Unit 10: Coordinate Plane Geometry

Content Area: **Mathematics**
Course(s): **Geometry, Honors Geometry**
Time Period: **May**
Length: **3 weeks**
Status: **Published**

Unit Overview

- Apply the slope formula and determine whether two lines are parallel, perpendicular, or neither
- Introduce the basic properties of vectors using the combinate of distance and slope
- State and apply algebraic formulas that translate to geometry, such as the distance and midpoint formulas and the equation of a circle

Enduring Understandings

- Coordinate geometry can be used to represent and verify geometric and algebraic relationships.
- Geometric figures can be described and compared through measurement.
- Valid argument and presentation of clearly conclusive evidence is essential to writing a proof

Essential Questions

- How can vectors be applied to real world situations?
- How can you find the midpoint of and distance between two points in the coordinate plane?
- How can you utilize slope to determine if two lines are parallel or perpendicular?

Student Learning Objectives

- Determine whether two lines are parallel, perpendicular, or neither.
- graph a linear equation in slope-intercept form.
- State and apply the midpoint and distance formulas
- State and apply the slope formula.
- Understand and apply the basic properties of vectors
- write the equation of a line in point-slope form of a linear equation.

Standards

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original

problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

MA.G-CO.C	Prove geometric theorems
MA.G-GPE	Expressing Geometric Properties with Equations
MA.G-GPE.B	Use coordinates to prove simple geometric theorems algebraically
MA.G-MG.A	Apply geometric concepts in modeling situations
	Connections to Equations.

Indicators

MA.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically.
MA.G-GPE.B.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).
MA.G-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts—interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material.

Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate, that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.)

During high school, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful

	proofs. Later in college some students develop Euclidean and other geometries carefully from a small set of axioms.

Lesson Titles

- Graphing Linear Equations
- Midpoint & Distance in the Coordinate Plane
- Slope of a Line
- Slopes of Parallel & Perpendicular Lines
- Vectors
- Writing Linear Equations

Equity Considerations

Climate Change

Students will embark in several activities that connect the issues of climate change with coordinate geometry.

https://mathsforplanetearth.ouce.ox.ac.uk/?cat=16

SCI.HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

Asian Americans and Pacific Islanders Considerations

Students will engage in learning different AAPI mathematicians that have contributed to mathematical processes and developments.

https://www.youtube.com/watch?v=_pUHaSapfuo

https://www.ngpf.org/blog/math/math-monday-celebrating-aapi-mathematicians/

https://ideas.ted.com/8-asian-americans-and-pacific-islanders-whose-innovations-have-changed-your-life-really/

LGBTQ and Disabilities Considerations

LGBTQ:

Sir Francis Bacon (1561–1626)

Florence NightingaleFrancis Bacon | Philosophy, Scientific Method, & Facts | Britannica(1820-1910)

George Washington Carver (1861-1943)

Sara Josephine Baker (1873-1945)

Alan Turing (1912-1954)

Allan Cox (1926-1987)

Sally Ride (1951-2012)

Ben Barres (1954-2017)

Ruth Gates (1962-2018)

Tim Cook (1960)

STEM

Disabilities:

Leonardo da Vinci (1452-1519)- Dyslexia

Isaac Newton (1664-1727)- Epilepsy

Thomas Edison (1847-1931)- Hearing

Charles Darwin (1809-1882)- Stutter, Dyslexia

Alexander Graham Bell (1847-1922)- Deaf

Albert Einstein (1879-1955)- Aspergers

Florence B. Seibert (1897-1991)- Mobility

Stephen Hawking (1942-2019)- ALS

John Forbes Nash (1928-2015)- Schizophrenia

Temple Grandin (1947)- Autism

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RL.9-10.1	Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.RL.9-10.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
LA.RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.) and make relevant connections, to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.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).
LA.WHST.9-10.1.E	Provide a concluding paragraph or section that supports the argument presented.
ARCH.9-12.9.4.12.B.(1).3	Integrate structural, environmental, safety, building envelope, and building service systems in the design of buildings and structures.

Instructional Strategies. Learning Activities. and Levels of Blooms/DOK:

- Demonstrate how to solve algebraic proofs
- Demonstrate how to solve basic congruence proofs
- Intro. applying special angles to proofs
- Intro. biconditional statements

- Intro. complementary angles
- Intro. Conclusions
- Intro. Conditional Statements
- Intro. Converse statements
- Intro. counterexamples
- Intro. finding measures of missing angles using theorems of specials angles
- Intro. finidng angle measurement with perpendicular lines
- Intro. Hypothesis
- Intro. perpendicular lines
- Intro. planning a proof
- Intro. proofs and how to use them to solve problems
- Intro. properties of congruence
- Intro. proving theorems
- Intro. reasons used in proofs
- Intro. students to algebraic proofs
- Intro. supplementary angles
- Intro. the Angle Bisector theorem
- Intro. the midpoint theorem
- Intro. theorems of perpendicular lines
- Intro. vertical angles
- Intro. what you can deduce from given information
- make connections between verbal statements and equations
- make connections definitions and equality statements-analyze given information
- Review anticipatory Set
- Review Homework
- Review properties of equality from algebra
- Review Quiz
- Review standardized-test practice questions for warmup
- students will be introduced to the concept of deductive reasoning
- Students will work independently on developing deductive reasoning skills
- Students will work independently on solving problems involving complementary and supplementary angles
- use mathematical properties to deduce new informationstandards

Modifications:

G&T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- CTE - Additional reinforcement activities soliciting a deeper understanding of curriculum.
- Employ differentiated curriculum to keep interest high.
- Generating and testing hypotheses
- Tutoring during Delsea One

ELLs Modifications

- 1:1 testing
- Digital translators
- Focus on domain specific vocabulary and keywords
- Offer alternate/or modify assessments
- Tutoring during Delsea One

IEP & 504 Modifications

- Cue Attention
- Extra time
- Family Communication
- Focus on domain specific vocabulary and keywords
- Frequent Check of Work/Reminders
- Modify homework expectations
- Preferential Seating
- Provide Study Guides/Notes
- providing students with content vocabulary prior to teaching a lesson including that vocabulary (pre-teaching)
- Repeat/Reword/Clarify
- Small group testing
- State Expectations Clearly
- Tutoring during Delsea One
- Use of calculator

At Risk Modifications

- Additional help during tutoring/Delsea One/Academic Enrichment
- Family Communication
- Retesting

- Study Guides
- Tutoring during Delsea One

Formative Assessment

- anticipatory set
- closure
- group work
- pass out of class
- Slopes of Parallel & Perpendicular Lines Investigation
- think-pair-share
- warm up

Alternate Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Benchmark Assessment

Skills-based assessment- math practice

Summative Assessment

- Alternate Assessment
- Marking Period Assessment
- Mini Assessment: midpoint, distance, slope, parallel and perpendicular lines
- Test inductive reasoning, conjecturing, algebraic proofs and introduction to geometric proofs
- Vocab Assessment

Resources & Technology

Resources and Materials

- Geometry Text Book- McDougal – Littell
- Manipulatives
- Protractor
- Ruler
- Study Guide and Practice Sheet – Glencoe/McGraw Hill
- Teacher Created worksheets
- Teacher Generated worksheets

Technology

- deltamath.com
- desmos.com
- edpuzzle.com
- Geometer sketchpad
- Gimkit.com
- IXL.com
- Kahoot.com
- Mathxl
- Peardeck
- Smart Board
- Ti-84 calculator
- Videos

TECH.8.1.12	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.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.