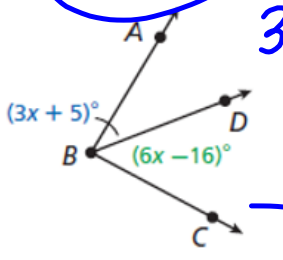
1. Given: $m\angle ABD = 3x + 5$, $m\angle DBC = 6x - 16$, $m\angle ABC = 8x$



$m\angle ABC = 8x°$

Prove: x = 11

$3x+5+6x-16=8x$

$9x-11=8x$

$+11 \quad +11$

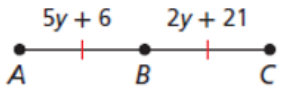
$9x=8x+11$

$-8x \quad -8x$

$x=11$

STATEMENTS	REASONS
$m\angle ABD = 3x+5$ $m\angle DBC = 6x-16$ $m\angle ABC = 8x$	Given
$3x+5+6x-16=8x$	Angle Addition.
$9x-11=8x$	Combine like terms
$9x=8x+11$	Add prop. of =
$x=11$	Sub prop of =

2. Given: B is the midpoint of AC.



Prove: y = 5

$5y+6=2y+21$

$-2y \quad -2y$

$3y+6=21$

$-6 \quad -6$

$3y=15$

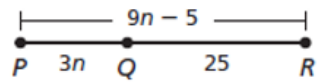
$\frac{3y}{3}=\frac{15}{3}$

$y=5$

STATEMENTS	REASONS
B is midpt of AC	Given
$AB = 5y+6$, $BC = 2y+21$	Def. of midpt
$AB = BC$	Substitution
$5y+6=2y+21$	sub of =
$3y+6=21$	sub prop. of =
$3y=15$	Division prop of =
$y=5$	

$m\overline{PR} = 9n - 5$

3. Given: $m\overline{PR} = 9n - 5$
$m\overline{PQ} = 3n$
$m\overline{QR} = 25$



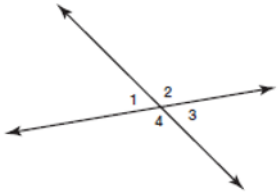
Prove: n = 5

$3n + 25 = 9n - 5$
$-9n \quad -9n$
$-6n + 25 = -5$
$-25 \quad -25$
$-6n = -30$
$\frac{-6n}{-6} = \frac{-30}{-6}$
$n = 5$

STATEMENTS	REASONS
$m\overline{PR} = 9n-5$ $PQ = 3n$ $QR = 25$	Given
$3n+25=9n-5$	Segment Addition
$-6n+25=-5$	Subprop of =
$-6n=-30$	Subprop of =
$n=5$	div. prop of =

Geometric Proofs

When writing a geometric proof, you use deductive reasoning to create a chain of logical steps that move from the hypothesis to the conclusion of the conjecture you are proving. By proving the conclusion is true, you have proven the original conjecture is true.

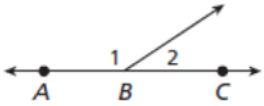


Hypothesis → • Definitions • Postulates • Properties • Theorems → Conclusion

When writing a proof, it is important to justify each logical step with a reason. You can use symbols and abbreviations, but they must be clear enough so that anyone who reads your proof will understand them.

Practice:
Fill in the blanks to complete a two column proof of the Linear Pair Theorem.

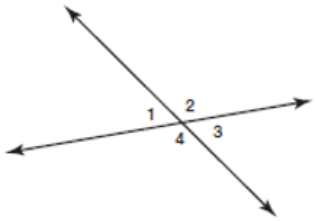
Given: Angle 1 and 2 form a linear pair.
Prove: Angle 1 and 2 are supplementary.



Statements	Reasons
1. ∠1 and ∠2 form a linear pair.	1. Given
2. BA and BC form a line.	2. Def. of a line
3. m∠ABC = 180°	3. Def of straight angle
4. $\angle 1 + \angle 2 = \angle ABC$	4. Angle Addition Postulate
5. $\angle 1 + \angle 2 = 180$	5. Substitution
6. ∠1 and ∠2 are supplementary	6. Def. of supplementary

Prove the Vertical Angles Theorem using a two column proof.

Given: Angle 4 and 1 are a linear pair.
Angle 1 and 2 are a linear pair.
Prove: $\angle 2 \cong \angle 4$

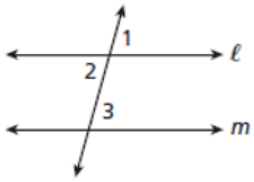


Statements	Reasons
1. $\angle 4$ & $\angle 1$ are a linear pair	1. Given
2. $\angle 1$ & $\angle 2$ are a linear pair	2. Given
3. $\angle 4$ and $\angle 1$ are Supp.	3. Linear Pair Theorem
4. $\angle 1$ & $\angle 2$ are Supp	4. Linear Pair Theorem
5. $m\angle 4 + m\angle 1 = 180$	5. Definition of Supplementary Angles
6. $m\angle 1 + m\angle 2 = 180$	6. Definition of Supplementary Angles
7. $m\angle 1 + m\angle 2 = m\angle 4 + m\angle 1$	7. Substitution
8. $m\angle 2 = m\angle 4$	8. Subtraction Property
9. $\angle 2 \cong \angle 4$	9. Definition of Congruent Angles

1

Prove the Alternate Interior Angles are Congruent Theorem using a two column proof:

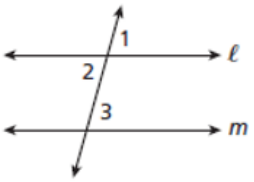
Given: l // m
Prove: ∠ 2 ≅ ∠ 3



Statements	Reasons
1. l // m	1. Given
2. ∠1 ≅ ∠2	2. Vertical Angles are Congruent
3. ∠1 ≅ ∠3	3. Corresponding Angles Postulate
4. ∠2 ≅ ∠3	4. Transitive Property

Prove that Corresponding Angles are congruent using a two column proof:

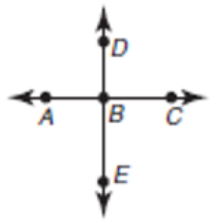
Given: l // m
Prove: ∠ 1 ≅ ∠ 3



Statements	Reasons
1. l // m	1. Given
2. ∠ 1 ≅ ∠ 2	2. Vertical ∠s are ≅
3. ∠ 3 ≅ ∠ 2	3. Alt. interior ∠ thm
4. ∠ 1 ≅ ∠ 3	4. Transitive Property

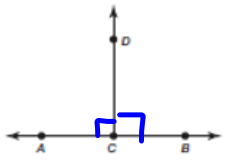
Prove the following using a two column proof:

Given: $\overleftrightarrow{AC} \perp \overleftrightarrow{DE}$
Prove: $\angle ABD \cong \angle CBD$



Statements	Reasons
1. $\overleftrightarrow{AC} \perp \overleftrightarrow{DE}$	1. Given
2. $\angle ABD$ is a Rt $\angle$	2. Definition of Perpendicular Lines
3. $\angle CBD$ is a right angle	3. Definition of Perpendicular Lines
4. $m\angle ABD = m\angle CBD$	4. Right $\angle$s are $\cong$ OR Transitive Prop.
5. $\angle ABD \cong \angle CDB$	5. Definition of Congruent Angles

Prove the Right Angle Congruence Theorem using a two column proof.
Given: $\angle ACD$ and $\angle BCD$ are right angles
Prove: $\angle ACD \cong \angle BCD$

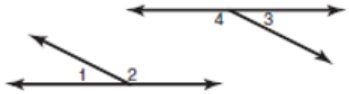


Statements	Reasons
1. $\angle ACD$ is a Rt $\angle$	1. Given
2. $\angle BCD$ is a Rt $\angle$	2. Given
3. $m\angle ACD = 90°$	3. Def. of Rt $\angle$
4. $m\angle BCD = 90°$	4. Def. of Rt $\angle$
5. $m\angle ACD = m\angle BCD$	5. Transitive Property
6. $\angle ACD \cong \angle BCD$	6. Def of Congruent $\angle$s

2

Prove the Congruent Supplement Theorem using a two column proof:

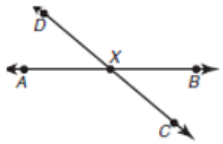
Given: ∠ 2 ≅ ∠ 4
Angle 1 is supplementary to angle 2
Angle 3 is supplementary to angle 4
Prove: ∠ 1 ≅ ∠ 3



Statements	Reasons
1. ∠ 2 ≅ ∠ 4	1. Given
2. m<2 = m<4	2. Definition of congruent angles
3. <1 is supp <2	3. Given
4. <3 is supp <4	4. Given
5. m<1 + <m2 = 180°	5. Defintion of supplementary angles
6. m∠3 + m∠4 = 180°	6. Def. of suppl. <s
7. m<1+m<2 = m<3 + m<4	7. Substitution Property
8. m∠1 + m∠2 = m∠3 + m∠2	8. Substitutio prop
9. m<1 = m<3	9. Subtraction Property of Equality
10. <1 ≅ <3	10. Def. of ≅

Prove the following using a two column proof:

Given: $m\overline{AX} = m\overline{CX}$, $m\overline{BX} = m\overline{DX}$
Prove: $m\overline{AB} = m\overline{CD}$



Statements	Reasons
1. $m\overline{BX} = m\overline{DX}$	1. _____
2. $m\overline{AX} = m\overline{CX}$	2. _____
3. $m\overline{AX} + m\overline{BX} = m\overline{CX} + m\overline{BX}$	3. _____
4. $m\overline{AX} + m\overline{BX} = m\overline{CX} + m\overline{DX}$	4. _____
5. $m\overline{AX} + m\overline{BX} = m\overline{AB}$	5. _____
6. $m\overline{CX} + m\overline{DX} = m\overline{CD}$	6. _____
7. $m\overline{AB} = m\overline{CD}$	7. _____