

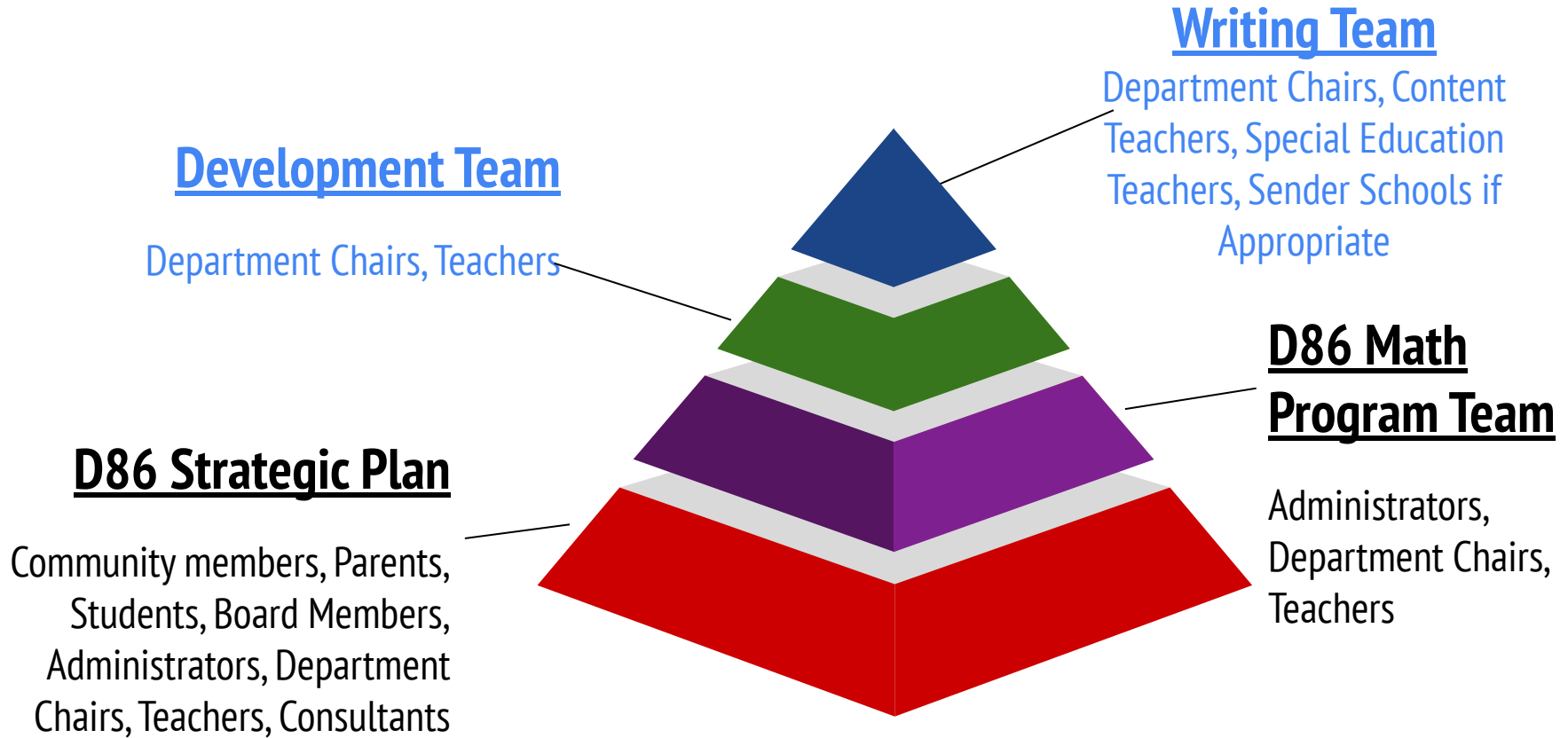
Math Program Updates and Plans



Board of Education Meeting

May 26, 2021

Structure of the Curriculum-Alignment Process



A Collaborative Juncture

The D86 Math Department strives to meet the needs of our students and our community, and much of our work has emerged from the communication and direction we have received from our school board leadership over the years.

As times change, the needs and interests of our students and community also change, and therefore so do the needs and interests of our school board. Our department members understand that to do our best work, we must engage in ongoing dialogue and adapt as well.

Math Pathways Program Goals- Linked to SP Goal 1

GOAL 1, STRATEGY 1 Alignment and Measures of Success	- Align course fees, texts, grading practices, objectives, semester exams
	- Develop a common D86 Program of Studies for implementation 2024-2025
	- Courses cohesively link to each other in terms of knowledge and skills
	- Courses are logically sequenced to enhance connections
	- Assessments increase opportunities to demonstrate knowledge in authentic ways
GOAL 1, STRATEGY 2 Increase exposure to real-world connections in the study of mathematics	- Courses support student development of Common Core Math Standards and Practices
	- Course content reflects the exploration and applications of mathematics
	- Instruction provides opportunities to demonstrate knowledge in authentic ways
	- Maximize connections between new concepts and previously learned ideas
GOAL 1, STRATEGY 3 Align courses with college and career opportunities.	- Maintain/increase AP enrollment and exam pass rate in all 5 Math/Computer Science AP courses
	- Provide 4th-year courses that match student interest/career paths
	- Develop transition math and/or dual credit options
	- Students have course options that further their math knowledge beyond typical Algebra 2 content

Math Pathways Program Goals- Linked to SP Goal 2

<u>GOAL 2, STRATEGY 4</u> Optimize the school day to meet student needs	- Ensure intervention opportunities are provided before, during, and after the school day
	- Opportunities are available outside of the 50-minute class period to support student goals
<u>GOAL 2, STRATEGY 5</u> Provide informed student choice of math courses	- Provide choices and options for pathways of study beyond essential concepts
	- Maximize support for academic risk-taking, including appropriate acceleration of student coursework
<u>GOAL 2, STRATEGY 6</u> Employ best practices to improve students' SEL skills	- Support student course changes to reflect adjustments of long-term goals
	- Social-Emotional Learning standards are embedded into the curriculum

Math Pathways Program Goals- Linked to SP Goal 3

<u>GOAL 3, STRATEGY 9</u> Support curricular collaboration	- Opportunities are provided to ensure students are mathematically prepared to enter the high school curriculum
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Fulfilling These Goals Ensures

1. Maintaining and expanding a program of excellence for our most advanced students in math - those entering D86 having successfully completed Algebra and Geometry in middle school.
2. *Moving the Middle* to higher levels of success through
 - Increased, personalized choices
 - Expanded advancement/enrichment pathways
 - Targeted application and connection of mathematical concepts
3. Equitable opportunities for students who struggle with math when they enter high school. Charting a path that challenges students with grade-level curriculum and supports them through traditional and innovative support systems.

Separate Components of the Curriculum Work in Mathematics

1. Align curricular outcomes in all AP courses to ensure academic readiness for College Board exams (1.1a, 1.3a): *More teacher collaboration between campuses*
2. Increase opportunities for students to take 4th year math courses designed to meet their future goals (1.3b, 1.3c, 1.3d): *More students extending and focusing their math experience during high school*
3. Provide equitable opportunities for all students to master college preparatory math skills (1.2a, 1.3d): *More students ready for college math*
4. Integrate math concepts in core math courses (1.1c, 1.1d, 1.2a, 1.2b, 1.2d): *More holistic, applicable and real-world approach to mathematics*

Future Direction by BoE

- 1.) Should we continue developing additional 4th year options for implementation between 2022-2024?
- 2.) Should we continue our work aligning AP courses as previously directed by the Board adopted District Strategic Plan?
- 3.) Should we continue developing the Quantitative Reasoning and Functional Relationships Course as an option for students previously enrolled in the G track courses?
- 4.) Should we continue developing the Integrated Math core sequence as recommended by the D86 Math Pathways Team or should we start the alignment process with the traditional core sequence and create integrated units as part of that process?

Equitable Opportunities in the D86 Math Program Plan

Illinois Math Graduation Requirements

Three credits of math courses are required for graduation, with geometry content being present in at least one course.

- For the Classes of 2017-2020, 94% of Hinsdale Central students took four years of math.
- For the Classes of 2017-2020, 89% of Hinsdale South students took four years of math.

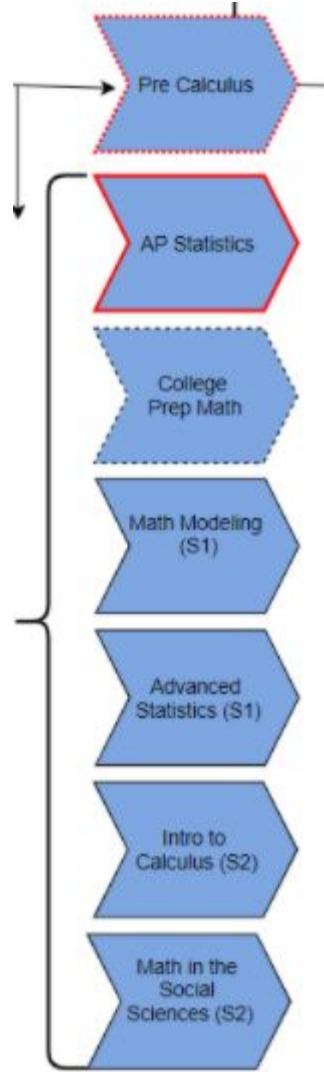
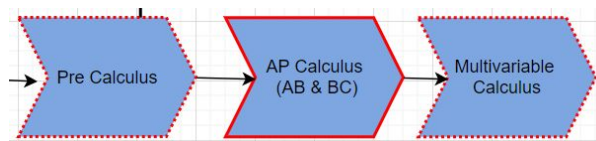
Expansion of 4th year Options

- Additional elective courses are being developed to encourage more students to enroll in four years of high school mathematics.
- Expanding options beyond the core sequence will appeal to students of all backgrounds and future career paths
- Additional courses are being developed with a focus on real-world applications of mathematics
- All 5 AP Math and Computer Science classes will continue to run and be a thriving part of our district curriculum
- These options are available sooner if students enter high school in a course higher than Algebra 1 / Math 1

59% HC begin Geo or higher

34% of HS begin Geo or higher

(Class of 17-20 data)



Current Work

Next steps we are taking over Summer 2021:

- Continue aligning AP Computer Science Principles, AP Computer Science A, AP Statistics, AP Calculus BC, AP Calculus AB for implementation Fall 2021

Future steps we will take in 2021-2022:

- Review common final exams and policies and curriculum.

District Equity Statement

Our District 86 Equity Statement reads:

The mission of Hinsdale Township High School District 86 is to empower students to pursue their ideal future by acquiring critical skills and knowledge to collaborate, create and connect with an ever-changing world.

We will accomplish this through coherent, deliberate, and intentional equity work that prioritizes the equality of opportunity and equality of outcome for every student. We define equity work as the act and art of providing each student with what they need to meet their learning and well-being requirements. We recognize that equity is not always providing all students with the same experience, rather all students receive what they need for their success.

By embracing our diversity, District 86 recognizes the importance of making and supporting significant shifts in mindset and practice to provide and sustain equitable outcomes for all students so that they may pursue their ideal future. By listening to our students, staff and community we acknowledge the importance of seeing, hearing and celebrating their identities in our curriculum, programs, pathways and school experiences.

Students who are currently tracked in tier 2 classes (G level) are not being exposed to higher instructional expectations and thus not offered the equality of opportunity. As noted in the (17-18) CEC Social Studies audit , “The disparity between the student makeup in some classes, within the same course and different leveled courses, is pronounced....Students in these classes are not receiving the same educational opportunities as others and, consequently, will never be able to close the learning gap and show academic gains until equitable classroom environments are standard.”

G-level classes in D86

Definition of a G-level: An education track between Essential and College Prep. The G-level curriculum is designed to cover the major content topics of the course but at a modified pace. G-level curriculum and assessments are aligned to reduced standards when compared to their CP counterparts.

What this means in practical terms: G-level courses are a track in math and science at HC only. If a student starts high school in a G-level course, the vast majority of students remain in this track. The opportunity to move up to on grade level college-prep course work is rare.

Important to note:

- There are no G-level courses offered in Elective areas
- There have not been G-level courses in English or Social Studies in D86 since 1998.
- There have not been G-level courses offered in Science or Math at Hinsdale South since 2018
- Hinsdale Central currently offers five General Level Courses: Biology, Earth Science, Algebra, Geometry, Algebra 2.
These are the only 5 G-level courses remaining in the District (n=215 students).
- **Over the course of the next four years, these 5 courses will be phased out and students will be enrolled in**
 - **College Prep courses with individualized support systems (like they have in all other departments)**
 - **OR an Essential course (only for students with IEPs)**

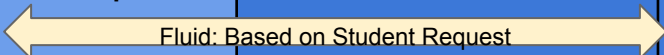
Clarification of D86 Academic Tracks

To ensure that all students graduate with college preparatory math skills, we are phasing out the G level track.

But knowing that the research indicates that tracking can have positive benefits for higher achieving students, D86 continues to offer three different 'tracks' or academic levels for students in all four core content areas. All three levels are fluid depending on the student's post secondary plans:

- Essential (requires an IEP - often called Applied, Self-Contained, Foundational)
 - Curriculum alignment work is building or fortifying pathways from Essential to CP
- College / Career Prep (CP)
 - Specific sections are designated for co-teachers in all core subjects
 - The standards are high; the support increases for those in need of support
- Honors / Dual Credit / AP

Continuum of Course Level Options

	Educational Services (Self-Contained or Applied)	College / Career Prep	Honors & Dual Credit	A.P. Advanced Placement
				
Description and Academic Support	<p>This program is designed for some students with an IEP. The curriculum focuses on essential skills and is tailored to the individual needs of the students in the class.</p> <p>The classes are capped at 13 and depending on the diagnosed disabilities of the students involve student aides, a personalized curriculum and support services</p>	<p>All general education courses have a college / career preparatory curriculum. Courses follow <u>on grade level Illinois learning standards</u>.</p> <p>Students who struggle in these courses are supported by the following:</p> <ul style="list-style-type: none"> - Differentiated Instruction - Coteachers (IEPs) - Resource (IEPs) - Interventionists - Paired Support Classes - Excel - GESST / SESST 	<p>Many core and elective courses have honors levels. These courses differentiate and accentuate the core curriculum by pace, content, product and inter/intra curricular application**</p> <p>Dual Credit opportunities are available for students in 13 courses. The curriculum for these courses is constructed in concert with partner colleges and universities. Successful completion of a dual credit course earns credit in D86 as well as our partner college/university</p>	<p>D86 is proud to offer 28 Advanced Placement courses. The curriculum is approved by the College Board and aligned to content specific exams.**</p> <p>Students who pass AP exams earn post secondary credit determined by colleges and universities across the country.</p> <p>**Students who struggle are supported by</p> <ul style="list-style-type: none"> - Differentiated Instruction - Interventionists - GESST / SESST - Resource (IEPs)

This *leveled* model encourages students to challenge themselves in content areas while knowing that they will receive academic support when they struggle.

Research on Tracking- Homogeneous Grouping

“Achievement follows from opportunity.” (Burris & Wellner, 2005)

Rui (2009) synthesized 4 decades of research on tracking/detracking in a meta-analysis: “The findings suggest that the detracking reform has appreciable effects on low-ability student achievement and no effects on average and high-ability student achievement. Therefore, detracking should be encouraged, especially in schools where lower-track classes have been traditionally assigned fewer resources.”

Four decades of research on the effects of detracking reform: Where do we stand?—A systematic review of the evidence

Ning Rui

Implications for practice and future research

The main finding from this review is that detracking, or heterogeneous-ability grouping, was beneficial to low ability students in terms of enhancing their academic achievement without being detrimental to the high- and average-ability students. Therefore, a major implication is that heterogeneous grouping should be encouraged and promoted, especially in schools where the lower-track classes have been traditionally assigned fewer resources and less qualified teachers. This review does not support the competing claims that the performance of higher achieving students would decrease as a result of detracking. At a time when all students are expected to meet high standards, this review of evidence on the effectiveness of detracking provides valuable information for educators and scholars. Al-

Ability Grouping Research Continued...

Other researchers argue that tracking affects all students negatively, regardless of track. Boaler, Wiliam, and Brown (2000) concluded that students in *setted* (tracked) math classes in the United Kingdom experienced a *curriculum polarization* where high-tracked students were forced to move too rapidly through course material and low-tracked students experienced restrictions in their opportunities to learn. This was disadvantageous to both groups, and students in both tracks reported dissatisfaction with their placement.

Beth C. Rubin

Tracking and Detracking:
Debates, Evidence, and Best
Practices for a Heterogeneous
World

WCER Working Paper No. 2009-6

August 2009

Tracking and Inequality:
New Directions for Research and Practice

Adam Gamoran

Because track location is correlated with traditional bases of socioeconomic disadvantage, tracking not only widens achievement gaps but also reinforces social inequality (Oakes et al., 1992; Lucas & Berends, 2002). In contrast to socioeconomic status, which has direct effects on track assignment, race and ethnicity affect track assignment indirectly. Minority students whose test scores and socioeconomic backgrounds match those of Whites are no less likely to be placed in high tracks (Gamoran & Mare, 1989; Lucas & Gamoran, 2002; Tach & Farkas, 2006). However, because minority students tend to reach high school with lower test scores and less advantaged socioeconomic circumstances, tracking works to the disadvantage of minority students and contributes to achievement gaps.

Position from NCSM- Math Leadership Organization

Tracking: Policies and Practices Widening the Opportunity Gap

“Tracking is the practice of dividing students into separate classes for high-, average-, and low-achievers.”¹ In practice, these might be considered low or high tracks, or some other, similar categorization, and students might be placed into these tracks based on questionable methods using grades and placement exams, perceived ability through teacher recommendation, or non-academic expectations adults have for the students. Much of the research on tracking policies demonstrates the negative effects on certain subgroups of students by denying them access to rigorous coursework.²

More generally, a number of studies point to the influence course-taking patterns have on academic outcomes.³ This influence is true for student subgroups like emergent bilingual students⁴ and students from low income backgrounds, different racial and ethnic groups, and different genders.⁵ It may disable students from pursuing whatever course of study interests them when they get to high school, college, career or beyond. Tracking becomes worse for students year-over-year, as each consecutive year in a track makes it more difficult to move out of that track.

¹ Oakes, 2005

² Lee & Bryk, 1988; Gamoran, et al, 1997; Cogan, et al. 2001

³ Lee, et al, 1997; Gamoran, 1997; Wang & Goldschmidt, 2003; Riegle-Crumb, 2006; Riegle-Crumb & Grodsky, 2010; Gottfried et al., 2014

⁴ Umansky, 2016; Thompson, 2017

⁵ Oakes et al., 1990; Riegle-Crumb, 2006; Long, et al., 2012; Palarady, et al., 2015

Policies and Practices Reducing the Opportunity Gap: Detracking

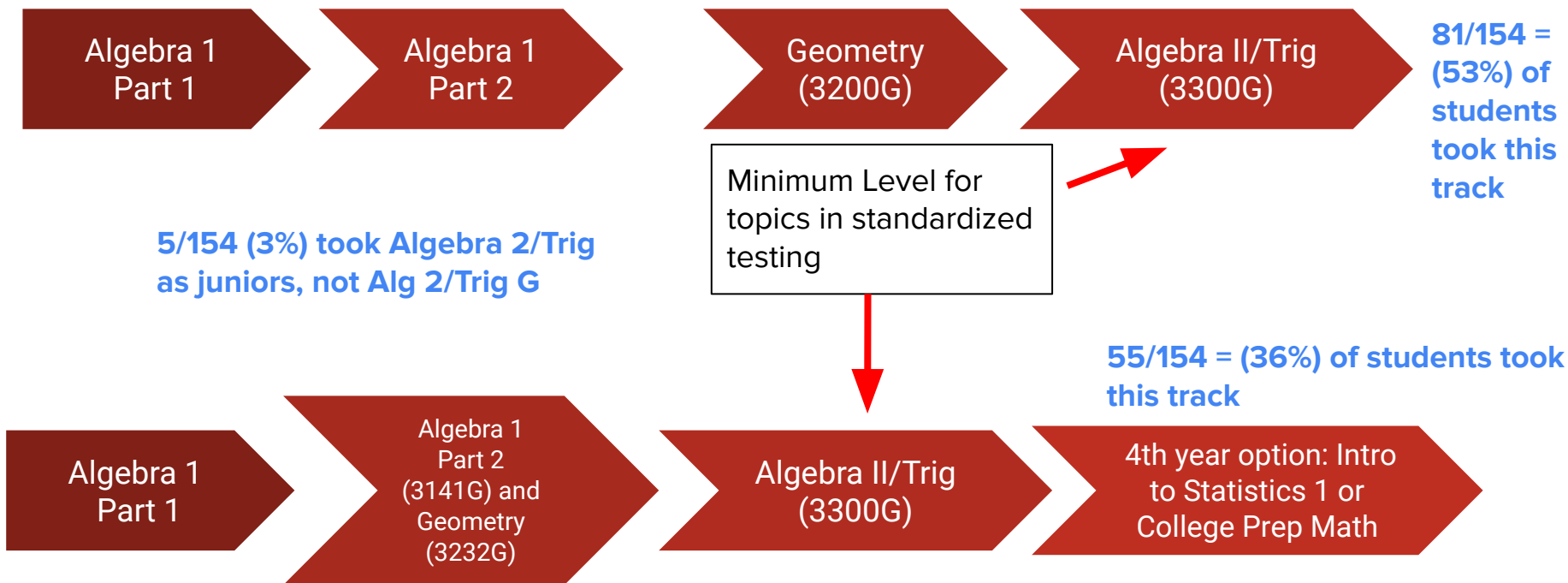
Detracking is the intentional practice of placing students into heterogeneous classrooms usually in an effort to reduce the opportunity gap and allow all students to learn mathematics at high levels. Detracking requires the interruption of policies that have led to the inequitable sorting of students into mathematics courses. If detracking is to happen, school districts and states must go through the difficult process of establishing a new vision for mathematics teaching and learning that dispels the culture of “low” and “high” students as well as “faster means smarter.”



Historical Approach- Hinsdale Central (Classes '17-'20)

Successful completion of Algebra and Geometry in any sequence and enrollment in Algebra 2 Trigonometry (3300G, 3310, or 3320) during or before junior year is ideal preparation for college standardized testing. (current HC Program of Studies)

For the classes of 2017-2020, 154 students started in Algebra 1 Part 1 and were enrolled in a junior year gen ed math class.
12/154 (8%) never made it to Algebra II/Trig G



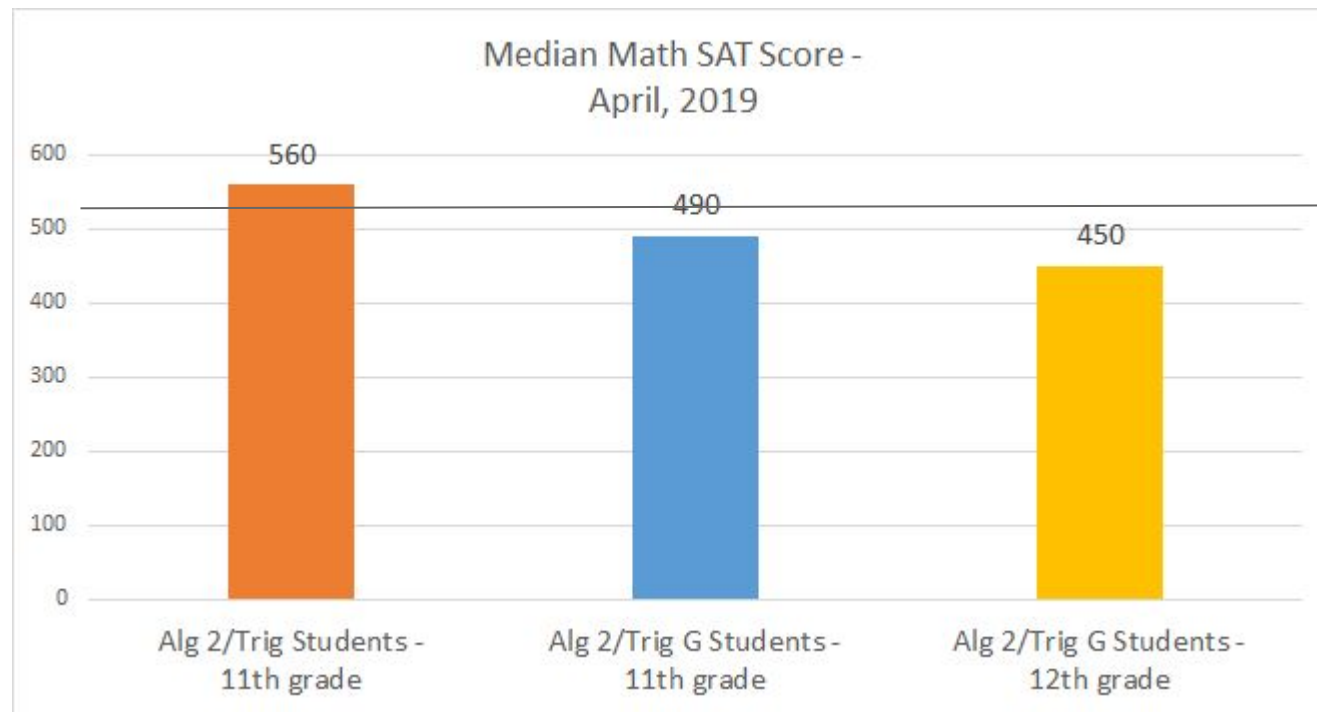
Historical Approach- Hinsdale Central (Classes '17-'20)

	Grade 9 Students taking Algebra 1 (Regular Level)	Grade 9 Students taking Algebra 1 Part 1 (G level)	Average Demographic Enrollment
White	78%	72%	71%
Black	4%	9%	2%
Asian	11%	6%	17%
Native Hawaiian or Other Pacific Islander	0%	2%	0.11%
Hispanic	7%	11%	6%
Special Education	10%	51%	8%
Fee Waiver	5%	20%	5%
EL	1%	3%	1%

Historical Approach- Hinsdale Central (Classes '17-'20)

	Grade 11 Students taking Algebra 2/Trig G who started in Alg 1 Part 1 (Class of 2017-2020) (55 students)		Grade 12 Students taking Algebra 2/Trig G who started in Alg 1 Part 1 (Class of 2017-2020) (81 students)		Average Demographic Enrollment
White	42	76%	67	83%	73%
Black	2	4%	6	7%	2%
Asian	5	9%	4	5%	18%
Native Hawaiian or Other Pacific Islander	2	4%	0	0%	0
Hispanic	4	7%	5	6%	7%
Special Education	20	36%	47	58%	9%
Fee Waiver	7	13%	19	23%	6%

SAT Performance Data - Hinsdale Central Class of 2020

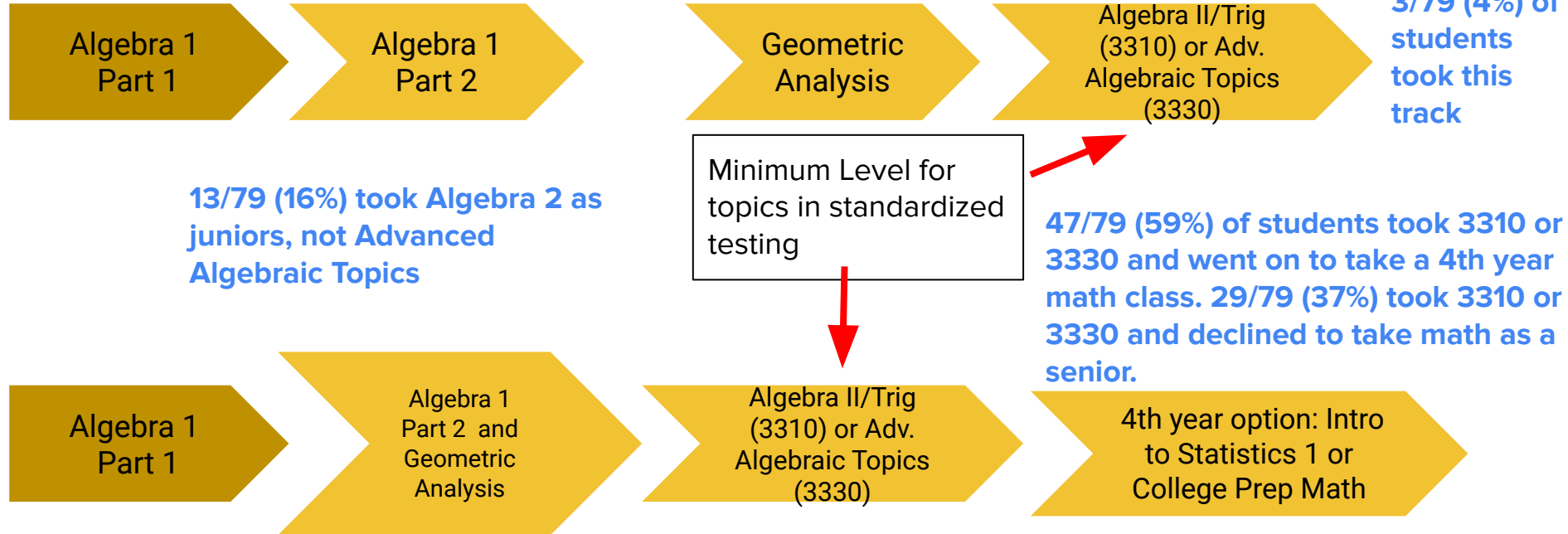


Benchmark:
530 - SAT

Historical Approach- Hinsdale South (Classes '17-'20)

Successful completion of Algebra and Geometry in any sequence and enrollment in Algebra 2 Trigonometry (3310) or Advanced Algebraic Topics (3330) during or before junior year is ideal preparation for college standardized testing. (Current HS Program of Studies)

For the classes of 2017-2020, 79 students started in Algebra 1 Part 1 and were enrolled in a junior year gen ed math class. All students that were enrolled at HSHS for 4 years made it to Algebra 2 Trig or Adv. Algebraic Topics by senior year.



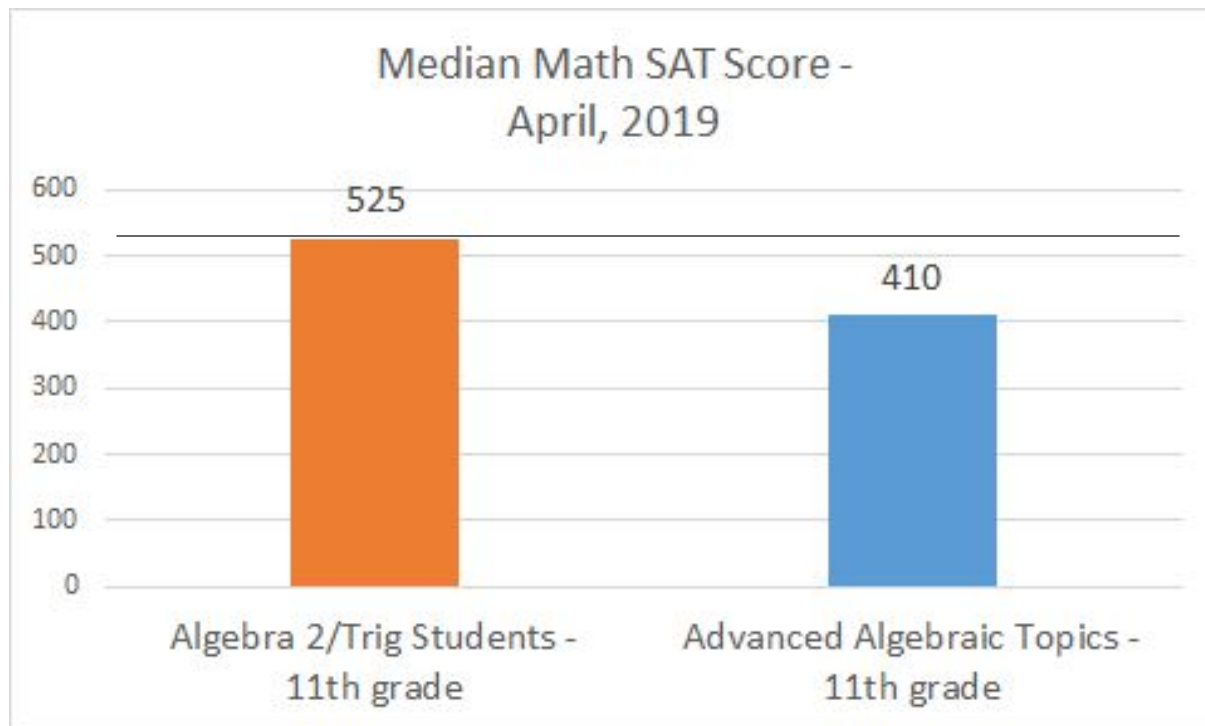
Historical Approach- Hinsdale South (Classes '17-'20)

	Grade 9 Students taking Algebra 1 (Regular Level)	Grade 9 Students taking Algebra 1 Part 1 (G level)	Average Demographic Enrollment
White	57%	26%	56%
Black	22%	44%	20%
Asian	7%	6%	10%
Native Hawaiian or Other Pacific Islander	0.1%	0.8%	0.2%
Hispanic	13%	11%	11%
American Indian or Alaska Native	0.30%	0.80%	0.07%
Special Education	6.00%	31.00%	12.5%
Fee Waiver	16%	36%	28.3%
EL	Program is at HC	Program is at HC	Program is at HC

Historical Approach- Hinsdale South (Classes '17-'20)

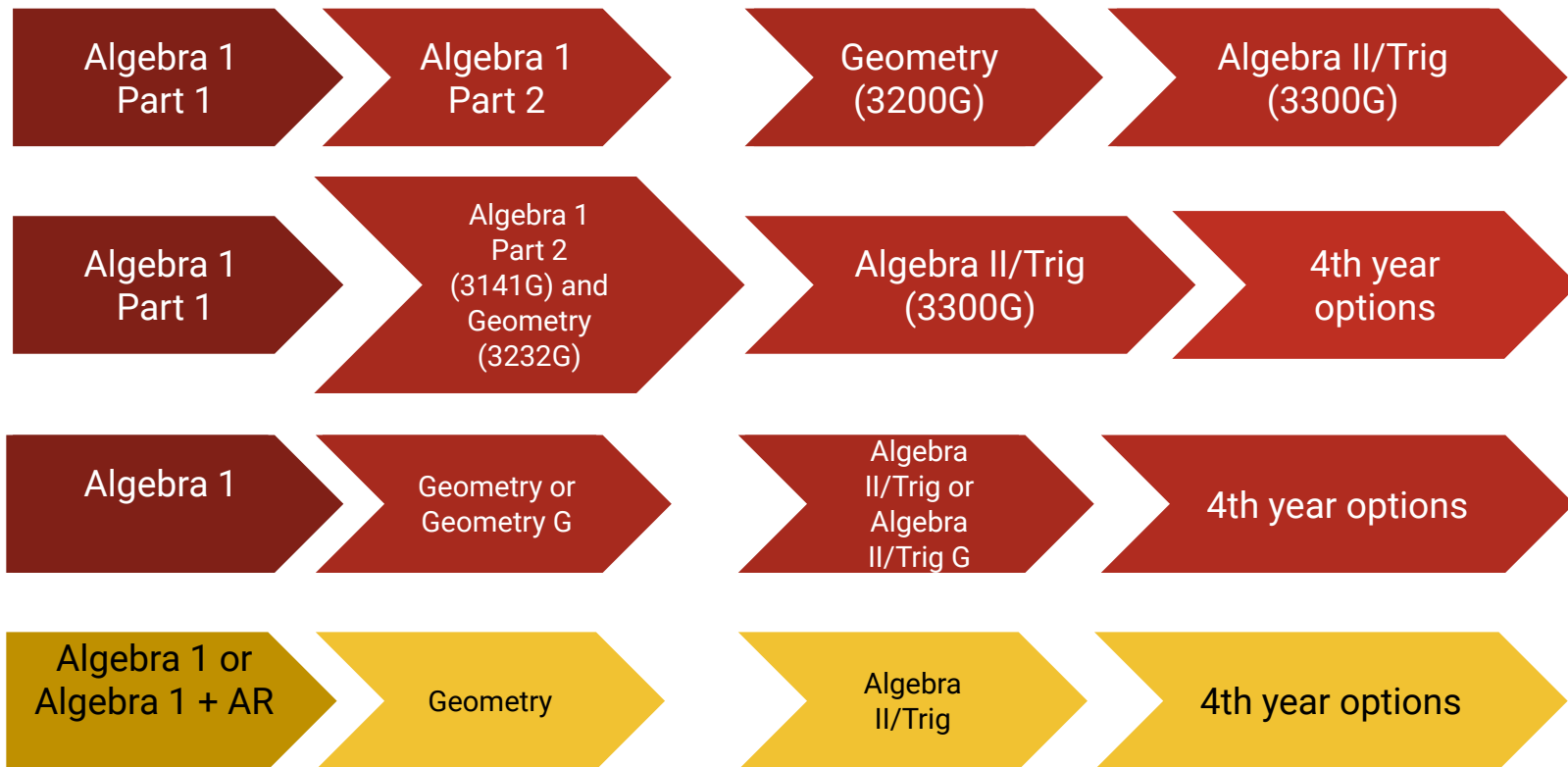
	Grade 11 Students taking Adv. Algebraic Topics or Algebra 2 who started in Alg 1 Part 1 (Class of 2017-2020) (76 students)		Grade 12 Students taking Adv. Algebraic Topics or Algebra 2 who started in Alg 1 Part 1 (Class of 2017-2020) (3 students)		Average Demographic Enrollment
White	33	43%	1	33%	56%
Black	35	46%	2	67%	19%
Hispanic	3	4%	0	0%	12%
Asian	4	5%	0	0%	10%
American Indian or Alaska Native	1	1%	0	0%	0.2%
Special Education	37	49%	2	67%	13%
Fee Waiver	26	34%	1	33%	28%

SAT Performance Data - Hinsdale South Class of 2020



Benchmark:
530 - SAT

Current Program of Studies

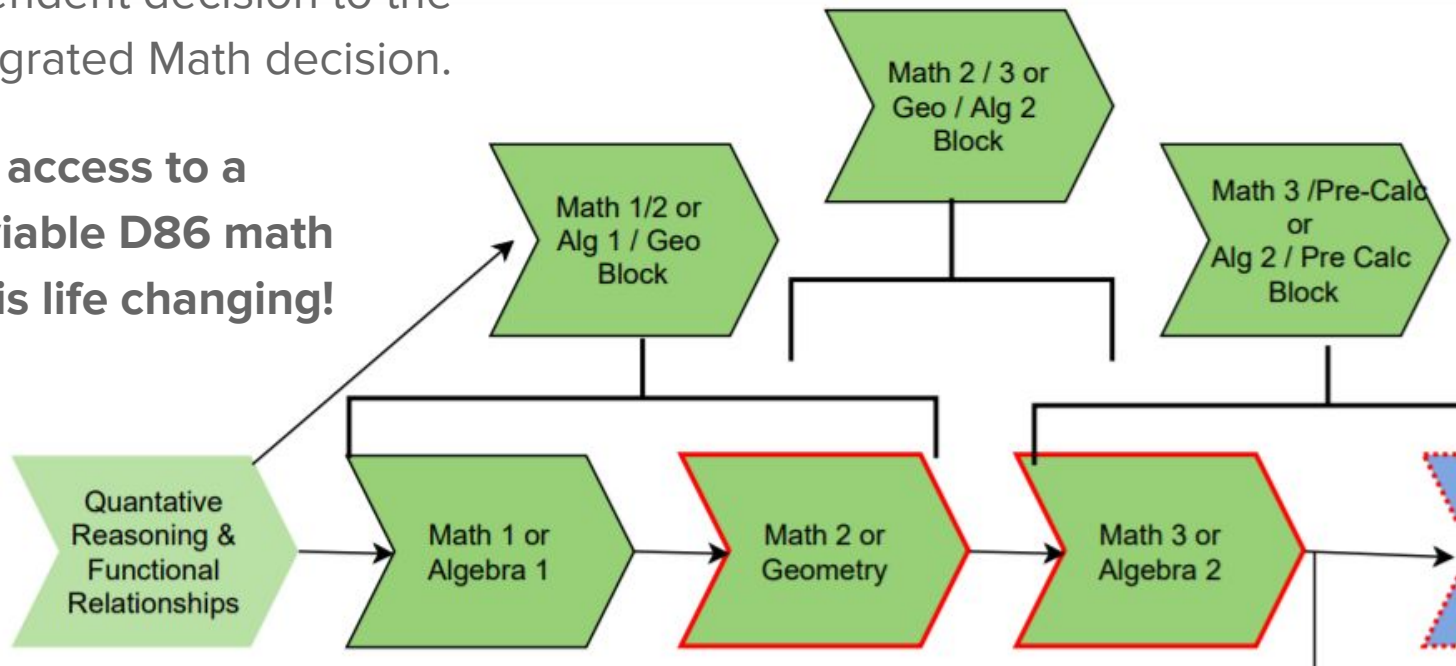


Proposed Core Sequence without a G-Track

This graphic is a visual of our core sequence. The G track removal is a completely independent decision to the Traditional vs. Integrated Math decision.

All students have access to a guaranteed and viable D86 math curriculum → this is life changing!

Red Border = Honors credit will be offered



PWR Act

- The Postsecondary Workforce Readiness Act (Public Act 99-0674, HB 5729) or PWR Act, was signed into law July 2016.
- This law establishes a statewide system for transition math instruction that increases college readiness for high school seniors and reduces remedial education needs in college.
- High schools have been partnering with local community colleges to develop a transition math course (D86's is called College Prep Math). Successful completion of a portability-approved course provides students with guaranteed placement into college-level math courses at ALL Illinois community colleges and accepting Illinois universities.

Transition Math & Remediation Rates

- Only students who have completed their math graduation requirements are eligible for Transition Math courses.
- This is yet another reason why the removal of G courses is important for students and we want to ensure all students have this as an option for their 4th year.
- Transition Math provides students with skills to meet their college/career goals and be successful in courses, thus reducing a senior's chances of needing remedial coursework.

	Hinsdale Central Class of 2017	Hinsdale Central Class of 2018	Hinsdale South Class of 2017	Hinsdale South Class of 2018
% of Grads that take remedial math classes at IL Community Colleges	23%	19%	25%	35%
% of Grads that attend IL Community College	11.8% 78 / 662 students	9.1% 65 / 715 students	26.3% 93 / 353 students	25.6% 91 / 355 students

Conclusions

G-level courses:

- In D86 have an overrepresentation of IEP, Low Income, and Black students in remedial courses
- Negatively impact the content students see prior to standardized tests (junior year content)
- Result in students needing to take (and pay for) remedial math courses in college

We believe we cannot uphold our District's Equity statement or realize the mission statement of our Math Department by continuing to run these courses. **By removing the G-level courses, more D86 students will graduate with college ready math skills.**

Current Work

Next steps we are taking over Summer 2021:

- To anticipate adoption in the 2022 Program of Studies, assemble the Curriculum Writing Team for Quantitative Reasoning and Functional Relationships to further develop the course for implementation in 2022-2023
- Articulate criteria for placement into Quantitative Reasoning and Functional Relationships for D86 Class of 2026 students

Future steps we will take in 2021-2022:

- Continue developing the Quantitative Reasoning and Functional Relationships Course with collaboration from various departments and feeder schools

Current Work

Next steps we are taking over Summer 2021:

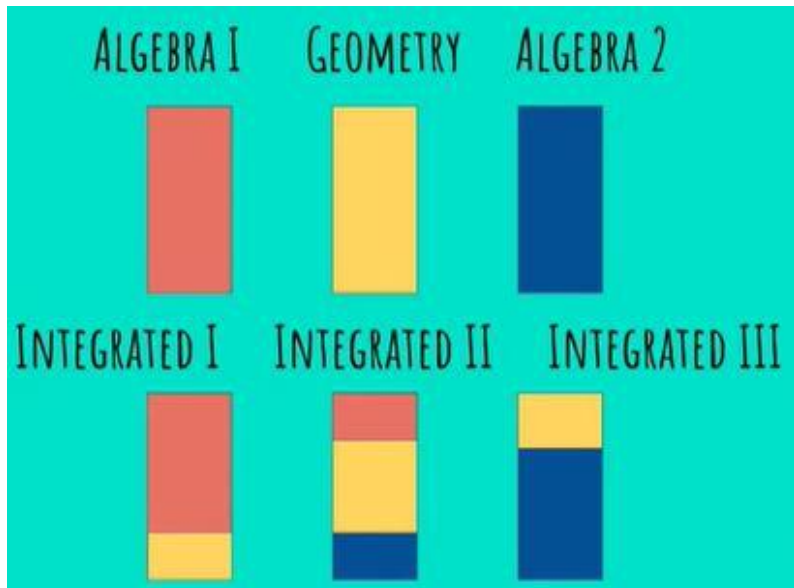
- Continue working with the D86 College Prep Math Writing team to further develop the course implemented during the 2021-2022 school year

Future steps we will take in 2021-2022:

- Continue our dialogue with COD and other DuPage County high schools in efforts to implement our Transition Math MOU

Math Program: Core Content Options

Math Program: Core Content Options Analysis



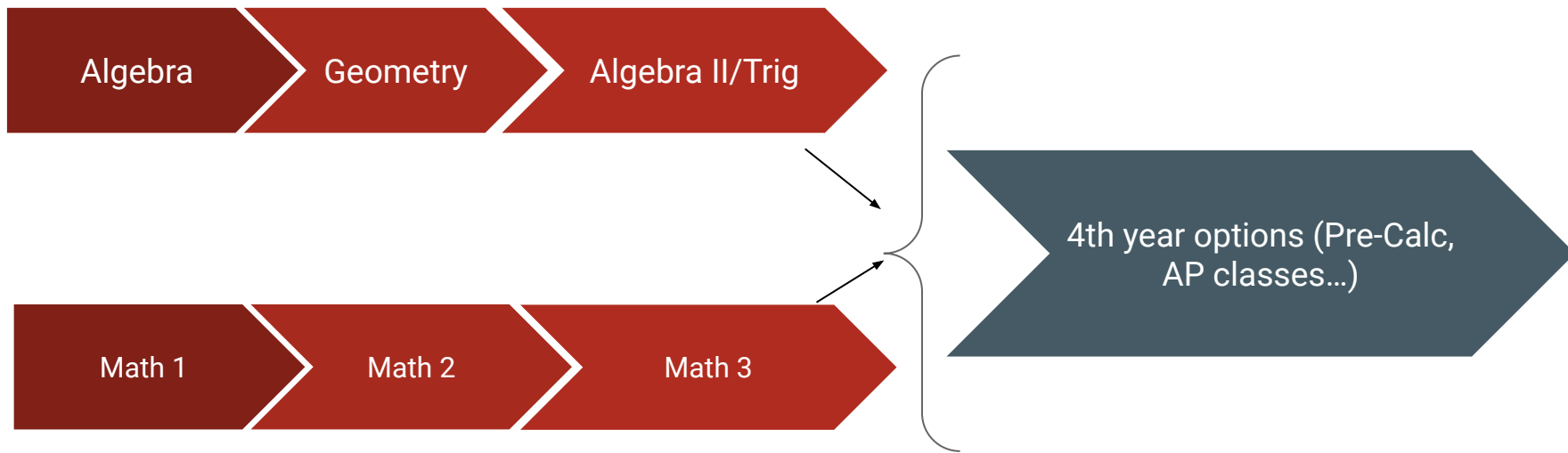
Statistics Standards are woven into each course

What is an integrated curriculum?

A traditional curriculum separates mathematics into Algebra 1, Geometry and Algebra 2. An integrated curriculum weaves algebra, geometry and statistics into its courses, and emphasizes the connection, understanding and retention of the content being studied. The integrated courses are called Math 1, Math 2 and Math 3.



Math Program: Core Content Options Analysis

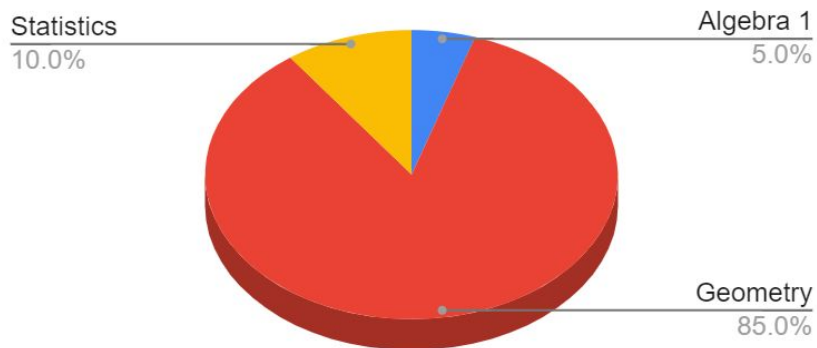


Both pathway models address the same standards, they are just organized differently. This ensures that students have covered the core topics essential for continued study of mathematics.

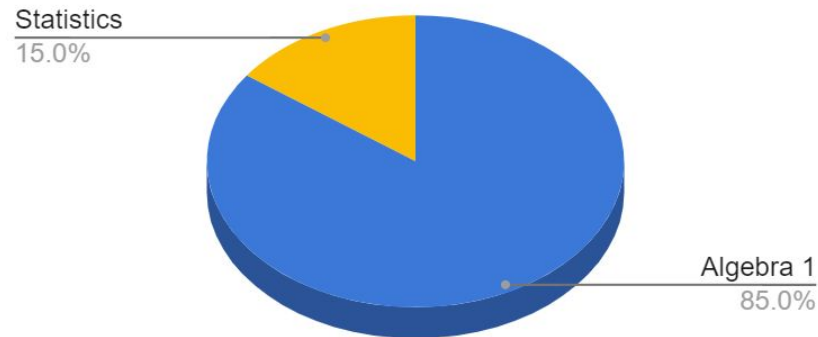
D86 Traditional Model by Math Domain

Addresses the acquisition of standards explicitly taught and assessed in each course

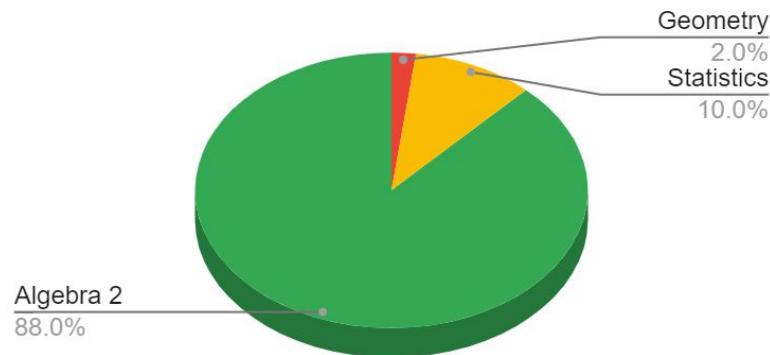
Geometry Approximate Composition



Algebra 1 Approximate Composition



Algebra 2 Approximate Composition



Course Descriptions from Other Schools

New Trier - Algebra 1 - Elementary algebra focuses on the structure of the real number system. The solution of equations, inequalities, and systems of equations and inequalities is presented. Graphing, both as a means of **displaying data and analyzing data in one and two dimensions**, is an integral part of these courses. A sound foundation in arithmetic and prealgebra skills is essential for success in these courses.

Glenbrook North and South - Geometry - Geometry 163 is a plane geometry course with applications in three dimensions. This course is designed to develop critical thinking through analytic reasoning and an understanding and appreciation of geometric relationships. The course focuses on topics such as parallel and perpendicular lines, congruence and similarity, right triangles and trigonometric ratios, properties, perimeter and area (of two-dimensional objects) as well as surface area and volume (of three-dimensional solids). An in-depth study of the properties of circles is also part of this course. Formal deductive proof and using inductive reasoning to make conjectures are emphasized. Students discover geometric relationships through manipulative tools and technology explorations. **In every unit of study, the application of algebra skills is stressed.**

Course Descriptions from Other Schools

Stevenson - Algebra 2 - This course is designed to engage students in the practice of mathematics by developing an understanding of mathematical relationships, functions, and models, **both in and out of context**, with an emphasis on problem solving. Algebraic topics will be developed and valued conceptually leading to procedural fluency. Students will utilize concepts, skills, representations, and techniques that address many different types of functions, including quadratic, polynomial, rational, exponential, logarithmic, and trigonometric functions. **This course also uses statistical models to analyze relationships represented by data.** Successful completion of this course will prepare students for entry into AMDM or Precalculus.

SAT Areas for Improvement: Snapshot of D86 data- Sept 2020

Medium and Hard Questions: Those that were answered incorrectly by test takers most often

Problem Solving and Data Analysis (12/58): This component of the SAT focuses on the assessment of students' ability to use ratios, percentages, and proportional reasoning, as well as describe graphical relationships and analyze data.

Analysis in Science Problem Solving and Data Analysis (8/58)- This component of the SAT focuses on the assessment of students' ability to apply reading, writing, language, and math skills to answer questions in science contexts.

Analysis in History / Social Sciences (6/58) This component of the SAT focuses on the assessment of students' ability to apply reading, writing, language, and math skills to answer questions in history and social studies contexts.

Passport to Advanced Mathematics (16/58) - This component of the SAT focuses on the assessment of students' skills with analyzing, manipulating, and rewriting expressions, interpreting and building functions, as well as reasoning with more complex equations.

Research

The skills, standards and concepts of traditional and integrated math pathways are the same. However, the order and approach to them is different. The integrated pathway places greater value on cohesion, connection and depth of knowledge.

AUTHORS	DESIGN	POPULATION	LENGTH	DESCRIPTION
Finkelstein, et al.	Data analysis	24,279	6 years	Students who take Algebra I before they are fully prepared may never reach proficiency in the subject.
Schoen and Hirsch	Quasi-experimental	1,050	2 years	Students using Core-Plus Mathematics, an integrated curriculum, scored significantly higher on multiple achievement metrics than students using a traditional curriculum.
Tauer	Randomized control trial	120	2 years	Students enrolled in an integrated math program were more likely to achieve proficiency on the Grade 10 Kansas State Mathematics Assessment and enroll in senior mathematics classes than their peers in traditional math classes.
Grouws et al.	Quasi-experimental	2,161	1 year	Students who studied from Core-Plus I, an integrated course, scored significantly higher on three achievement tests than students taking an Algebra I course.
Tarr, et al.	Quasi-experimental	3,258	3 years	Students who studied from Core-Plus II, an integrated course, scored significantly higher on standardized achievement tests than students taking a Geometry course.
Tarr, et al.	Data analysis	2,621	3 years	Curriculum type (i.e., subject-based or integrated) is significantly correlated with student achievement.

Image from: Hanover Research

https://resources.finalsite.net/images/v1544033814/lmsdorg/mhfugknr7thdftiudylf/181205_HanoverResearch_IntMathResearch.pdf

Research

Abstract

Krupa, E. E., & Confrey, J. (2017). Effects of a Reform High School Mathematics Curriculum on Student Achievement: For Whom Does it Benefit? *Journal of Curriculum Studies*, 49(2), 191-215.

<https://www.tandfonline.com/doi/abs/10.1080/00220272.2015.1065911?journalCode=tcus20>

This study compared the effects of an integrated reform-based curriculum to a subject-specific curriculum on student learning of 19,526 high school algebra students. Using hierarchical linear modelling to account for variation in student achievement, the impact of the reform-based *Core-Plus Mathematics* curricular materials on student test scores is compared to the subject-specific curriculum. Findings from this study indicate that students enrolled in integrated mathematics outperformed subject-specific students on an Algebra I exam (highly aligned with content), and performed equally on an Algebra II exam (poorly aligned). High minority students in high-need schools demonstrated higher performance when they were enrolled in integrated mathematics.

The work was supported by a US Department of Education Mathematics Science Partnership Grant and the North Carolina Department of Public Instruction

Accepted Course Offerings

The NCAA has approved both traditional (Algebra 1, Geometry, Algebra 2/Trig) and Integrated Math courses (Math 1, Math 2, Math 3) for numerous schools.

Guidance Departments at area schools that have switched to an Integrated model have not reported any issues with college acceptance of these courses.

Based on the Analysis from our Program Team: (Oct. 2020)

We determined that an integrated curriculum will best support our mission and goals, and enable us to provide the learning experience we want for our students. Through this curriculum, we will be able to foster a strong connection between and understanding of key ideas. We will also be able to help students develop skill proficiency and teach them how to effectively investigate, critique and apply knowledge.

Integrated Model Development Work (Oct 2020- present)

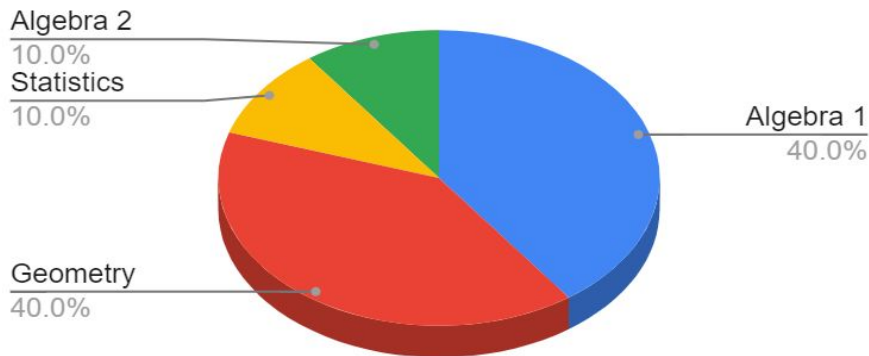
Since the October 2020 BoE voted to support our Integrated Pathway work, we have:

- Assembled a Curriculum Development Team to further research the organization of an Integrated core curriculum sequence
- Investigated the unit organization of the Integrated core curriculum with the help of local districts using an Integrated Math model
- Began drafting units for Math 1, Math 2, and Math 3, being sure to address all the CCSSM as well as providing continuity for student experiences from one course to the next
- Shared the initial unit drafts with our departments and science chairs for feedback

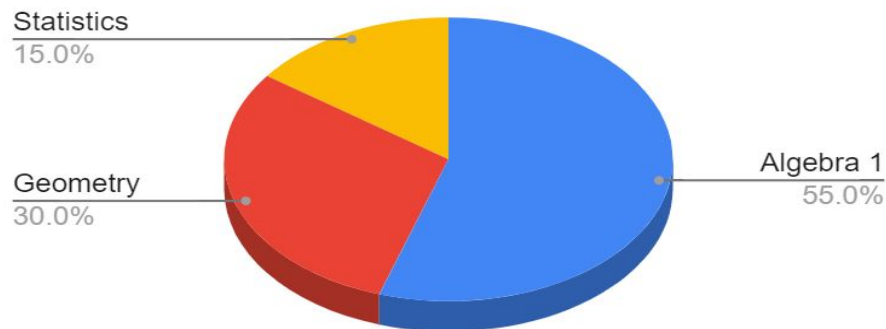
Integrated Model by Math Domain

Addresses the acquisition of standards explicitly taught and assessed in each course

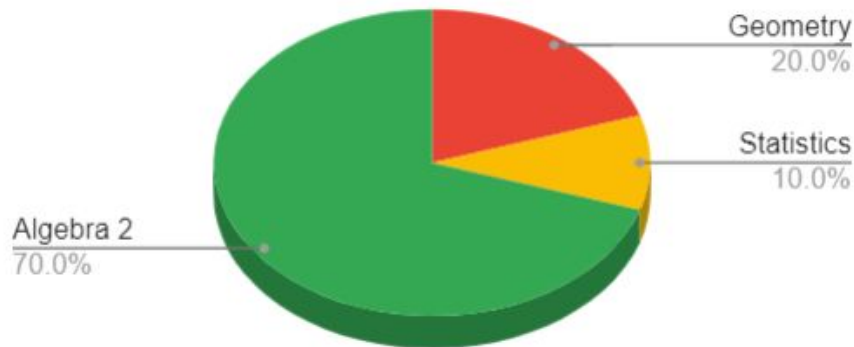
Math 2 Approximate Composition



Math 1 Approximate Composition



Math 3 Approximate Composition



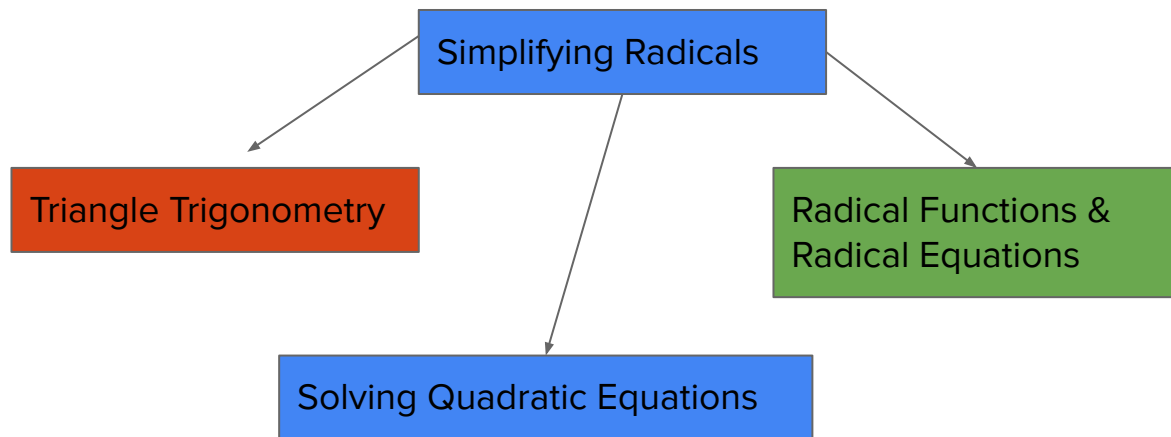
Example of the connections possible in a sequence

Math 1

Math 2



Math 3



Traditional model of the previous example

Algebra 1

Simplifying Radicals



Solving Quadratic Equations

Geometry

Simplifying Radicals



Triangle Trigonometry

Algebra 2

Simplifying Radicals



Radical Functions &
Radical Equations

Example of the connections possible in a sequence

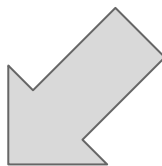
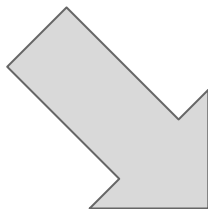
Algebra 1

- Factoring Quadratics
- Solving Quadratic Equations
- Transformations of Quadratic Functions
- Applications of Quadratic Functions

Geometry

Algebra 2/Trig

- Factoring Quadratics
- Solving Quadratic Equations
- Transformations of Quadratic Functions
- Simplifying Rational Expressions
- Graphing Rational Functions
- Factoring Polynomials of Degree 3+
- Graphing Polynomial Functions



Math 2

Draft D86 Course Descriptions

Math 1:

Integrated Math 1 is the first course in high school mathematics. Students in all integrated courses study content standards in the 5 domains: Number and Quantities, Algebra, Functions, Geometry, and Statistics. The Standards of Mathematical Practice will be emphasized throughout. Linear and exponential relationships, function representations and their applications, algebraic connections to coordinate geometry, and representing and interpreting statistical data are major themes of the course. Mastery of basic arithmetic skills is a prerequisite for this course. *A graphing calculator is required for this course.*

Math 2:

Integrated Math 2 is the second course in high school mathematics. Students in all integrated courses study content standards in the 5 domains: Number and Quantities, Algebra, Functions, Geometry, and Statistics. The Standards of Mathematical Practice will be emphasized throughout. Solving and graphing quadratics, simplifying radicals, applications of trigonometry, similarity, area and circles and an introduction of probability are major themes of the course. *A graphing calculator is required for this course.*

Math 3:

Integrated Math 3 is the third course in high school mathematics. Students in all integrated courses study content standards in the 5 domains: Number and Quantities, Algebra, Functions, Geometry, and Statistics. The Standards of Mathematical Practice will be emphasized throughout. Polynomial, rational, exponential and logarithmic functions, as well as volume, trigonometric functions, and inferential statistics are major themes of the course. *A graphing calculator is required for this course.*

Current Work for an Integrated Pathway

Next steps we are taking over Summer 2021 in the Integrated Math Pathway are to:

- Use feedback the Curriculum Development Team received from the District Department regarding the sequence of units to further organize the curriculum in the three core courses
- Continue reviewing textbook options with the Curriculum Development Team for adoption in 2022-2023

Future steps we will take in 2021-2022:

- Assemble the Math 1 Writing team to further develop the course and continue collaborating with stakeholders and prepare for adoption in the 2022-2023 Program of Studies

If asked to adjust to a Traditional Pathway

Next steps we would take under a Traditional Pathway are to:

- Begin drafting units for Algebra 1, Geometry, Algebra 2, being sure to address all the CCSSM as well as providing continuity for student experiences from one course to the next
- Integrate and align instruction in data analysis, statistics, applied probability, and connections to social and hard sciences (areas for standardized test growth)
- Share the initial unit drafts with our departments and science chairs for feedback

Future steps we would take in 2021-2022:

- Assemble the Algebra 1 Writing Team to further develop and align the course

Future Direction by BoE

- 1.) Should we continue our work aligning AP courses as previously directed by the Board adopted District Strategic Plan?
- 2.) Should we continue developing additional 4th year options for implementation between 2022-2024?
- 3.) Should we continue developing the Quantitative Reasoning and Functional Relationships Course as an option for students previously enrolled in the G track courses?
- 4.) Should we continue developing the Integrated Math core sequence as recommended by the D86 Math Pathways Team or should we start the alignment process with the traditional core sequence and create integrated units as part of that process?

Achievement of the D86 Math Mission

Every decision we made was to allow us to achieve our goals. There are many dimensions to the decisions we made but all allow us to achieve our D86 math mission:

Math Mission Statement

The mission of the District 86 Mathematics Department is to empower our students to investigate, understand, and critique the world. Students will develop the quantitative literacy and critical thinking processes they need for professional opportunities and productive citizenship. We are committed to providing an equitable, rigorous, and supportive curriculum that actively engages students in constructing and applying mathematical concepts.