Lines and Linear Systems: Unit Overview

MPM2D, Grade 10 Principles of Mathematics (Academic), Unit 1. 11 classes of 75 minutes, plus one class for the unit test (about two and a half weeks).

The big question

How can two straight lines model a decision, and how do we find where they meet?

Students bridge from MTH1W by developing the slope formula and interpreting slope as a rate of change, then write equations of lines from graphs, tables, a point and a slope, or two points. They translate between $y = mx + b$, $Ax + By + C = 0$ and $Ax + By = D$, and use equal and negative reciprocal slopes to write parallel and perpendicular lines and test for right angles. They solve linear systems by graphing, substitution and elimination, predict the number of solutions, choose efficient methods, and solve problems about tickets, coins, investments, mixtures, travel, currents, wind and rental plans. An optional coding lesson reads and alters a Python program that solves any system. The summative, Event Planner, uses every idea in the unit to plan a year-end festival.

Lessons

#	Lesson	Classes	Question	Expectations	What's inside
1	**Slope Revisited**	1	How steep, and how fast?	AG1.4	The slope formula; rates; ramps and grades
2	**Equations of Lines**	1	How do we name a line?	AG1.4	From graphs, tables, points; linear models
3	**Forms of a Line**	1	Which form fits?	AG1.5	$y = mx + b$, $Ax + By + C = 0$, $Ax + By = D$
4	**Parallel and Perpendicular Lines**	1	What do the slopes say?	AG1.3	Equal and negative reciprocal slopes; right angles
5	**Solving Systems by Graphing**	1	Where do two lines meet?	AG1.2	Intersection; one, none or infinitely many
6	**Substitution**	1	Can we solve it exactly?	AG1.1	Isolate, substitute, solve, verify
7	**Elimination**	1	What if we add the equations?	AG1.1	Adding, subtracting and multiplying equations
8	**Choosing a Method**	1	Which method is fastest?	AG1.1, AG1.2	One system three ways; justified choices
9	**Systems at Work: Money and Mixtures**	1	How many of each?	AG1.2	Tickets, coins, investments, juice

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#	Lesson	Classes	Question	Expectations	What's inside
10	**Systems at Work: Rates and Distance**	1	When do they meet?	AG1.2	Travellers, currents, wind, rental plans
11	**Coding Systems and Review**	1	Can one program solve them all?	AG1.1, AG1.2	A Python solver (optional); unit review

Assessment

Type	In this unit
Assessment for learning	Slope from Two Points, Find the Equation, Translate the Form, Parallel or Perpendicular?, Graph and Solve, Substitute and Solve, Eliminate and Solve, Pick Your Method, Tickets, Coins and Blends, On the Move, Read the Solver, quick checks and exit tickets
Assessment as learning	Self-checks, Three Ways, Which Form Fits?, Unit Review
Assessment of learning	Summative task (Event Planner) with a rubric, and a unit test with full solutions

Materials

Included:

- **Original problems and graphs:** every problem, data set and diagram was written for this unit
- **Code:** one short Python program (any free Python editor, or trace on paper)
- **Start Here:** unit overview, summative task and rubric, unit test, and teacher solutions for both

Free tools only: graph paper, rulers, calculators, Desmos (free) and any board-approved Python editor. The coding lesson extends MTH1W coding and is optional.

What's in each lesson

- Teacher lesson plan with expectations, timed sequence, differentiation, look-fors and answer guides
- Slides with speaker notes
- Student handouts and organizers
- Editable Word and PowerPoint files, plus PDFs

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