

Points of Emphasis in M154

Whereas a typical instructional unit on coordinate geometry might begin with a focus on plotting points, memorizing formulas, or proving theorems disconnected from real-world contexts, in M154, students should:

- use formulas and equations to interpret the meaning of geometric concepts, derive equations, and prove geometric ideas (LP 3).
- apply rules, look for patterns, and analyze structure to prove properties of geometric figures (LP 3).
- regularly encounter real-world tasks that connect geometry and algebra (LP 1).
- be able to choose tasks that are organized around different scientific, social, or other topics, allowing students to have agency in their learning (LP 4).
- collaboratively explore how geometry and algebra are connected, share solution methods, and make thinking visible (LP 2).

In M154, students should:

- engage with tasks to discover geometric concepts by applying algebraic formulas to geometric figures and definitions. For example, students should:
 - reason about and understand how to derive the equations of circles and parabolas.
 - make connections between the different representations of the graphs of conic sections.
 - verify algebraically the properties of geometric figures by understanding the importance of and applying the formulas associated with the coordinate plane: slope formula, distance formula, midpoint formula, and section formula (partitioning a line segment).
 - use coordinates to verify geometric relationships by using the Pythagorean theorem, area, and perimeter.
 - reason about the relationships between the algebraic and geometric definitions.
 - justify algebraically the relationships between the slopes of parallel and perpendicular lines and geometric figures on the coordinate plane (LP 3).
- have opportunities to share their reasoning with partners or in groups, allowing for practice sharing, critiquing, and revising their arguments and including social interaction as part of the learning process (LP 2).

Students should also be given opportunities to understand and reflect on the ways that coordinate geometry can authentically be applied in real-world situations (LP 6).

Often, coursework with coordinate geometry is focused on performing computations by hand. Instead, students should be given frequent opportunities to:

- use graphing software to allow for focus on understanding, seeing patterns, forming generalizations, and testing conclusions (LP 7).
- use various technologies, like interactive sketches (LP 7).