# Unit 04: Lines in the Plane

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 10**
Length: **Weeks**
Status: **Published**

## Unit Overview

During this unit, students will work with the properties of perpendicular lines. They will begin their study by writing detour proofs, using previously learned theorems and triangle congruence postulates to complete these proofs. The students will write the "set up" and draw the diagrams for proofs that are solely given in words. Student will also use theorems about congruent and supplementary angles, equidistance, and perpendicular bisectors to write proofs. Finally, they will use their previous knowledge of slope to prove lines are either parallel or perpendicular.

## Standards

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| MA.G-CO.A.1 | Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. |
| MA.G-CO.B.8 | Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. |
| MA.G-CO.C.10 | Prove theorems about triangles. |
| MA.G-SRT.B.5 | Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. |
| 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. |

## Essential Questions

1) Why is proof necessary?

2) How does writing proofs allow us to support claims that we believe to be true?

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

## Application of Knowledge and Skills...

## Students will know that...

- 1) detour proofs are proofs in which a pair of triangles can only be proven congruent if another set of triangles are proven congruent.
- 2) problems in which diagrams are not provided will require "set up" before a proof can be written.
- 3) if two angles are both supplementary and congruent, then they are right angles.
- 4) a perpendicular bisector of a segment is a line that bisects and is perpendicular to the segment.
- 5) if two points are each equidistant from the endpoints of a segment, then the two points determine the perpendicular bisector of that segment.
- 6) if a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of that segment.
- 7) corresponding, alternate interior, and alternate exterior angles are formed when two coplanar lines are intersected by a transversal.
- 8) parallel lines are coplanar lines that do not intersect.
- 9) lines whose slopes are the same are parallel, and lines whose slopes are opposite reciprocals are perpendicular.

## Students will be skilled at...

Students will be able to:

- a) write detour proofs.
- b) organize information, draw diagrams, set up the given, and prove statements for problems presented in words.
- c) prove that two angles are right angles by using the given information that they are congruent and supplementary.
- d) apply the properties of equidistance and perpendicular bisectors to prove statements about geometric figures.
- e) identify corresponding, alternate interior, and alternate exterior angles that are formed when a transversal intersects two coplanar lines.
- f) recognize and prove parallel and perpendicular lines using slopes.

## 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 perpendicular lines, parallel lines, using the midpoint formula, and slope.
- Unit Quiz Formative: Written Test Students will be assessed on writing detour proofs, providing the "set up" for problems involving proofs, and proving two angles are right angles.
- Unit Test Summative: Written Test Students will be assessed on writing detour proofs, providing the "set up" for problems involving proofs, proving two angles are right angles, applying theorems involving

equidistance in proofs, and using slope to prove lines are either parallel or perpendicular.

## 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 understand that writing geometry proofs is similar to writing persuasive essays. They must take given information, build supporting details, and draw a conclusion.

## 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

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| 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 |

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| | 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. |