



Newport-Mesa
Unified School District

Secondary Mathematics: Curriculum, Resources and Pathways

June 18, 2018



History of the Math Adoption Process

Our Vision: A Cohesive K-12 Math Experience for All Students

NMUSD Math Adoption Timeline

- 2016-2017, K-5
- 2017-2018, 6-8
- 2018-2019, Pilot Math I



Unit of Change: Our Sites

Our Vision: A Cohesive K-12 Math Experience for All Students.

- An Adoption Process: Alignment & Deepening Content Knowledge
- Taking Inventory of our NMUSD K-12 math System
 - Connecting K-12 Decisions
 - Working with Dr. Patrick Callahan



Our Essential Questions!

1. What secondary mathematics curricula and resources best support students success in secondary mathematics?
2. While still providing access to the highest levels of math currently offered (AP Calculus), what mathematics pathway options should be available to all students to support success and college and career readiness for all students?



Four Points

1. Shifts in expectations in mathematics from college and career
2. Common Core standards are different -- math class is not the same as it used to be (focus, rigor, coherence)
3. Middle school is critical mathematics (why acceleration is better in HS)
4. Pathways can have the exact same endpoints, no students are being denied higher level mathematics options (AP Calculus, etc) that were previously available.



Commitment to Meet the Expectations of our Standards

- Our K-8 Math Standards tell a coherent story in preparation for high school
- Focus, Coherence and Rigor: balanced, connected and deeper understanding
- All K-8 content is the foundation for high school mathematics success



Highest Rated Materials in 6-8 Classrooms

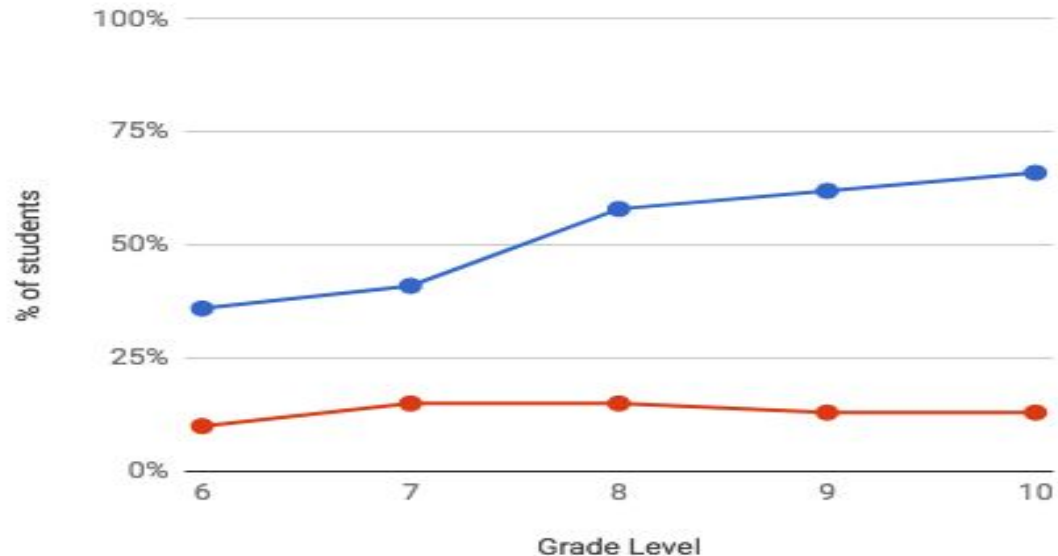
Open Up Resources OPEN UP RESOURCES 6-8 MATH 6-8									
Title (35)	Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
Open Up Resources 6-8 Math Open Up Resources Show Reports			Focus and Coherence				 14/14	 14/14	 14/14
Title (35)	Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
Open Up Resources 6-8 Math Open Up Resources Show Reports			Rigor and Mathematical Practices				 18/18	 18/18	 18/18
Title (35)	Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
Open Up Resources 6-8 Math Open Up Resources Show Reports			Usability				 37/38	 37/38	 37/38



Current Results...

Correct Answer versus Grade Level Explanation

- Correct Answer
- Grade Level Explanation





Addressing the Essential Question

While still providing access to the highest levels of math currently offered (AP Calculus), what mathematics pathway options should be available to all students to support success and college and career readiness for all students?



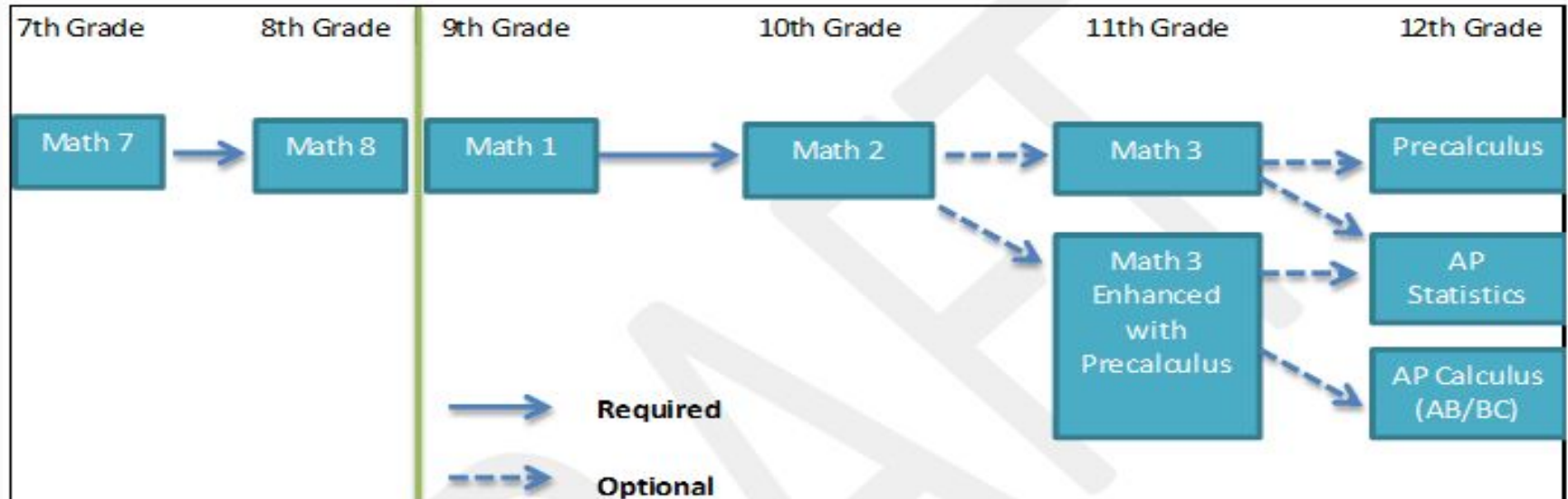
Our Proposal

1. 7th Grade: Offer Math 7 for all 7th grade students
 - a. Schools run intervention support classes as an elective supplemental course
2. 8th Grade: Offer Math 8 for all 8th grade students
 - a. 2018-19 only: Math I for students who completed Enhanced Math 7 / 8 in 2017-18
 - b. Schools run intervention support classes as an elective supplemental course
3. 9th Grade: Math I for all students.
 - a. Schools run intervention support classes as an elective supplemental course
4. Math HS Pathways to be determined next year; discussion TBD



Possible Road to Calculus: What it Can Look Like

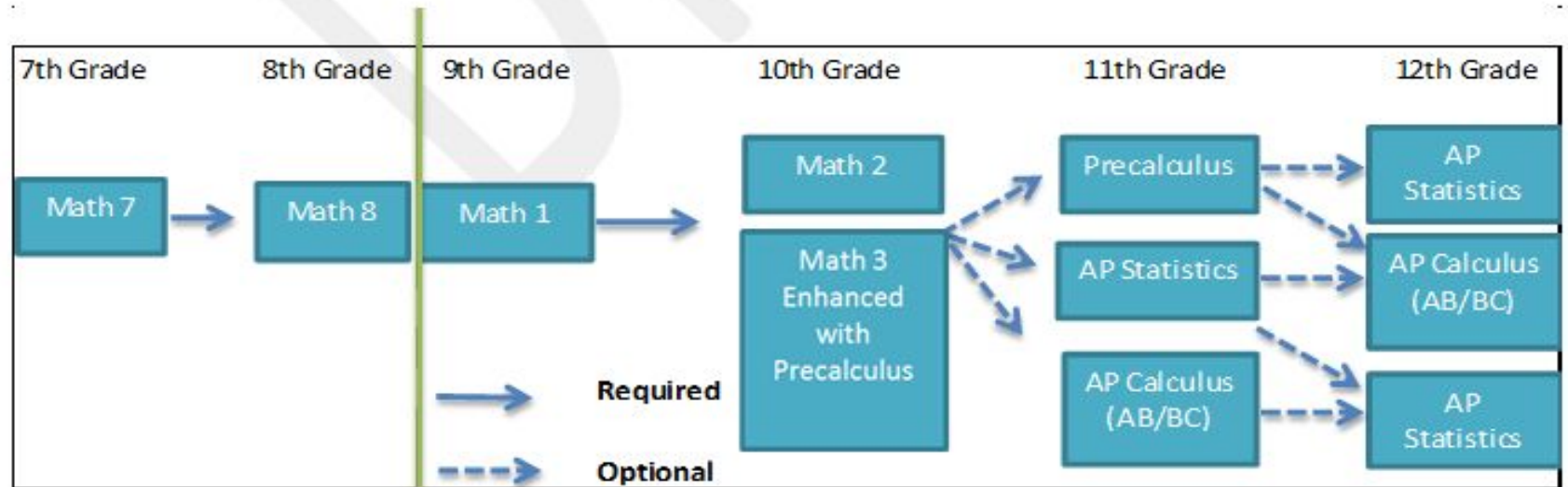
Recommended Course Sequence





Other Possible Options

Accelerated 10th Grade to Calculus



Dr. Patrick Callahan

The NMUSD Adoption Committee has spent the past year and a half doing careful research and analysis to develop a thorough set of recommendations regarding secondary curriculum, instruction, pathway and placement policies.

The Committee has reached out to get support and advice from many outside experts. Dr. Callahan has worked with the Committee to provide in-person facilitation during the process.

He will share a few key points that emerged over the course of the Committee's work.



Four Points

1. Shifts in expectations in mathematics from college and career
2. Common Core standards are different -- math class is not the same as it used to be (focus, rigor, coherence)
3. Middle school is critical mathematics (why acceleration is better in HS)
4. New proposed pathways have the exact same endpoints, no students are being denied higher level mathematics options (AP Calculus, etc) that were previously available.

1. Shifts in expectations

Careers and Colleges are looking for different skills, knowledge and use of mathematics from students.



Fortune 500: Most valued skills

	1970	1999
1	Writing	Teamwork
2	Computational Skills	Problem Solving
3	Reading Skills	Interpersonal Skills
4	Oral Communications	Oral Communications
5	Listening Skills	Listening Skills
6	Personal Career Development	Personal Career Development
7	Creative Thinking	Creative Thinking
8	Leadership	Leadership
9	Goal Setting / Motivation	Goal Setting / Motivation
10	Teamwork	Writing



2015 World Economic Forum: Top Skills

Top 10 skills

in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity

The Future of Jobs

Employment, Skills
and Workforce
Strategy for the
Fourth Industrial
Revolution



Hewlett Foundation: Deeper Learning

Competencies
1. Master core academic content
2. Think critically and solve complex problems
3. Work collaboratively
4. Communicate effectively
5. Learn how to learn
6. Develop academic mindsets



2. Shifts in standards

The Common Core State Standards were adopted by CA in 2010

They were a response to what colleges and careers were asking from K-12 schools. There was a two step process:

- 1) Survey many fields, universities, and businesses: “What mathematics should a high school graduate know and be able to use?”. Synthesize the responses into a definition of “College and Career Readiness”
- 2) Reverse engineer from these HS graduate expectations to create a **focused, coherent, and rigorous** set of standards grades K-11



Common Core defines rigor as a balance...

3) **Rigor:** Pursue conceptual understanding, procedural skills and fluency, and application with equal intensity

Rigor refers to deep, authentic command of mathematical concepts, not making math harder or introducing topics at earlier grades. To help students meet the standards, educators will need to pursue, with equal intensity, three aspects of rigor in the major work of each grade: conceptual understanding, procedural skills and fluency, and application.

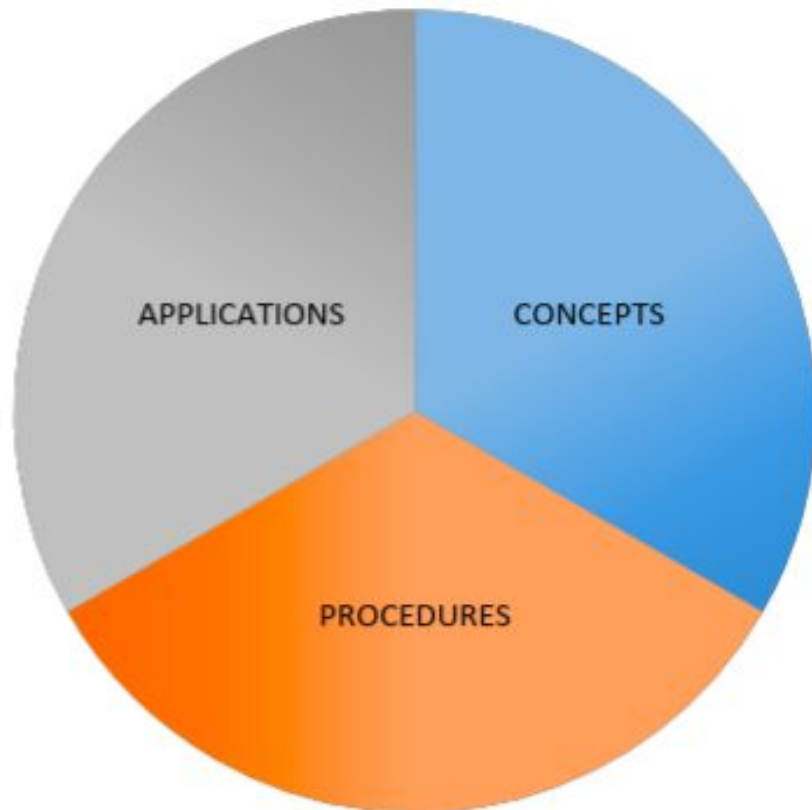
“Not making math harder or introducing topics at earlier grades”



Rigor in Mathematics

COMMON CORE MATHEMATICS

Defines rigor as procedural fluency, conceptual understanding, and applications in equal intensity.





The new SAT exam

It's About the Real World

Instead of testing you on every math topic there is, the new SAT asks you to use the math that you'll rely on most in all sorts of situations. Questions on the Math Test are designed to mirror the problem solving and modeling you'll do in:

- College math, science, and social science courses
- The jobs that you hold
- Your personal life

For instance, to answer some questions you'll need to use several steps—because in the real world a single calculation is rarely enough to get the job done.

What the Math Test Measures

Fluency

The Math Test is a chance to show that you:

- Carry out procedures flexibly, accurately, efficiently, and strategically.
- Solve problems quickly by identifying and using the most efficient solution approaches. This might involve solving a problem by inspection, finding a shortcut, or reorganizing the information you've been given.

Conceptual Understanding

You'll demonstrate your grasp of math concepts, operations, and relations. For instance, you might be asked to make connections between properties of linear equations, their graphs, and the contexts they represent.

Applications

These real-world problems ask you to analyze a situation, determine the essential elements required to solve the problem, represent the problem mathematically, and carry out a solution.



Sample item from new SAT



SAT

PSAT/NMSQT

PSAT 10

Calculator: Permitted

Problem Solving and Data Analysis

A typical image taken of the surface of Mars by a camera is 11.2 gigabits in size. A tracking station on Earth can receive data from the spacecraft at a data rate of 3 megabits per second for a maximum of 11 hours each day. If 1 gigabit equals 1,024 megabits, what is the maximum number of typical images that the tracking station could receive from the camera each day?



New SAT item



SAT

PSAT/NMSQT

PSAT 10

Calculator: Permitted

Heart of Algebra

The recommended daily calcium intake for a 20-year-old is 1,000 milligrams (mg). One cup of milk contains 299 mg of calcium and one cup of juice contains 261 mg of calcium. Which of the following inequalities represents the possible number of cups of milk m and cups of juice j a 20-year-old could drink in a day to meet or exceed the recommended daily calcium intake from these drinks alone?

Select an Answer

(A) $299m + 261j \geq 1,000$

(B) $299m + 261j > 1,000$

(C) $\frac{299}{m} + \frac{261}{j} \geq 1,000$

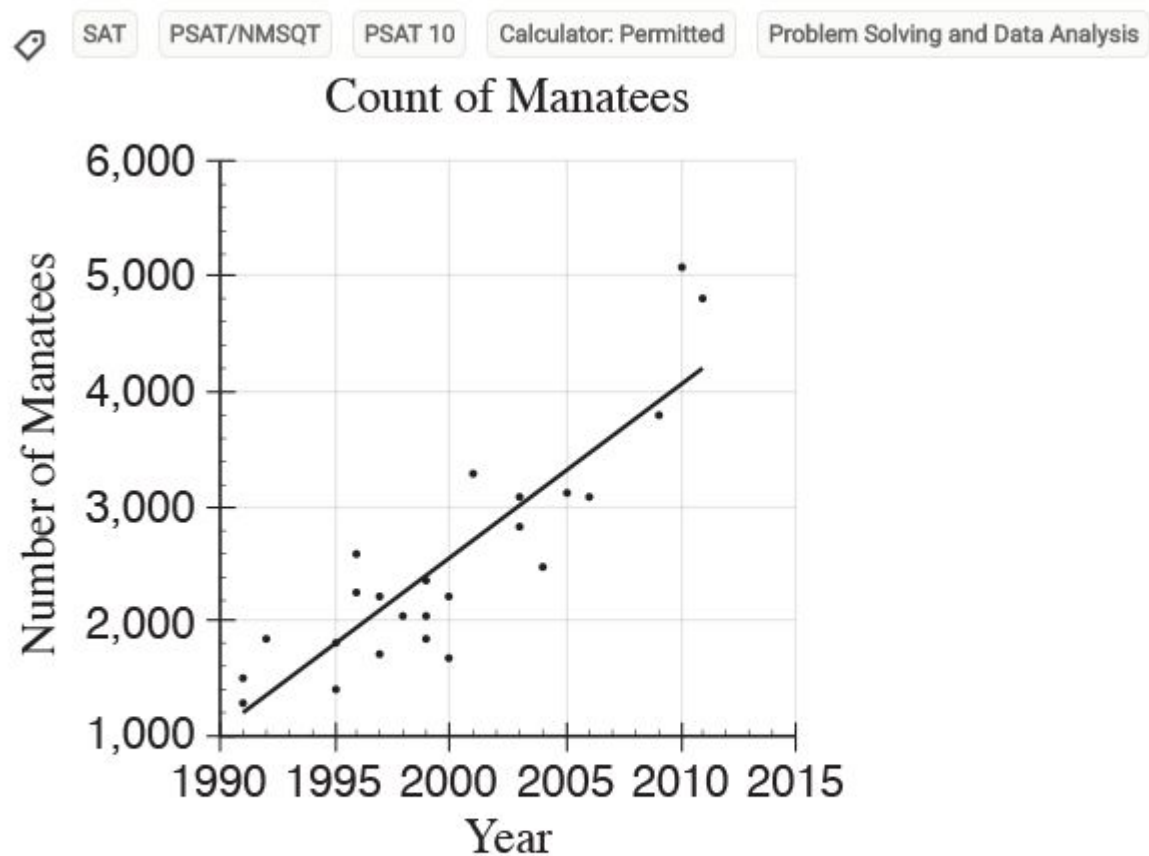
(D) $\frac{299}{m} + \frac{261}{j} > 1,000$



SAT

SAT (2016)

Question include
more data
analysis



The scatterplot above shows counts of Florida manatees, a type of sea mammal, from 1991 to 2011. Based on the line of best fit to the data shown, which of the following values is closest to the average yearly increase in the number of manatees?



Old expectations (CA STAR test)

More emphasis on procedural, routine, decontextualized items.

Less focus on sense making, complex problem solving, and concepts.

Which is one of the solutions to the equation

$$2x^2 - x - 4 = 0?$$

A $\frac{1}{4} - \sqrt{33}$

B $-\frac{1}{4} + \sqrt{33}$

C $\frac{1 + \sqrt{33}}{4}$

D $\frac{-1 - \sqrt{33}}{4}$

$$(4x^2 - 2x + 8) - (x^2 + 3x - 2) =$$

A $3x^2 + x + 6$

B $3x^2 + x + 10$

C $3x^2 - 5x + 6$

D $3x^2 - 5x + 10$

Contrast old STAR test to new SAT items (on the same topic but different expectations)

🔍 SAT PSAT/NMSQT PSAT 10 Calculator: Permitted Heart of Algebra

The toll rates for crossing a bridge are \$6.50 for a car and \$10 for a truck. During a two-hour period, a total of 187 cars and trucks crossed the bridge, and the total collected in tolls was \$1,338. Solving which of the following systems of equations yields the number of cars, x , and the number of trucks, y , that crossed the bridge during the two hours?

Which ordered pair is the solution to the system of equations below?

$$\begin{cases} x + 3y = 7 \\ x + 2y = 10 \end{cases}$$

A $\left(\frac{7}{2}, \frac{13}{4}\right)$ C $(-2, 3)$
B $\left(\frac{7}{2}, \frac{17}{5}\right)$ D $(16, -3)$

Select an Answer

(A) $x + y = 1,338$
 $6.5x + 10y = 187$

(B) $x + y = 187$
 $6.5x + 10y = \frac{1,338}{2}$

(C) $x + y = 187$
 $6.5x + 10y = 1,338$

(D) $x + y = 187$
 $6.5x + 10y = 1,338 \times 2$



3. Significant shifts in Middle School

The Common Core puts the **MOST USEFUL** mathematics topics and tools in middle school.

Proportional reasoning, decimals, percentages, functions, data, geometry



Math in context



Home Decorators Collection Bays
Mountain - Color Scout Texture 12 ft.
Carpet

\$1⁵³ /sq. ft.



TrafficMASTER Thoroughbred II -
Color Indy Texture 12 ft. Carpet

\$9⁰⁰ /square yard



Why accelerate in HS instead of MS?



Why did we accelerate or skip MS math?

We were trying to solve the problem of students not being sufficiently challenged in MS math.

Previous standards were significantly more procedural in MS. Speed and accuracy are salient components of procedural fluency. Some students were faster and hence not challenged. The solution the CA adopted was to move advanced math courses for HS and put them into MS and skip or accelerate through the old MS courses.



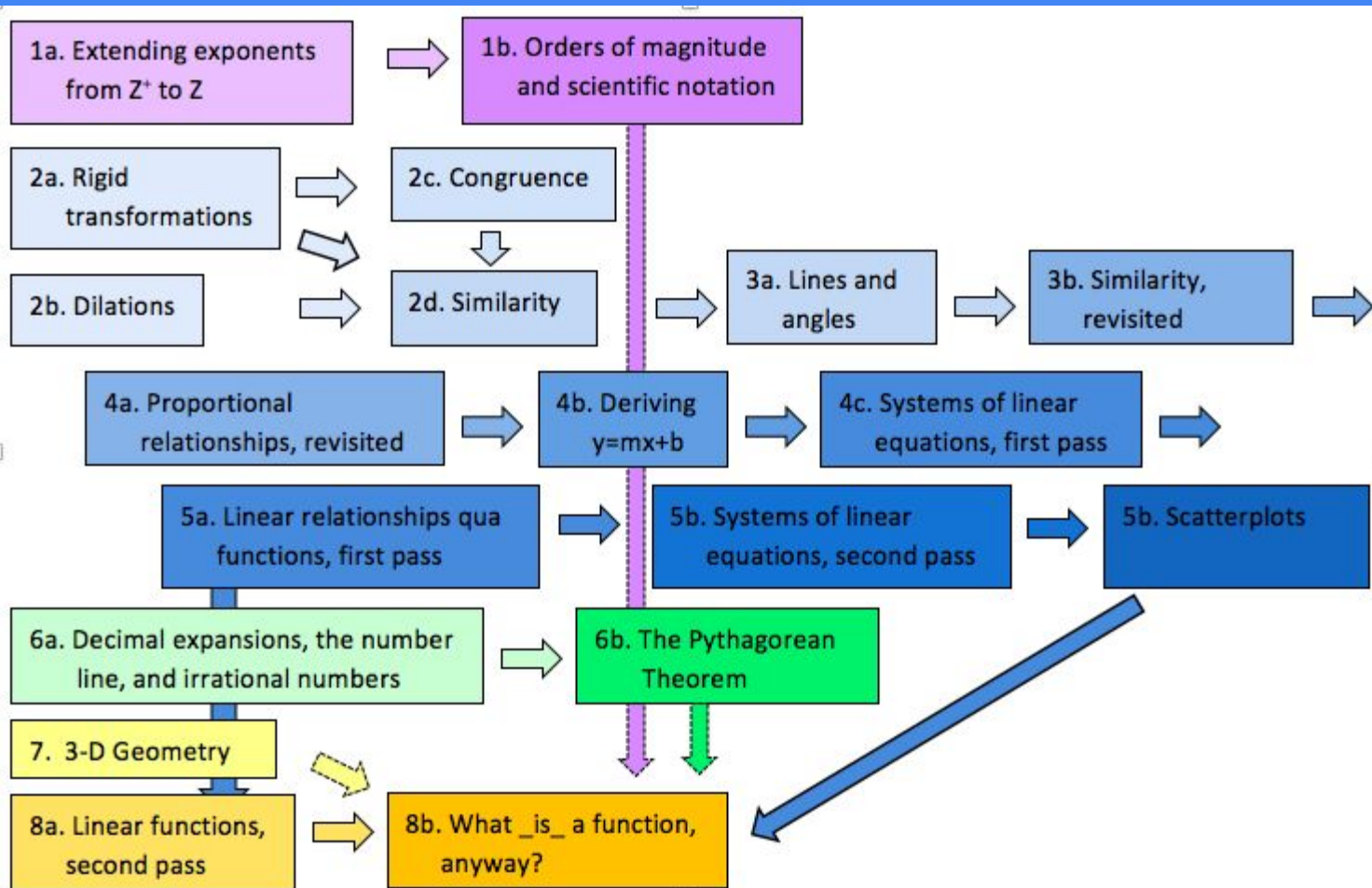
There is another solution

If MS math is not challenging for some students, they can skip ahead to HS math.

OR

Change the mathematics taught in MS to make it more rigorous and challenging. This is what the Common Core did.

Grade 8
Math covers
important
topics.
Many of
which were
HS topics





4. End goals: higher level math options

Before the Common Core in CA there was a standard sequence of courses:

Algebra 1, Geometry, Algebra 2, Pre-Calculus, Calculus

If a student wanted access to Calculus, they had to somehow fit five years of courses into four years of high school.

This coupled with the fact that the previous MS was not challenging for some students led to the policy of Algebra 1 in Grade 8.



The shift is less about “topics covered” and more about what students do with them:

Given a mathematical situation:

- 1) Set up the mathematics
- 2) **Do the computations**
- 3) Interpret the results
- 4) Communicate the results

Previous expectations

Given a mathematical situation:

- 1) **Set up the mathematics**
- 2) **Do the computations**
- 3) **Interpret the results**
- 4) **Communicate the results**

Current expectations



ALSO: You do not need to accelerate to access and succeed in AP Calc or AP Stats

IMPORTANT: The Common Core is more rigorous than previous standards. A student who is successful in a high quality Math 1, 2, 3 sequence in Grades 9-11 would be well prepared to take AP Calculus or AP Statistics *without any acceleration*.



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Unified School District

The upshot

Shifts in expectations from Careers and Colleges

Shifts in standards and assessments

Lead to new curriculum and instruction

And new policies and pathways

To better serve all students, regardless of their goals.