

### Bell Ringer

Thursday 1/23

Fill in the reason that justifies each step.  
 Given:  $\angle ABD$  and  $\angle DBC$  are supplementary.  
 Prove:  $x = 50$

$\angle ABD \neq \angle DBC$  are supp. Given

Statements	Reasons
1. $m\angle ABD + m\angle DBC = 180$	1. Def. of Supp.
2. $x + 2x + 30 = 180$	2. Substitution Prop.
3. $3x + 30 = 180$	3. Substitution Prop.
4. $3x = 150$	4. Subtraction Prop.
5. $x = 50$	5. Division Prop.

### Correct Lines and Angles Proofs ws

Name: \_\_\_\_\_ Hr: \_\_\_\_\_ Lines and Angles Proofs ws **KEY**

Spend a few minutes looking over the Unit 6: Reasons for proofs sheet. Always start your proofs with the given information and build from there.

1. Fill in the blanks on the following proof.  
 Given:  $\angle 1 \cong \angle 2$   
 Prove:  $\angle 4 \cong \angle 3$

Statements	Reasons
1) $\angle 1 \cong \angle 2$	1) Given
2) $\angle 4 \cong \angle 2$	2) Vertical angles are $\cong$
3) $\angle 1 \cong \angle 4$	3) Transitive Property of Congruence
4) $\angle 1 \cong \angle 3$	4) Vertical angles are $\cong$
5) $\angle 4 \cong \angle 3$	5) Transitive P. of Congruence

2. Given the angles below:

Fill in the reason that justifies each step.  
 $\angle CDE$  and  $\angle EDF$  are supplementary.  
 $m\angle CDE + m\angle EDF = 180$   
 $x + (8x - 90) = 180$   
 $9x - 90 = 180$   
 $9x = 270$   
 $x = 30$

$\angle$  that form a linear pair are supplementary.  
 a. definition of Suppl.  
 b. substitution P.  
 c. substitution / distributive  
 d. addition P.  
 e. division P.

3. Write a complete proof using the information given.  
 Given:  $\angle 2 \cong 140^\circ$   
 Prove:  $\angle B \cong 40^\circ$

Statements	Reasons
1) $\angle 2 \cong 140^\circ$	1) Given
2) $\angle 2$ and $\angle B$ are supplementary	2) definition of a linear pair
3) $\angle 2 + \angle B = 180^\circ$	3) Definition of supplementary
4) $140^\circ + \angle B = 180^\circ$	4) Substitution
5) $\angle B = 40^\circ$	5) Subtraction Property

4. Complete the proof by filling in the spaces below.

Given:  $JK = 48$   
 Prove:  $x = 9$

Statements	Reasons
1) $JL = 4x$	1) Given
2) $JL + LK = JK$	2) Segment addition postulate
3) $4x + x + 3 = 48$	3) Substitution Property
4) $5x + 3 = 48$	4) Distributive Property
5) $5x = 45$	5) subtraction P.
6) $x = 9$	6) division prop.

5. Use the statements and reasons given at the bottom to write a complete proof of the following:  
 Given:  $C$  is the midpoint of  $\overline{AD}$ .  
 Prove:  $x = 4$

Statements	Reasons
1) $C$ is the midpoint of $\overline{AD}$	1) Given
2) $\overline{AC} \cong \overline{CD}$	2) definition of midpoint
3) $m\overline{AC} = m\overline{CD}$	3) congruent segments have = lengths
4) $5x = 3x + 8$	4) Substitution Property
5) $2x = 8$	5) Subtraction property
6) $x = 4$	6) Division Property of Equality

6. Given:  $\angle AEC \cong \angle DEB$   
 Prove:  $\angle AEB \cong \angle DEC$

Statements	Reasons
1. $\angle AEC \cong \angle DEB$	1. Given
2. $m\angle AEC = m\angle DEB$	2. Definition of Congruent Angles
3. $m\angle AEB + m\angle DEC = m\angle AEC$	3. Angle Addition Postulate
4. $m\angle DEC + m\angle BEC = m\angle DEB$	4. Angle Addition Postulate
5. $m\angle AEB + m\angle BEC = m\angle DEC + m\angle BEC$	5. Substitution Prop.
6. $m\angle AEB = m\angle DEC$	6. Subtraction Prop.
7. $\angle AEB \cong \angle DEC$	7. Definition of Congruent Angles

7. Given:  $\overline{BC} \cong \overline{DE}$   
 Prove:  $\overline{AC} \cong \overline{AE}$

Statements	Reasons
1. $\overline{BC} \cong \overline{DE}$	1. Given
2. $\overline{BC} = \overline{DE}$	2. Definition of Congruent Segments
3. $\overline{AC} = \overline{AB} + \overline{BC}$	3. Segment Addition Postulate
4. $\overline{AC} = \overline{AB} + \overline{DE}$	4. Substitution Prop.

8. Given:  $B$  is between  $A$  and  $D$ ;  $C$  is between  $A$  and  $D$   
 Prove:  $AB + BD = AC + CD$

Statements	Reasons
1. $B$ is between $A$ and $D$ ; $C$ is between $A$ and $D$	1. Given
2. $AB + BD = AD$	2. Segment Addition Postulate
3. $AC + CD = AD$	3. Segment Addition Postulate
4. $AB + BD = AC + CD$	4. Substitution Prop.
5. $AB + BD = AC + CD$	5. Substitution Prop.

9. Given:  $A, B,$  and  $C$  are collinear;  $AB = BD$ ;  $BD = BC$   
 Prove:  $B$  is the midpoint of  $\overline{AC}$

Statements	Reasons
1. $A, B,$ and $C$ are collinear; $AB = BD$ ; $BD = BC$	1. Given
2. $AB = BC$	2. Transitive Property of Equality
3. $B$ is the midpoint of $\overline{AC}$	3. Definition of Congruent Segments
4. $B$ is the midpoint of $\overline{AC}$	4. Definition of Midpoint

10. Given:  $\overline{AB} \perp \overline{BC}$ ;  $m\angle 1 = m\angle 2 = 90^\circ$   
 Prove:  $m\angle 1 + m\angle 2 = 90^\circ$

Statements	Reasons
1. $\overline{AB} \perp \overline{BC}$ ; $m\angle 1 = m\angle 2 = 90^\circ$	1. Given
2. $\angle ABC$ is a right angle	2. Definition of Perpendicular
3. $m\angle ABC = 90^\circ$	3. Definition of Right Angle
4. $m\angle ABC = m\angle 1 + m\angle 2$	4. Angle Addition Postulate
5. $m\angle 1 + m\angle 2 = 90^\circ$	5. Substitution Prop. (or transitive)
6. $m\angle 1 + m\angle 2 = 90^\circ$	6. Substitution Prop.

11. Given:  $\angle 1$  and  $\angle 2$  form a linear pair;  
 $m\angle 2 + m\angle 3 + m\angle 4 = 180^\circ$   
 Prove:  $m\angle 1 = m\angle 3 + m\angle 4$

Statements	Reasons
1. $\angle 1$ and $\angle 2$ form a linear pair	1. Given
2. $\angle 1$ and $\angle 2$ are supplementary	2. Definition of Linear Pair
3. $m\angle 2 + m\angle 3 + m\angle 4 = 180^\circ$	3. Given
4. $m\angle 1 + m\angle 2 = 180^\circ$	4. Definition of Supplementary Angles
5. $m\angle 1 = m\angle 2$	5. Reflexive Prop.
6. $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3 + m\angle 4$	6. Substitution Prop.
7. $m\angle 1 = m\angle 3 + m\angle 4$	7. Subtraction Prop.

### Review

Transversal

Parallel

**Corresponding Angles:** The angles that occupy the same relative position on the transversal. These angles are equal.  
 Ex: 1 and 5; 2 and 6; 3 and 7; 4 and 8

**Alternate Interior Angles:** The angles inside the parallel lines and on opposite sides of the transversal. These angles are equal.  
 Ex: 3 and 6; 4 and 5

**Alternate Exterior Angles:** The angles outside the parallel lines and on opposite sides of the transversal. These angles are equal.  
 Ex: 1 and 8; 2 and 7

**Consecutive Interior Angles:** The angles inside the parallel lines and on the same side of the transversal. These angles are supplementary.  
 Ex: 3 and 5; 4 and 6

**Vertical Angles:** The angles opposite of one another on two intersecting lines. These angles are equal.  
 Ex: 1 and 4; 2 and 3; 5 and 8; 6 and 7

**Adjacent angles:** Angles next to each other on the same side of a line. These angles are supplementary.  
 Ex: 1 and 2; 1 and 3; 2 and 4; 3 and 4; 5 and 6; 5 and 7; 6 and 8; 7 and 8

Kahoot!

<https://play.kahoot.it/v2/?quizId=ffb10748-77be-4e20-9404-814fe0ff8861>

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**Theorem 6 Alternate Interior Angles Theorem**

Theorem	If ...	Then ...
If a transversal intersects two parallel lines, then alternate interior angles are congruent.	$\ell \parallel m$	$\angle 4 \cong \angle 6$ $\angle 3 \cong \angle 5$

**Postulate 1 Same-Side Interior Angles Postulate**

Postulate	If ...	Then ...
If a transversal intersects two parallel lines, then same-side interior angles are supplementary.	$\ell \parallel m$	$m\angle 4 + m\angle 5 = 180$ $m\angle 3 + m\angle 6 = 180$

**Theorem 7 Corresponding Angles Theorem**

Theorem	If ...	Then ...
If a transversal intersects two parallel lines, then corresponding angles are congruent.	$\ell \parallel m$	$\angle 1 \cong \angle 5$ $\angle 2 \cong \angle 6$ $\angle 3 \cong \angle 7$ $\angle 4 \cong \angle 8$

*You will prove Theorem 7 in Exercise 22.*

**Theorem 9 Converse of the Corresponding Angles Theorem**

Theorem	If ...	Then ...
If two lines and a transversal form corresponding angles that are congruent, then the lines are parallel.	$\angle 2 \cong \angle 6$	$\ell \parallel m$

**Theorem 10 Converse of the Alternate Interior Angles Theorem**

Theorem	If ...	Then ...
If two lines and a transversal form alternate interior angles that are congruent, then the two lines are parallel.	$\angle 4 \cong \angle 6$	$\ell \parallel m$

**Theorem 11 Converse of the Same-Side Interior Angles Postulate**

Theorem	If ...	Then ...
If two lines and a transversal form same-side interior angles that are supplementary, then the two lines are parallel.	$m\angle 3 + m\angle 6 = 180$	$\ell \parallel m$

**Theorem 12 Converse of the Alternate Exterior Angles Theorem**

Theorem	If ...	Then ...
If two lines and a transversal form alternate exterior angles that are congruent, then the two lines are parallel.	$\angle 1 \cong \angle 7$	$\ell \parallel m$

Do #3,#7, #9, #11 & #13 Together as a class

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**Due Monday**

Name: \_\_\_\_\_ Hour: \_\_\_\_\_

**Parallel Lines and Transversals Proofs**

Identify each pair of angles as corresponding, alternate interior, alternate exterior, consecutive interior, vertical, or linear pair.

1)

2)

Find the measure of each angle indicated.

3)   
 Same Side Interior:  $180 - 75 = 105$

4)

5)

6)

Solve for x:

7)   
 Vertical:  $2x + 17x = 70$   
 $17x = 68$   
 $x = 4$

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9) Given:  $\angle 1$  and  $\angle 3$  are supplementary  
 Prove:  $c \parallel d$

$\angle 1 \neq \angle 3$  SUPP.  
 $\angle 1 \neq \angle 3$  SUPP

Statement	Reason
1. $\angle 1$ and $\angle 3$ are supplementary	1. Given
2. $\angle 1 \neq \angle 4$	2. Vertical Angles
3. $\angle 4$ and $\angle 3$ are supplementary	3. Substitution P.
4. $c \parallel d$	4. Converse Same Side Interior

10) Given:  $\angle STW \cong \angle UVW$   
 $\overline{TW} \parallel \overline{UV}$   
 Prove:  $\angle TUV \cong \angle UVW$

Statement	Reason
1. $\angle STW \cong \angle UVW$	1.
2. $\overline{TW} \parallel \overline{UV}$	2.
3. $\angle TUV \cong \angle STW$	3.
4. $\angle TUV \cong \angle UVW$	4.

11) Given:  $m\angle 1 = m\angle 3$   
 $m\angle 1 = m\angle 2$   
 Prove:  $m\angle 3 = m\angle 4$

Statement	Reason
1. $m\angle 1 = m\angle 3$	1. Given
2. $m\angle 1 = m\angle 2$	2. Given
3. $m\angle 2 = m\angle 3$	3. Transitive Prop
4. $m\angle 1 = m\angle 3$ are corresponding angles	4. Def of Corresponding
5. $\overline{DE} \parallel \overline{BC}$	5. Converse of Corresponding Angles
6. $m\angle 3 = m\angle 4$	6. Corresponding Angles =
7. $m\angle 3 = m\angle 4$	7. Transitive Prop

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12) Given: Line ABCD  
 $m\angle ECD = 130^\circ$   
 $m\angle ABF = 50^\circ$   
 Prove:  $\overline{BF} \parallel \overline{CE}$

Statement	Reason
Line ABCD, $m\angle ECD = 130^\circ$ , $m\angle ABF = 50^\circ$	1.
$\angle ECD$ and $\angle ECB$ are supplementary	2. Definition of supplementary
	3. Substitution property of equality
$m\angle ECB = 50^\circ$	4.
$m\angle ECB = m\angle ABF$	5.
$\overline{BF} \parallel \overline{CE}$	6. Substitution property of equality
	7.

Statements: a.  $m\angle ECD + m\angle ABF = 180^\circ$  b. Definition of supplementary c.  $m\angle ECD + m\angle ECB = 180^\circ$  d. Converse of corresponding angles theorem e.  $50 + m\angle ECB = 180^\circ$  f. Given g.  $130 + m\angle ECB = 180^\circ$  h. Converse of same side int. angles theorem i.  $\angle ECD$  &  $\angle ECB$  are supplementary l. Substitution property of equality

Reasons: a. Definition of Linear Pair b. Definition of supplementary c. Converse of corresponding angles theorem d. Addition property of equality e. Given f. If lines, Same side interior angles are congruent g. Subtraction property of equality h. Converse of same side int. angles theorem i.  $\angle ECD$  &  $\angle ECB$  are supplementary l. Substitution property of equality

13) Given:  $m\angle 3 = 60^\circ$ ,  $m\angle 5 = 2x - 8$ ,  $a \parallel b$   
 Prove:  $x = 64$

Statement	Reason
$m\angle 3 = 60^\circ$ , $m\angle 5 = 2x - 8$ , $a \parallel b$	1. Given
$180 = m\angle 3 + \angle 5$	2. Same Side Interior Angles
$180 = 60 + 2x - 8$	3. Substitution property of equality
$180 = 52 + 2x$	4. Substitution P.
$128 = 2x$	5. Substitution property of equality
$64 = x$	6. Division property of equality
$x = 64$	7. Symmetric property of equality

Statements: a.  $64 = x$  b.  $180 = 60 + 2x - 8$  c.  $64 = x$  d.  $x = 64$  e.  $128 = 2x$

Reasons: a. Vertical angles are congruent b. Substitution property of equality c. Given d. Addition property of equality e. If lines, Same Side Interior Angles are Supplementary f. Subtraction property of equality

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14) Given:  $\angle 1 = 115^\circ$ ,  $\angle 1$  and  $\angle 3$  are supplementary  
 Prove:  $m \parallel n$

Statement	Reason
1.	Given
2.	Definition of Supplementary
$115 + \angle 3 = 180^\circ$	3.
4.	Subtraction Property of Equality
$\angle 2 = \angle 3$	5.
6.	Substitution Property of Equality
$\angle 1$ and $\angle 2$ are supplementary	7.
$m \parallel n$	8.

Statements: a.  $\angle 2 = 65^\circ$  b.  $\angle 3 = 115^\circ$ ,  $\angle 1$  and  $\angle 3$  are supplementary c.  $m\angle 1 + m\angle 3 = 180^\circ$  d.  $\angle 1 + \angle 2 = 180^\circ$  e.  $\angle 2 + \angle 3 = 180^\circ$  f.  $\angle 2 = \angle 3$  g.  $\angle 3 = 65^\circ$

Reasons: a. Definition of supplementary b. Vertical angles are equal in measure c. Converse of corresponding angles d. Addition property of equality e. Converse of same side interior angles f. Same side interior angles are congruent g. Substitution property of equality

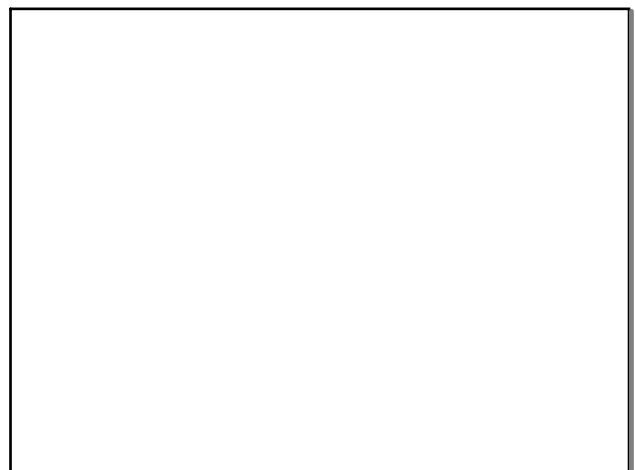
15) Given:  $\angle 1$  and  $\angle 3$  are supplementary,  $m\angle 3 = 120^\circ$   
 Prove:  $c \parallel d$

Statement	Reason
$\angle 1$ and $\angle 3$ are supplementary	1.
$m\angle 3 + m\angle 1 = 180^\circ$	2.
3.	Given
$120 + m\angle 1 = 180^\circ$	4.
5.	Subtraction property of equality
6.	Vertical Angles are equal in measure
$\angle 4 = 60^\circ$	7.
8.	Definition of supplementary
$c \parallel d$	9.

Statements: a.  $\angle 1 = \angle 4$  b.  $\angle 3 = 140^\circ = 180^\circ$  c.  $60 + \angle 4 = 180^\circ$  d.  $m\angle 3 = 120^\circ$  e.  $\angle 1$  and  $\angle 4$  are supplementary f.  $\angle 3$  and  $\angle 4$  are supplementary g.  $m\angle 1 = 60^\circ$

Reasons: a. Definition of supplementary b. Converse of same side interior angles c. Converse of corresponding angles d. Addition property of equality e. Substitution property of equality f. Given g. Subtraction property of equality

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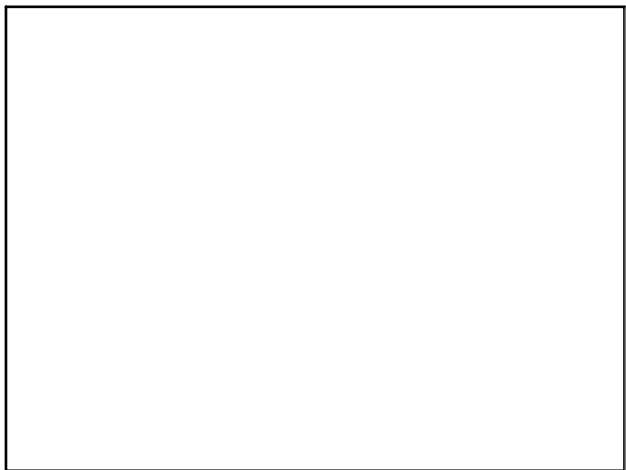
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