

# Line Segments and Angles Lesson Plan

GRADE/SUBJECT: GEOMETRY

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TIME: 1 PERIOD

## Lesson Description:

This lesson plan includes two-column geometric proofs that can be used as a review after introducing students to line segments and angles. The fill-in paper proofs are meant to be worked with a partner. Once completed, have students work through CanFigureIt Geometry proof activities individually as exit tickets.

## Key Essential Questions:

- How can you find the lengths and midpoints of segments and the measures of angles?
- How can we use technology to better understand geometric proofs?

## Desired Results + Learning Outcomes: (Students will know that... / Students will be able to...)

- Identify lines, line segments, rays, and angles
- Classify angles as acute, obtuse, or straight
- Identify complementary and supplementary angles
- Complete segment and angle addition

## Prior Student Knowledge:

Students will need to be familiar with:

- Adjacent Angles
- Supplementary Angles

- Angle Bisectors
- Vertical Angles
- Congruent Angles
- Congruent Segments
- Transitive Property
- Substitution Property
- Segment Addition Postulate
- Linear Pairs Postulate
- Algebraic properties of equality

## Lesson Materials:

- Teacher Projector/Screen/Board for warm-up
- Handouts for fill-in paper proofs (attached)
- Individual Access to CanFigureIt Geometry (laptops, chromebooks, macbooks, or desktops)

## Standards Alignment:

G-CO 9. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints

## Lesson Plan Structure:

1. Warm-Up (CanFigureIt Geometry + Paper)
2. Partner Activity 1 (Paper)
3. Individual Exit Tickets/Homework (CanFigureIt Geometry)

## Warm-Up:

This warm-up is designed to facilitate discussions around line segments and angle properties.

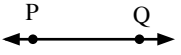
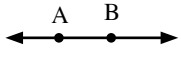
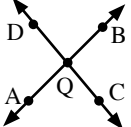
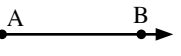
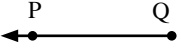
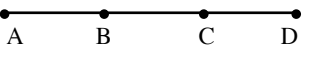
1. Direct students to log into CanFigureIt Geometry with their individual username and password
2. Teacher should also log into CanFigureIt Geometry account with username and password and project screen onto board
3. As a class, work through the following activities under the “All Activities” tab:
  - a. Line and Angles > Why Is It True?
    - i. Perpendicular Lines, Right Angles 1, Congruent Parts of Segments 1, Congruent Parts of Segments 2, Midpoint 1, Segment Bisector 1, Congruent Parts of an Angle, Angle bisector, Corresponding Angles
  - b. Use the guiding questions in each “Why Is It True?” activity to prompt discussions and review lines and angles concepts
    - i. Ex. When is a segment divided into two equal parts by a point?

The screenshot shows the CanFigureIt Geometry interface for the activity "Congruent parts of segments 1". The main area displays the title "C is midpoint of  $\overline{AB}$ " and the question "When is a segment divided into two equal parts by a point?". Below the text is a diagram of a line segment  $\overline{AB}$  with a point  $C$  on it. Tick marks on  $\overline{AC}$  and  $\overline{CB}$  indicate that  $C$  is the midpoint. The interface includes a "Prove" section, a "Working on..." grid, and a "Justified Claims" section with the claim  $\overline{AC} \cong \overline{CB}$ . A "Stuck?" button is located in the bottom left corner. The top right corner shows the "Proof Ninja" logo and navigation icons.

- c. Complete all 9 activities together

4. After students have reviewed basic lines and angles concepts on CanFigureIt Geometry, project the following image to reinforce lines and angles properties as a class.

d. You may print this out for students

1.  is a \_\_\_\_\_
2.  The points on the straight line are \_\_\_\_\_
3.  The lines  $\overleftrightarrow{AB}$ ,  $\overleftrightarrow{CD}$  intersect at a point \_\_\_\_\_
4.  is called \_\_\_\_\_
5.  On PQ, Q is a \_\_\_\_\_
6.  Name the line segments in the figure \_\_\_\_\_

## Partner Activity--Fill-in Paper Proofs

1. Make enough full-page copies of the proofs below to distribute to students. Although the students will work with a partner, make enough copies for each student so each student will have his or her own copy.
2. When students are ready to do the activity, you will give each student a copy of the proofs. They will work with a partner. Teacher will put all the "missing parts" on the board or cut them and put them in baggies for each group. When partners think they are correct, the teacher will check their work. If their proof is correct, they will write the correct proof on the template, so they have a copy for a reference for the following activity. If incorrect, the teacher will tell them they need to look at their proof again. Students continue to work on their proofs until they get it correct. Students continue until all proofs are done.
3. A portion of the proof is provided to the students on a template; students are then given cut-out cards with the statements/reasons (or they can be displayed on a board). Students will need to place the statements/reasons in correct order.

# Warm-Up

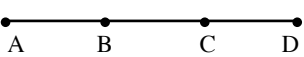
1.  is a \_\_\_\_\_

2.  The points on the straight line are \_\_\_\_\_

3.  The lines AB, CD intersect at a point \_\_\_\_\_

4.  is called \_\_\_\_\_

5.  On PQ, Q is a \_\_\_\_\_

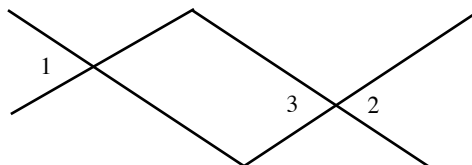
6.  Name the line segments in the figure \_\_\_\_\_

## Partner Cut-Out Proofs

Complete the proofs.

Given:  $\angle 1 \cong \angle 3$

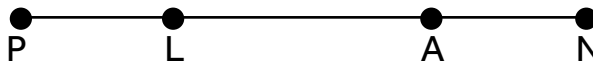
Prove:  $\angle 1 \cong \angle 2$



Statement	Reason
$\angle 3 \cong \angle 2$	

Given:  $PA = LN$

Prove:  $PL = AN$

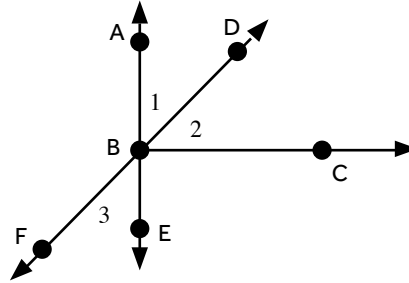


Statement	Reason
$PL + LA = PA$	
$LA + AN = LN$	
$PL + LA = LA + AN$	

## Partner Cut-Out Proofs

Given:  $\overrightarrow{BD}$  bisects  $\angle ABC$

Prove:  $\angle 2 \cong \angle 3$



Statement	Reason
$\angle 1 \cong \angle 2$	
$\angle 1 \cong \angle 3$	

Given:  $\angle 1$  and  $\angle 2$  form a linear pair  
and  $\angle 1 \cong \angle 3$



Prove:  $\angle 2$  and  $\angle 3$  are supplementary

Statement	Reason
$\angle 1$ and $\angle 2$ are supplementary	
	Definition of supplementary angles
$m\angle 1 = m\angle 3$	
$m\angle 3 + m\angle 2 = 180^\circ$	

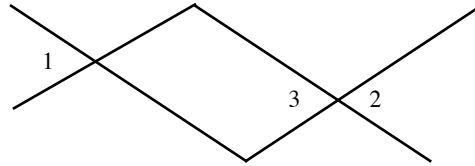
# Partner Cut-Out Proofs

## ANSWERS

Complete the proofs.

Given:  $\angle 1 \cong \angle 3$

Prove:  $\angle 1 \cong \angle 2$



Statement	Reason
$\angle 1 \cong \angle 3$	Given
$\angle 3 \cong \angle 2$	If $\angle$ 's are vertical, then they are $\cong$ .
$\angle 1 \cong \angle 2$	Transitive

Given:  $\angle 1$  and  $\angle 2$  form a linear pair  
and  $\angle 1 \cong \angle 3$



Prove:  $\angle 2$  and  $\angle 3$  are supplementary

Statement	Reason
$\angle 1$ and $\angle 2$ form a linear pair and $\angle 1 \cong \angle 3$	Given
$\angle 1$ and $\angle 2$ are supplementary	Linear Pair Postulate
$m\angle 1 + m\angle 2 = 180^\circ$	Definition of supplementary angles
$m\angle 1 = m\angle 3$	Definition of congruent angles
$m\angle 3 + m\angle 2 = 180^\circ$	Substitution
$\angle 2$ and $\angle 3$ are supplementary	Definition of supplementary angles

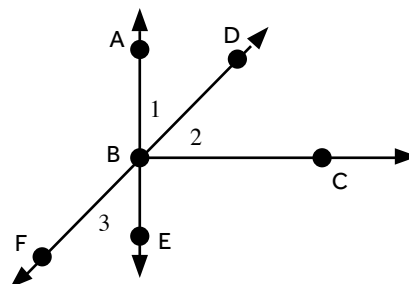


# Partner Cut-Out Proofs

## ANSWERS

Given:  $\overrightarrow{BD}$  bisects  $\angle ABC$

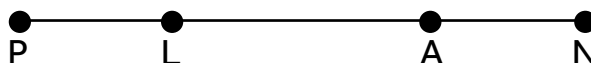
Prove:  $\angle 2 \cong \angle 3$



Statement	Reason
$\overrightarrow{BD}$ bisects $\angle ABC$	Given
$\angle 1 \cong \angle 2$	Definition of Angle Bisector
$\angle 1 \cong \angle 3$	If $\angle$ 's are vertical, then they are $\cong$ .
$\angle 2 \cong \angle 3$	Transitive

Given:  $PA = LN$

Prove:  $PL = AN$



Statement	Reason
$PA = LN$	Given
$PL + LA = PA$	Segment Addition Postulate
$LA + AN = LN$	Segment Addition Postulate
$PL + LA = LA + AN$	Substitution
$PL = AN$	Subtraction

1. If time permits, direct students to log into [CanFigureIt Geometry](#) using their individual usernames and passwords
2. Students should complete the following activities individually as exit tickets/homework.
  - a. Angles & Linear pairs 7
  - b. Supplementary Angles 1
  - c. Midpoint 2
  - d. Sum & Difference of Segments 1
  - e. Sum & Difference of Segments 3
  - f. Sum & Difference of Angles 1
  - g. Sum & Difference of Angles 2
3. Teachers can review work via the CanFigureIt Geometry teacher dashboard or have students print completed activities as PDFs or upload/email PDFs to the classroom management system.