Unit 11: Coordinate Geometry

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 29**
Length: **3 Weeks**
Status: **Published**

Unit Overview

This unit provides another perspective of geometry by focusing on the use of the coordinate plane while utilizing concepts that students have learned throughout the course. Students will revisit concepts from Algebra 1 and apply them to solve complex geometry problems. These concepts include graphing lines and linear inequalities, finding the slope of a line, calculating x and y-intercepts, and writing equations of lines. Additionally, they will explore the new concepts of writing equations of circles and determining types of triangles and types of quadrilaterals when given the coordinates of the vertices.

Standards

MA.G-GPE.A.1	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
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.6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
MA.G-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Essential Questions

1) How can concepts involving the coordinate plane be utilized to solve real-world problems?

2) How can prior concepts from this course be applied to solve problems involving the coordinate plane?

3) How can algebraic principles be used to solve problems or prove geometric statements?

Application of Knowledge and Skills...

Students will know that...

- 1) a graph of an equation is composed of all of the coordinate points that are solutions to that equation.
- 2) parallel lines have the same slopes and perpendicular lines have opposite reciprocal slopes.
- 3) systems of equations can have either one solution, no solution, or an infinite amount of solutions that consist of all points on the line.
- 4) two-dimensional inequalities contain an infinite amount of solutions.
- 5) three-dimensional coordinates are of the form (x, y, z).
- 6) the distance formula for two three-dimensional points is d = √((x2 - x1)2 + (y2 - y1)2 + (z2 -z1)2).
- 7) the equation of a circle whose center is (h, k) and whose radius is r is (x - h)2 + (y - k)2 = r2.

Students will be skilled at...

- a) apply graphing equations, calculating slope, and calculating x and y-intercepts to solve problems.
- b) use definitions learned previously and formulas from the course to write equations for lines.
- c) use systems of equations to solve problems.
- d) solve problems involving the graphing of linear inequalities and systems of linear inequalities.
- e) graph three-dimensional coordinates and find the distance and midpoint between two three-dimensional coordinates.
- f) graph and write equations of circles.

Assessments

- Daily Formative Assessments Formative: Other written assessments Formative assessments, such as Do-Now assignments, homework assignments, Tickets-to-Leave, and SmartPal response board practice problems, will provide daily data for teachers.
- Pre-Assessment Diagnostic: Other written assessments Students will be assessed on their prior knowledge of graphing and writing equations, calculating slope and x and y-intercepts, and graphing linear inequalities.
- Unit Quiz Formative: Written Test Students will be assessed on solving problems by applying the concepts of graphing equations, writing equations, calculating slope and intercepts, solving systems of equations, and graphing linear inequalities.
- Unit Test Summative: Written Test Students will be assessed on solving problems by applying the concepts of graphing equations, writing equations, calculating slope and intercepts, solving systems of equations, graphing linear inequalities, graphing and finding the distance between three-dimensional points, and writing equations of circles.

Activities

Communicator Practice

Students will complete differentiated practice problems on SmartPal response boards.

Cooperative Problem-Solving

Students will work cooperatively on challenge problems. This work may be presented by students, discussed as a class, or submitted for grading and comments.

Activities to Differentiate Instruction

Interactive Smartboard Activities will be utilized.

Students will work in mixed-level groups.

Students will be assigned optional and mandatory challenge problems on homework assignments.

Enrichment worksheets will be available for classwork and/or homework.

Guided notes and study guides will be provided accordingly.

Appropriately-leveled problems for students to complete. Proofs can range from having few steps to requiring multiple steps using multiple geometric figures.

Integrated/Cross-Disciplinary Instruction

Students will build connections between geometry and geography by discovering how two-dimensional coordinate geometry can be related to lines of latitude and longitude.

Resources

McDougal Littell *Geometry for Enjoyment and Challenge* textbook and resources

Smartboard

Smart Exchange

McDougal Littell *Activity Generator* CD-ROM

Protractors

Rulers

Smart Exchange

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.