Orange Public Schools

Office of Curriculum & Instruction
2019-2020 Mathematics Curriculum Guide

Geometry

Unit2: Deductive Reasoning with Angles and Lines

November 14, 2019 – January 30, 2020

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Contents

Curriculum Map 1

Unit Overview 2

Pacing Guide 4

Calendar: 5

Student Learning Material 8

Modifications 9

21st Century Life and Career Skills: 11

Technology Standards: 12

Interdisciplinary Connections: 13

Assessment Framework 14

5 Practices for Orchestrating Productive Mathematics Discussions 21

Ideal Math Block 22

Idea Math Block with Intervention Stations 23

Sample Lesson Plan 24

Sample Performance Assessment 26

- Link of Performance Tasks 26
- Geometry Reasoning Performance Task (Multiple Parallel Lines) – Rubric 27

Extended Constructed Response (ECR) 28

- ECR Conversion Chart 29

Multiple Representations 30

NJSLA Sample Items 32

Supplement Resource 34

Curriculum Map

A STORY OF UNITS (Yearly Pacing Guide)				
Marking Period	MP 1 (9/9/19 – 11/13/19)	MP 2 (11/14/19- 1/30/20)	MP 3 (1/31/20-4/9/20)	**MP 4 (4/10-20-6/22/20)**
Unit Topic	Linear Equations and Inequalities	System of Linear Equations/Inequalities & Functions	Quadratic Functions & Equations	Solve Quadratic Equations
Description	Creating linear equations & Inequalities to model situations given and solve the problems	Creating system of equations/Inequalities to model real-life situations and solve the problems Identify types of functions with tables and graphs	Identify quadratic functions; find key features for the graphs. Solve quadratic equations by using tables, graphing and solving algebraically	Interpret, write, and solve quadratic equations.

Unit Overview

Unit 2: Deductive reasoning with angles and lines

Overview

This course uses Agile Mind as its primary resource, which can be accessed at the following URL:

- www.orange.agilemind.com

Each unit consists of 4-6 topics. Within each topic, there are "Exploring" lessons with accompanying activity sheets, practice, and assessments. The curriculum guide provides an analysis of teach topic, detailing the standards, objectives, skills, and concepts to be covered. In addition, it will provide suggestions for pacing, sequence, and emphasis of the content provided.

Essential Questions

- What is a postulate?
- How do you prove theorems and geometric/algebraic relationships?
- What is deductive reasoning?
- What is a conditional statement? How do you find its converse?
- How is the vertical angle theorem? How do we prove it?
- What are the relationships between angles formed by two parallel lines and a transversal? How do we prove these relationships?
- What is the relationship between slopes and parallel/perpendicular lines?

Enduring Understandings

- A proof is when a mathematician takes true statements within a mathematical system and uses deductive reasoning to line them together to reach a conclusion that is also true
- If two lines intersect to form vertical angles, then the angles have the same measure
- If two parallel lines are cut by a transversal, then their corresponding angles and alternate interior angles are congruent
- If two lines are cut by a transversal and their corresponding angles and/or alternate interior angles are congruent, then the lines are parallel
- If two lines are parallel, then their slopes are equivalent; if two lines are perpendicular, then their slopes are opposite reciprocals

NJSLS

1) 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.~~
2) G.GPE.5: Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Major Content
Supporting Content
Additional Content
~~Parts of standard not contained in this unit~~

21st Century Career Ready Practice

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

Pacing Guide

Overview			
Topic	Name	NJSLS	Suggesting Pacing
1	Deductive reasoning logic, and proof	G.CO.C.9	7 Periods
2	Conditional Statements and Converses	G.CO.C.9	6 Periods
3	Lines and Transversals	G.CO.C.9, G.GPE.B.5	12 periods

Summary:

25 days on new content (3 topics)
2 task days
1 review day
1 test day
3-4 NWEA days
2 Benchmark day

35 days in Unit 1

Note: Geometry Period (45 minutes per day)

Calendar:

Please create a pacing calendar for your classes based on the scopes and sequence (page 7) in this unit plan.

November 2019						
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**

December 2019						
Sun	Mon	Tue	Wed	Thu	Fri	Sat

January 2020						
Sun	Mon	Tue	Wed	Thu	Fri	Sat

Student Learning Material

Agile Mind Geometry: https://orange.agilemind.com/LMS/lmswrapper/LMS.html

Drawing on more than twenty-five hundred years of mathematical work, Geometry introduces the tools central to the study of space and spatial relationships. Students began their study of geometric concepts in elementary and middle school mathematics. In middle school, they studied area, surface area, and volume and informally investigated lines, angles, and triangles. Students in middle school also explored transformations, including translations, reflections, rotations, and dilations. The Charles A. Dana Center and Agile Mind have intentionally designed this Geometry course to begin with developing the tools of geometry, including transformations, proof, and constructions. These tools are used throughout the course as students formalize geometric concepts studied in earlier courses and extend those ideas to new concepts presented in the high school standards.

Once students have some tools with which to explore geometry, they begin to formalize geometric relationships involving angles, lines, triangles, quadrilaterals, and circles. Respecting a deeply rooted tradition, Geometry provides for students a first introduction to formal mathematical reasoning, logic, and proof, in which they are introduced to what constitute the standards of evidence in modern mathematics. Students spend time creating viable arguments around triangle congruence and similarity, using transformations as the key underlying definition of congruence and similarity.

Their study of triangles includes trigonometric ratios and right triangle relationships. Students create arguments and solve problems with shapes represented both on and off the coordinate grid. Coordinate geometry provides a connection and reinforcement to ideas studied in Algebra I. Students extend their understanding of plane geometry to model the world they live in using three-dimensional shapes. Extending their understanding of area and volume from middle school, students are able to solve geometric modeling problems and analyze characteristics of three-dimensional shapes, including plane sections and solids of revolution. Throughout the course, students focus on developing logical arguments and using geometry to model their world

There is a focus throughout the course on the Mathematical Practice Standards. These practices should become the natural way in which students come to understand and do mathematics. While—depending on the content to be understood or on the problem to be solved—any practice might be brought to bear, some practices may prove more useful than others. In a high school geometry course, communication, reasoning, and justification are particularly important, as are modeling, the strategic use of appropriate tools, and precision of language.

Modifications

Special Education/ 504:	English Language Learners:
-Adhere to all modifications and health concerns stated in each IEP. -Give students a MENU options, allowing students to pick assignments from different levels based on difficulty. -Accommodate Instructional Strategies: reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), handouts, definition list with visuals, extended time -Allow students to demonstrate understanding of a problem by drawing the picture of the answer and then explaining the reasoning orally and/or writing , such as Read-Draw-Write -Provide breaks between tasks, use positive reinforcement, use proximity -Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum by using manipulatives -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 17-18) -Strategies for Students with 504 Plans	- Use manipulatives to promote conceptual understanding and enhance vocabulary usage - Provide graphic representations, gestures, drawings, equations, realia, and pictures during all segments of instruction - During ALEKS lessons, click on "Español" to hear specific words in Spanish - Utilize graphic organizers which are concrete, pictorial ways of constructing knowledge and organizing information - Use sentence frames and questioning strategies so that students will explain their thinking/ process of how to solve word problems - Utilize program translations (if available) for L1/ L2 students - Reword questions in simpler language - Make use of the ELL Mathematical Language Routines (click here for additional information) -Scaffolding instruction for ELL Learners -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 16-17)
Gifted and Talented:	**Students at Risk for Failure:**
- Elevated contextual complexity - Inquiry based or open ended assignments and projects - More time to study concepts with greater depth - Promote the synthesis of concepts and making real	- Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum - Modify Instructional Strategies, reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), inclusion of more visuals and manipulatives, Field Trips, Google Expeditions, Peer

world connections - Provide students with enrichment practice that are imbedded in the curriculum such as: ● Application / Conceptual Development ● Are you ready for more? - Common Core Approach to Differentiate Instruction: Students with Disabilities (pg. 20) - Provide opportunities for math competitions - Alternative instruction pathways available	Support, one on one instruction - Assure constant parental/ guardian contact throughout the year with successes/ challenges - Provide academic contracts to students and guardians - Create an interactive notebook with samples, key vocabulary words, student goals/ objectives. - Always plan to address students at risk in your learning tasks, instructions, and directions. Try to anticipate where the needs will be and then address them prior to lessons. -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 19)

21st Century Life and Career Skills:

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

https://www.state.nj.us/education/cccs/2014/career/9.pdf

- **CRP1**. Act as a responsible and contributing citizen and employee.
- **CRP2**. Apply appropriate academic and technical skills.
- **CRP3**. Attend to personal health and financial well-being.
- **CRP4**. Communicate clearly and effectively and with reason.
- **CRP5**. Consider the environmental, social and economic impacts of decisions.
- **CRP6**. Demonstrate creativity and innovation.
- **CRP7**. Employ valid and reliable research strategies.
- **CRP8**. Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP9**. Model integrity, ethical leadership and effective management.
- **CRP10**. Plan education and career paths aligned to personal goals.
- **CRP11**. Use technology to enhance productivity.
- **CRP12**. Work productively in teams while using cultural global competence.

Students are given an opportunity to communicate with peers effectively, clearly, and with the use of technical language. They are encouraged to reason through experiences that promote critical thinking and emphasize the importance of perseverance. Students are exposed to various mediums of technology, such as digital learning, calculators, and educational websites.

Technology Standards:

All students will be prepared to meet the challenge of a dynamic global society in which they participate, contribute, achieve, and flourish through universal access to people, information, and ideas.

https://www.state.nj.us/education/cccs/2014/tech/

8.1 Educational Technology:

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. **Technology Operations and Concepts:** Students demonstrate a sound understanding of technology concepts, systems and operations.
B. **Creativity and Innovation:** Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
C. **Communication and Collaboration:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
D. **Digital Citizenship:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
E. **Research and Information Fluency:** Students apply digital tools to gather, evaluate, and use of information.
F. **Critical thinking, problem solving, and decision making:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:

All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. **The Nature of Technology: Creativity and Innovation-** Technology systems impact every aspect of the world in which we live.
B. **Technology and Society:** Knowledge and understanding of human, cultural, and societal values are fundamental when designing technological systems and products in the global society.
C. **Design:** The design process is a systematic approach to solving problems.
D. **Abilities in a Technological World:** The designed world in a product of a design process that provides the means to convert resources into products and systems.
E. **Computational Thinking: Programming-** Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Interdisciplinary Connections:	
English Language Arts:	
ELA.Literacy.RI-9-10.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
ELA-LITERACY.SL.9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
ELA-LITERACY.W.9-10.2.A	Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

Assessment Framework

Assessment	Assignment Type	Grading	Source	Estimated in-class time	When?
Diagnostic Assessment *Unit 2 Diagnostic*	Diagnostic Assessment	Traditional (zero weight)	Curriculum Dept. created – see Dropbox	1 period	Beginning of unit
Mid-Unit Assessment	Formative Assessment	Traditional	Teacher created using "Assessments" in Agile Mind	1-2 periods	Mid unit (optional, must have 3 tests per MP)
Benchmark Assessment	Summative Assessment	Traditional	Curriculum Dept. created	2 periods	End of unit
ECRs	Performance Assessment	Rubric	Curriculum Dept. Created	½ period for each ECR	Last week of each month
Performance Task *Unit 1 Performance Tasks*	Performance Assessment	Rubric	Teacher co-created Assessment	2 periods	In topic 3
Quizzes	Formative Assessment	Rubric or Traditional	Teacher created or "Practice" in Agile Minds	< ½ block	Varies (must have 3 quizzes per MP)
Daily Exit Ticket	Formative Assessment	Varies	Teacher created	3-5 minutes	Daily

NWEA Map Winter test n: Test Window: 1/6/2020 – 1/17/2020

Benchmark Assessment Window: 1/13/2020 – 1/24/2020

Topic 4: Deductive reasoning, logic, and proof

Topic Objectives (Note: these are not in 3-part or SMART objective format)

1. Use deductive reasoning to create informal arguments
2. Create two-column proofs and flow-charts to prove mathematical relationships (providing both statements and reasons)
3. Prove the vertical angle theorem

Focused Mathematical Practices

- MP 2: Reason abstractly and quantitatively
- MP 3: Construct viable arguments and critique the reasoning of others
- MP 6: Attend to precision

Vocabulary

- ***Core***: deductive reasoning, proof, postulate, theorem, linear pair, flow-chart format, two-column format, and vertical angles
- ***Previous***: conjecture, inductive reasoning, equality, reflexive, symmetric, substitution, transitive, vertex, bisector, perpendicular, intersection, and measurement
- ***Academic***: determine, establish, deduce, define, justify, prove, conclude, represent, apply, and reference

Fluency

- Solving linear equations
- Properties of equality (understanding each property and naming them as a way to justify steps in the process of solving an equation)

Note:

- Students should reach mastery on Objective #3 in Unit 3, however they do not need to reach mastery on creating proofs for every theorem introduced. This will be a revisited and spiraled skill throughout several units.

Suggested Topic Structure and Pacing

Block	Objective(s) covered	Agile Mind "Blocks" (see Professional Support for further lesson details)	MP	Additional Notes
1	1	*Period1* *Period 2*	2, 3, 6	
2	2	*Period 3-5*	2, 3, 6	Use Block 4 as the Unit 2 Reasoning Performance Task
3	3, 2	*Period 6-7*	2, 3, 6	

NJSLS	**Concepts** What students will know	**Skills** What students will be able to do
G.CO.9: Prove theorems about lines and angles. Theorems include: vertical angles are congruent; ~~when a transversal crosses~~	***Review*** • Properties of equality • Inductive reasoning is the process of observing and forming conclusions about patterns and relationships • A conjecture is a statement made based	***Review*** • Measure segments with a ruler • Measure angles with a protractor • Solve linear equations and justify each step with a property of equality • Multiply binomials and factor trinomials

~~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~~	upon the observations and relationships. • Two angles of a linear pair are supplementary • ***New*** • Once a conjecture is proved, it becomes a theorem • A postulate is a statement believed to be true and accepted without proof • A proof is when a mathematician takes true statements within a mathematical system and uses deductive reasoning to line them together to reach a conclusion that is also true • Two types of proofs are two-column and flow-chart • The segment addition postulate states that if Z is between A and B on a line, then AZ + ZB = AB • The angle addition postulate states that if B is on the interior of AXD, then m∠AXB + m∠BXD = m∠AXD • The Common Segment Theorem states if on a line containing points A, B , C, D, and AC = BD, then AB = CD, and if AB = CD, then AC = DB • If two lines intersect to form vertical angles, then the angles have the same measure.	(minor focus) • Use correct notation when naming lines, angles, points, segments, rays, etc. • Use and apply the correct use of previously learned vocabulary ***New*** • Construct logical arguments using deductive reasoning • Construct proofs (statements and reasons) to prove theorems or other mathematical relationships true • Use the properties of equality to justify steps in proving a geometric statement true •

Topic 5: Conditional Statements and Converses

Topic Objectives (Note: these are not in 3-part or SMART objective format)

4. Form conditional statements and their converses and determine whether they are true or false
5. Use counter examples to prove that conditional statements and their converses are false
6. Prove the vertical angle theorem using indirect proof

Focused Mathematical Practices

- MP 2: Reason abstractly and quantitatively
- MP 3: Construct viable arguments and critique the reasoning of others
- MP 7: Look for and make use of structure

Vocabulary

- ***Core***: statement (vs. sentence), conditional, converse, biconditional, contradiction, logical paradox, logic notation, counterexample, negation, indirect proof, and Euler diagram
- ***Previous***: deductive reasoning, proof, vertical angles, prime number, composite number, angle bisector, consecutive, rational number, irrational number, acute angle, and linear pair.
- ***Academic***: conjecture, represent, content, structure, declarative, qualify, hypothesis, conclusion, sufficient, analyze, exceed, and assumption

Fluency

- Solving linear equations
- Properties of equality (understanding each property and naming them as a way to justify steps in the process of solving an equation)
- Calculating slopes on lines (upcoming topic)

Note:

- Students should reach master on Objective #6 in Unit 3, however objectives 4 and 5 will be revisited and spiraled into other units

Suggested Topic Structure and Pacing

Block	Objective(s) covered	(see Professional Support for further lesson details)	MP	Additional Notes
1	4	*Period1* *Period2*	2, 3, 7	
2	4, 5	*Period3* *Period 4*	2, 3, 7	Emphasis in this topic should be on proving the vertical angle theorem
3	6	*Period 5* *Period 6*	2, 3, 7	Emphasis in this topic should be on proving the vertical angle theorem

NJSLS	**Concepts** What students will know	**Skills** What students will be able to do
G.CO.9: Prove theorems about lines and angles. Theorems include: vertical angles are congruent; ~~when a~~	***Review*** • Knowledge of vertical angle theorem: If two lines intersect to form vertical angles, then the angles have the same	***Review*** • Use deductive reasoning to construct simple proofs • Use and understand correct notation when

~~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~~	measure. ***New*** • A statement is a declarative sentence that is either true or false • A conditional statement, or if-then statement, has a hypothesis and an conclusion • The converse of a conditional statement is a statement where the hypothesis and conclusion are switched • A counterexample to a statement is an example that shows the statement is false • If a conditional statement and its converse are both true, it is biconditional • The negation of a statement is a statement you form by denying some other statement; it is formed by inserting the word "not" in the statement • A contradiction is a situation where a statement and its negation have the same truth value	naming lines, angles, points, segments, rays, etc. • Use and apply the correct use of previously learned vocabulary ***New*** • Understand the different between a logic statement and an English language sentence • Create conditional statements and their converses given a situation • Identify the hypothesis and conclusion given a conditional statement • Prove the vertical angle theorem •

Topic 6: Lines and Transversals

Topic Objectives (Note: these are not in 3-part or SMART objective format)

7. Prove that corresponding and alternate interior angles of two parallel lines cut by a transversal are congruent
8. Find the equation of a line that is parallel or perpendicular to a given line that passes through a given point

Focused Mathematical Practices

- MP 2: Reason abstractly and quantitatively
- MP 3: Construct viable arguments and critique the reasoning of others
- MP 6: Attend to precision
- MP 8: Look for and express regularity in repeated reasoning

Vocabulary

- ***Core***: parallel lines, skew lines, transversal, corresponding angles, postulate, alternative interior angles, consecutive interior angles (or same side interior angles), and perpendicular lines

Fluency

- Calculating slopes of lines
- Linear equations in slope-intercept form (writing an equation given a line, graphing a line given an equation)

Suggested Topic Structure and Pacing

Block	Objective(s) covered	Agile Mind "Blocks" (see Professional Support for further lesson details)	MP	Additional Notes
1	7	*Period 1-4*	2, 3, 6, 8	
2	8	*Period 5-8*	2, 3, 6, 8	
3		*Period 9-12*	2, 3, 6, 8	

NJSLS	Concepts What students will know	Skills What students will be able to do
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~~	***Review*** • Basic understanding of parallel lines ***New*** • Parallel lines are lines that lie in the same plane and never intersect • Skew lines are non-coplanar lines that never intersect • A transversal is a line that intersects two or more lines in a plane • If two parallel lines are cut by a transversal, then their corresponding angles and alternate interior angles are congruent • If two lines are cut by a transversal and their corresponding angles and/or	***Review*** • Understand and apply translations to prove geometric properties • Calculating slopes of lines • Given a line, write its equation in slope-intercept form • Given a linear equation in slope-intercept form, graph its line ***New*** • Prove that corresponding and alternate interior angles of two parallel lines cut by a transversal are congruent • Prove that consecutive interior angles of two parallel lines cut by a transversal are supplementary

GPE.5: Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	alternate interior angles are congruent, then the lines are parallel • If two parallel lines are cut by a transversal, then their consecutive interior angles are supplementary • If two lines are cut by a transversal and their consecutive interior angles are supplementary, then the lines are parallel • If two lines are parallel, then their slopes are equivalent; if two lines are perpendicular, then their slopes are opposite reciprocals	• Find the equation of a line that is parallel or perpendicular to a given line that passes through a given point • Understand and describe the relationship between slope and perpendicular and parallel lines

5 Practices for Orchestrating Productive Mathematics Discussions	
Practice	Description/ Questions
1. Anticipating	What strategies are students likely to use to approach or solve a challenging high-level mathematical task? How do you respond to the work that students are likely to produce? Which strategies from student work will be most useful in addressing the mathematical goals?
2. Monitoring	Paying attention to what and how students are thinking during the lesson. Students working in pairs or groups Listening to and making note of what students are discussing and the strategies they are using Asking students questions that will help them stay on track or help them think more deeply about the task. (Promote productive struggle)
3. Selecting	This is the process of deciding the *what* and the *who* to focus on during the discussion.
4. Sequencing	What order will the solutions be shared with the class?
5. Connecting	Asking the questions that will make the mathematics explicit and understandable. Focus must be on mathematical meaning and relationships; making links between mathematical ideas and representations.

Ideal Math Block

The following outline is the department approved ideal math block for grades 9-12.

1) Fluency Practice (5 min) (see focused fluency skills in each curriculum unit plan)

2) Do Now (7-10 min)
    a. Serves as review from last class' or of prerequisite material
    b. Provides multiple entry points so that it is accessible by all students and quickly scaffolds up

3) Starter/Launch (5 min)
    a. Designed to introduce the lesson
    b. Uses concrete or pictorial examples
    c. Attempts to bridge the gap between grade level deficits and rigorous, on grade level content
    d. Provides multiple entry points so that it is accessible by all students and quickly scaffolds up

4) Mini-Lesson (15-20 min)
    a. Design varies based on content
    b. May include an investigative approach, direct instruction approach, whole class discussion led approach, etc.
    c. Includes CFU's
    d. Anticipates misconceptions and addresses common mistakes

5) Class Activity (25-30 min)
    a. Design varies based on content
    b. May include partner work, group work/project, experiments, investigations, game based activities, etc.

6) Independent Practice (7-10 min)
    a. Provides students an opportunity to work/think independently

7) Closure (5-10 min)
    a. Connects lesson/activities to big ideas
    b. Allows students to reflect and summarize what they have learned
    c. May occur after the activity or independent practice depending on the content and objective

8) DOL (5 min)
    a. Exit slip

Idea Math Block with Intervention Stations

Whole Group Instruction	50 min	INSTRUCTION (Grades 9 – 12) Daily Routine: Mathematical Content or Language Routine Anchor Task: Anticipate, Monitor, Select, Sequence, Connect Collaborative Work* Guided Practice Independent Work (Demonstration of Student Thinking)	TOOLS Manipulatives RESOURCES Agile Mind	
Rotation Stations (Student Notebooks & Chromebooks Needed)	1-2X 35 min	STATION 1: Focus on current Grade Level Content STUDENT EXPLORATION* Independent or groups of 2-3 Emphasis on MP's 3, 6 (Reasoning and Precision) And MP's 1 & 4 (Problem Solving and Application) TOOLS/RESOURCES Agile Mind Math Journals	STATION 2: Focus on Student Needs TECH STATION Independent TOOLS/ RESOURCES Khan Academy Approved Digital Provider Fluency Practice	TEACHER STATION: Focus on Grade Level Content; heavily scaffolded to connect deficiencies TARGETED INSTRUCTION 4 – 5 Students TOOLS/ RESOURCES Agile Homework Manipulatives
	5 min	INSTRUCTION Exit Ticket (Demonstration of Student Thinking) TOOLS/RESOURCES Notebooks or Exit Ticket Slips		

Sample Lesson Plan

Lesson	Topic 4, blocks 1-2	**Days**	1
Objective	By applying properties and postulates, students will create proofs to prove geometric relationships with 4/4 correct on the Exit Ticket	**NJSLS**	G.CO.9
Learning activities/strategies	**Materials needed:** **Do Now (5 minutes):** 1) Fluency check: SAS 1, #1c • SAS 1, #2 **Starter/Launch (2 minutes):** • Use page #1-5 from the Overview to go over Do Now and introduce deductive reasoning • Students complete #3 from SAS 1 **Mini lesson and exploration (40 minutes, majority of time spend on "creating proofs"):** • Teacher steps through pages 1-2 from exploring "Algebraic proofs and properties" and students follow along using SAS 2, #1 (optional) • Students attempt page 3, and SAS 2, #2 independently • Teacher uses pages 3-6 to review • As pairs, students attempt SAS 2, #3 • Teacher uses page 7 to review • As pairs or a small group, students use an individual computer to work through page 8 and SAS 2, #4 • Teacher observes results and uses page 1 from exploring "creating proofs" to review/introduce a postulate; students complete SAS 3, #1 • Students independently work on SAS 3, #2-3 • Teacher uses page 2 and student responses to review • After reviewing answers, students try SAS 3, #4 and teacher uses page 3 to review answers • Use these pages to define a linear pair and investigate a related theorem. Discuss how a postulate, conjecture, and theorem differ. [SAS 3, questions 5, 6, and 7] • Pages 6 and 7 introduce students to a flow-chart proof. The proof produces a theorem that we later name Common Segment Theorem. Distinguish between trying inductive reasoning (using different values for LI, AN, and IN to show that LA = AN) and inductive reasoning (making the logical connections between steps to prove it is true for all cases). • On page 7, have students cut the tiles out and solve the puzzle. [SAS 3, question 8] • Have students pair up and reach consensus on a solution. Then have two pairs come to consensus. Solicit students' reasoning. • Page 8 introduces students to a two-column proof. Point out that the "Given" and "Prove" statements are reversed. This foreshadows work with converses, which is the next topic. [SAS 3, question 9] • Follow the same consensus-building process used with SAS, question 8. Solicit students' reasoning.		

	• Display page 9. Celebrate the fact that the class has done the important and necessary work in order to add a theorem to their geometry toolbox. Now, students can apply the theorem. [SAS 3, question 10] **Practice (15 minutes):** • Students work independently (or as pairs if needed) to complete Guided Practice #4-9 **Closure (4 minutes):** • Spend ~2 minutes assigning HW and allowing students to ask any questions (HW is More Practice #7-11) • Teacher uses pages 1-2 from "Summary" to review key terms and the properties of equality; if time permits, teacher goes over the postulates and theorems proved into todays class (otherwise this can be reviewed at a later time) **DOL (5 minutes):** • Automatically Scored assessment questions #3-8

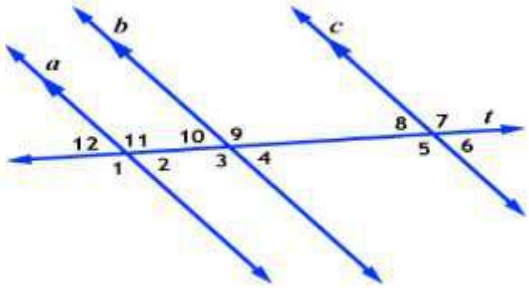
Sample Performance Assessment

Unit 2 Performance Task – Parallel Lines and Angle Relationships
Name: _____ Date

Part A:
/
When explaining your reasoning, use **appropriate vocabulary**, for example the name of the angle pair relationship you used or other mathematical vocabulary.

Angle	Measure	Work	Reason
a			
b			
c			
d			
e			
f			

Part B:



In the diagram above, a || b || c.

If the measure of angle 1 is 4x + 20 and the measure of angle 6 is x-10, find x and the measure of both angles.

Show all work or explain how you got your answer.

Link of Performance Tasks
https://www.dropbox.com/sh/6mvbywc3f6x5afh/AABaIguEpeb5WrhZzEYSu9RGa?dl=0

Geometry Reasoning Performance Task (Multiple Parallel Lines) – Rubric Name: _____ Date: _____

NJSLS: G.CO.9 ***SMP***: MP 2, MP 3, MP 6

Teacher: _____

Task Description	➢ Solves for unknown angle measures in a diagram involving multiple parallel lines and transversals ➢ Uses precise vocabulary, properties of equality, and/or angle pair relationships to show work ➢ Correctly identifies angles in a diagram with multiple parallel lines as congruent or supplementary ➢ Correct algebraic work to solve for x and find missing angle measures				
Command Level Description	***Level 5: Distinguished Command*** Perform the task items accurately or with minor computation errors. (100%)	***Level 4: Strong Command*** Perform the task items with some non-conceptual errors (89%)	***Level 3: Moderate Command*** Perform the task items with minor conceptual errors and some computation errors. (79%)	***Level 2: Partial Command*** Perform the task items with some errors on both math concept and computation. (69%)	***Level 1:*** Perform the task items with serious errors on both math concept and computation. (59%)
Score range	11-12 pts	8-10 pts	5-7 pts	2-4 pt	0-1 pts
Task Score & PLD Assigned					
Teacher Feedback					

Extended Constructed Response (ECR)

Math Department ECR Protocol

ECR Protocol

(Extended Constructed Response)

Issuing

- Moving forward ECR'S will be disseminated by the first of each month and collected by the end of each month
- Method of Issuing: email and post on the website

Dissemination

- Teachers can elect to print copies for each student or use the Smartboard to project the ECR. (Note: Student work will be included in Student Portfolios)
- Students should be given up to 30 minutes depending on the complexity of the ECR
- Assure appropriate testing environment
- ECR should be completed independently

Scoring

- Conversion tables are available in the *Assessment & Data in Mathematics Bulletin* for genesis inputting purposes
- ECR's will count as Authentic Assessments
- Naming Protocol "Course Month ECR" (ex: Grade 6 October ECR)

Collection

- ECR's will be collected & kept in student portfolios
- Student work will be reviewed during CPT's

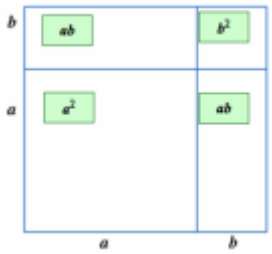
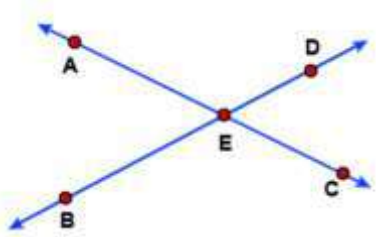
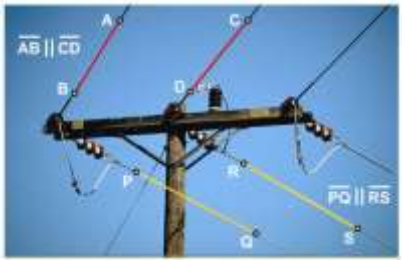
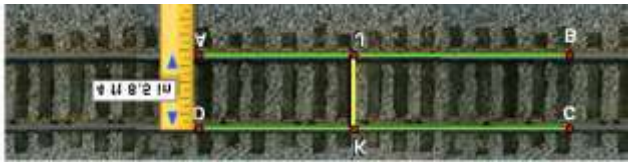
Link of Unit 1 ECRs

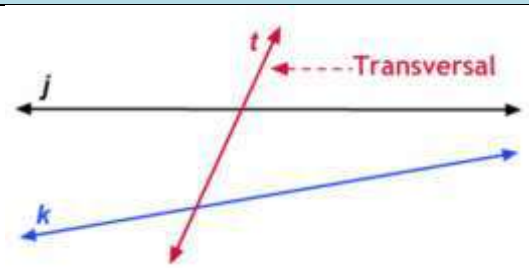
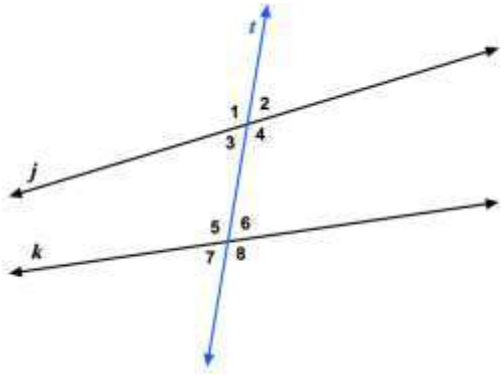
https://www.dropbox.com/sh/yujzxex28eebxsj/AAD99HcYHhjEQ_ym1FnfXcTRa?dl=0

ECR Conversion Chart

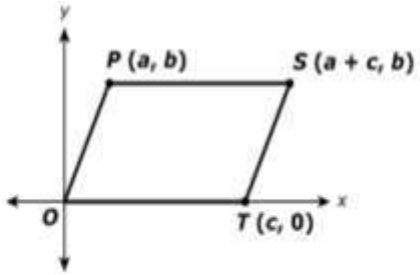
Points	Genesis Conversion	Points	Genesis Conversion	Points	Genesis Conversion
0	55	0	55	0	55
1	59	1	69	1	69
2	69	2	79	2	89
3	79	3	89	3	100
4	89	4	100		
5	100				

Multiple Representations

Representations	Distributive Property
Area Model	
Symbolic Representation	Area of the Rectangle: $(a + b)(a+b) = a^2 + 2ab + b^2$
	Vertical Theorem: If two lines intersect to form vertical angles, then the angles have the same measure
Pictorial	
Verbal Description	The pairs of angles that are opposite each other are known as ***vertical angles***. In the diagram, ∠DEC and ∠AEB are one pair of vertical angles; ∠AED and ∠BEC are the other pair.
	Parallel Lines
Concrete Representation	 
Pictorial/Symbolic	 $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$

	Parallel Lines and Angle Relationships
Parallel Lines & Transversal	
Angle Relationships	
	Corresponding Angles are congruent: Angle 2 & Angle 6; Angle 4 & Angle 8 Angle 1 & Angle 5; Angle 3 & Angle 7 Alternate Interior Angles are congruent: Angel 3 & Angle 6; Angle 4 & Angle 5 Alternate Exterior Angels are congruent: Angle 2 & Angle 7; Angle 1 & Angle 8 Consecutive Interior angles are supplementary: Angle 4 & Angle 6, Angle 3 & Angle 5

NJSLA Sample Items

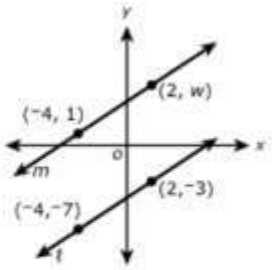


Is the figure shown in the *xy*-coordinate plane a parallelogram? Why or why not? Use the given coordinates to justify your answer.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

Part A

Line ℓ passes through the points $(-4, -7)$ and $(2, -3)$ on the coordinate plane.
Line m passes through the points $(-4, 1)$ and $(2, w)$.

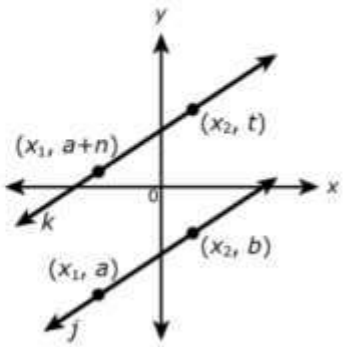


For what value of w is line m parallel to line ℓ?

Enter your answer in the box.

Part B

Given the figure, write an expression that can replace t and will guarantee that lines j and k are parallel. Support your answer.



Enter your expression and your support in the space provided.

[A] [π]

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

Supplement Resource

Task	Link
Deductive Reasoning Task	https://www.dropbox.com/s/efxoqrbg3k2jy02/Deductive%20Reasoning%20Task.docx?dl=0
Parallel Lines Measure Task	https://www.dropbox.com/s/2lbyai6ojyvyu3x/Task%205%20Parallel%20Lines%20Measurement.docx?dl=0
Parallel Lines Proof Task	https://www.dropbox.com/s/09aws6u7g152rix/Task%206%20-%20Parallel%20Line%20Proofs.docx?dl=0
Multiple Parallel Lines Task	https://www.dropbox.com/s/8dzrsdbhnnijf9y/Task%207%20%2B%20Practice%20Multiple%20Parallel%20Lines.docx?dl=0
Slope 1 & Practice	https://www.dropbox.com/s/one4t13ll088tm4/Task%208%20Slope%20%26%20Claswork.docx?dl=0
Slope Task 2	https://www.dropbox.com/s/e5zu65e4pwi1fn6/Task%209%20Slope%20and%20Classwork.docx?dl=0