

Richmond Public Schools
Curriculum Framework
Geometry

Strand: Reasoning, Lines, and Transformations		
G.2	The student will use the relationships between angles formed by two lines intersected by a transversal to a) prove two or more lines are parallel; and b) solve problems, including practical problems, involving angles formed when parallel lines are intersected by a transversal.	
G.4	The student will construct and justify the constructions of g) a line parallel to a given line through a point not on the line	
Suggested Pacing	Cognitive Demand	
First Nine Weeks	G.2a-c	G.4g
5 instructional days (including assessment)	Apply	Create
Spiraling Down Standards	Spiraling Up Standards	
8.5 The student will use the relationships among pairs of angles that are vertical angles, adjacent angles, supplementary angles, and complementary angles to determine the measure of unknown angles. A.6a The student will determine slope of a line given equation of line/graph of line or two points on line – slope as rate of change.	N/A	
Essential Questions	Common Misconceptions	
<p>What is the difference between parallel lines and perpendicular lines?</p> <p>When there are two parallel lines, these two lines are never able to intersect or touch. Parallel lines have the same slope. Perpendicular lines are two lines in which one of the lines intersects the other line, and the angles created from the intersection of these two lines are all</p>	<ul style="list-style-type: none"> • Some students may think that a visual confirmation is enough to determine that lines are parallel rather than verify this property using geometric relationships. • Students may think that linear pairs and vertical angles prove lines are parallel. Emphasize that ONLY corresponding angles, alternate interior angles, alternate exterior angles, consecutive 	

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right angles. Perpendicular lines have slopes that are negative (opposite) reciprocals of each other.

How are lines proven parallel?

1. Corresponding Angles Converse Postulate
2. Alternate-Interior Angles Converse Theorem
3. Alternate-Exterior Angles Converse Theorem
4. Consecutive(Same-side) Interior Angles Converse Theorem
5. Consecutive(Same-side) Exterior Angles Converse Theorem
6. Two lines are parallel to the same line are parallel.
7. Two lines perpendicular to the same line are parallel.

What are the relationships between the angles formed when two parallel lines are cut by a transversal?

When two lines are cut by a transversal, there are 8 angles formed.

There are relationships formed by these angles and transversal.

Vertical angles are across from each other where 2 lines intersect.

Vertical angles are congruent.

Linear pairs are two adjacent angles whose sum is 180 degrees.

Interior angles are angles that are between the two lines.

Exterior angles are angles that are on the outside of the two lines.

Alternate-interior angles are interior angles that are on opposite sides of the line and transversal. These angles are congruent.

Alternate-exterior angles are exterior angles on opposite sides of the line and transversal. These angles are congruent.

Corresponding angles are angles on the same side of the line and transversal. They are in the same position at different intersections.

These angles are congruent.

Consecutive interior angles are interior angles that are on the opposite side of the line and same side of the transversal. These angles are supplementary.

interior angles, and consecutive exterior angles can prove that lines are parallel.

- Students may confuse which angle relationships are supplementary or congruent. Having students label the angles with A (acute) or O (obtuse) will help students determine which angles should be congruent and which angles should be supplementary. Patty paper can also be used to help emphasize the angle relationships.
- Students may incorrectly apply the postulates and theorems presented when lines cut by a transversal are not parallel. Remind them that the postulates and theorems are only true for parallel lines.
- Students may incorrectly apply the converses presented because they assume that lines are parallel and then “prove” that they are. Remind them that the converse of postulates and theorems have different given conditions than those of the original theorems.

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<p>Consecutive exterior angles are exterior angles that are on the opposite side of the line and same side of the transversal. These angles are supplementary.</p> <p>How does construction of two parallel lines cut by a transversal validate the geometric relationships that occur between the angles formed? Congruent corresponding angles were constructed, so the Converse of the Corresponding Angles Theorem applies.</p> <p>How is the Parallel Postulate used in the parallel lines construction? The Parallel Postulate guarantees that, for any line, you can always construct a parallel line through a point that is not on the line.</p>	
Understanding the Standard	Essential Knowledge and Skills
<p>G.2a-b</p> <ul style="list-style-type: none"> • Deductive or inductive reasoning is used in mathematical proofs. In this course, deductive reasoning and logic are used in direct proofs. Direct proofs are presented in different formats (typically two-column or paragraph) and employ definitions, postulates, theorems, and algebraic justifications including coordinate methods. • Parallel lines intersected by a transversal form angles with specific relationships. • Some angle relationships may be used when proving two lines intersected by a transversal are parallel. • If two parallel lines are intersected by a transversal, then: 	<p>G.2a-b The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> • Prove two or more lines are parallel given angle measurements expressed numerically or algebraically. (a) • Prove two lines are parallel using deductive proofs given relationships between and among angles. (a) • Solve problems by using the relationships between pairs of angles formed by the intersection of two parallel lines and a transversal including corresponding angles, alternate interior angles, alternate exterior angles, same-side (consecutive) interior angles, and same-side (consecutive) exterior angles. (b)

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<ul style="list-style-type: none">- Corresponding angles are congruent;- Alternate interior angles are congruent;- Alternate exterior angles are congruent;- Same-side (consecutive) interior angles are supplementary; and- Same-side (consecutive) exterior angles are supplementary. <ul style="list-style-type: none">• Deductive proofs can be used to show that two or more lines are parallel.• The construction of the line parallel to a given line through a point not on the line can be justified using the angle relationships formed when two lines are intersected by a transversal. <p>G.4g</p> <ul style="list-style-type: none">• Construction techniques are used to solve practical problems in engineering, architectural design, and building construction.• Construction techniques include using a straightedge and compass, paper folding, and dynamic geometry software.• Geometric constructions assist in justifying, verifying, and visually reinforcing geometric relationships.• There are multiple methods to most geometric constructions. Students would benefit from experiences with more than one method and should be able to justify each step of geometric constructions.• Individual steps of constructions can be justified using angle relationships, properties of quadrilaterals, congruent triangles, and/or circles.	<ul style="list-style-type: none">• Solve problems, including practical problems, involving intersecting and parallel lines. (b) <p>G.4g The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none">• Construct and justify the constructions of<ul style="list-style-type: none">- a line parallel to a given line through a point not on the given line; (g)
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<p>- The construction for a line parallel to a given line through a point not on the line can be justified using the angle relationships formed when two lines are intersected by a transversal.</p>			
Vocabulary			Instructional Activities Organized by Learning Objective
Transversal	Alternate Exterior Angles	Alternate Interior Angles	<p>Virginia Department of Education</p> <ul style="list-style-type: none"> • Lines and Angles <p>Textbook</p> <ul style="list-style-type: none"> • Geometry, ©2012, Price, et al, McGraw-Hill School Education Group page(s) 172-184 and 205-212 <p>Notes and Homework</p> <p>G.2 Notes and Keys</p> <p>G.2 Homework and Keys</p> <p>Summary of Parallel Lines Reference Sheet</p> <p>G.4g Notes and Keys</p> <p>Resources</p> <ul style="list-style-type: none"> • Print <ul style="list-style-type: none"> ○ Coach book, Virginia edition Lesson 6 page(s) 46-53, 59 ○ Mulligan Math in Minutes, G.2 • Technology-Based <ul style="list-style-type: none"> ○ Youtube Videos <ul style="list-style-type: none"> ■ Parallel Lines Cut by a Transversal Mashup Math Youtube video
Consecutive (same-side) Interior Angles	Consecutive (same-side) Exterior Angles	Corresponding Angles	
Parallel	Perpendicular	Vertical Angles	
Linear Pair	Adjacent Angles	Supplementary	
Congruent Slopes	Opposite Reciprocal	Deductive Proof	
Assessment			
<p>1. PowerSchool Assessments</p> <p>G.2a (E:2XMGJT)</p> <p>G.2b (E:AGF874)</p> <p>G.4g (E:1XR34S)</p> <p>2. Mulligan Checkpoint G.2</p> <p>Checkpoint G.2</p> <p>3. Formative Assessments (paper)</p> <p>G.2a,b FA</p> <p>G.4g FA</p> <p>4. Cumulative Assessment #3 (SOLs G.1a-d, G.2 a-c, G.3a-d, G.4a-d,g)</p>			

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[Cumulative Assessment #3](#)

- [How to Construct a Line Parallel to a Given line from point not on the line Youtube video](#)
 - **GeoGebra**
 - [Parallel Lines Cut by a Transversal Exploration](#)
 - [Exploration Worksheet](#)
 - [Answers to Exploration Worksheet](#)
 - **Quizizz Practice**
 - [G.2a Practice on Quizizz](#)
 - [G.2b Practice on Quizizz](#)
 - [Parallel Lines Proof Practice on Quizizz](#)
 - [G.4g Practice on Quizizz](#)

Instructional Activities

- [City Design Project](#)
- [Angle Pair Riddle Project](#)

G.2a

- [Proving Lines Parallel Practice Worksheet](#)
- [Parallel Lines Deductive Proofs Worksheet](#)

G.2b

- [Parallel Lines Practice Worksheet](#)
- [Mixed Review Practice \(Differentiated\)](#)
- [Parallel Lines Snapshots and Exit Tickets](#)

G.4g

- [Parallel Lines construction snapshot and exit ticket](#)

Cross-Curricular Connections

Tiered Interventions

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Architects, engineers, and other professionals who work with visual representations of real-world objects frequently need to verify that different elements in their plans really are parallel or perpendicular.

Tier 3: Recall and Reproduction

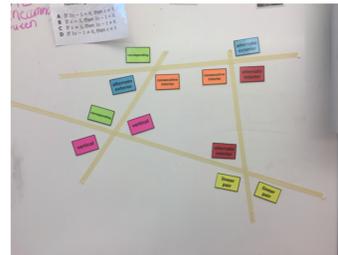
Vocabulary

Have students study flashcards, create their own flashcards, play a matching game or test themselves on Quizlet.

[Quizlet Flashcards Parallel Lines](#)

If students cannot identify the angle when given three letters that name it, then consider tracing the angle starting at one letter in colored pencil.

Create hands-on manipulative angle pairs for students to practice vocabulary. If students confuse the angle terms, then consider using word association for each term.



[Angle Pair Names color coded cut outs](#)

Give students a graphic organizer on ways to prove lines parallel.

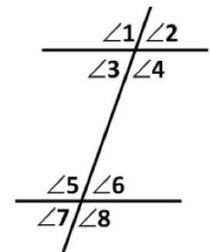
[Proving Parallel Lines Graphic Organizer](#)

Name a pair of alternate interior angles: ____ and ____

Name a pair of consecutive interior angles: ____ and ____

Name two pairs of corresponding angles:

____ and ____



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Tier 2: Basic Skills and Concepts

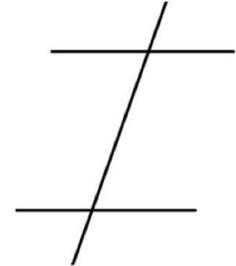
Practice and Drill

[Parallel Lines Drills](#)

Have students create a graphic organizer on ways to prove lines parallel.

Add angles to the diagram to the right such that:

- $\angle 1$ and $\angle 7$ are alternate interior angles
- $\angle 7$ and $\angle 3$ are a linear pair
- $\angle 3$ and $\angle 6$ are alternate interior angles
- $\angle 2$ and $\angle 7$ are vertical angles
- $\angle 4$ and $\angle 5$ are alternate exterior angles
- $\angle 5$ and $\angle 3$ are corresponding angles

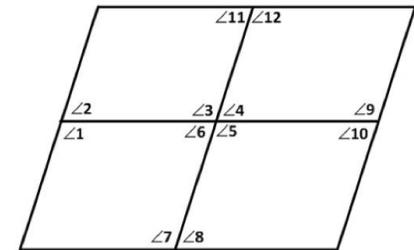


Tier 1: Strategic Thinking and Reasoning

Application

Describe a path through the maze on the right using proper vocabulary (special angle pair names) that

- Starts at $\angle 1$
- Ends anywhere
- Uses **every** angle exactly once
- Does not use the same rule twice in a row



G.4g

[Construction g Drills](#)

Ask students to compare constructions using a reflective device, tracing paper, compass and straightedge, and geometry software. Discuss the advantages of each. Have students consider not only how easy each is to use, but also how accurate, and how well each one helps them understand the geometric relationships being studied.