

Pocatello/Chubbuck School District #25
High School Integrated Math

Background Information

- There are two approaches to the teaching of high school mathematics:
 - Traditional: Algebra I, Geometry, Algebra II
 - Integrated: Integrated Mathematics I, II, and III
- The District's High School Teachers and Administrators have been studying the topic for the last 4-5 years.
- The following slides share our journey to integrated mathematics.

Goal of High School Mathematics in Pocatello/Chubbuck School District

- Provide instruction that enables students to use mathematics to become better thinkers and problem solvers, and provides students the mathematical foundation necessary for their future endeavors.
- Think College and Career

Belief Statement

- Students should be:
 - exposed to *reasoning, sense making, and problem-solving*, in the context of strong mathematical content, thereby developing an understanding of a situation, context or concept by *connecting it with existing knowledge*.
 - given multiple opportunities to *apply mathematics in meaningful ways* as part of the learning process, as learning mathematics is enhanced when *content is placed in context* and is connected to other subject areas.
 - provided instruction that strikes a *necessary balance between conceptual understanding and procedural fluency*.

Adapted from *NCTM Strategic Plan, Statement of Beliefs; and Attributes of Effective Formative Assessment*

Teaching through Tasks

- Tasks are central to students' learning as they require students to:
 - Solve problems
 - Explore situations and gather data
 - Listen to and critique explanations
 - Read texts
 - Conjecture and justify
- **Tasks traditionally assigned** to students such as story problems make only **minimal demands** on student thinking, relying primarily on memorization or use of procedures.
- Students learn best when presented with **academically challenging tasks without a clear solution path.**

See, for example, Campbell, 1996; Carpenter, Fennema, Peterson, Chiang, and Loef, 1989; Hiebert, Carpenter, Fennema, Fuson, Wearne, Murray, Olivier, and Human, 1997; Knapp, 1995; Silver and Stein, 1996

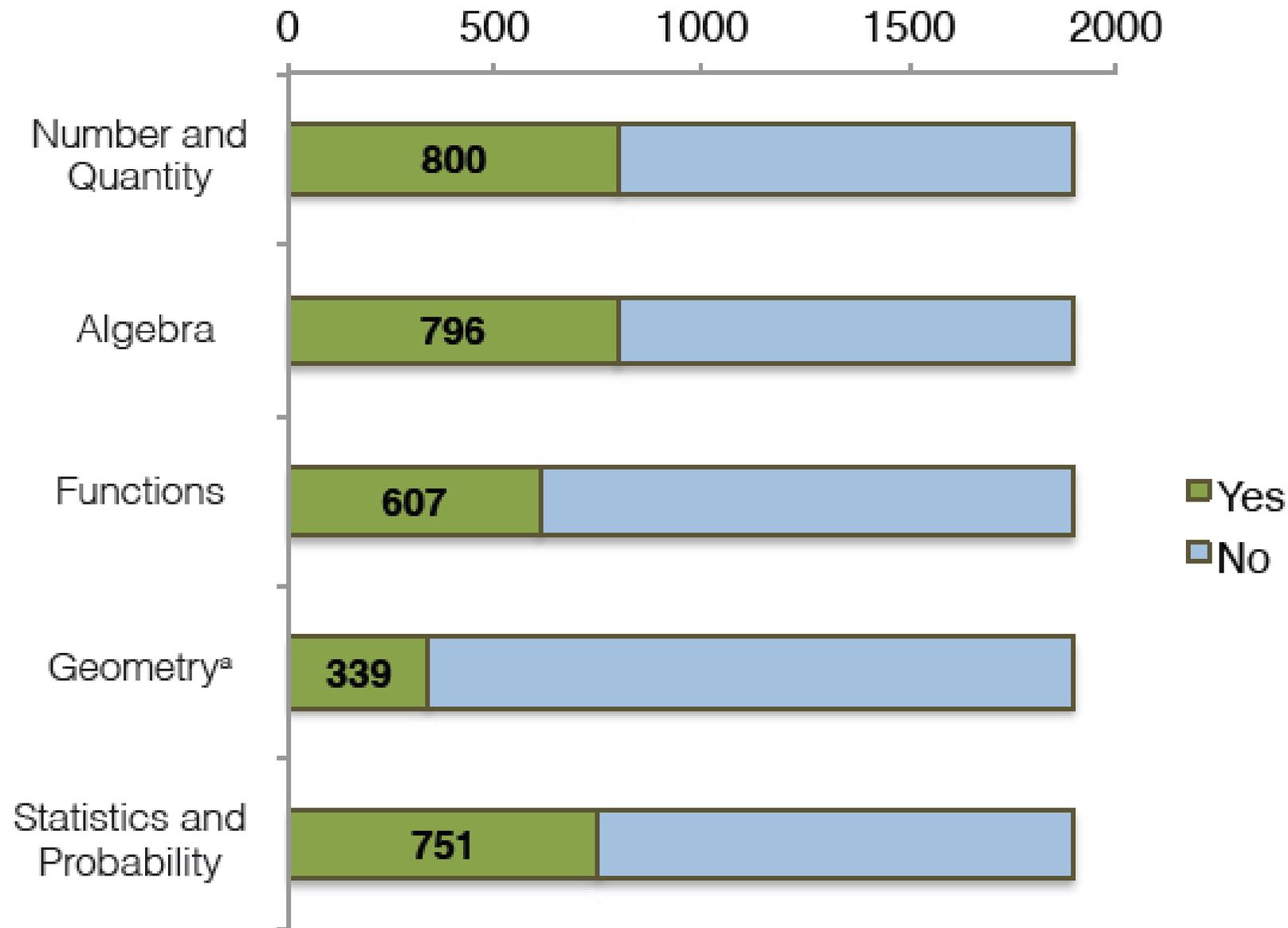
Video Example of Teaching Through Tasks

College and Career Ready?

- Business Professionals and College Professors in a variety of disciplines were asked what math skills students need to be successful in the workforce or in college.
- 1815 postsecondary instructors surveyed
 - English language arts, mathematics, science, social science, business management, computer technology, and healthcare
 - Determined the applicability and importance of standards
 - Greater emphasis given to Number and Quantity, Algebra, Functions, and Statistics/Probability than Geometry topics

<http://www.epiconline.org/reaching-the-goal-full-report/>

Figure 32. Response from Sample ($n = 1897$) to Overall Relevancy Question for Mathematics Conceptual Categories



^aGeometry has 1896 respondents because, due to a system error, this conceptual category and its standards statements were not presented to one respondent.

Redesigned SAT

Question Content	Percent of test
Heart of Algebra Analyzing and fluently solving and understanding the relationships between linear equations and inequalities	33%
Problem Solving and Data Analysis Creating and analyzing relationships using ratios, proportional relationships, percentages, and units. Finding and applying probabilities	29%
Advanced Math Identifying and creating equivalent algebraic expressions, creating, analyzing, and fluently solving quadratic, exponential, and other nonlinear equations and graphing their functions	28%
Additional Topics Solving area and volume problems, Applying definitions and theorems related to lines, angles, triangles, and circles. Working with right triangles, the unit circle and trigonometric functions.	10%

ISAT 2.0

Topic	% of Questions
Concepts and Procedures (Trig ratios/right triangles)	50% (2 out of 22 questions)
Problem Solving, Modeling, and Data Analysis	25%
Communicating Reasoning (Geometry)	25% (at most 2 out of 10 questions)

From Traditional to Integrated Mathematics Curriculum

- Traditional U.S. High School mathematics curricula typically organize the content into year-long courses. Students take Algebra I, followed by Geometry, followed by Algebra 2.
- Integrated Mathematics is a curriculum that combines several mathematics topics, such as number, algebra, geometry, probability and statistics into single courses, typically over a 3 year period. The courses are referred to as Integrated Math 1, Integrated Math 2 and Integrated Math 3.

Rationale for Integrated Math

- Infusion of Algebra, Geometry, Statistics
 - Aligned with college/career recommendations
 - Students better prepared for SAT and other standardized tests
 - Topics are not isolated
 - Allows for better connections among topics
 - Will improve concept retention
- Consistency across the district
 - Transition from elementary through high school
 - Between high schools
- Students will have more trimesters of math before testing

Transition to Integrated Math

- Transition to Integrated Math I, II, III over three years beginning in 2017-2018
 - Math I: 3 trimesters
 - Math II: 3 trimesters
 - Math III: 2 trimesters

Class of 2018, 2019, 2020 Math Sequence

Grade Level

Grade 6

Grade 7

Grade 8

Grade 9

Grade 10

Grade 11

Grade 12

Honors Track

Mathematics 6th

Pre-Algebra

Algebra I A/B/C

Honors Geometry

Honors Algebra II

Honors
College Algebra/
Trigonometry/
Calculus/
AP Statistics

AP Calculus

AP Statistics

Trigonometry/
College Algebra

AP Statistics

On Grade Level

Mathematics 6th

Mathematics 7th

Mathematics 8th

Algebra I A/B/C

Geometry

Algebra II

Trigonometry/
College Algebra

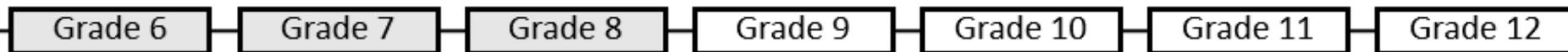
Probability and
Statistics A/B

Business Math A/B

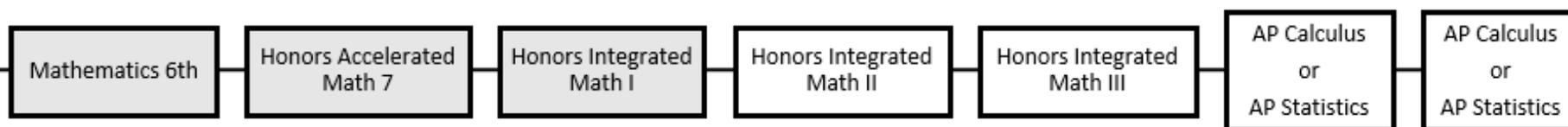
AP Statistics

Class of 2021 and beyond Math Sequence

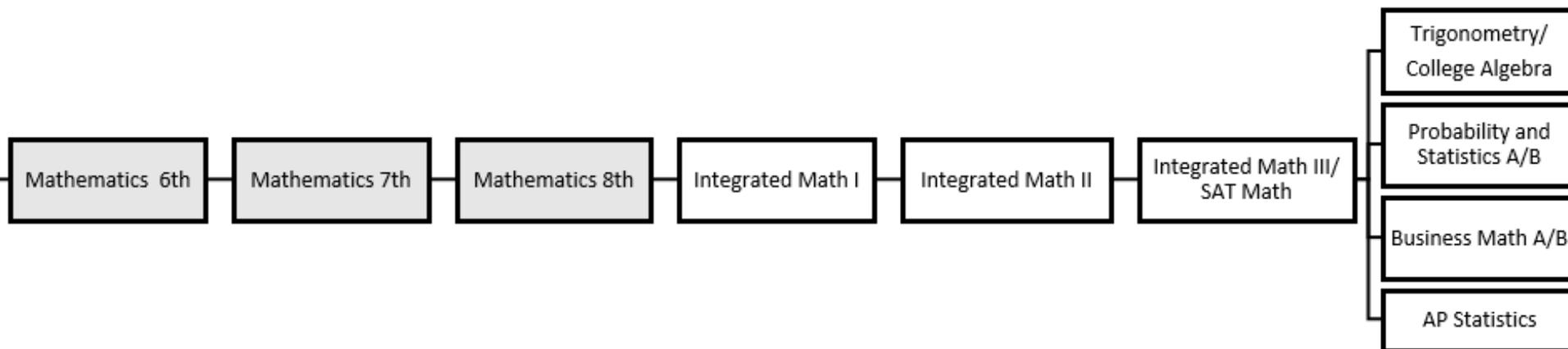
Grade Level



Honors Track



On Grade Level



FAQ

- Integrated accepted by universities
- Integrated meets NCAA academic eligibility requirements

Integrated Mathematics I

Prerequisite: Math 8 A/B/C

Integrated Mathematics I is the first of three high school–level courses that integrate algebra, geometry, trigonometry, and statistics aligned to the Idaho Core Standards and the SAT. This course formalizes and extends the mathematics that students learned in middle school. This course includes much of the content of an Algebra I course as well as geometry and statistics. Integrated Mathematics I focuses on linear and exponential expressions, equations, and functions. Students graph and analyze data throughout the course to make real life connections. Transformations, congruence, coordinate geometry, and basic constructions are incorporated to deepen students' understanding of mathematical relationships.

Integrated Mathematics II

Prerequisite: Integrated Mathematics I A/B/C

Integrated Mathematics II is the second of three high school–level courses that integrate algebra, geometry, trigonometry, and statistics aligned to the Idaho Core Standards and the SAT. This course continues an emphasis on exploring algebraic and geometric relationships. Integrated Mathematics II focuses on quadratic expressions, equations, and functions while comparing their characteristics and behavior to those of linear and exponential relationships as encountered in Integrated Mathematics I. A study of polygons, circles, right triangle trigonometry, data analysis, and probability further deepens students' understanding of mathematical concepts.

Integrated Mathematics III

Prerequisite: Integrated Mathematics II A/B/C

Integrated Mathematics III is the third of three high school-level courses that integrate algebra, geometry, trigonometry, and statistics aligned to the Idaho Core Standards and the SAT. This course extends the mathematical concepts students learned in Integrated Mathematics II. Students expand their repertoire of functions to include polynomial, rational, radical, logarithm and trigonometric functions. The study of right-triangle trigonometry is expanded to include general triangles. Students combine understanding of data, functions, and geometry to create models and solve contextual problems.

For questions, please contact:

- Chuck Orr, Director of Curriculum:
orrch@sd25.us

- Jan Harwood, Director of Secondary
Education:

harwooja@sd25.us