

M101 Linear Equations: Concepts and Skills

Illustrative Mathematics—Algebra 1 Unit 2-Linear Equations, Inequalities, and Systems

Notes for improving overall alignment:

- Opportunities for students to engage in pair or group work are an integral part of this curricular design, and special considerations will need to be taken into account if working outside of a traditional classroom setting to give students opportunities to **engage in social activities (LP2)**.
- Leverage the structure of the curriculum to give space for students to **have agency in their learning (LP4)**. This can be accomplished by learning about students' interests and lived experiences, then tailoring curricular prompts to reflect those experiences and interests. Use the curriculum's mathematical learning arcs to structure opportunities and check for progress toward attainment of *Content and Practice Expectations*.
- Leverage the structure of the curriculum to give students space to **view mathematics as a human endeavor across centuries (LP5)**. This can be done by positioning students as authors of important mathematical ideas, where their thinking is at the center of discussion and exploration, as well as by giving time to reflect on progress and personal growth.
- Educators will need to bring in space to attend to the second part of Indicator 101.d.iii. Spaces where we see an opportunity for this are indicated by a triangle ▲.

Learning Principles

Engage with cognitively demanding tasks in heterogeneous settings (LP 1). Students should be given opportunities to grapple with multistep, non-routine tasks that promote mathematical rigor. These experiences should be differentiated so that all students engage in appropriate challenges—for example, through tasks with multiple entry points and solution pathways. These experiences should continue to integrate knowledge and skills developed in grades 6-8 at the level of sophistication of high school mathematics.

Engage in social activities (LP 2). Students should have opportunities to work independently and to communicate with one another about mathematics by engaging in collective and collaborative learning activities. Explaining and having opportunities to revise one’s thinking has excellent value in solidifying one’s knowledge.

Build conceptual understanding through reasoning (LP 3). Students should be given the opportunity to reason, justify, and problem solve with critical thinking, reading, writing, speaking, and listening. Through reasoning and work with multiple representations, students learn why procedures work and build a conceptual understanding of key mathematical ideas.

Have agency in their learning (LP 4). Students should be able to choose tasks and learning experiences that align with their interests and aspirations. All students have rich and varied experiences and home lives. Learning mathematics should bring students’ identities and interests to the fore and build on the strengths that they bring to the learning space.

View mathematics as a human endeavor across centuries (LP 5). Students should understand that mathematical ideas emanated over time from civilizations around the world and have opportunities to explore these contributions to mathematics. Students should develop an appreciation of mathematics as a human endeavor: one in which they feel a sense of belonging, where they see themselves as mathematicians, and one that offers opportunities to broaden their ideas about what mathematics is, how it is used, and who it is for.

See mathematics as relevant (LP 6). Students should engage with mathematics in ways that authentically involve real-world situations. Problem-solving contexts should allow students to perceive mathematics as a tool for addressing the questions that arise in everyday life, as well as the ways it can model our world and address global economic, social, and environmental challenges. Students should also engage with mathematics in ways that connect to academic disciplines and future careers by doing the mathematics used by artists, designers, engineers, and other professionals.

Employ technology as a tool for problem-solving and understanding (LP 7). Research indicates that technology is a powerful tool for learning deeper mathematics by improving calculation efficiency and enabling more sophisticated analysis. Students should learn to use technology, with emphasis put on widely used tools and software, such as calculators and spreadsheets, to make sense

of models. Technology use should not be limited to supporting “doing mathematics,” but should also be used as a tool for displaying and communicating results to appropriate audiences.

Content and Practice Expectations

Content and Practice Expectations	Indicators Choose an artifact where you...
101.a: Reason about and solve one-variable linear equations and inequalities.	i. use variables to represent numbers and write equations when solving a real-world or mathematical problem. ii. demonstrate understanding that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.
101.b: Solve real-life and mathematical problems using linear expressions, equations, and inequalities.	i. solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form while using tools strategically. ii. construct simple equations and inequalities to solve problems by reasoning about quantities.
101.c: Analyze and solve two-variable linear equations and pairs of simultaneous linear equations.	i. solve linear equations in two-variables. ii. give examples of linear equations in two-variables with one solution, an infinity of solutions, or no solutions. iii. analyze and solve pairs of simultaneous linear equations.
101.d: Represent and solve linear equations and inequalities graphically.	i. explain why the x-coordinates of the points where the graphs of the linear equations $y=f(x)$ and $y=g(x)$ intersect are the solutions to the equation $f(x)=g(x)$. ii. find solutions to a system of linear equations in the form $y=f(x)$ and $y=g(x)$ approximately by using their graphs. iii. graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Unit Overview

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L24
101.a.i	X	X		X		X	X																
101.a.ii	X	X	X	X		X	X											X	X				
101.b.i				X	X				X	X		X							X	X		X	X
101.b.ii	X	X	X	X	X	X			X	X								X	X	X	X	X	X
101.c.i			X	X	X				X	X		X											
101.c.ii												X					X						
101.c.iii												X	X	X	X	X	X						
101.d.i												X	X	X	X	X	X						X
101.d.ii												X	X										X
101.d.iii																					X	X	X

Note: Columns in gray indicate a recommendation to delete the lesson

Guidance for Lesson Priority

Unit.Lesson	Priority D - Delete M - Modify K - Keep	Content and Practice Expectations (CPE)	Learning Principles (LP)	Additional Lesson Information
2.1	M Skip 1.3 Good lesson to set stage for use of mathematics to solve real-life and mathematical problems	101a.i 101.a.ii 101.b.ii	LP2, LP6	Context: Planning a pizza party Math focus: Using equations to represent situations
2.2	M Skip Activity 2.2 to give space for deeper discussion and engagement in Activity 2.3.	101a.i 101.a.ii 101.b.ii	LP2, LP6	Context: Platonic solids, blueberries, car prices Math focus: Using equations to represent situations
2.3	K	101.a.ii 101.b.ii 101.c.i	LP2, LP3	Context: Running, walking from home, electricity bills, monthly salary Math focus: Writing equations to model relationships
2.4	K	101a.i 101.a.ii 101.b.i 101.b.ii 101.c.i	LP1, LP3, LP6	Context: Earning money, calories and protein Math focus: Equations with one variable and two variables

Unit.Lesson	Priority D - Delete M - Modify K - Keep	Content and Practice Expectations (CPE)	Learning Principles (LP)	Additional Lesson Information
2.5	M For Activity 5.3 - Have students choose between #1 or #2	101.b.i 101.b.ii 101.c.i	LP4, LP6, LP7	Context: Snacks at a grocery store, savings, pay check, draining water from a tank Math focus: Graphing equations
2.6	M For Activity 6.3 - Assign a few equations per table group	101.a.i 101.a.ii 101.b.ii	LP2, LP3, LP5	Context: Buying jeans with a discount, family and ages Math focus: Equivalent equations
2.7	K	101.a.i 101.a.ii	LP1, LP3	Context: Purely mathematical Math focus: Equivalent equations
2.8	D Better fit for M102-Modeling with Linear Functions and Equations			Context: Parade clean up, filling/emptying tanks Math focus: Rearrange equations to solve for a specific variable
2.9	M Skip Activity 9.1	101.b.i 101.b.ii 101.c.i	LP3, LP7	Context: Cargo shipping, city resurfacing roads and hiring additional staff Math focus: Rearrange equations to solve for a specific variable

Unit.Lesson	Priority D - Delete M - Modify K - Keep	Content and Practice Expectations (CPE)	Learning Principles (LP)	Additional Lesson Information
2.10	M Prioritize Activity 10.2 to highlight the relationship between an equation and its graph. This means skip Activity 10.3. This lesson has connections to Badge M102.	101.b.i 101.b.ii 101.c.i	LP2	Context: Games and rides at a carnival Math focus: Connecting equations to graphs
2.11	D Better fit for M102- Modeling with Linear Functions and Equations			Context: Gallons in a tank, almonds and figs Math focus: Connecting equations to graphs
2.12	M Please note this lesson is also included in Badge M102 for focus on aspects of mathematical modeling. Consider having students engage in this through a modeling lens, then return to it with a lens on the CPEs listed.	101.b.i 101.c.i 101.c.iii 101.d.i 101.d.ii	LP1, LP3, LP7	Context: Trail mix, dining, fall, family tickets to a magic show, posters of favorite bands Math focus: Writing and graphing system of equations

Unit.Lesson	Priority D - Delete M - Modify K - Keep	Content and Practice Expectations (CPE)	Learning Principles (LP)	Additional Lesson Information
2.13	K Make graphing technology available (LP7) to give students opportunity to use graphs (101.d.ii) with Activity 13.1 and 13.2	101.c.iii 101.d.i 101.d.ii	LP1, LP2, LP7	Context: Purely mathematical Math focus: Solving system of equations by substitution
2.14	K	101.c.iii 101.d.i	LP1, LP3, LP7	Context: Purely mathematical Math focus: Solving system of equations by elimination
2.15	K	101.c.iii 101.d.i	LP2, LP3	Context: Teacher buying class supplies, reimbursement Math focus: Solving system of equations by elimination
2.16	M Prioritize Activity 16.3, space to communicate with peers and critique the reasoning of others (MP3). This may mean skipping 16.2.	101.c.iii 101.d.i	LP2, LP7	Context: Purely mathematical Math focus: Solving system of equations by elimination

Unit.Lesson	Priority D - Delete M - Modify K - Keep	Content and Practice Expectations (CPE)	Learning Principles (LP)	Additional Lesson Information
2.17	M Consider using Activity 17.3's <i>Are you ready for more?</i> prompt as an additional opportunity for students to engage with Indicator 101.c.ii. Skip Activity 17.2, it is a better fit for Badge M102.	101.c.ii 101.c.iii 101.d.i	LP2, LP3, LP7	Context: Pool passes and gym membership Math focus: Number of solutions for systems of equations
2.18	M Please note this lesson is also included in Badge M102 for focus on aspects of mathematical modeling. Consider having students engage in this through a modeling lens, then return to it with a lens on the CPEs listed.	101.a.ii 101.b.ii	LP3	Context: Budgeting for a senior ball Math focus: Writing inequalities
2.19	M Please note this lesson is also included in Badge M102 for focus on	101.a.ii 101.b.i 101.b.ii	LP3, LP7	Context: Class field trip to an orchard, working to make money for college tuition Math focus: Solutions to one-variable

Unit.Lesson	Priority D - Delete M - Modify K - Keep	Content and Practice Expectations (CPE)	Learning Principles (LP)	Additional Lesson Information
	aspects of mathematical modeling. Consider having students engage in this through a modeling lens, then return to it with a lens on the CPEs listed.			inequalities
2.20	K	101.b.i 101.b.ii	LP1, LP2, LP3	Context: Buying food for rehearsal for drama club, mowing a lawn Math focus: Writing and solving inequalities with one-variable
2.21	K	101.b.ii 101.d.iii	LP2	Context: Purely mathematical Math focus: Graphing linear inequalities in two-variables
2.22	K	101.b.i 101.b.ii 101.d.iii	LP2, LP3, LP7	Context: Homeowner making plans to landscape a yard, vendors making profit at a market, raising money for a charity concert Math focus: Graphing linear inequalities in two-variables

Unit.Lesson	Priority D - Delete M - Modify K - Keep	Content and Practice Expectations (CPE)	Learning Principles (LP)	Additional Lesson Information
2.24	M Complete Activity 24.4 if time allows.	101.b.i 101.b.ii 101.d.iii	LP5, LP6, LP7	<p>Context: Buying fabric to make a quilt, opening bank accounts, types of concert tickets, packages for advertising services</p> <p>Math focus: Writing and graphing systems of linear inequalities in two-variables</p>