

## Algebra 1A/1B Curriculum

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Goals:

- Address all common core standards
- Set a modeling, data-based tone for course
- Focus on relationships between functions and their representations

Units & Rationale:

1A:

1. One-variable stats
  - a. Students will look at ways to collect, organize, and analyze data
  - b. Sets a data-based tone of course
  - c. Students will become comfortable with using their calculator early on
2. Intro to two-variable stats
  - a. Gives students an overview of different functions they will see
  - b. Gives context and need for functions as models of data
3. Functions & Linear Functions
  - a. Starting with perfectly linear data, students can use linreg to generate linear functions and explore aspects of the functions ( $x$ ,  $y$ , slope,  $y$ -intercept)
  - b. Function notation introduced as an easier/clearer way to model data
  - c. Functions viewed as graphs, tables, and equations
  - d. Linear functions linked to some context (scatterplot and/or story)
  - e. Slope-intercept and standard forms can be linked to specific examples where one form is easier than the other
4. Solving linear equations and inequalities
  - a. Students will use the linear functions they created to find  $x$ -values for given  $y$ -values, in the context of data; reinforces link between algebraic and graphical representation of functions, and what  $x$  &  $y$  represent in context of data
  - b. Real-life linear equations can be the springboard into more abstract equations, where students have to use various properties
  - c. Students should give rationales for each step in an equation, like a geometry proof
  - d. Leads into solving equations with two variables and literal equations
5. Solving systems of equations and inequalities
  - a. Everything in the context of word problems, so that students first have to create equations and then use them
  - b. Start with graphical solutions, then algebraic

6. Exponential functions
  - a. Starting with perfectly exponential data, students can use expreg to generate exponential functions and explore aspects of the functions (x, y, growth factor, y-intercept)
  - b. View across multiple representations (table, graph, equation)
7. Properties of exponents
  - a. Use graphs and tables of exponential functions to understand the rule of exponents
  - b. Link back to real-life where possible
8. Other Functions
  - a. Look at properties of all functions (domain, range, intercepts, extrema, inc/dec, open/closed circles/arrows, etc.)
  - b. Focus on relationships among multiple representations (graph, table, equation, verbal description)
  - c. Transformations of all functions
9. Special functions; wrap up
  - a. Piecewise and step functions
  - b. Reinforce various function types and representations

1B:

10. Review of scatterplots and functions
  - a. set a data-based, modeling tone for course
11. Review of linear functions
12. Review of exponential functions
13. Quadratic graphs
  - a. Starting with perfectly quadratic data, students can use quadreg to generate quadratic functions and explore aspects of the functions
  - b. Review transformations
  - c. Look at quadratic word problems from a graphical point of view
14. Polynomial operations and factoring
  - a. Background knowledge for working with quadratics algebraically
  - b. Focus on hands-on, visual representation of operations (algebra tiles)
  - c. Link between quadratics in factored form and their graphs
15. Solving quadratic equations algebraically
  - a. simplifying radicals
  - b. Use algebra tiles to visualize completing the square
  - c. Revisit word problems from an algebraic point of view
16. Overview of modeling
  - a. Revisit all major functions using all representations; notice similarities and differences
  - b. Practice using calculator

17. Analyzing and using scatterplots

- a. Revisit scatterplots, but this time they will be non-exact
- b. Reinforce differences among types of functions
- c. Choose most appropriate regression type visually and numerically

18. Sequences

- a. Link to linear and exponential functions

1A Sequence:

Unit	Topic	Standard	Text	# of days	Regents question	Comments
1.1	Displaying data: histograms, dot plots	S.ID.1 (A) N-Q.1,2,3 (S)	11.5	2		First day activity: collect data from students and make graphs
1.2	Analyzing data: measures of central tendency (mean, median, mode)	S.ID.2 (A)	11.1	2	8/14.4 6/15.20	Use calculator; start vocabulary focus
1.3	Effect of outliers, skew of data	S.ID.3 (A)	11.1, 11.3	2	6/15.20	
1.4	Box plots	S.ID.1 (A)	11.2	2	6/14.32 1/15.14	(Not worth showing on calculator)
1.5	Measures of dispersion (Range, standard deviation, IQR)	S.ID.2 (A)	11.1	2	6/14.19	Also compare when to use which measure of central tendency/spread from data
	Review and test			3		Include calculator review (scavenger hunt?)
2.1	Two-way Tables (intro to 2-var standards)	S.ID.5 (S)	11.4	2	1/15.26	Ex., what percent of students are in club...
2.2	Overview of scatterplots (focus on linear, exponential, quadratic, no correlation); identify by shape; Independent/dependent variables in the context of data	S.ID.6a (S) N-Q.1,2,3 (S) F.IF.5 (M)	4.4	4		Look at many examples, look for patterns fatty snacks-sugary drinks (break into groups)? Use calculator
2.3	Correlation & causation (not in depth yet)	S.ID.9 (M)	4.4, 4.5	1	1/15.35 6/15.16	Discussion-based, not numerical yet
2.4	Linear regression for data with perfect correlation	S.ID.6c (S)	4.5	2		Using calculator (at some point do

						calculator scavenger hunt)
	Review and test			2		
3.1	When does data represent a function? What is a function? Introduction to functions from tables, mappings, and graphs; domain and range; use function notation	F-IF.1 (M) F-IF.5(M)	3.1 3.2	3	6/14.20 6/14.30 8/14.12 1/15.1 1/15.27	Use linear regression from previous chapter to introduce functions; tables with x and f(x)
3.2	Real-life domain/range from graph & situation (Continuous/discrete)	F-IF.5(M)	3.2	2	6/14.2, 8/14.23, 1/15.6	Link to scatterplots; use interval and set builder notation, and verbal descriptions
	Quiz: Functions			1		
3.3	Linear functions in the context of data (table and graph only); discussion of what makes a function linear (determining linear relationship from table and graph); introduce idea of rate of change/slope	N-Q.1,2,3 (S) A-CED.2 (M) A-REI.10 (M) F-IF.2 (M) F-IF.4 (M) F-IF.5(M) F-LE.5 (S)	3.2	2	8/14.13 8/14.14 1/15.9 6/15.4 6/15.11	Include units for slope
3.4	Rate of change from equation (from linear regression; understanding what m and b represent in context of data, and how they relate to table and graph); distance/time stories to contrast pos/neg/zero rate of change	S.ID.7 (M) F-IF.6(M) F-IF.7a(S)	<a href="#">4.1</a> , 3.5	4	6/14.7 6/14.18 6/14.22 6/15.1 6/15.2	Use the same data from previous section; link table, graph, equation
3.5	Evaluating linear functions (from table, graph, equation: all 3 at once to reinforce; also decimals to show limitation of table and revisit real life domain/range)	F-IF.2 (M) A-REI.10 F-IF.6(M)	3.3	2	6/14.2 6/14.15 6/14.20 6/15.34	Use both y and f(x)
3.6	Writing and graphing linear functions in the context of a story (make table, draw graph, identify slope and y-intercept and x-intercept algebraically and relate to context, real-life domain and range, continuous/discrete)	A.CED.2 (M) N-Q.1,2,3 (S) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-IF.6(M)	3.3, 3.4	4	6/14.16 6/14.21 6/14.22 6/14.29 6/14.35 8/14.8	Changing window in calculator; each example has scenario, table, graph and equation to reinforce relationships

		F-IF.7a(S) F-BF.1 (S)			6/15.26	
Review and Test				3		
4.1	Solving linear equations in one-variable in the context of a problem (explaining each step with properties and justifying solution method); interpreting solution in context of problem; then more abstract (variables on both sides, using distributive property)	A.REI.1 (M) A.REI.3 (M) A-CED.1 (M) A.CED.3 (M)	1.1, 1.2, 1.3	4	6/14.1 6/14.5 6/14.32 8/14.20 8/14.34 8/14.36	Write as a proof; do all properties, in context of solving
4.2	Writing and rearranging equations of lines between slope-intercept and standard	A.CED.4 (M) A-CED.2 (M) F-BF.1 (S) F-LE.1b (S) F-LE.2 (S) F-IF.4 (M) F-IF.6(M) F-BF.1 (S)	<a href="#">4.1</a> , 3.4	2		Give reason for writing in a different form; start with word problem, then standard form, then slope/intercept to graph
4.3	Solving literal equations	A-CED.4(M) A.REI.3 (M)	1.5	2	6/14.23 1/15.16 6/15.19	
4.4	Solving and graphing linear inequalities in 1 variable, including compound inequalities	A.REI.3 (M)	2.1, 2.2, 2.3, 2.4, 2.5	3	6/14.27 8/14.7 8/14.30 1/15.7 6/15.5 6/15.24 6/15.30	Reinforce interval notation
Review and Test				2		
5.1	Writing and solving systems graphically in context of a word problems	A.CED.3 (M) A.REI.6 (A) F-IF.4 (M)	5.1 5.4	2	6/14.37 1/15.13	word problems in $y=mx+b$ form; verbal description of answers
5.2	Writing and solving systems algebraically (substitution & elimination) in the context of a word problem	A.CED.3 (M) A-REI.5 (A)	5.2 5.3	5	6/14.14 6/14.36	

		A-REI.11 (M)			8/14.19 8/14.27 1/15.31 1/15.33 6/15.6 6/15.33 6/15.34	
5.3	Solving and graphing systems of linear inequalities in 2 variables (solve graphically)	A.CED.3 (M) A-REI.12 (M)	5.6, 5.7	4	6/14.4 8/14.37 1/15.34 6/15.35	Start with one inequality in 2 variables
Review and Test				2		
MIDTERM REVIEW (In-class midterm)				8		
6.1	Exponential Regression (exact fits), graphs; contrast between exponential and linear functions from graphs, tables, and equations (start with table of data; then scatterplot; then equation from regression)	S-ID.6a (S) N-Q.1,2,3 (S)	4.4, 6.3, supp leme nt	4	6/14.6 6/15.13	Revisit 2.2; integer inputs throughout unit; stress repeated multiplication
6.2	Writing and identifying exponential growth and decay models (as graphs, tables, and equations); stress distinction between growth factor and growth rate; review of percent change	N-Q.1,2,3 (S) A-SSE.1b(M) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-BF.1 (S) F-LE.1a (S) F-LE.1c (S) F-LE.2(S) F-LE.5 (S)	6.4	5	6/14.26 1/15.4 6/15.17 6/15.29 6/15.36	Include domain, range; interest compounded annually only (activity: looking at car loans etc.)
6.3	Using exponential models: evaluating and solving exponential equations in context of model (graphically, integer exponents only)	A-CED.1 (M) N-Q.1,2,3 (S) F-BF.1 (S)	6.5, supp leme nt	4	8/14.10 1/15.8 1/15.15 1/15.19 1/15.32 6/15.13	Putting both sides of equation into calculator y1 and y2

					6/15.17	
	Review and Test			2		
	Project: exponential functions			5		
7.1	Understanding zero and negative integer exponents in context of model	A-SSE.3c (S)	6.1, supplement	3		Exclude 6.2 (book); no rational exponents
7.2	Understanding exponent rules (introduce in context of model, ex. table)	A-SSE.3c (S)	6.1, supplement	2		
	Review and Quiz			2		
8.1	Quadratic functions (in a real-life context - not in depth until 1B); graphing and evaluating from graph, table, and equation	N-Q.1,2,3 (S) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-BF.1 (S) F-IF.7b (S)	8.1 8.2	2	8/14.5	Look at properties of all functions (including domain, range, inc/dec, arrows/open/closed circles, intercepts)
8.2	Square root functions (in a real-life context); graphing and evaluating from graph, table, and equation	N-Q.1,2,3 (S) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-BF.1 (S) F-IF.7b (S)	10.1	2	6/14.25 6/15.9	
8.3	Cubic and cube root functions (in a real-life context); graphing and evaluating from graph, table, and equation	N-Q.1,2,3 (S) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-BF.1 (S) F-IF.7b (S)	10.2	2		
8.4	Absolute value functions (in a real-life context); graphing and evaluating from graph, table, and equation	N-Q.1,2,3 (S) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-BF.1 (S) F-IF.7b (S)	3.7	2	8/14.33 1/15.30 6/15.25	



8.5	Transformations of all functions	N-Q.1,2,3 (S) F-IF.4 (M) F-IF.7(S) F-BF.3(A) F-BF.1 (S)	3.6, 6.38. 1, 8.2, 10.2,	5	6/14.28 8/14.17 8/14.33	
	Review and Test			2		
	Project			5		
9.1	Step functions; graphing and evaluating from graph, table, and equation	F-IF.7b (S) N-Q.1,2,3 (S) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-BF.1 (S) F-IF.7b (S)	4.7	4	6/15.7	
9.2	Piecewise functions; graphing and evaluating from graph, table, and equation	N-Q.1,2,3 (S) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-BF.1 (S) F-IF.7b (S)	4.7	5	8/14.22 6/15.34	
9.3	Wrap up: identify functions from tables, equations, graphs; comparing functions across different representations; revisit average rate of change for all functions;	N-Q.1,2,3 (S) F-IF.5(M) F-IF.6(M) F-IF.9(S) F-BF.1 (S) F-LE.3 (S) F-LE.5 (S) A-APR.3(S)	8.6	5	6/14.15 6/14.18 6/15.11 6/15.14	
	Review and Test			2		
	FINAL REVIEW					

1B Sequence:

Unit	Topic	Standard	Text	# of days	Regents question	Comments
10.1	Overview of scatterplots (focus on linear, exponential, quadratic, no correlation); identify by shape; Independent/dependent variables in the context of data	S.ID.6a (S) N-Q.1,2,3 (S) F.IF.5 (M)	4.4	4		
10.2	When does data represent a function? What is a function? Introduction to functions from tables, mappings, and graphs; domain and range; use function notation	F-IF.1 (M) F-IF.5(M)	3.1 3.2	4	6/14.20 6/14.30	Use linear regression from previous chapter to introduce functions; tables with x and f(x)
Review and Test				2		
11.1	Linear functions in the context of data (table and graph only); discussion of what makes a function linear (determining linear relationship from table and graph); introduce idea of rate of change/slope	N-Q.1,2,3 (S) A-CED.2 (M) A-REI.10 (M) F.IF.2 (M) F-IF.4 (M) F-IF.5(M) F-LE.5 (S)	3.2	2	8/14.13 8/14.14 1/15.9 6/15.11 6/15.4	Include units for slope
11.2	Rate of change from equation (from linear regression; understanding what m and b represent in context of data, and how they relate to table and graph)	S.ID.7 (M) F-IF.6(M) F-IF.7a(S)	<a href="#">4.1</a> , 3.5	2	6/14.7 6/14.22 8/14.2 1/15.9	Use the same data from previous section; link table, graph, equation
11.3	Evaluating linear functions (from table, graph, equation: all 3 at once to reinforce; also decimals to show limitation of table and revisit real life domain/range)	F.IF.2 (M) A-REI.10 F-IF.6(M)	3.3	2	6/14.2 6/14.17 6/14.24 6/15.15 6/15.34	Use both y and f(x)
11.4	Writing and graphing linear functions in the context of a story (make table, draw graph, identify slope and y-intercept algebraically and relate to context, real-life domain and range, continuous/discrete)	A.CED.2 (M) N-Q.1,2,3 (S) A-REI.10 (M) F-IF.4 (M)	3.3, 3.4	2	6/14.16 6/14.35 1/15.23 1/15.37	Changing window in calculator; each example has scenario, table, graph and

		F-IF.5(M) F-IF.6(M) F-IF.7a(S) F-BF.1 (S)			6/15.26	equation to reinforce relationships
	Review and Test			2		
12.1	Exponential Regression (exact fits), graphs; contrast between exponential and linear functions from graphs, tables, and equations (start with table of data; then scatter plots; then equation from regression)	S-ID.6a (S) N-Q.1,2,3 (S)	4.4, 6.3, supp leme nt	2	6/14.6	Revisit 2.2; integer inputs throughout unit; stress repeated multiplication
12.2	Exponential growth and decay models (as graphs, tables, and equations); stress distinction between growth factor and growth rate; review of percent change	N-Q.1,2,3 (S) A-SSE.1b(M) A-REI.10 (M) F-IF.4 (M) F-IF.5(M) F-BF.1 (S) F-LE.1a (S) F-LE.1c (S) F-LE.2(S) F-LE.5 (S)	6.4	3	1/15.4 1/15.19 1/15.21 6/15.29	Include domain, range; interest compounded annually only (activity: looking at car loans etc.)
12.3	Using exponential models: evaluating and solving exponential equations in context of model (graphically, integer exponents only)	A-CED.1 (M) N-Q.1,2,3 (S) F-BF.1 (S)	6.5, supp leme nt	3	8/14.26 1/15.32 1/15.8 6/15.13 6/15.17	Putting both sides of equation into calculator y1 and y2
	Review and Test			2		
13.1	Quadratic regression (form $y=ax^2+bx+c$ ); contrast with linear and exponential functions	F-BF.1 (S)		2		Start with perfect quadratic data
13.2	Aspects of quadratic functions in standard form using graph and table, in context (domain/range, inc/dec, vertex, axis of symmetry, roots, y-intercept, maximum and minimum)	F-IF.7 (S) F-IF.4 (M) N-Q.1,2,3 (S) A-REI.10 (M)	8.1, 8.2, 8.3	4	6/14.9 8/14.29 1/15.12 1/15.36 6/15.14	

13.3	Review of transformations with quadratics	N-Q.1,2,3 (S) F-IF.4 (M) F-IF.7(S) F-BF.3(A) F-BF.1 (S)	8.1, 8.2, 8.3	2	6/14.28	
13.4	Solve a quadratic equation in context (using graph and table only); word problems	F-IF.5(M)	9.2	5	8/14.9 6/15.37	include adjusting window; look at regents question
Review and Test				2		
Project: Quadratic graphs				4		
14.1	Review of operations with rational/irrational numbers and polynomials (addition, subtraction, multiplication); also terminology	A-SSE.1a(M) A-APR.1 (M) N-RN.3(A)	7.1, 7.2	4	6/14.3 6/14.13 6/14.33 8/14.1 8/14.6 8/14.28 1/15.28 6/15.8 6/15.28	Relate to operations with integers; introduce algebra tiles
14.2	Factoring GCF (introducing factoring using algebra tiles; relationship between area and factoring)	A-SSE.2(M)	7.4, 7.5, 7.6	3	6/14.31	exclude factoring by grouping
14.3	Factoring DOTS	A-SSE.2(M)	7.7	2	6/14.3 8/14.3 8/14.15 1/15.3	Consider doing after trinomials
14.4	Factoring trinomials (leading coefficient of 1)	A-SSE.2(M) A-SSE.3a (S)	7.6	3	6/14.31 8/14.25	
Quiz				1		
14.5	Factoring trinomials (leading coefficient not 1)	A-SSE.2(M) A-SSE.3a (S)	7.6	3	1/15.29	
14.6	Factoring completely	A-SSE.2(M) A-SSE.3a (S)	7.8	2	1/15.22	
14.7	Applications with factoring	A-SSE.2(M)	7.8	2		

		A-SSE.3a (S)				
14.8	Solve quadratic equations algebraically (by factoring); putting quadratics into intercept form by factoring; drawing rough sketches of graphs using zeros; Analyzing intercept (factored) form of a quadratic	A-REI.4b (M) A-CED.1 (M) A-SSE.3a (S) A-APR.3(S) F-IF.8a (S)	7.4 8.5	4	6/14.12 1/15.24 6/15.10 6/15.27	
Review and Test				2		
MIDTERM REVIEW (Midterm during midterm week)				5		
15.1	Solving quadratics in the form $x^2 = a$ (use this as motivation for simplifying radicals)	A-REI.4b (M) A-CED.1 (M)	9.1 9.3	4	8/14.3 1/15.17	
15.2	Solve quadratic equations algebraically (by CTS)	A-REI.4a (M) A-CED.1 (M) F-IF.8a (S)	9.4, 9.1, 8.4 9.4	4	6/14.8 8/14.18 8/14.32 1/15.36 6/15.18 6/15.21	
Quiz				1		
15.3	Using CTS to put quadratic into vertex form (compare to solving; analyze zeros); analyzing vertex form of a quadratic	A-SSE.3b (S)	8.4	4	8/14.18	Do the same examples from previous section, with y instead of 0
15.4	Solving quadratic equations using Quadratic Formula (understand when there is no solution, rational/irrational roots)	A-CED.1 (M)	9.5	3	6/14.10 6/15.23	Revisit same examples
15.5	Wrap up: revisit quadratic word problem	A-CED.1 (M)	8.4 8.5	4	6/14.34	Revisit problems from 13.4, algebraically; project
Review and Test (or project)				3		
16.1	Overview of modeling: revisit all major functions (graphs, tables, equations, verbal descriptions)		8.6	5	6/15.12 6/14.28	Reinforce calculator skills
16.2	Solving systems graphically (including word problems and different types of functions)	A.CED.3 (M) A.REI.6 (A) F-IF.4 (M) N-Q.1,2,3 (S)	5.5 9.6	3	8/14.35 1/15.18	More graphing practice; adjusting window
Review and Test				2		

17.1	Revisit scatterplots (non-exact); Choosing appropriate regression visually	N-Q.1,2,3 (S) S-ID.6a (S)	4.4	2	8/14/.21	Introduce word problems that can be used throughout unit
17.2	Choosing appropriate regression using correlation coefficient (revisit correlation/causation)	F-LE.5 (S) S-ID.6 (S) S-ID.8 (M) S-ID.9 (M)	4.5	3	6/14.11	
17.3	Choosing appropriate regression using residuals	S-ID.6b (S)	4.5	3	8/14.31 6/15.31	
17.4	Using regression (evaluating and solving); word problems	S-ID.6a (S) N-Q.1,2,3 (S) F-BF.1 (S)	4.5	3		choose level of accuracy appropriate to problem
	Review and Test (or project)			3		
18.1	Recursive sequences	F-IF.3 (M)	6.7	4	8/14.24 1/15.20	
18.2	Arithmetic sequences (link to linear functions)	F-IF.3 (M) F-LE.1c (S)	4.6	3	6/14.24 8/14.16 6/15.22	
18.3	Geometric sequences (link to exponential functions)	F-IF.3 (M) F-LE.1c (S)	6.6	3		
	Review and Test			2		
	Review for Regents					

Extra resources:

- [http://lift-schools-collaboration.cmswiki.wikispaces.net/file/view/84\\_scavenger\\_hunt.pdf](http://lift-schools-collaboration.cmswiki.wikispaces.net/file/view/84_scavenger_hunt.pdf)
- [http://online.math.uh.edu/EatMath/06\\_07/GraphingCalculatorScavengerHunt.pdf](http://online.math.uh.edu/EatMath/06_07/GraphingCalculatorScavengerHunt.pdf)
- <https://www.engageny.org/resource/grades-9-12-mathematics-curriculum-map>
- <http://www.ncesd.org/Page/983> Vocabulary
- <http://www.njctl.org/courses/math/>
- <https://mrallens.wikispaces.com/House+C+Mathematics>
- <https://quizlet.com/subject/1-common-core-algebra/>
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