Math Pathways

BoE Presentation

October 15, 2020

Structure of the Curriculum-Building Process

Writing Team

Department Chairs, Content Teachers, Special Education Teachers, Sender Schools if Appropriate

Development Team

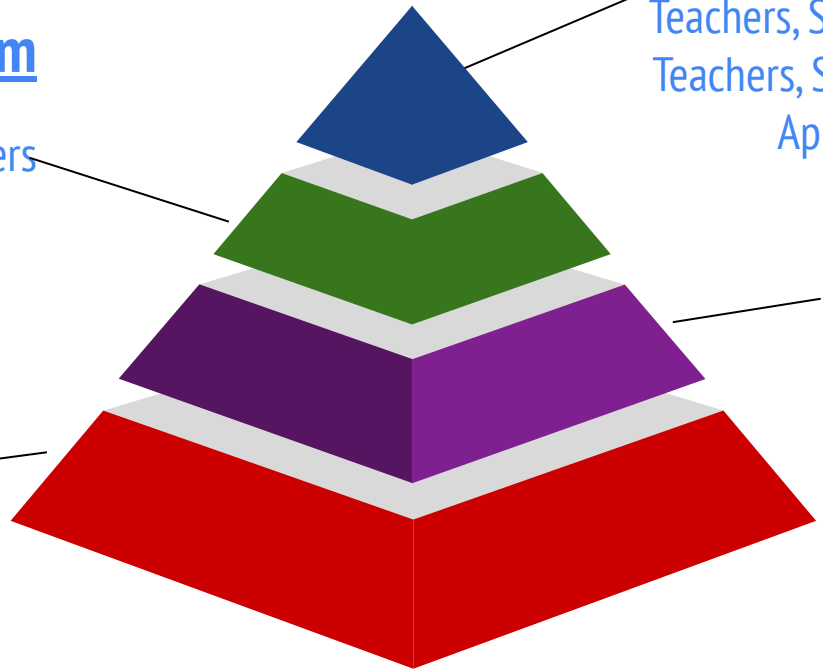
Department Chairs, Teachers

D86 Math Pathways Team

Administrators, Department Chairs, Teachers

D86 Strategic Plan

Community members, Parents, Students, Board Members, Administrators, Department Chairs, Teachers, Consultants



Purpose of the Math Pathway Team

Our team's purpose is to develop the vision of our District 86 math program and determine what course pathways will allow us to realize that vision.

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.

Overview of the Math Pathways Work

The Math Pathways team has done a thorough job evaluating the benefits of both a traditional and an integrated pathway. This recommendation is not intended to fix a broken system; it is designed and focused on making an excellent system even better. The specific goals of District 86 and the identified needs of the students drove the team's decision making process.

D86 Math Pathways Team

Arwen Pokorny Lyp	Principal - South	
Bill Walsh	Principal - Central	
Eric Martzolf	Assistant Principal of Instruction - South	Director of STEM, former Math DC at Downers Grove South High School; Algebra, Geometry, Geometry Honors, Algebra 2/Trig 200, Algebra 2/Trig, Algebra 2/Trig Honors, Pre-Calculus, Pre-Calculus Honors, College Prep Math
Kerin Sancken	Math Department Chair - South	Algebra 1 Part 1, Algebra 1 Part 2, Algebra 1 Block, Algebra 1, Algebraic Reinforcement, Advanced Algebraic Topics, Algebra 2 Trig Honors, Pre-Calculus Honors, AP Calculus AB, Math Topics Honors, Math Intervention
Kurt Vonnahme	Math Department Chair - Central	Algebra 1, Algebra 1 Block, Geometry, Algebra 2/Trig Honors, Pre-Calculus, Pre-Calculus Honors, AP Calculus BC

D86 Math Pathways Team

Melanie Galich	Math Teacher - Central	Algebra 1 Part 2, Alg 1 Part 2/Geometry Block, Geometry, Algebra 2, Pre-Calculus, Intro to Stats, College Prep Math
Abbey Green	Math Teacher - Central	AP Calculus AB, Intro to Calculus, Intro to Stats, Algebra 2/Trig Honors, Algebra 2, Integrated Honors, Geometry Honors, Geometry, Geometry Excel, Algebra 2 Excel, Algebra 1 Honors, Senior Advanced Algebra, TA for Stats 100 (AP Stats)
Lexi Miuccio	Math Teacher - South	Algebra 1, Algebra 2, Algebraic Reinforcement, Honors Geometry, Geometry, Math Intervention
Sarah Porod	Math Teacher - Central	Geometry, Geometry/Alg 2/Trig. Block, Algebra 1, Pre-Calculus, Geometry G, Intro to Stats, College Prep Math
John Richerson	Math Teacher - South	Algebra 1, Algebra 1 Block, Geometry, Geometric Analysis, Advanced Algebraic Topics, Algebra 2, Math Intervention
Heddi Sirovatka	Math Teacher - South	Algebra 1 Part 1, Algebra 1 Part 2, Algebra 1, Geometry, Advanced Algebraic Topics, Algebra 2 Trig H, Pre-Calculus, AP Calculus BC

An exciting time for D86

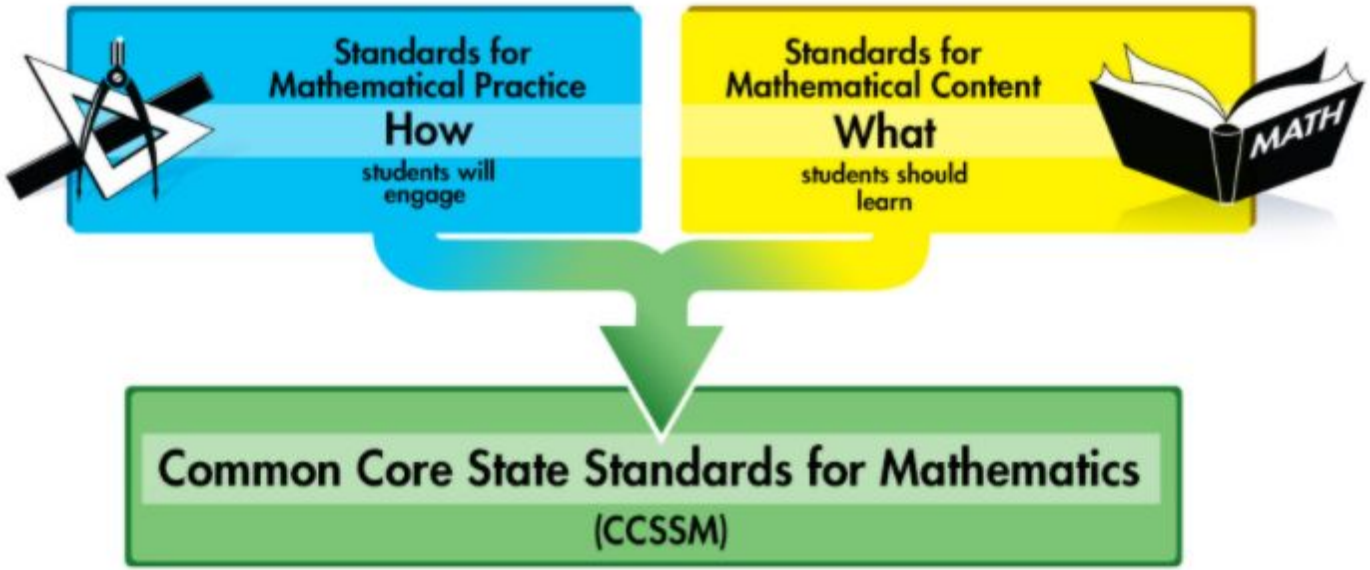
A change to an integrated approach means:

- An opportunity to rethink our curriculum
- Increased ability to develop problem solvers
- Greater depth in content to increase understanding
- Reduced redundancies in curriculum
- Less emphasis on memorizing facts and algorithms and a greater emphasis on meaning and connections
- Time to encourage students to develop mathematical identities

What do the D86 staff members say?

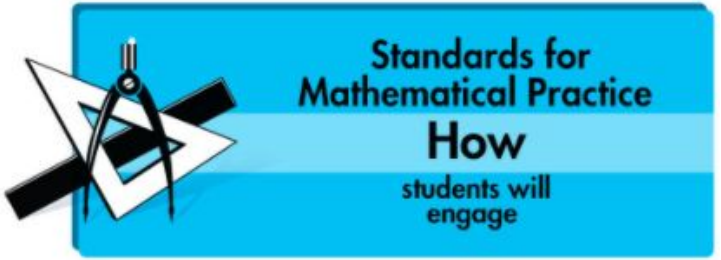
- Math Department
  - Want to do the work and believe the work is important
  - Love the opportunities offered
  - Want development of courses to occur before writing
  - Support this work, just need time to do it right
- Directors of Counseling
- Directors of Special Education

Common Core State Standards for Mathematics

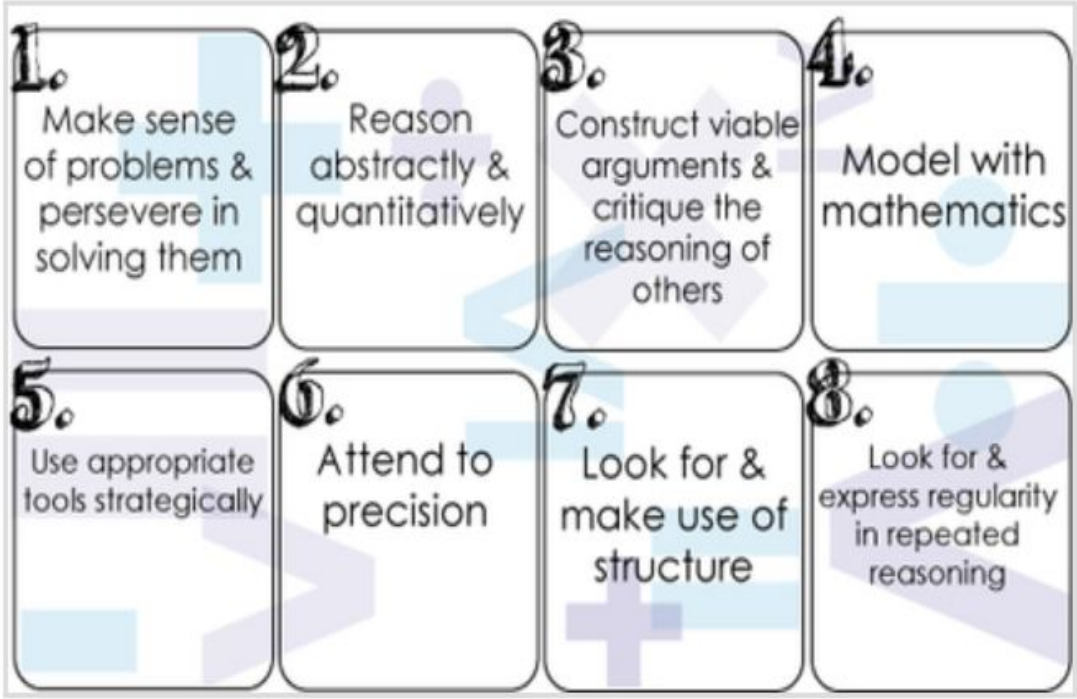


https://iris.peabody.vanderbilt.edu/module/math/cresource/q1/p02/

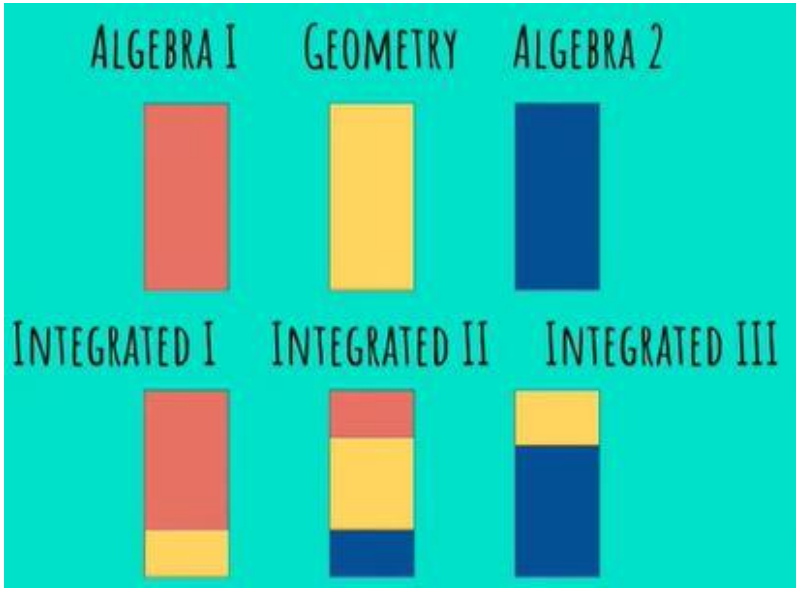
Math Practice Standards



- Transcend all levels of math (K-12)
- These directly connect to the SEL CASEL standards
- There is not one set way these standards are addressed in math curricula



Math Pathways: 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.

Coherence

Coherence: The ability to think across grades and link major topics within grades.

College and career-ready standards are designed around coherent progressions from grade to grade. Learning is carefully connected across grades so students can build new understanding onto foundations built in previous years. Each standard is not a new event but an extension of previous learning.

An integrated approach supports students in developing meaning and problem solving using all math skills.

https://achievethecore.org/page/900/college-and-career-ready-shifts-in-mathematics
https://iris.peabody.vanderbilt.edu/module/math/cresource/q1/p02/

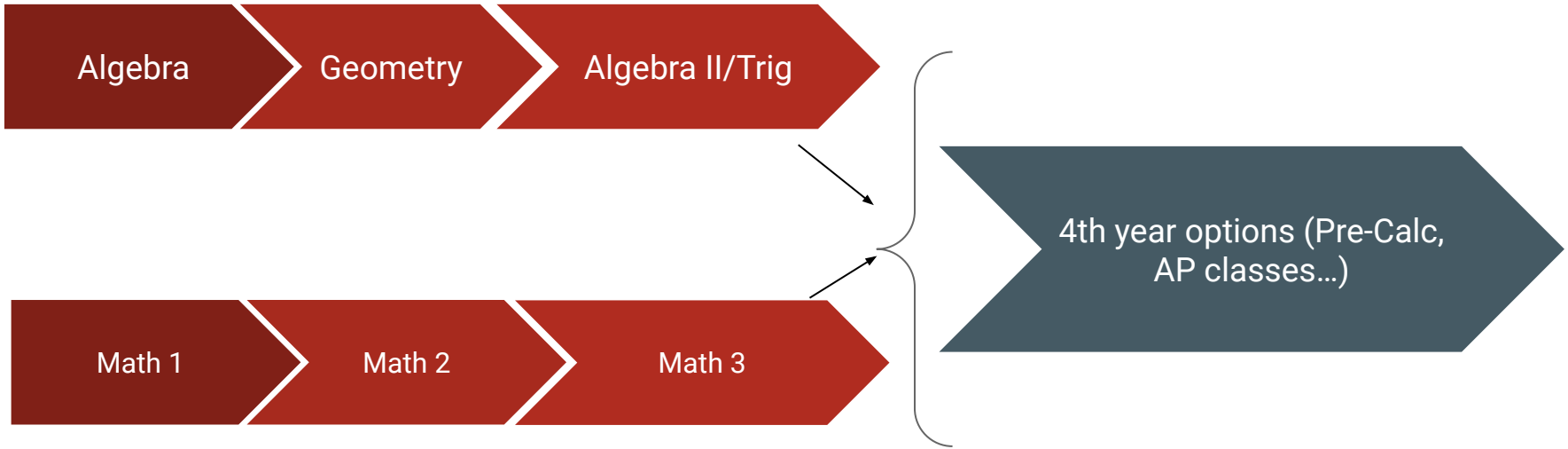
CCSSM Standards Progressions

Common Core State Standards – Mathematics — Standards Progressions

Kindergarten	1	2	3	4	5	6	7	8	HS
Counting and Cardinality									Number and Quantity
Number and Operations in Base Ten						Ratios and Proportional Relationships			
			Number and Operations - Fractions			The Number System			
Operations and Algebraic Thinking						Expressions and Equations			Algebra
								Functions	Functions
Geometry						Geometry			Geometry
Measurement and Data						Statistics and Probability			Statistics and Probability

http://www.bitingintothecore.com/progressions-and-learning-trajectories.html

Math Pathways: 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.

An Integrated Mathematics Model

Integrated mathematics weaves topics and themes throughout each course in a student's math experience. Each course incorporates topics from algebra and geometry, and provides opportunities for problem solving and analysis. This approach is similar to the process followed in elementary and middle school, where students' courses are simply referred to as "math class."

Integrated mathematics also provides a coherent curriculum that thoroughly prepares students for 4th year options. Integrated intentionally bridges connections among topics, and allows students recognize the interconnected nature of mathematical topics and see their application in context.

Math Pathways Program Goals- Linked to 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 Goal 2

GOAL 2, STRATEGY 4 **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
GOAL 2, STRATEGY 5 **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
GOAL 2, STRATEGY 6 **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 Goal 3

GOAL 3, STRATEGY 9 **Support curricular collaboration**	-Opportunities are provided to ensure students are mathematically prepared to enter the high school curriculum

Pathway Analysis

Please rate each pathway against each goal by the following parameters:

- If you feel the pathway moves us towards the goal, enter a **1** (somewhat moves us toward the goal) or a **2** (definitely moves us toward the goal)
- If you feel the pathway neither moves us towards or away from the goal, please enter a **0**
- If you feel the pathway moves us away from the goal, enter a **-1** (somewhat moves us away from the goal) or a **-2** (definitely moves us away from the goal)

***This is not an analysis of our current programs*

Sender School Role

- Each of our public school sender schools was sent an invitation to participate in the analysis and discussion regarding the goals
- Not every sender school had a representative attend (6 of the 7 did)
- 5 of our sender schools are in complete support of the integrated pathway
- Gower is neutral on it
- D181 does not support this pathway

As we move into the development and writing phases of this plan, District 86 will continue to involve the sender schools: seeking input, collaboration and open communication.

Pathway Analysis

	Martzolf		Miuccio		Sirovatka		Richerson		Green		Galich		Porod		Sancken		Vonnahme	
D86 MathProgram Goals	**Trad**	**Integ**	**Trad**	**Integ**	**Trad**	**Integ**	**Trad**	**Integ**	**Trad**	**Integ**	**Trad**	**Integ**	**Trad**	**Integ**	**Trad**	**Integ**	**Trad**	**Integ**
D86 GOAL 1 STRATEGY 1 (Alignment and Measures of Success)																		
Courses align: Fees, texts, objectives, semester exams, grading practices.																		
Courses cohesively link to each other in terms of knowledge and skills																		
Courses are logically sequenced to enhance connections																		
Assessments increase																		

D86 Math Program Goals	Traditional	Integrated	Key Points
D86 GOAL 1 STRATEGY 1 (Alignment and Measures of Success)			
1.1a: Courses align: Fees, texts, objectives, semester exams, grading practices.	0	0	This has to happen regardless of the pathway chosen
1.1b: Courses cohesively link to each other in terms of knowledge and skills	1	2	Integrated gives us an opportunity to make sure students are mentally ready for certain topics. Removes the “Algebra student/Geometry student” to a “Math student”. Allows us to remove sporadic redundancy and moves to a planned redundancy
1.1c: Courses are logically sequenced to enhance connections	1	2	“Enhanced” is what applies more to the integrated model. Avoids the geometry sandwich which makes sense to math teachers, not so much others. Allows you to get outside the box. Aligns more with what the students are familiar with: K-8.
1.1d: Assessments increase opportunities to demonstrate knowledge in authentic ways	1	2	Offers more ways to add more application problems that assess multiple skills. Modeling helps us assess all of the content vs. isolated scenarios

D86 Math Program Goals	Traditional	Integrated	Key Points
D86 GOAL 1 STRATEGY 2 (Increase exposure to real-world connections in the study of mathematics)			
1.2a: Courses support student development of Common Core Math Standards and Practices	1	2	Students in the “driver seat” more with the integrated pathway. Content standards in both pathways. Development of the mathematical practices in the integrated curriculum.
1.2b: Course content reflects the exploration and applications of mathematics	1	2	Traditional doesn’t lend itself to fluent patterns. Integrated allows for patterns and is infused consistently in the pathway.
1.2c: Instruction provides opportunities to demonstrate knowledge in authentic ways	1	2	The integrated pathway allows for more opportunities because time is gained by reducing redundancy. Emphasized the depth of the curriculum.
1.2d: Maximize connections between new concepts and previously learned ideas	1	2	The integrated pathway allows for more opportunities.

D86 Math Program Goals	Traditional	Integrated	Key Points
D86 GOAL 1 STRATEGY 3 (Align courses with college and career opportunities)			
1.3a: Maintain/increase AP enrollment and exam pass rate in all 5 Math/Computer Science AP courses	1	1	These are goals and needs under either pathway option. AP content is driven by College Board and full preparation for AP courses (and Precalculus) occurs under both pathways.
1.3b: Provide 4th-year courses that match student interest/career paths	1	1	
1.3c: Develop transition math and/or dual credit options	1	1	
1.3d: Students have course options that further their math knowledge beyond typical Algebra 2 content	1	1	

D86 Math Program Goals	Traditional	Integrated	Key Points
D86 GOAL 2 STRATEGY 4 (Optimize the school day to meet student needs)			
2.4a: Ensure intervention opportunities are provided before, during, and after the school day	1	1	Both models will ensure intervention opportunities are available
2.4b: Opportunities are available outside of the 50-minute class period to support student goals	1	1	Intervention, NHS students involved. Both Integrated and Traditional will help ensure opportunities are available to help support student goals

D86 Math Program Goals	Traditional	Integrated	Key Points
D86 GOAL 2 STRATEGY 5 (Provide informed student choice of math courses)			
2.5a: Provide choices and options for pathways of study beyond essential concepts	1	1	Essential Concepts: common core standard courses in the first 3 years Try to create time regardless of pathway. There are opportunities for time in both pathways. Will focus on how we design and implement.
2.5b: Maximize support for academic risk-taking, including appropriate acceleration of student coursework	0	0	Common department philosophy. Support student decisions on course/level selection. Easier with the same grading structures. Recommendations easier and more suited for students.

D86 Math Program Goals	Traditional	Integrated	Key Points
D86 GOAL 2 STRATEGY 6			
2.6a: Support student course changes to reflect adjustments of long-term goals	0	0	This can be done in both pathways, but we have a vision to offer multiple options for students. Either pathway, we need to work on this strategy.
2.6b: Social-Emotional Learning standards are embedded into the curriculum	0	1	Integrated curriculum naturally embeds the standards. Can be accomplished in both, but integrated lends itself to support the math practices by enhancing instructional practices

D86 Math Program Goals	Traditional	Integrated	Key Points
D86 GOAL 3 STRATEGY 9			
3.9a: Opportunities are provided to ensure students are mathematically prepared to enter the high school curriculum	1	1	Has to occur no matter which pathway we choose, as both pathways would change in a positive way. A Quantitative Reasoning and Functional Relationships course would be created regardless of the pathway

Based on the Analysis...

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.

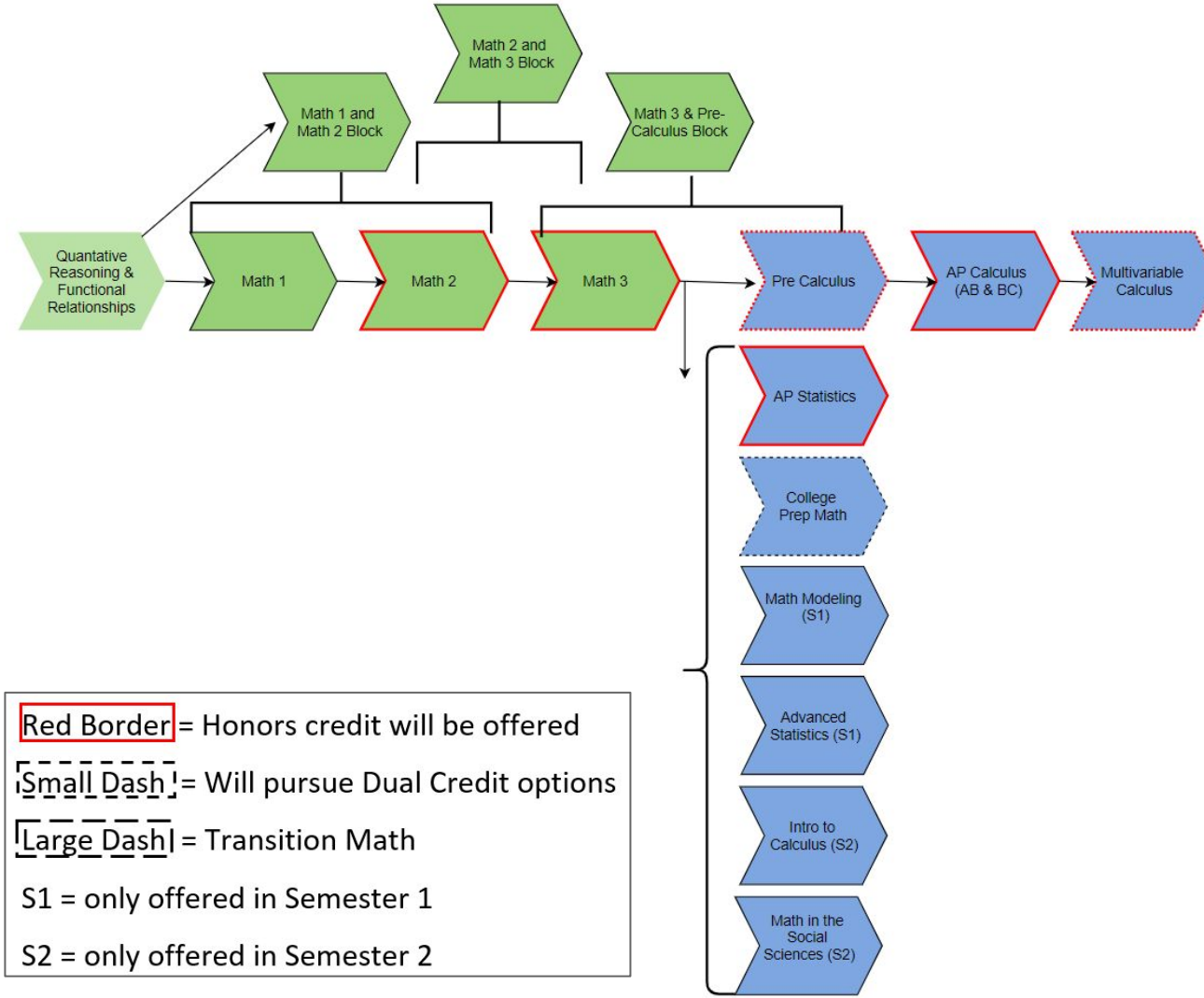
Frequently Asked Questions

Will Advanced Placement courses continue to be offered?
We will continue to offer the following Advanced Placement courses: Statistics, Calculus AB, Calculus BC, Computer Science A and Computer Science Principles. We will also continue offering Multivariable Calculus.

Do colleges and universities recognize an integrated curriculum?
Yes. The integrated curriculum is based entirely on the Common Core State Standards for Mathematics, and thoroughly prepares students for post-secondary math courses.

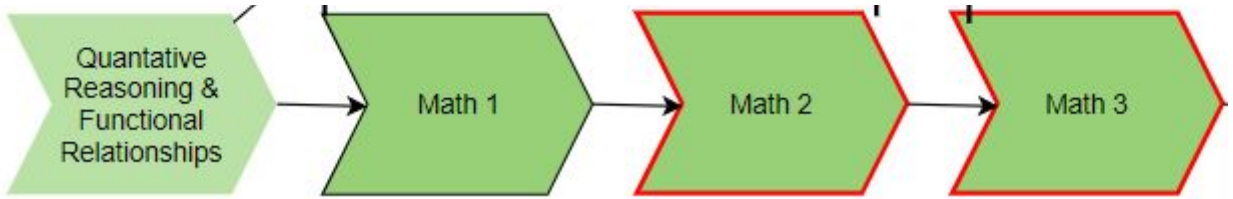
Frequently Asked Questions

What courses will be offered?



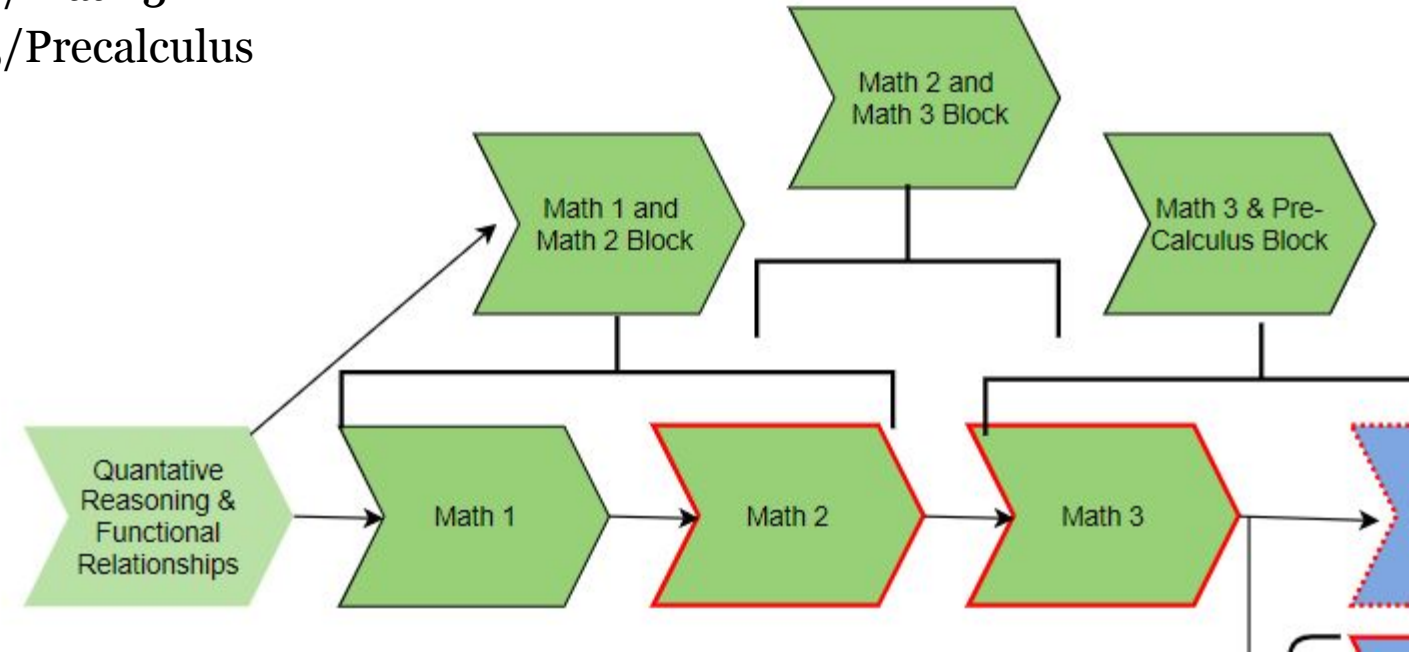
Critical Items to Address: Levels & Core

- Quantitative Reasoning & Functional Relationships
- Math 1
- Math 2 Regular
- Math 2 Honors
- Math 3 Regular - will have two options focusing on different applications of the content
- Math 3 Honors



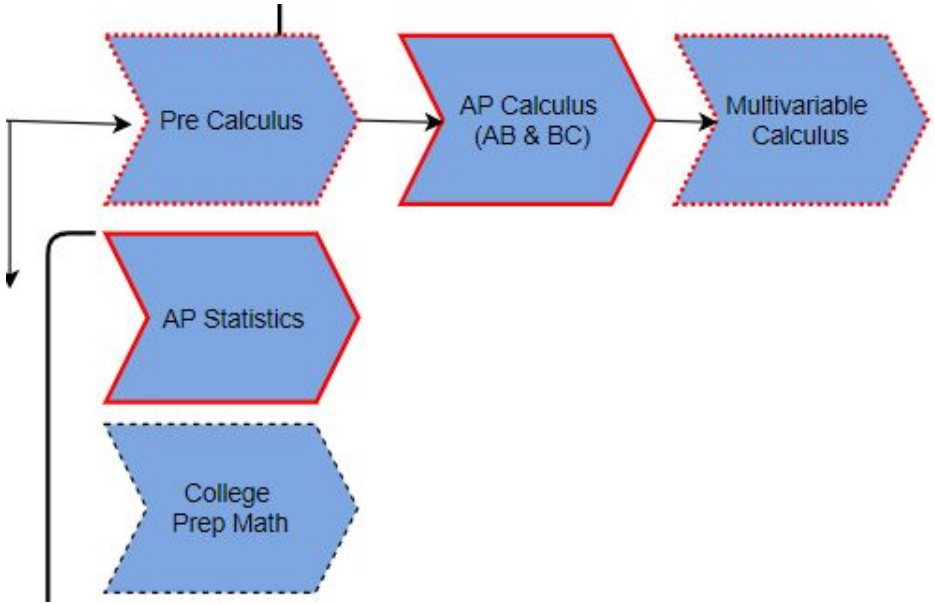
Critical Items to Address: Block Courses

- Block courses for advancement - student must be at least a sophomore
    - Math 1/Math 2
    - Math 2/Math 3
    - Math 3/Precalculus



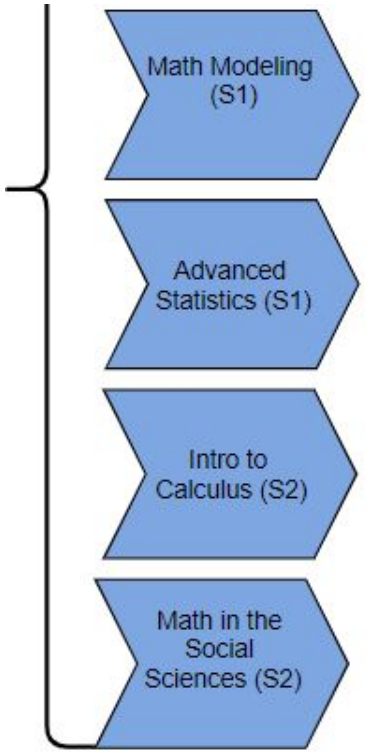
Critical Items to Address: 4th year

- Pre-Calc (potential Dual Credit)
- College Prep Math - needs to be a full year due to PWR Act
- **AP options do not change**
- Multivariable Calc (potential Dual Credit)



Critical Items to Address: 4th year

- **Mathematical Modeling (S1)** - emphasizes data, patterns, functions. Builds on knowledge of Math 3, forecasting in project based format where students make predictions and analyze.
- **Advanced Stats** (prev. Intro to stats 2) (S1)
- **Math in the Social Sciences** (S2) - connects to psychology, economics, sociology and displaying data (how it matters and what the implications for society are), current events spin. Use math ideas but use it in the context of current events and current data; perfect course to discuss how data makes you view an argument
- **Intro to Calc** (S2)



Critical Items to Address: Grade 8 course

- Students who took 8th grade:
  - Algebra/Math 1
    - Math 1
      OR
    - Math 2 or Math 2H with successful score on placement test
      - **Summer enrichment course in lieu of successful score on placement test
  - Geometry/Math 2
    - Math 2 or 2H
      OR
    - Math 3 or Math 3H with successful score on placement test
      - **Summer enrichment course in lieu of successful score on placement test

Sample Student Schedules

	Freshman Year	Sophomore Year	Junior Year	Senior Year
Student 1	Math 1	Math 2	Math 3	College Prep Math
Student 2	Math 1	Math 2 / Math 3 Block	Pre-Calc	AP Calc AB
Student 3	Math 2 Honors	Math 3 Honors	Pre Calc & Honors AP Stats	AP Calc BC & Math in the Social Sciences

Students have choices to make based on their personal goals

Implementation Timeline

	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Implementation		CPM	Math 1	Math 2	Math 3
		AP Calc BC	QR&FR	Math 1/2	Math 2/3
		AP Calc AB	Advanced Stats	Math 2H	Math 3H
		AP Stats	Intro to Calc	Math in Social Science	Pre Calc
		AP CS P	Multivariable Calc	Math Modeling	Pre Calc H
		AP CS A	Comp Sci Topics H		
Out		CPM 1 sem	Algebra 1	Geometry	Alg 2 Trig
			Alg 1 Pt 1 (HC)	Geo H	Alg 2 Trig H
			AR (HS)	Geo G (HC)	Alg 2 G (HC)
			Stats 2	Alg 1 Pt 2 (HC)	Integrated Alg/Geo (HC)
				Integrated Alg/Geo (HS)	

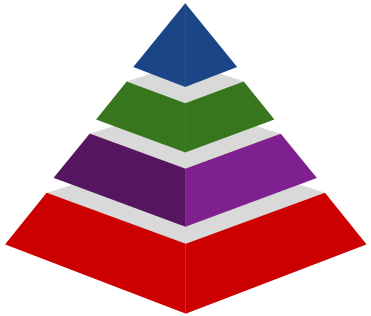
D86 Math Pathways Implementation

Class of 2026 (Current 7th Grade)	2022-2023 (Freshman)	2023-2024 (Sophomore)	2024-2025 (Junior)	2025-2026 (Senior)
8th grade math	Math 1	Math 2	Math 3	Pre-Calc Math in Social Sciences Math Modeling Advance Stats
Algebra in 8th grade	Geometry Geometry Honors	Alg 2 Trig Alg 2 Trig Honors	Pre-Calc Math in Social Sciences Math Modeling Advance Stats	AP Calc (AB/BC) AP Stats Math in Social Sciences Math Modeling Advance Stats Intro to Calc
Geometry in 8th grade	Alg 2 Trig Alg 2 Trig Honors	Pre-Calc Pre-Calc Honors	AP Calc (AB/BC) AP Stats Math in Social Sciences Math Modeling Advance Stats Intro to Calc	AP Calc (AB/BC) AP Stats Math in Social Sciences Math Modeling Advance Stats Multivariable Calc

D86 Math Pathways Implementation

Class of 2027 (Current 6th grade)	2023-2024 (Freshman)	2024-2025 (Sophomore)	2025-2026 (Junior)	2026-2027 (Senior)
8th grade math	Math 1	Math 2	Math 3	Pre-Calc Math in Social Sciences Math Modeling Advance Stats
Algebra in 8th grade	Math 2 Math 2 Honors	Math 3 Math 3 Honors	Pre-Calc Math in Social Sciences Math Modeling Advance Stats	AP Calc (AB/BC) AP Stats Math in Social Sciences Math Modeling Advance Stats Intro to Calc
Geometry in 8th grade	Alg 2 Trig Alg 2 Trig Honors	Pre-Calc Pre-Calc Honors	AP Calc (AB/BC) AP Stats Math in Social Sciences Math Modeling Advance Stats Intro to Calc	AP Calc (AB/BC) AP Stats Math in Social Sciences Math Modeling Advance Stats Multivariable Calc

Frequently Asked Questions



What will the teachers focus on for the 20-21 school year?
We will assemble a curriculum development team to construct our integrated core units. Teachers will have professional development opportunities available to them to help them prepare for the pathway implementation. We hope to pilot some of the developed materials in 21-22.

The curriculum writing team for College Prep Math will work on developing materials for the year-long course. AP district course teams will assemble in order to complete the alignment process (Math Goal 1.1a)

Potential Resources

Local School Districts that have an Integrated Math Curriculum

- Northside College Prep (ranked 2nd in IL)
- Jones College Prep (ranked 3rd in IL)
- Brooks College Prep (ranked 10th in IL)
- Illinois Math and Science Academy
- Maine Township 207
- Downers Grove 99
- Lemont 210
- Lockport High School
- District 230 (Sandburg, Stagg, Andrew)
- CHSD 117 (Antioch, Lakes)
- Proviso Math and Science Academy

Sample of Textbook series:

- Houghton Mifflin - Full HS Textbook series
- College Board - Full HS Textbook series
- McGraw Hill - Full HS Textbook series
- Cengage / National Geographic - Big Ideas - Full HS textbook series

Closing Remarks

The Integrated Pathway and 4th-year courses provide:

- A vision for how students can pursue mathematics education in our district
- An entry point into high school that supports individual learning needs
- Opportunities for students to accelerate through the pathway, should they be interested
- An honors option to students to pursue mathematics at greater depth
- High expectations for all students.

This entire pathway is an opportunity for systemic change. With this pathway, we are giving students more ownership of their learning, holding students to high expectations, and providing a more relevant curriculum to our learners. There is time and opportunity for students to choose a path in high school based on career aspirations. This is a system in which our philosophy of mathematics education is visually and structurally represented; we see each student as an individual and will help each of them achieve their personal ambitions.