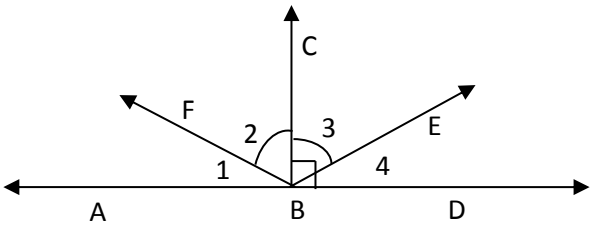
Name _____ Date _____ Period _____

Section 2-6: Geometric Proof

Objectives: 1. Write two-column proofs.
2. Prove geometric theorems by using deductive reasoning.

Choices for Reasons in Proofs

Reason	If you see this…. (examples)
Congruent Complements Theorem	If two angles are complementary to the same angle (or to two congruent angles), then the two angles are congruent.
Congruent Supplements Theorem	If two angles are supplementary to the same angle (or to two congruent angles), then the two angles are congruent.
Right Angle Theorem	If two angles are right angles, then they are congruent.
Linear Pair Theorem	If two angles form a linear pair, then they are supplementary.
Angle Addition Postulate	$m\angle 1 + m\angle 2 = m\angle 3$
Segment Addition Postulate	AB + BC = AC
Reflexive Property of =	a = a
Symmetric Property of =	If a = b, then b = a.
Transitive Property of =	If a = b and b = c, then a = c.
Distributive	If a(b + c) then ab + ac.
Substitution	If a + b = c and b = 2, then a + 2 = c.
Addition Property of =	If a – 4 = 7, then a = 11.
Subtraction Property of =	If a + 2 = 10, then a = 8.
Multiplication Property of =	If x/2 = 4, then x = 8.
Division Property of =	If 3x = 21, then x = 7.
Definition of Congruent Angles	Angles that have the same measure.
Definition of Congruent Segments	Segments that have the same measure.
Definition of Midpoint	Point that divides a segment into two congruent segments.
Definition of Segment Bisector	Line, ray or segment that divides a segment into two congruent segments.
Definition of Angle Bisector	Ray that divides an angle into two congruent angles.
Definition of Right Angle	Angle that measures 90 degrees.
Definition of Straight Angle	Angle that measures 180 degrees.
Definition of Complementary	Two angles that add to 90 degrees.
Definition of Supplementary	Two angles that add to 180 degrees.
Definition of Linear Pair	Adjacent angles that form a straight angle.



Justify the given statement using the picture above.

1. m∠1 + m∠2 = m∠ABC _____

2. If B is the midpoint of $\overline{AD}$, then AB = BD. _____

3. If $\overrightarrow{BC}$ bisects ∠FBE, then ∠2 ≅ ∠3. _____

4. If ∠1 and ∠FBD are supplementary, then m∠1 + m∠FBD = 180°_____

5. If m∠CBD = 90°, then ∠CBD is a right angle. _____

6. AB + BD = AD _____

7. If m∠2 = m∠3, then $\overrightarrow{BC}$ bisects ∠FBE. _____

8. If m∠3 + m∠4 = 90°, then ∠3 and ∠4 are complementary. _____

9. If ∠ABC and ∠CBD are right angles, then ∠ABC ≅ ∠CBD. _____

10. If ∠1 ≅ ∠2 and ∠2 ≅ ∠3, then ∠1 ≅ ∠3. _____

The following five steps are used to give geometric proofs:

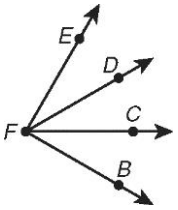
The Proof Process
1. Write the conjecture to be proven.
2. Draw a diagram if one is not provided.
3. State the given information and mark it on the diagram.
4. State the conclusion of the conjecture in terms of the diagram.
5. Plan your argument and prove your conjecture.

Mark the diagram and answer the questions about the following proof.

Given: $\overrightarrow{FD}$ bisects $\angle EFC$.

$\overrightarrow{FC}$ bisects $\angle DFB$.

Prove: $\angle EFD \cong \angle CFB$



Proof:

1. $\overrightarrow{FD}$ bisects $\angle EFC$, $\overrightarrow{FC}$ bisects $\angle DFB$.	1. Given
2. $\angle EFD \cong \angle DFC$, $\angle DFC \cong \angle CFB$	2. Definition of $\angle$ bisector
3. $m\angle EFD = m\angle DFC$, $m\angle DFC = m\angle CFB$	3. Definition of $\cong$ $\measuredangle$s
4. $m\angle EFD = m\angle CFB$	4. Transitive Property of Equality
5. $\angle EFD \cong \angle CFB$	5. Definition of $\cong$ $\measuredangle$s

11. What was the given information?

_____

12. What should be marked in the diagram?

_____

13. What was the conjecture to be proved?

_____

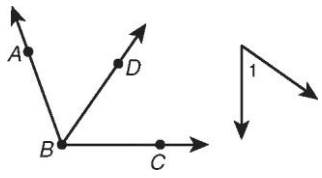
14. What titles should be put above the two columns?

_____

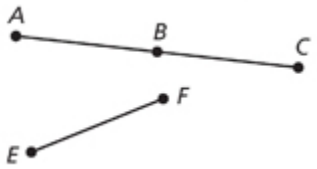
15. What property of equality was used to prove the angles congruent?

_____

16. Given: $\overrightarrow{BD}$ is the angle bisector of ∠*ABC*, and ∠*ABD* ≅ ∠1.
Prove: ∠*DBC* ≅ ∠1



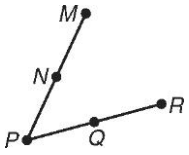
1. $\overrightarrow{BD}$ is the angle bisector of ∠*ABC*.	1. _____
2. ∠*ABD* ≅ ∠*DBC*	2. _____
3. ∠*ABD* ≅ ∠1	3. _____
4. ∠*DBC* ≅ ∠1	4. _____



17. Given: B is the midpoint of $\overline{AC}$ and $\overline{AB} \cong \overline{EF}$
Prove: $\overline{BC} \cong \overline{EF}$

1. B is the midpoint of $\overline{AC}$	1. _____
2. $\overline{\mathrm{AB}} \cong \overline{\mathrm{BC}}$	2. _____
3. $\overline{AB} \cong \overline{EF}$	3. _____
4. $\overline{BC} \cong \overline{EF}$	4. _____

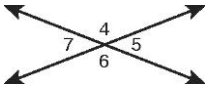
18**. Given:** *N* is the midpoint of $\overline{MP}$, *Q* is the midpoint of $\overline{RP}$, and $\overline{PQ} \cong \overline{NM}$.
Prove: $\overline{PN} \cong \overline{QR}$



1. *N* is the midpoint of $\overline{MP}$.	1. _____
2. *Q* is the midpoint of $\overline{RP}$.	2. _____
3. $\overline{PN} \cong \overline{NM}$	3. _____
4. $\overline{PQ} \cong \overline{NM}$	4. _____
5. $\overline{PN} \cong \overline{PQ}$	5. _____
6. $\overline{PQ} \cong \overline{QR}$	6. _____
7. $\overline{PN} \cong \overline{QR}$	7. _____

19. Given: ∠4 and ∠5 are supplementary and ∠5 and ∠6 are supplementary.

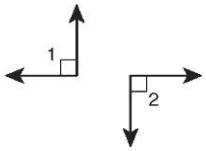
Prove: ∠4 ≅ ∠6



Statements	Reasons
1. ∠4 and ∠5 are supplementary.	1.
2. ∠5 and ∠6 are supplementary.	2.
3. m∠4 + m∠5 = 180°	3.
4. m∠5 + m∠6 = 180°	4.
5. m∠4 + m∠5 = m∠5 + m∠6	5.
6. m∠4 = m∠6	6.
7. ∠4 ≅ ∠6	7.

20. Given: ∠1 and ∠2 are right angles.

Prove: ∠1 ≅ ∠2



Statements	Reasons
1. ∠1 and ∠2 are right angles	1.
2. m∠1 = 90°	2.
3. m∠2 = 90°	3.
4. m∠1 = m∠2	4.
5. ∠1 ≅ ∠2	5.