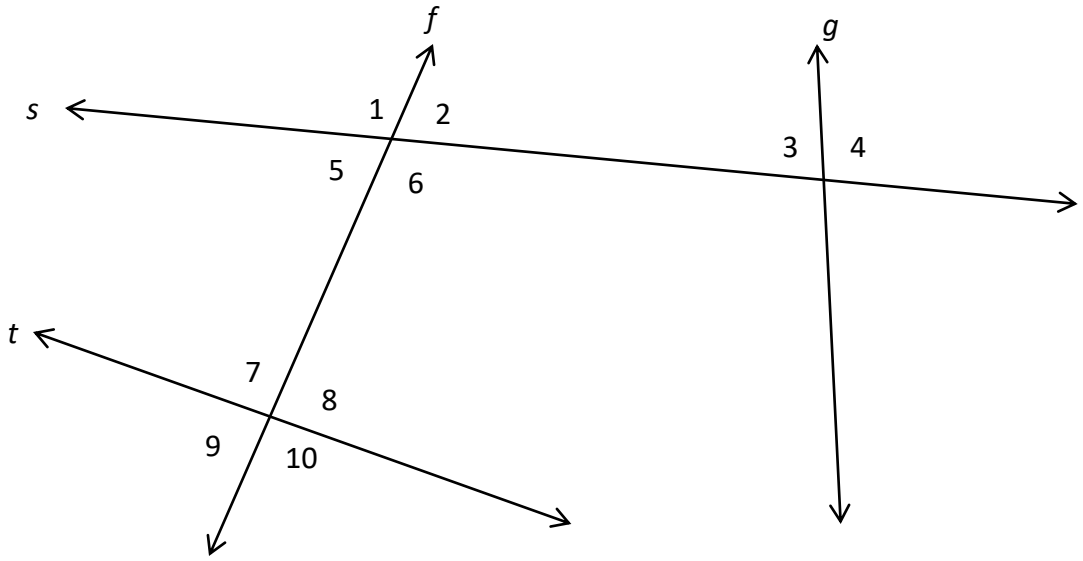

4. **Given:** f ∥ g, ∠3 ≅ ∠7

Prove: s ∥ t

	Statement	Justification
1	f ∥ g	Given
2	∠3 ≅ ∠7	Given
3	∠3 ≅ ∠1	Corresp. Angles Post.
4	∠1 ≅ ∠7	Transitive Prop. (2, 3)
5	s ∥ t	Converse of Corresp. Angles Post.
6		
7		
8		
9		

5. **Given:** ∠8 ≅ ∠6, s ∥ t

Prove: m∠2 = 90°

	Statement	Justification
1	∠8 ≅ ∠6	Given
2	s ∥ t	Given
3	m∠8 = m∠6	Defn. congruent
4	m∠8 + m∠6 = 180	Same-Side Interior Angles Thm.
5	m∠8 + m∠8 = 180	Substitution (3, 4)
6	2 (m∠8) = 180	Simplified line 5
7	m∠8 = 90	Division Prop. of Eq.
8	m∠2 = m∠8	Corresp. Angles Post.
9	m∠2 = 90	Substitution (7, 8)

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Two- Column Proof Template

Name: _____
Date: _____ Class: _____

1. Given:

Prove:

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

2. Given:

Prove:

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

3. Given:

Prove:

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

4. Given:

Prove:

	Statement	Justification
1		
2		
3		
4		
5		
6		
7		
8		

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TWO-COLUMN PROOF TEMPLATE

Name: _____
Date: _____ Class: _____

Given:

Prove:

	STATEMENT	JUSTIFICATION
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Given:

Prove:

	STATEMENT	JUSTIFICATION
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

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