



# Invigorating High School Mathematics

Secondary Mathematics Curriculum Committee

January 11, 2022



*Cherry Hill*  
PUBLIC SCHOOLS

## Mission Statement

We shall provide all children with an education that develops open-minded thinkers with the strong academic and interpersonal skills to thrive in an ever-changing world and make it a better place for all.

## District Goal

**Connecting Beyond Our Classrooms:**  
Provide resources, opportunities, and experiences for our students to connect to the world beyond their classrooms and to become informed and empathetic agents of change in the world.

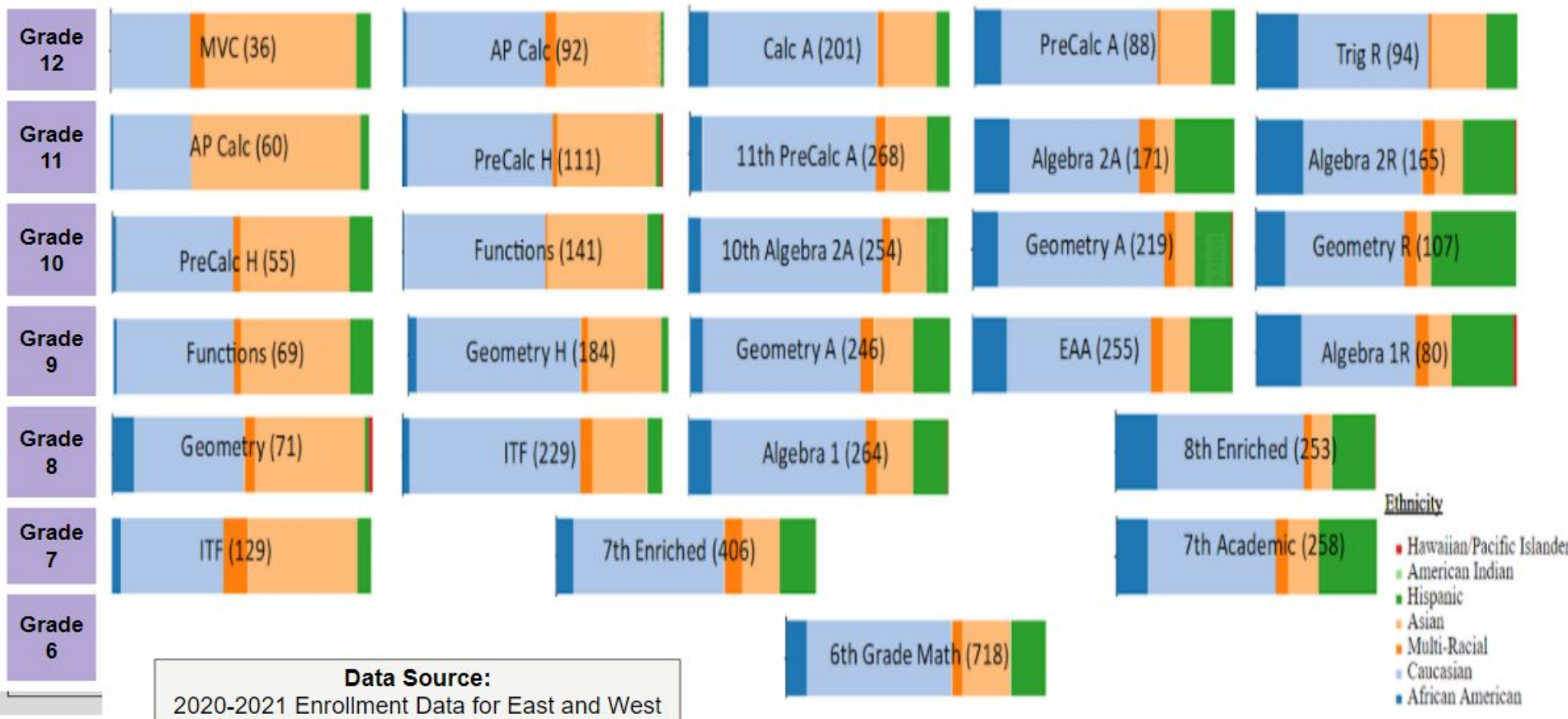
## Major Activities

**Student Pathways at the high school level:**  
Support diverse learners through increased educational opportunities for STEAM, Career & Technical Education (CTE)

## Math 2020-2021 Course Sequence

Grade 12	Multivariable Calculus	AP Calculus	Calculus A	Statistics A/AP (Elective)	Discrete Math Probability & Statistics (Elective)	Pre-Calculus A	Trigonometry R	College Math R
Grade 11	AP Calculus	Pre-Calculus H	Pre-Calculus A		Algebra 2A		Algebra 2R	Geometric Concepts
Grade 10	Pre-Calculus H	Functions H	Algebra 2A	Geometry A & Algebra 2A	Geometry A		Geometry R	Algebraic Concepts 2
Grade 9	Functions H	Geometry H	Geometry A	Enriched Algebra A			Algebra 1R	Algebraic Concepts 1
Grade 8	Geometry	Intro to Functions	Algebra 1	8th Grade Enriched				Resource Room Math

# What do you notice? What do you wonder?



“We have a new revolution where societies are generating real time data that is driving the systems we are operating in...trying to understand that connection between **technical** aspect of things and the **social** aspect of things...[requires] an education of new students that are extremely skilled in **analytical methods** but also understand **people and institutions**.”

Dr. Munther Dahleh

Director of the Institute for Data,  
Systems, and Society - MIT



# Mathematics Curriculum Long Range Plan

Continuously monitor changes  
and re-evaluate as needed



2021

Condense 7th  
Grade Courses  
& Implement  
Eureka 6-8



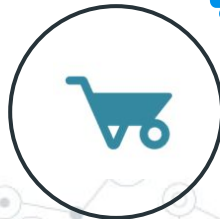
2023

HS Course  
Changes &  
Implement new  
HS Curricular  
Resources



2025

Continuing  
towards an  
equitable  
mathematics  
program



2022

Revise 8th  
Grade Courses  
& Pilot HS  
Curricular  
Resources



2024

HS Course  
Changes &  
Implement new  
HS Curricular  
Resources



# Purpose of High School Mathematics

**Expand  
Professional  
Opportunity**

**Understand  
and  
Critique the  
World**

**Experience  
Wonder, Joy,  
and Beauty**



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“

*“When **multiple purposes** are emphasized, students are prepared to flourish no matter what path they take or profession they choose”*





# Inclusive of ALL Students

**Students that are differently abled are no exception to benefiting from multiple purposes related to mathematics.**

- ◎ Annual review meetings for students with IEPs consider postgraduate pathways each year for students.
- ◎ Whether students intend to go to a two-year or four-year college or are entering the workforce, making real world connections is imperative for learning.



## What we know:

“

“Large numbers of high school students do not have access to the mathematics that they need either for their personal or for their professional adult lives. Further, and more fundamentally, it is the “seemingly intractable” issue of inequity in mathematics education that makes it **essential to catalyze change in high school mathematics** so that all students have the opportunity to obtain an education in mathematics that will serve them well, regardless of their interests and ambitions”



## Opening Opportunities with Pathways

“Education systems must be able to respond as effectively to a future musician who is uninterested in traditional math courses as they would to a student who wants to be an engineer but hasn’t had a chance to take advanced math courses.”



# Common Pathway Through Geometry

Each and every student should learn the **Essential Concepts** in order to:

- Expand professional opportunities
- Understand and critique the world
- Experience the joy, wonder, and beauty of mathematics



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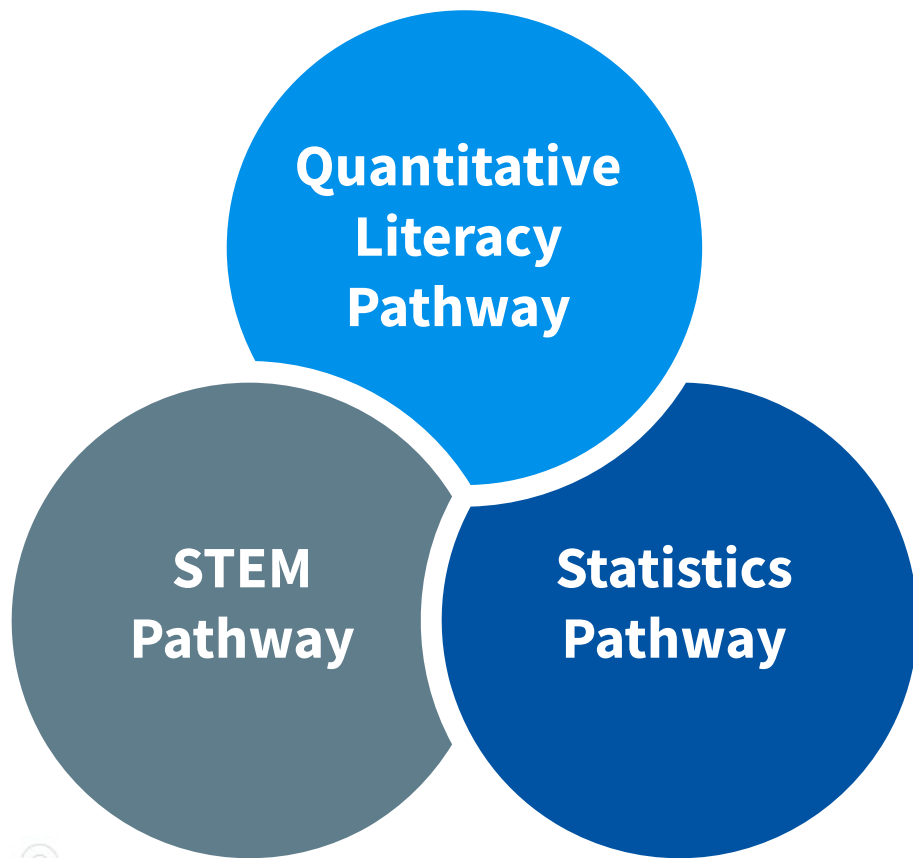
## **New Jersey State Minimum<sup>1</sup> Graduation Requirements by Content Area 120 credits ([N.J.A.C. 6A:8-5.1](#))**

### **Mathematics**

#### **15 credits including:**

- Algebra I or the content equivalent<sup>2</sup>
- Geometry or the content equivalent<sup>2</sup>
- Third year of math that builds on the concepts and skills of algebra and geometry and prepares students for college and 21st century careers

## Pathways



Students are offered options based upon their **aspirations** and **interests**.

# Quantitative Literacy Pathway

- ◎ Focuses on the mathematics of numbers, modeling, financial literacy, and effective citizenship.
- ◎ Preparatory for success in the humanities and technical fields
- ◎ First Course:
  - Quantitative Reasoning
    - Number, Ratio, and Proportional Reasoning
    - Mathematical Modeling
    - Predicting with Probability
    - Statistics and Data Analysis

# Quantitative Literacy Pathway

The diagram illustrates the Quantitative Literacy Pathway. On the left, a word cloud features various career titles including: politician, fundraiser, program, teacher, talent, speech, museum, therapist, publicist, tv, producer, designer, camera, project, researcher, writer, media, innovation, technical, advisor, creator, buyer, social, policy, reporter, curator, professor, retail, civil, actor, analytics, maker, literary, director, diplomat, scriptwriter, gallery, copywriter, operations, filmmaker, coordinator, radio, assistant, events, journalist, advertising, corporate, executive, community, digital, web, arts, public, analyst, pr, marketing, correspondent, translator, servant, affairs, officer, design, film, art, sales, brand, solicitor, investigator, theatre, recruiter, and merchandiser.

On the right, a vertical pathway diagram shows the sequence of courses leading to the final outcome, indicated by a large blue upward arrow:

- Pathway Course
- Pathway Course
- Pathway Course
- Quantitative Reasoning
- Geometry
- Algebra

Pathway Course

Pathway Course

Pathway Course

Quantitative Reasoning

Geometry

Algebra



# Statistics Pathway

- ◎ Focuses on developing students computational and statistical thinking skills for creative work and as a means of telling stories with data.
- ◎ Preparatory for success in the health, social sciences, and business fields.
- ◎ First Course:
  - [Introduction to Data Science](#)
    - The Idea of Data and Visualizations
    - Making Inferences, Justifying Conclusions, and Probability
    - Data Collection Methods
    - Predictions and Modeling

[illegible]

# Algebra

# STEM Pathway

- ◎ Focuses on the mathematics of functions and leads to calculus.
- ◎ Preparatory for success in the STEM fields.
- ◎ First course in pathway:
  - **Algebra 2**
    - Functions, Inverse Functions, and Transformations
    - Logarithms, Absolute Value, Piecewise functions
    - Complex Numbers, Radical and Rational Equations and Functions
    - Polynomial Equations, Functions, and End Behavior
    - Trigonometric Functions and Models

# STEM Pathway

manufacturing biomedical  
chemical electro-mechanical  
information mechanical research surveyors  
**engineers**  
systems industrial biological  
health sciences hardware  
statisticians biophysicists analysts electronics operations  
representatives soil medical electrical architectural  
**technicians** **engineering**  
technical civil managers computer natural  
chemists surveying **scientists** safety electronic epidemiologists  
environmental biochemists food architects landscape  
products  
drafters actuaries plant sales scientific mapping  
conservation microbiologists

Multivariable  
Calculus / BC

AP Calculus  
AB/BC

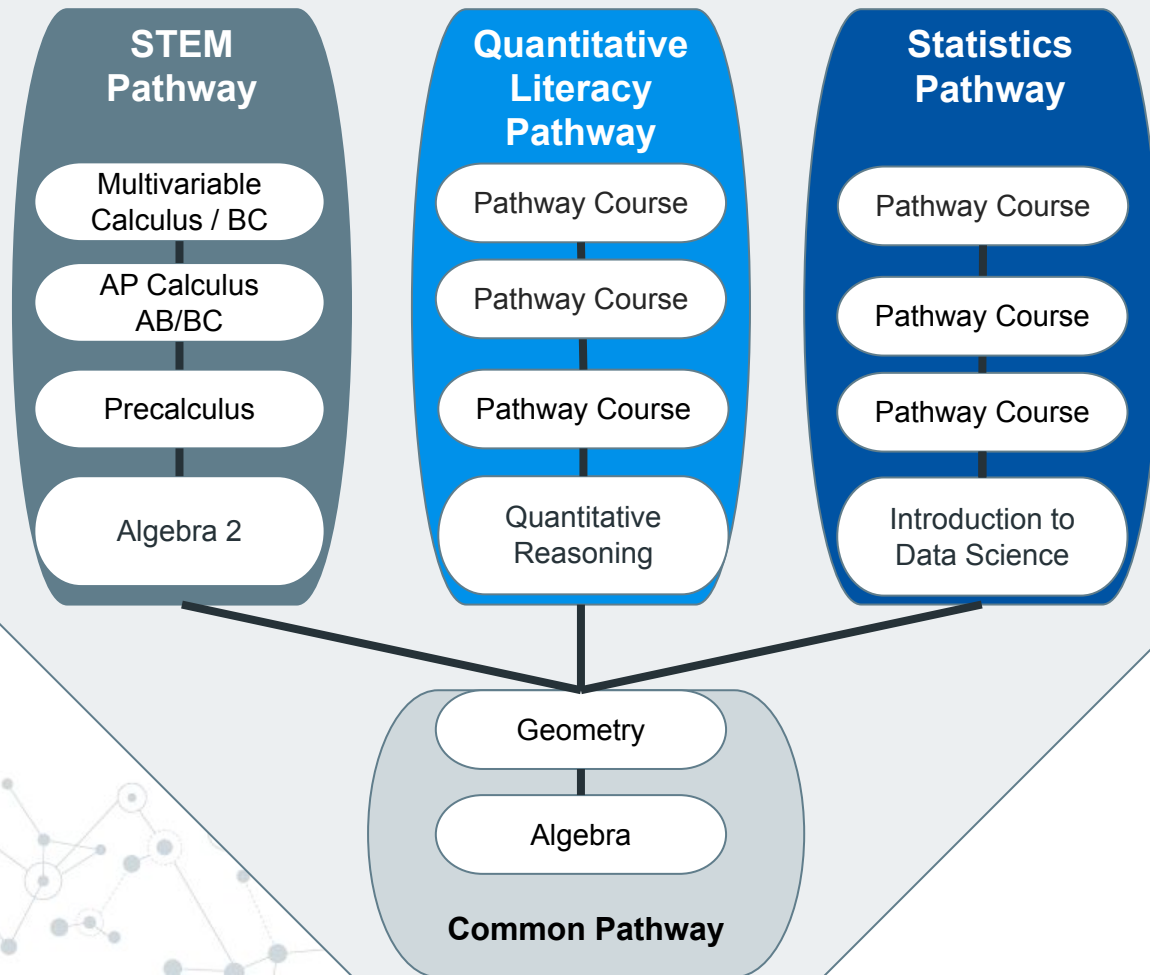
Precalculus

Algebra 2

Geometry

Algebra

# College and Career Aspirations



## Pathway Courses

AP Statistics (full year)  
Business Statistics (semester)  
Data Visualization and Manipulation(semester)  
Geometric Constructions (semester)  
Advanced Algebra and Finance (full year)  
Business Calculus\* (full year)  
Algebra 2  
Precalculus\*  
AP Calculus AB/A\*  
AP Calculus BC\*  
Multivariable Calculus\*

\*Prerequisite Required




## Commonalities between pathways

**Technology:** All pathways make full use of technologies that increase the productivity of instruction and enrich students' experiences. Calculators, computers, data-gathering tools and probes, and student response systems are used regularly.

**Problem Solving and Reasoning:** All pathways allow students to ask questions, explain their thinking, make reasonable estimates and predictions, and justify and respond to one another's mathematical arguments, strategies, and decisions.

**Rigor:** All pathways include expectations are high for all student work and courses challenge students to understand important mathematical concepts deeply.

**Modeling:** All pathways include the use of numeric, algebraic, geometric, and statistical ideas to model, better understand, and more accurately explain real-world situations and phenomena.



## Key Recommendation and Next Steps

**Every student learns the Essential Concepts in Algebra and Geometry before branching off to the pathway of choice for advanced mathematics study.**

### **2022-2023 School Year:**

- Consolidation of Algebra and Introduction to Functions courses at the 8th grade level into one Algebra course
- Utilizing the Eureka Math resource for Algebra.
- Develop new courses at the high school level

### **2023-2024 School Year:**

- Implement initial pathway courses: Algebra 2, Quantitative Reasoning, and Introduction to Data Science.



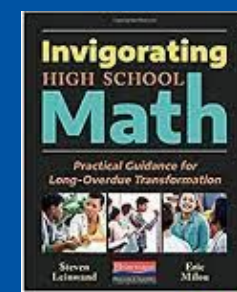
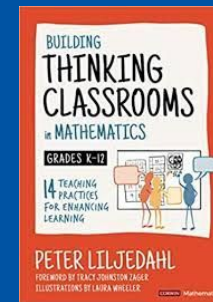
# Key Recommendation and Next Steps

## Continued focus on professional learning:

- February 1st district in-service day
- Classroom visits and coaching with Dr. Milou at all secondary schools
- Coaching cycles with district math coaches
- Teacher book study: *Building Thinking Classrooms in K-12 Mathematics*

## Community Book Study (tentative):

- *Catalyzing Change in High School Mathematics*







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# Questions and Discussion