El Monte Union High School District

Course Outline

High School District

Title: Integrated Math 1 P

Transitional*_____(Eng. Dept. Only)

Sheltered (SDAIE)*____Bilingual*___

AP**_____Honors**_____

Department: Math

Grade Level (s): 9 – 12

Semester_____Year X

Based on Mathematics CCSS

This course meets graduation requirements:

( ) English
( ) Fine Arts
( ) Foreign Language
( ) Health & Safety
(X) Math
( ) Physical Education
( ) Science
( ) Social Science
( ) Elective

Department/Cluster Approval	Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Instructional materials appropriate for English Language Learners are required.

**For AP/Honors course attach a page describing how this course is above and beyond a regular course. Also, explain why this course is the equivalent of a college level class.

1. **Prerequisite(s): None**

2. **Short description of course which may also be used in the registration manual**:
This UC approved college preparatory course follows an approach typically seen internationally (integrated) that consists of a sequence of three courses, each of which includes number, algebra, geometry, probability and statistics. The fundamental purpose of Integrated Math I is to formalize and extend the mathematics that students learned in the middle schools. The critical areas, organized into units, deepen and extend understanding of linear relationships in part by contrasting them with exponential phenomena, and in part by applying linear models to data that exhibit a linear trend. Integrated Math I uses properties and theorems involving congruent figures to deepen and extend understanding of geometric knowledge from prior grades. The final unit in the course ties together the algebraic and geometric ideas studied. The Mathematical Practice Standards apply throughout each course and together with the content standards, prescribe that students experience mathematics as a coherent, useful and logical subject that make use of their ability to make sense of problem situations.

3. **Describe how this course integrates the schools SLOs (School-wide Learning Outcomes): This section may be replaced with specific site SLOs.**

   All schools have SLOs that refer to students as academic achievers, critical thinkers, and effective communicators. This course addresses the mentioned SLOs.

4. **Describe the additional efforts/teaching techniques/methodology to be used to meet the needs of English Language Learners:**

   The special needs of English language learners are met throughout the course in a number of ways:
   - By using the Sheltered Instruction Observation Protocol (SIOP) or other researched based strategies that engage students in learning and communicating their thoughts in the four language domains.
   - By probing prior knowledge to connect existing knowledge with knowledge to be learned.
   - By teaching concepts for which English learners may not have a cultural reference, including obscure terms, and academic vocabulary.
   - By defining abstract concepts in concrete terms, and using specific examples.
   - By using graphic organizers and rubrics to set expectations and facilitate organization of thought.
   - By using a variety of other visual aids during instruction, such as pictures, films, and realia.
   - By encouraging students to express themselves in a variety of modalities.

5. **Describe the interdepartmental articulation process for this course:**

   The study of mathematics in each year of high school leads directly to preparedness for college and career readiness. The skills learned in math are applied to other courses of study including science, social science, and Career Technical Education (CTE). Problem solving, communicating reasoning, modeling and data analysis that are used in mathematics prepare students to apply those same skills in all courses and in real-world scenarios.

6. **Describe how this course will integrate academic and vocational concepts, possibly through connecting activities. Describe how this course will address work-based learning/school to career concepts:**

   Various projects and Performance Tasks that relate real-life problems are implemented throughout the course. These Performance Tasks are usually assigned at the end of each chapter to assess the ability of students to apply concepts learned throughout the chapter towards a real-world situation.

7. **Materials of Instruction (Note: Materials of instruction for English Language Learners are required and should be listed below.)**

   A. Textbook(s) and Core Reading(s):
      - Integrated Mathematics 1: Common Core (HMH) Teacher and Student Edition Textbooks.
        By Timothy Kanold, Edward Burger, Juli Dixon, Matthew Larson, Steven Leinwand
        Copyright 2015 by Houghton Mifflin Harcourt Publishing Company

B. Supplemental Materials and Resources:
   - Overhead transparencies or documents for projection
   - Extra practice worksheets
   - Kuta Software
   - Examview Test Generator
   - ALEKS
   - my.hrw.com (online resources from HMH)
   - Performance Tasks
   - Teacher made resources and manipulatives
   - Materials found on-line: projects; performance tasks, problems of the week...

C. Tools, Equipment, Technology, Manipulatives, Audio-Visual:

   - Protractors
   - Graphing Calculators
   - Projectors
   - Chromebooks
   - Document Readers

8. (see below and attached)

- **Objectives of Course:** The objective of this course is to extend the mathematics students learned in middle school. The Mathematical Practice Standards will be infused throughout the course together with the CCSS for mathematics. This attention to the Practice Standards as well as the Content Standards will ensure that students experience mathematics as coherent, useful, and logical and make use of the student's ability to make sense of problem situations. After completing this course successfully, students will be prepared to proceed to Integrated Math 2.

- **Unit detail including projects and activities including duration of units (see attached)**

  SEE ATTACHED DOCUMENT

- **Indicate references to state framework(s)/standards (If state standard is not applicable then national standard should be used)**

- **Student performance standards**

  Guidelines for grading are:

  A 90 – 100%
  B 80 – 89%
  C 70 – 79%
  D 60 – 69%
  F 59% and below

  - Make sense of problems and persevere in solving them.

- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

- **Evaluation/assessment/rubrics**

  - District assessments (Common Formative Benchmark Assessments)
  - Site assessments to include formative assessments
  - Performance Tasks

- **Include minimal attainment for student to pass course**

  Students must attain at least 60% overall average for all assignments (Tests, Quizzes, Homework, Classwork, Notes, etc.) for the course.

HMH Integrated Math 1 Unit/Module Detail

Unit 1: Quantities and Modeling

Module 1 – Quantitative Reasoning
- 1.1: Solving Equations
  - A-REI.1 Solve equations and explain each step
- 1.2: Modeling Quantities
  - N-Q.2 Scale factors, conversions
- 1.3: Reporting with Precision and Accuracy **NONE**
  - N-Q.3 Significant Digits

Module 2 – Algebraic Models
- 2.1: Modeling with Expressions **NONE**
  - A-SSE.1a Words to symbols
- 2.2: Creating and Solving Equations
  - A-CED.1 Word prob. w multi-step equations
- 2.3: Solving for a Variable
  - A-CED.4 Formulas, manipulating variables
- 2.4: Creating and Solving Inequalities
  - A-CED.3 Solve Inequalities, word problems
- 2.5: Creating and Solving Compound Inequalities
  - A-CED.1 Solve/graph, word problems

Unit 2: Understanding Functions

Module 3 – Functions and Models
- 3.1: Graphing Relationships
  - F-IF.4 Interpret graphs
- 3.2: Understanding Relations and Functions
  - F-IF.1 Domain, Range, map, vertical line test
- 3.3: Modeling with Functions
  - F-IF.2 Independent/Dependent, word problems
- 3.4: Graphing Functions
  - F-IF.1 Graph w tables, interpret graphs

Module 4 – Patterns and Sequences **(Covered in IM 3 Module 12)**
- 4.1: Identifying and Graphing Sequences
  - F-IF.3 Generating and graphing sequences
- 4.2: Constructing Arithmetic Sequences
  - F-LE.2 Using a general form to construct rules
- 4.3: Modeling with Arithmetic Sequences
  - F-BF.1a Word problems

Unit 3: Linear Functions, Equations, and Inequalities

Module 5 – Linear Functions
- 5.1: Understanding Linear Functions
  - F-LE.1b Graph standard from
- 5.2: Using Intercepts
  - F-IF.7a Graph using intercepts
- 5.3: Interpreting Rate of Change and Slope
  - F-IF.6 Slope from a graph, slope formula

Module 6 – Forms of Linear Equations
- 6.1: Slope-Intercept Form
  - F-IF.7a Derive and graph Slope-intercept form
- 6.2: Point-Slope Form
  - A-REI.1 Derive and graph point-slope form
- 6.3: Standard Form
  - A-CED.2 Manipulate equations into standard form
- 6.4: Transforming Linear Functions
  - F-BF.3 f(x)+k, kf(x), f(kx), f(x+k)
- 6.5: Comparing Properties of Linear Functions
  - F-IF.9 Compare given graphs, tables, descriptions

Module 7 – Linear Equations and Inequalities
- 7.1: Modeling Linear Relationships
  - A-CED.3 Represent constraints
- 7.2: Using Functions to Solve One-Variable Equations
  - A-REI.11 Determine approximate solutions
- 7.3: Linear Inequalities in Two Variables
  - A-REI.12 Graph linear inequalities

Unit 4: Statistical Models

Module 8 – Multi-Variable Categorical Data **(Covered in IM 2 Modules 22 and 23)**
- 8.1: Two-Way Frequency Tables
  - S-ID.5 Categorical data, two-way tables, frequency
- 8.2: Relative Frequency
  - S-ID.5 Conditional frequency, associations

Module 9 – One-Variable Data Distributions **(Covered in IM 3 Modules 20 and 21)**
- 9.1: Measures of Center and Spread
  - S-ID.2 Mean, median, range, standard deviation
- 9.2: Data Distributions and Outliers
  - S-ID.1 Dot plots, outliers, compare data distribute
- 9.3: Histograms and Box Plots
  - S-ID.2 Construct, compare, estimate
- 9.4: Normal Distributions
  - S-ID.2 Symmetry, properties, probabilities

Module 10 – Linear Modeling and Regression **(Covered in IM 2 Module 10)**

- 10.1: Scatter Plot and Trend Lines
  - S-ID.6c Correlation, causation, line of best fit
- 10.2: Fitting a Linear Model to Data
  - S-ID.6b Residuals, linear regression

Unit 5: Linear Systems and Piecewise-Defined Functions

Module 11 – Solving Systems of Linear Equations

- 11.1: Solving Linear Systems by Graphing
  - A-REI.6 Consistent, independent, special systems
- 11.2: Solving Linear Systems by Substitution
  - A-REI.6 Substitution
- 11.3: Solving Linear Systems by Adding or Subtracting
  - A-REI.6 Simple elimination
- 11.4: Solving Linear Systems by Multiplying First
  - A-REI.5 Elimination with multiplication

Module 12 – Modeling with Linear Systems

- 12.1: Creating Systems of Linear Equations
  - A-CED.3 Systems from tables, graphs, word problems
- 12.2: Graphing Systems of Linear Inequalities
  - A-REI.12 Graph, determine solutions
- 12.3: Modeling with Linear Systems
  - A-CED.3 Systems inequalities word problems

Module 13 – Piecewise-Defined Functions

- 13.1: Understanding Piecewise-Defined Functions **NONE**
  - F-IF.7b Explore, evaluate, graph
- 13.2: Absolute Value Functions and Transformation **(Covered in IM 3 Module 5)**
  - F-IF.7b Graphs
- 13.3: Solving Absolute Value Equations
  - A-REI.3.1 Solve by graphing and algebraically
- 13.4: Solving Absolute Value Inequalities **NONE**
  - A-REI.3.1 Solve by graphing and algebraically

Unit 6: Exponential Relationships

Module 14 – Geometric Sequences and Exponential Functions **(Covered in IM 3 Module 12 and 13)**

- 14.1: Understanding Geometric Sequences
  - F-LE.2 Growth patterns
- 14.2: Constructing Geometric Sequences
  - Recursive and explicit rules, derive general rules
- 14.3: Constructing Exponential Functions
  - F-LE.2 Construct from words and ordered pairs
- 14.4: Graphing Exponential Functions
  - F-IF.7e Tables, graphs, increase, decrease

14.5: Transforming Exponential Functions
F-BF.3 f(x), f(x)+k, kf(x), f(kx), f(x+k)

Module 15 – Exponential Equations and Models **(Covered in IM 3 Module 13 and 14)**
15.1: Using Graphs and Properties to Solve Equations with Exponents
A-CED.1 Solve algebraically and graphically
15.2: Modeling Exponential Growth and Decay
F-IF.7e End behavior, compare growth/decay
15.3: Using Exponential Regression Models
S-ID.6a Fitting, plotting, modeling
15.4: Comparing Linear and Exponential Models
F-LE.1c Choose between linear and exponential

Unit 7: Transformations and Congruence

Module 16 – Tools of Geometry
16.1: Segment Length and Midpoints
G-CO.1 Basic terms, construct bisector, midpoint
16.2: Angle Measures and Angle Bisectors
G-CO.1 measure/construct angles and bisectors
16.3: Representing and Describing Transformations
G-CO.2 Transformation using coordinate notation
16.4: Reasoning and Proof
G-CO.9 Inductive and deductive reasoning

Module 17 – Transformations and Symmetry
17.1: Translations
G-CO.4 Translations using vectors
17.2: Reflections
G-CO.4 Reflections using graph paper
17.3: Rotations
G-CO.4 Rotations using ruler and protractor
17.4: Investigating Symmetry
G-CO.3 Line and rotational symmetry

Module 18 – Congruent Figures
18.1: Sequences of Transformations
G-CO.5 combining rotations and reflections
18.2: Proving Figures Are Congruent Using Rigid Motions
G-CO.6 Congruence using rigid motion
18.3: Corresponding Parts of Congruent Triangles are Congruent
G-CO.7 CPCTC and proofs

Unit 8: Lines Angles, and Triangles

Module 19 – Lines and Angles

19.1: Angles Formed by Intersecting Lines
G-CO.9 Vertical, supplementary, complementary

19.2: Transversals and Parallel Lines
G-CO.9 Alternate interior, corresponding

19.3: Proving Lines are Parallel
G-CO.9 Construct parallel lines

19.4: Perpendicular Lines
G-CO.9 Construct Perpendicular lines & bisectors

19.5: Equations of Parallel and Perpendicular Lines
G-GPE.5 Slopes, writing equations

Module 20 – Triangle and Congruence Criteria

20.1: Exploring What Makes Triangles Congruent
G-CO.7 Properties of congruent triangles

20.2: ASA Triangle Congruence
G-CO.8 Decide if /prove congruent triangles

20.3: SAS Triangle Congruence
G-CO.8 Decide if /prove congruent triangles

20.4: SSS Triangle Congruence
G-CO.8 Decide if /prove congruent triangles

Module 21 – Applications of Triangle Congruence

21.1: Justifying Constructions
G-CO.12 Angle, perpendicular and angle bisector

21.2: AAS Triangle Congruence
G-SRT.5 Justify, prove and apply AAS

21.3: HL Triangle Congruence
G-SRT.5 Justify, prove and apply HL

Module 22 – Properties of Triangles

22.1: Interior and Exterior Angles
G-CO.10 In triangles and polygons

22.2: Isosceles and Equilateral Triangles
G-CO.10 Using properties to prove

22.3: Triangle Inequalities **NONE**
G-GMD.6 Find possible side lengths

Module 23 – Special Segments in Triangles

23.1: Perpendicular Bisectors of Triangles
G-C.3 Concurrency and using properties

23.2: Angle Bisectors of Triangles **NONE**
G-C.3 Inscribed circle and using properties

23.3: Medians and Altitudes of Triangles **NONE**
G-CO.10 Balance point, centroid, orthocenter

23.4: Midsegments of Triangles **NONE**
C-CO.10 Using triangle midsegment theorem

Unit 9: Quadrilaterals and Coordinate Proof

Module 24 – Properties of Quadrilaterals
- 24.1: Properties of Parallelograms
  - G-CO.11 Opposite sides/angles are congruent
- 24.2: Conditions for Parallelograms
  - G-CO.11 Using properties to prove parallelogram
- 24.3: Properties of Rectangles, Rhombuses, and Squares
  - G-CO.11 Sides, angles, diagonals
- 24.4: Conditions for Rectangles, Rhombuses, and Squares
  - G -CO.11 Using properties to prove
- 24.5: Properties and Conditions for Kites and Trapezoids
  - G -SRT.5 Using properties to prove

Module 25 – Coordinate Proof Using Slope and Distance
- 25.1: Slope and Parallel Lines
  - G -GPE.5 Use side slopes to classify figures
- 25.2: Slope and Perpendicular Lines
  - G -GPE.5 Use right angles to classify figures
- 25.3: Coordinate Proof Using Distance with Segments and Triangles
  - G -GPE.4 Distance and midpoint formulas
- 25.4: Coordinate Proof Using Distance and Quadrilaterals
  - G -CO.11 Prove properties quadrilaterals
- 25.5: Perimeter and Area on the Coordinate Plane
  - G -GPE.7 Areas of composite figures

IM1 2018-2019 Pacing Calendar (Reference Only)

Monday	Tuesday	Wednesday	Thursday	Friday
8/13	8/14 First Day for Teachers	8/15 PD for Teachers	8/16 PD for Teachers	8/17 PD for teachers
8/20 First Day for Students Introduction and Syllabus	8/21 Vocab Activities Listening and Speaking Checking for understanding ALEKS Know. Check	8/22 Vocab Activities Listening and Speaking Checking for understanding ALEKS Knowledge Check	8/23 Vocab Activities Listening and Speaking Checking for understanding ALEKS Knowledge Check	8/24 ALEKS Knowledge Check
8/27 ALEKS (2 days on ALEKS)	8/28 2.1 Expressions	8/29 1.1 Solving Equations	8/30 1.1 Solving Equations	8/31 ALEKS
9/3 No School Labor Day (1 day on ALEKS)	9/4 2.2 Solving Equations with variables on both sides	9/5 2.2 Solving Equations with variables on both sides	9/6 2.3 Literal Equations	9/7 2.2 or 2.3 or ALEKS
9/10 ALEKS	9/11 ALEKS/Review	9/12 Review	9/13 Mod 1.1, 2.1-2.3 Test	9/14 2.4 Solving Inequalities
9/17 ALEKS	9/18 2.4 Solving Inequalities	9/19 2.5 Solving Compound Inequalities	9/20 2.5 Solving Compound Inequalities	9/21 2.4/2.5/ALEKS
9/24 ALEKS	9/25 1.2 Ratio and Proportion	9/26 Review	9/27 Test Mod 2.3 -2.4 + 1.2	9/28 1st Grading Period Ends District PT
10/1 ALEKS Knowledge Check (2 days on ALEKS)	10/2 3.1 Interpreting Graph	10/3 3.2 Understanding Functions	10/4 3.3 Modeling and Functions	10/5 3.1/3.2/3.3/ALEKS
10/8 ALEKS	10/9 3.4 Graphing Functions	10/10 3.4 Graphing Functions	10/11 ALEKS	10/12 Review
10/15 ALEKS	10/16 Review	10/17 Test Mod 3	10/18 4.1 Patterns and Linear vs Non-Linear	10/19 ALEKS
10/22 ALEKS	10/23 4.2 Arithmetic Sequences	10/24 4.3 Modeling with Arithmetic Sequences	10/25 14.1 Intro Geometric Sequences	10/26 ALEKS

10/29 ALEKS	10/30 14.2 Constructing Geometric Sequences	10/31 14.3 Constructing Exponential Functions	11/1 ALEKS	11/2 15.4 Comparing Linear and Exponential Models

11/5 ALEKS	11/6 ALEKS/Review	11/7 Review	11/8 Test Mod 4 and 14.2, 14.3, 15.4	11/9 2nd Grading Period Ends District PT
11/12 No school Veteran's Day	11/13 ALEKS Knowledge check	11/14 5.1 Understanding Linear Functions	11/15 5.2 Using Intercepts	11/16 ALEKS
11/19 Student/Teacher Free Day	11/20 Student/Teacher Free Day	11/21 Student/Teacher Free Day	11/22 Thanksgiving	11/23 Thanksgiving holiday
11/26 ALEKS	11/27 5.3 Interpreting Rate of Change and Slope	11/28 ALEKS	11/29 Review	11/30 Test Mod 5
12/3 ALEKS	12/4 6.1(Slope-Intercept form) or 6.2 first (Point Slope Form)	12/5 ALEKS	12/6 6.2 (Point-Slope form) or 6.1 2nd (Slope-Intercept Form)	12/7 6.3 Standard Form
12/10 Review For Finals	12/11 Performance Task	12/12 Review for Finals	12/13 Review for Finals	12/14 Review for Finals
12/17 Review for Finals	12/18 FINAL EXAMS	12/10 FINAL EXAMS	12/20 FINAL EXAMS	12/21 Student/Teacher Free Day
December 24 – January 4 WINTER VACATION				
1/7 2nd Semester Begins ALEKS Knowledge Check	1/8 ALEKS	1/9 6.4 Transforming Linear Functions	1/10 6.5 Comparing Properties of Linear Functions	1/11 19.5 Equations of Parallel and Perpendicular Lines
1/14 ALEKS	1/15 19.5 Equations of Parallel and Perpendicular Lines	1/16 ALEKS/Review	1/17 Review	1/18 Test Mod 6 + 19.5
1/21 No School Martin Luther King Jr. Birthday	1/22 ALEKS	1/23 7.1 Modeling Linear Relationships	1/24 7.2 Using Functions to Solve One Variable	1/25 ALEKS

			Equations	
1/28 ALEKS	1/29 7.3 Linear Inequalities in Two Variables	1/30 Review/ALEKS	1/31 Review	2/1 Test Mod 7
2/4 ALEKS	2/5 11.1 Solving Linear Equations by Graphing	2/6 11.2 Solving Linear Equations by Substitution	2/7 ALEKS	2/8 11.3 Solving Linear Equations by Adding or Subtracting
2/11 No School Lincoln Birthday	2/12 ALEKS	2/13 11.4 Solving Linear Equations by Multiplying First	2/14 12.1 Creating Systems of Linear Equations	2/15 ALEKS
2/18 No School President's Day	2/19 ALEKS	2/20 12.2 Graphing Systems of Linear Inequalities	2/21 12.3 Modeling with Linear Systems	2/22 1st grading period ends District PT
2/25 ALEKS Knowledge Check	2/26 Review	2/27 Review/ALEKS	2/28 Test Mod 11+12	3/1 9.1 Measures of Center and Spread
3/4 ALEKS	3/5 9.2 Data Distributions and Outliers	3/6 9.3 Histograms and Box Plots	3/7 10.1 Scatter Plots and Trend Lines	3/8 ALEKS
3/11 ALEKS	3/12 10.2 Fitting a linear Model to Data	3/13 Review	3/14 ALEKS	3/15 Test Mod 9 + 10
3/18 ALEKS	3/19 16.1 Segment Lengths and Midpoints	3/20 16.1 Segment Lengths and Midpoints	3/21 16.2 Angle Measure and Angle Bisectors	3/22 ALEKS
3/25 ALEKS	3/26 16.2 Angle Measure and Angle Bisectors	3/27 Review	3/28 Review/ALEK	3/29 Test Mod 16
4/1 Student/Teacher Free Day	4/2 ALEKS	4/3 19.1 Angles Formed by Intersecting Lines	4/4 19.1 Angles Formed by Intersecting Lines	4/5 2nd grading period ends District PT
4/8 ALEKS Knowledge Check	4/9 19.2 Transversals and Parallel Lines	4/10 19.2 Transversals and Parallel Lines	4/11 ALEKS	4/12 19.3 Proving Lines are Parallel
4/15	4/16	4/17	4/18	4/19

ALEKS	19.3 Proving Lines are Parallel	ALEKS	ALEKS/catch up	Student/Teacher Free Day
April 22-26 Spring Break				
4/29 ALEKS	4/30 19.4 Perpendicular Lines	5/1 19.4 Perpendicular Lines	5/2 ALEKS	3/3 Review
5/6 ALEKS AP US Government, Chinese, Environmental Science	5/7 Review AP Spanish language and Culture, Japanese Lang, Physics 1	5/8 Test 19 AP English Lit and Comp., European History, French	5/9 16.3 Describing Transformations AP Chemistry, Spanish Lit and Cult. German Lang and Cult, Psychology	5/10 ALEKS AP US History, Computer Science Princ., Physics 2
5/13 ALEKS AP Biology, Physics C (Mech, Electr. And Mag.)	5/14 16.3 Describing Transformations AP Calculus AB/BC, Art History, Human Geo.	5/15 17.1 Translations AP English Lang and Comp, Italian Lang, Macroeconomics	5/16 17.2 Reflections AP Comparative, Government and Politics, World History, Statistics	5/17 ALEKS AP Microeconomics, Music Theory, Computer Science A, Latin
5/20 ALEKS	5/21 17.3 Rotations	5/22 17.4 Investigating Symmetry	5/23 Review	5/24 Test 16.3 + 17
5/27 No School Memorial Day Holiday	5/28 Review	5/29 Review	5/30 Review	5/31 Review
6/3 Review	6/4 FINAL EXAMS	6/5 FINAL EXAMS	6/6 FINAL EXAMS	6/7 Last Day for Teachers

Mathematics I Overview

Number and Quantity

Quantities

- Reason quantitatively and use units to solve problems.

Algebra

Seeing Structure in Expressions

- Interpret the structure of expressions.

Creating Equations

- Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities

- Understand solving equations as a process of reasoning and explain the reasoning.
- Solve equations and inequalities in one variable.
- Solve systems of equations.
- Represent and solve equations and inequalities graphically.

Functions

Interpreting Functions

- Understand the concept of a function and use function notation.
- Interpret functions that arise in applications in terms of the context.
- Analyze functions using different representations.

Building Functions

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

- Construct and compare linear, quadratic, and exponential models and solve problems.
- Interpret expressions for functions in terms of the situation they model.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mathematics I Overview *(continued)*

Geometry

Congruence

- Experiment with transformations in the plane.
- Understand congruence in terms of rigid motions.
- Make geometric constructions.

Expressing Geometric Properties with Equations

- Use coordinates to prove simple geometric theorems algebraically.

Statistics and Probability

Interpreting Categorical and Quantitative Data

- Summarize, represent, and interpret data on a single count or measurement variable.
- Summarize, represent, and interpret data on two categorical and quantitative variables.
- Interpret linear models.

Number and Quantity

Quantities N-Q

Reason quantitatively and use units to solve problems. [Foundation for work with expressions, equations, and functions]

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★
2. Define appropriate quantities for the purpose of descriptive modeling. ★
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

Algebra

Seeing Structure in Expressions A-SSE

Interpret the structure of expressions. [Linear expressions and exponential expressions with integer exponents]

1. Interpret expressions that represent a quantity in terms of its context. ★
   a. Interpret parts of an expression, such as terms, factors, and coefficients. ★
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of* P *and a factor not depending on* P. ★

Creating Equations A-CED

Create equations that describe numbers or relationships. [Linear and exponential (integer inputs only); for **A-CED.3**, linear only]

1. Create equations and inequalities in one variable **including ones with absolute value** and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* **CA** ★
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. ★
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* ★
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law* $V = IR$ *to highlight resistance* R. ★

M1 Mathematics I

Reasoning with Equations and Inequalities — A-REI

Understand solving equations as a process of reasoning and explain the reasoning. [Master linear; learn as general principle.]

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Solve equations and inequalities in one variable.

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. [Linear inequalities; literal equations that are linear in the variables being solved for; exponential of a form, such as $2^x = 1/16$.]

3.1 Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context. CA

Solve systems of equations. [Linear systems]

5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

Represent and solve equations and inequalities graphically. [Linear and exponential; learn as general principle.]

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. ★

12. 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.

Functions

Interpreting Functions — F-IF

Understand the concept of a function and use function notation. [Learn as general principle. Focus on linear and exponential (integer domains) and on arithmetic and geometric sequences.]

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.

2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ *for* $n \geq 1$.

Interpret functions that arise in applications in terms of the context. [Linear and exponential (linear domain)]

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* ★
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★

Analyze functions using different representations. [Linear and exponential]

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
   a. Graph linear and quadratic functions and show intercepts, maxima, and minima. ★
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. ★
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Building Functions F-BF

Build a function that models a relationship between two quantities. [For F-BF.1, 2, linear and exponential (integer inputs)]

1. Write a function that describes a relationship between two quantities. ★
   a. Determine an explicit expression, a recursive process, or steps for calculation from a context. ★
   b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* ★
2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. ★

Build new functions from existing functions. [Linear and exponential; focus on vertical translations for exponential.]

3. Identify the effect on the graph of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*

Linear, Quadratic, and Exponential Models F-LE

Construct and compare linear, quadratic, and exponential models and solve problems. [Linear and exponential]

1. Distinguish between situations that can be modeled with linear functions and with exponential functions. ★
   a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. ★
   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. ★
   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. ★
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). ★
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. ★

Interpret expressions for functions in terms of the situation they model. [Linear and exponential of form $f(x)=b^x+k$]

5. Interpret the parameters in a linear or exponential function in terms of a context. ★

Geometry

Congruence G-CO

Experiment with transformations in the plane.

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.
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions. [Build on rigid motions as a familiar starting point for development of concept of geometric proof.]

6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Make geometric constructions. [Formalize and explain processes.]

12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*
13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Expressing Geometric Properties with Equations G-GPE

Use coordinates to prove simple geometric theorems algebraically. [Include distance formula; relate to Pythagorean Theorem.]

4. Use coordinates to prove simple geometric theorems algebraically.
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).
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. ★

Statistics and Probability

Interpreting Categorical and Quantitative Data S-ID

Summarize, represent, and interpret data on a single count or measurement variable.

1. Represent data with plots on the real number line (dot plots, histograms, and box plots). ★
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

Summarize, represent, and interpret data on two categorical and quantitative variables. [Linear focus; discuss general principle.]

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★
    a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* ★
    b. Informally assess the fit of a function by plotting and analyzing residuals. ★
    c. Fit a linear function for a scatter plot that suggests a linear association. ★

Interpret linear models.

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. ★
8. Compute (using technology) and interpret the correlation coefficient of a linear fit. ★
9. Distinguish between correlation and causation. ★