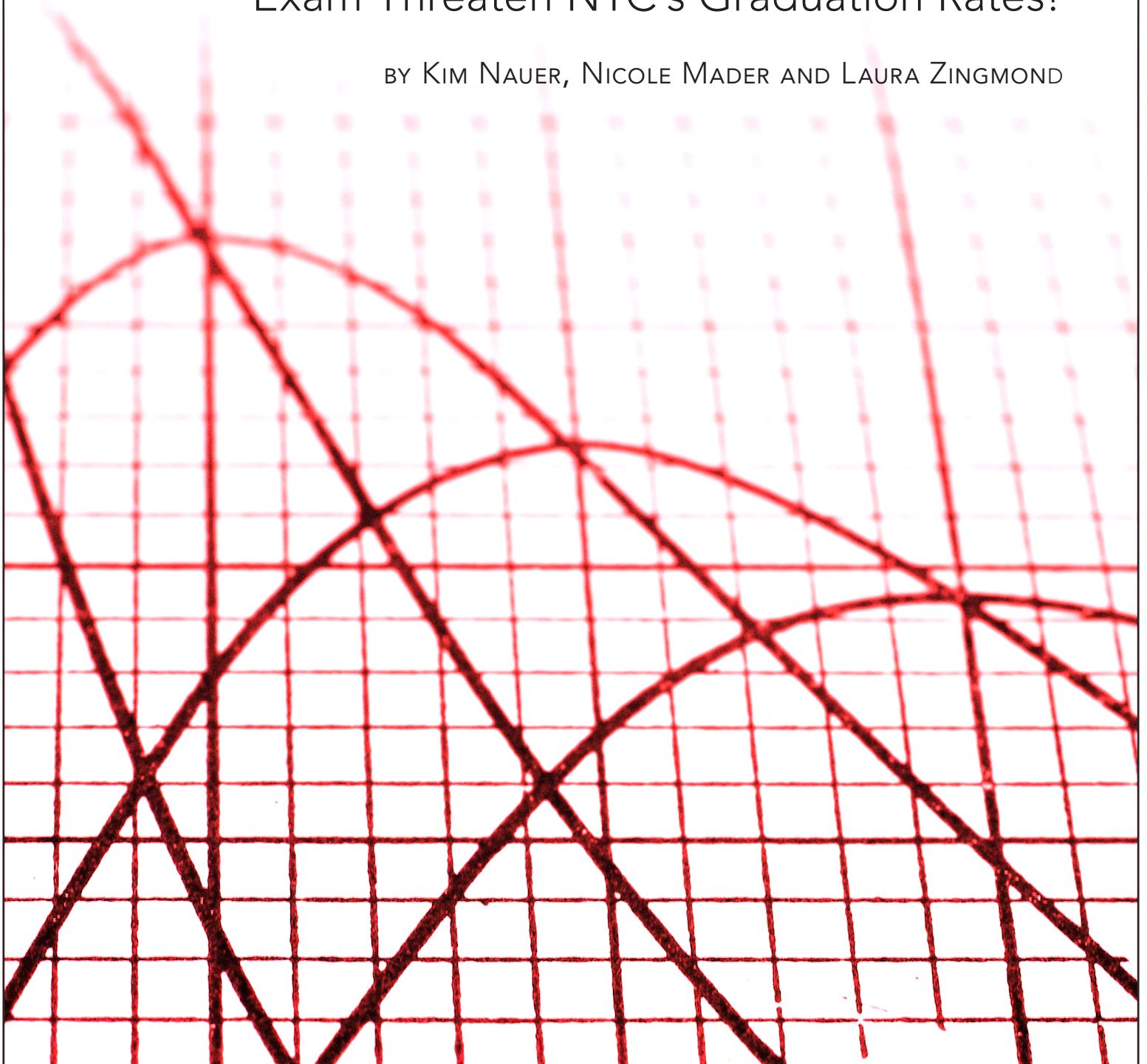


ROUGH CALCULATIONS

Will the Common Core Algebra Regents Exam Threaten NYC's Graduation Rates?

BY KIM NAUER, NICOLE MADER AND LAURA ZINGMOND



For New York City public high school students, algebra 1 represents either the gateway to advanced math or a huge, even insurmountable, stumbling block in their education. For all students, success in algebra 1 is crucial—and with the introduction of new Common Core–aligned statewide tests, the odds for success have just become considerably longer.

What makes algebra 1 so important? For the vast majority of students, passing the Regents exam for the course fulfills the state's math requirement for graduation. In addition, 8th- and 9th-graders who do well in algebra 1 are then steered to higher-level math and into college. But for those who struggle, the course can be a dead end. Every year, thousands of New York City students find themselves taking and retaking aspects of algebra in order to graduate. Both the course and the exam have been deemed too important to fail. But plenty of kids do—too often, repeatedly. It's a phenomenon some educators call the "algebra whirlpool."

For example, of the roughly 75,500 students who entered high school as the prospective Class of 2014, more than 22,000 flunked the Integrated Algebra Regents on their first attempt. Those who failed the first time went on to retake the exam an average of twice more in later years in order to graduate, according to a Center for New York City Affairs analysis. Among students repeating the exam, the pass rate plummeted to as low as 20 percent. Some 2,500 of these students took the exam more than five times; 66 took the Integrated Algebra Regents 10 or more times. At this writing, roughly half of those 66 students have yet to either pass the Regents exam, or graduate from high school.

The challenge of passing algebra 1 has now become significantly and ominously harder. The Integrated Algebra Regents was officially retired in June 2015 in favor of a new Common Core–aligned exam reflecting New York State's new and tougher academic standards. The new exam has been laced with material that used to be on the Algebra 2/Trigonometry Regents exams. "The old algebra exam was at a 7th-grade level. The new algebra exam is at a 10th-grade level," says Midwood High School Principal Michael McDonnell.

New York City schools tested out the new exam in June 2014 with miserable results. Only 46 percent of freshmen who took the test passed.¹ Educators are awaiting a citywide analysis of the June 2015 results to see whether pass rates will bounce back, or whether a dreary new normal of failure looms.

"We already have a tremendous challenge to get students to graduate in our struggling schools," says Mark Dunetz, vice president of school support at New Visions for Public Schools, a nonprofit working in 77 mostly high-poverty New York City high schools. "Many students may take a Regents exam four, five or six times before they get the 65 to graduate." If the failure rates get significantly higher on Algebra 1, or any of the new Regents exams, "you could be looking at a tremendous set of obstacles to graduating on time," he says.

The new exam also has reinvigorated an old debate over the best way to teach high school math to students who need extra help. New York City schools have long been experimenting with one-year versus two-year algebra, "double-dose" two-period algebra, early 8th-grade algebra and algebra taught with real world applications. Analyzing high school

transcripts, Center researchers found an astonishing variety of course sequences and names, ranging from “Algebra Themes,” “Algebra Exploration” and “Algebraic Problem Solving” to “Financial Algebra,” “Principles of Algebra in the Real World” and “Algebra Achieve Academy.” The same data also revealed another trend: Students who take these kinds of courses repeatedly have less opportunity to progress to the higher-level math Regents courses, like algebra 2 and pre-calculus, that colleges and employers want to see.

Stalling out in math is a challenge at a great many high schools in the city, where students arrive unprepared for high school math and every passed Regents exam is a victory. Of the city’s 542 high schools, 428 serve a majority of students who scored below the state proficiency standard on their 8th-grade math test.² The default tendency in such cases is to repeat the material until the students get what they need to squeak over the finish line, but this isn’t necessarily a good way to teach math, says Phil

Weinberg, the New York City Department of Education’s deputy chancellor in charge teaching and learning. “The idea is that I am just going to go slower, so the kids can catch on,” he says, describing what’s otherwise known as the “more and louder” approach to teaching. Weinberg, himself a former principal of a well-regarded high-poverty high school, says he knows alternative solutions won’t come easy, but Chancellor Carmen Fariña is encouraging schools to share both their best strategies and their failures. “We’re asking them to learn from each other,” he says.

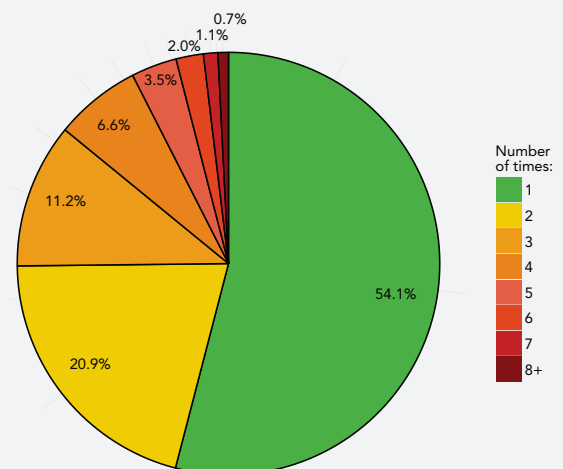
MAJOR CHANGES IN HIGH SCHOOL MATH

Over the 2014–15 school year, researchers at the Center for New York City Affairs and Insideschools visited more than 60 high schools, polling principals and teachers to see how they were dealing with the challenge of getting their students to pass—and ideally master—algebra. We scoured transcript data to see how high schools were helping as many students as pos-

MANY STUDENTS REPEAT THE ALGEBRA 1 REGENTS EXAM

Nearly half of students in the Class of 2014 took the Integrated Algebra exam repeatedly to get the math Regents credit they needed to graduate high school. Students typically retake the exam until they get the math Regents credit they need to graduate high school. Educators worry that the tougher Common Core Regents exam will exacerbate this problem.

Number of Times Students Took the Algebra 1 Regents Before Graduation



sible pass Algebra 1 on the first try and what was happening to students who had fallen into the “whirlpool.” And we interviewed city and state policymakers to get a sense of where the high school math standards will be going in the future. We found there were some important things to understand:

- o **Algebra 1 is the culmination of the K–8 Common Core State Standards; gaining a solid grounding of algebraic concepts in the elementary and middle school years is essential to passing Algebra 1.** The authors of the national standards looked at what students needed in college and concluded that two-thirds of American 8th-graders lacked essential algebra skills. The controversial K–8 standards in math have been an attempt to fix that, says Jason Zimba, a lead writer of the Common Core State Standards for mathematics and co-founder of Student Achievement Partners, a nonprofit promoting the standards. In the future, he said, students

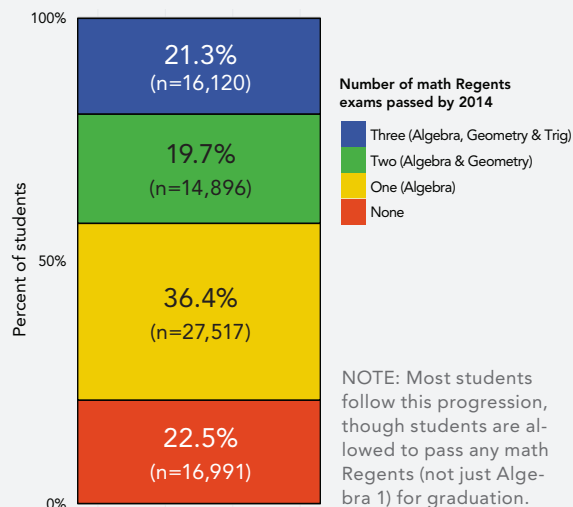
will enter high school with a thorough understanding of material—like linear equations, functions and introductory geometry—that would have previously been taught or re-taught in high school. “These standards are certainly more rigorous than we are used to,” he told teachers on a recent webinar about the standards. “The Common Core is a staircase to algebra,” he said adding, “it’s a pretty steep staircase.”

- o **Recognizing that colleges require students to have a genuine understanding of algebra, policymakers have been pushing schools to improve their algebra courses for some time now, with high schools getting most of the pressure.** In 2010, the New York State Board of Regents introduced an “aspirational” measure of math success, saying students needed to get a score of 80 or better on the Integrated Algebra Regents or another math Regents to be deemed “college-ready.” (This was in contrast to the

ONLY 40 PERCENT OF STUDENTS MOVE BEYOND THE ALGEBRA 1 REGENTS EXAM

Both colleges and employers want to see advanced math, but this is out of reach for many NYC students. Among students slated to graduate in 2014, a majority of students topped out at Algebra 1—and many in the class struggled to pass even this exam.

Number of Math Regents Exams Passed by Expected Date of Graduation



much-easier-to-attain score of 65 needed to pass and graduate.) In 2011, then New York City schools chancellor Dennis Walcott also introduced a number of measures designed to gauge how college-ready students were, in the hopes of driving down very high rates of costly remediation of city public high school graduates at schools like those in the City University of New York system. This remains a priority for current schools chancellor Fariña. "That is incredibly important to us," says Carol Mosesson-Teig, the Department of Education's mathematics director.

Teachers have been frustrated by the state's curriculum materials and poor guidance on the Common Core Regents exams.

- o **The shift in math standards accompanying the Common Core presents a major challenge for middle and high school educators: What exactly to teach and when?** Math skills need to be taught in a coherent progression and the Common Core has changed what that progression looks like. Teachers and principals say they have been doing their best to anticipate what the state's Common Core-aligned achievement tests and exams will look like, gleaning what they can from the national standards and from the materials provided on the New York State Department of Education's teaching website EngageNY. But middle school teachers find themselves rushing through the curriculum to make up ground lost in elementary school on fractions and other fundamental con-

cepts. In high school, teachers are dealing with the fact that the algebra 1, geometry and algebra 2/trigonometry standards have been reorganized across the board. This would be fine if teachers were given clear guidance on what is expected of students at each grade level, but that isn't happening.

Researchers at the Center interviewed more than 20 principals and nearly three dozen math teachers. Nearly all said New York State's curriculum needed improvement to be truly useful to teachers. They were frustrated with the inadequate guidance they have been given on what to teach so their students can succeed on their Common Core-aligned Regents exams. All could cite questions on the new Algebra 1 and Geometry Regents examinations that were either confusing to students or off-base given the state's stated priorities for teaching Common Core math.

They also criticized the EngageNY curriculum for being poorly paced, a failing attributed to it being designed by non-teachers. The result: A lesson that EngageNY allots one period of instruction, for example, might actually require three periods to do well. Teachers said New York State fails to let instructors know which of many possible math topics are the top priorities. Miriam Nightengale, principal of the Columbia Secondary School for Math, Science & Engineering, a well-regarded 6-12 school on the Upper West Side, is representative of many of the educators interviewed. She has carefully read the state's suggested curriculum materials for both middle and high schools and finds them lacking. "The tests are being developed outside of a curriculum. What is that for?" she asks. "Teachers need to have something to teach. They can't keep guessing."

Only one-quarter of students escape the "algebra whirlpool" in any given round of Regents exams.

- o **Educators worry that Common Core confusion could increase the number of students failing Algebra 1, reducing their exposure to advanced math and potentially driving down graduation rates.** New York State has strict rules for what students must do to graduate. Students who enter high school in September 2015, for example, will be required to pass five Regents exams³ with a 65 and successfully complete 44 credits. Students can easily fall "off-track" if they stumble on any of these requirements. Failing the Algebra 1 Regents can have big repercussions for both the student and the school down the line, explains Dunetz at New Visions. Many students may pass an algebra 1 class, but not the Regents exam, meaning that they essentially need two math classes the next year: another crack at algebra 1 as well as a different math class. Using teachers to do remedial work rather than advanced work will quickly whittle down academic opportunities for all students, he says. Repeating classes is also disheartening to the students, only one-quarter of whom escape the "algebra whirlpool" in any given round of exams. Principals find themselves "doing crazy, crazy acrobatics" of scheduling to help struggling students get the material they need to pass the Regents, Dunetz says. If more students fail the Common Core-aligned Regents, the effects could cascade through schools, reducing the numbers of students who graduate. "You want your students to pass the Algebra 1 Regents in 9th grade," he says.

CHALLENGE: TEACHING MORE MATH WITH LESS TIME

This challenge is not new to New York City high school principals, who must routinely balance the needs of remedial students with an urgent mandate to better prepare all students for college. Reporters from Insideschools visited more than 50 middle schools and more than 60 high schools over the 2014–15 school year. Every school had been touched by the national Common Core Standards, and many educators were excited and energized by the more hands-on teaching practices the standards espouse and the chance to work with a wider variety of materials. We found dozens of educators who were thinking about new ways to teach math and to structure and sequence class time so students fully understand the material leading up to algebra 1 and, ideally, more advanced math too. There was a heightened attention to getting algebra 1 instruction right, knowing the importance of higher-level math to kids seeking careers in medicine and technology.

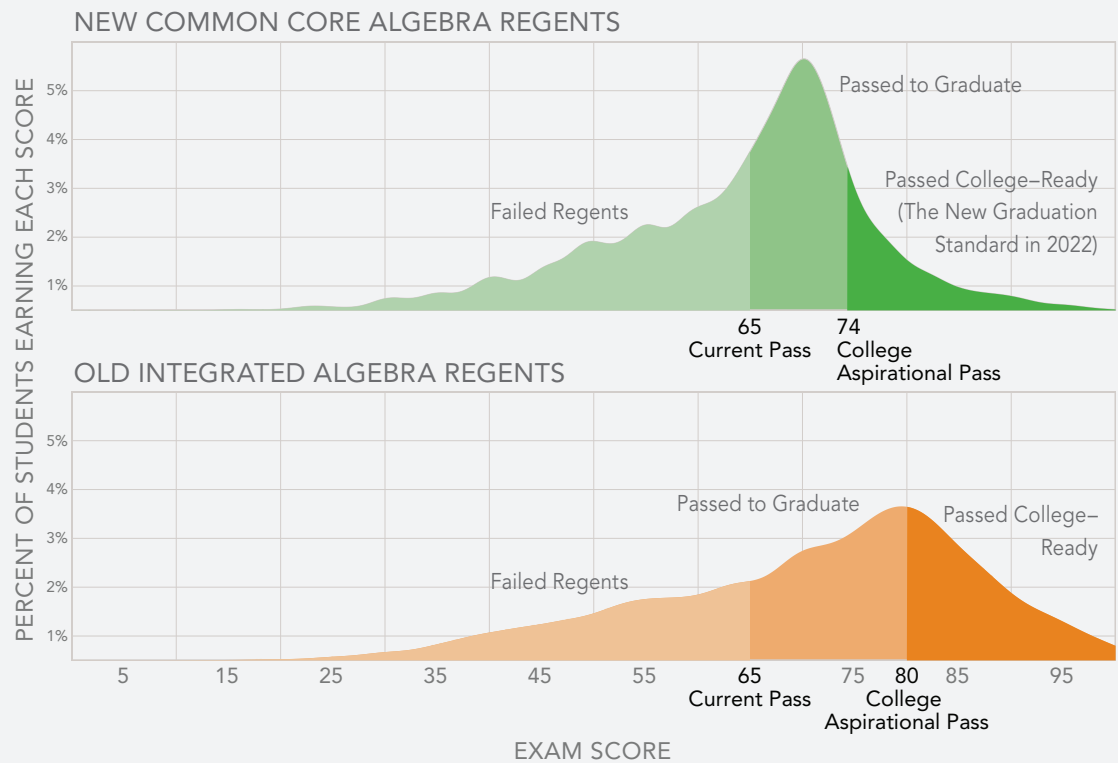
Unfortunately, however, both middle and high school math teachers also told us that they were struggling against tough time constraints. That's because while reading, writing and math instruction compose the lion's share of the elementary school day, in secondary schools more class time is devoted to other topics, including social studies, the sciences, foreign languages and electives. The result: As the math concepts taught to students get harder, there is much less time devoted to their instruction. Elementary school students typically get about an hour of math instruction a day. In middle and high school, principals say 42 minutes a day for math instruction is the average. The pressures of the Common Core have made this longstanding conundrum even more intense.

The most pressing problem is what to do with students who lack the mathematics foundation to easily master algebra in 8th or 9th grade. New York City's high schools have employed a variety of strategies to tackle this challenge. Some common approaches:

One-Year Double-Dose Algebra: Park East in East Harlem is an example. The school frontloads extra time for math in 9th grade. All students take two classes of math a day, both algebra and "Math Applications," which is designed to shore up students' skills in math

MORE STUDENTS ARE FAILING THE ALGEBRA 1 REGENTS WITH TOUGHER STANDARDS YET TO COME FOR TODAY'S SIXTH GRADERS

Distribution of Scores on June 2014 Algebra 1 Regents Exam:
 Common Core Algebra v Integrated Algebra (First-Time Test Takers)



New York State unveiled the new Common Core Algebra Regents exam in June 2014. That year, students were allowed to take both exams and use the better score. The results gave educators a glimpse of possible challenges to come. In the charts above, we can see how students tended to score. More students failed the exam. Perhaps more importantly, far fewer passed at New York's "college aspirational" level, foreshadowing a major new challenge for students entering sixth grade this year. The Class of 2022 will be required to pass at this new college-ready level to graduate.

and word problems. Students who are having trouble with particular concepts are pulled out of regular classes to work with teachers in small groups.

Park East, founded as a small alternative school in 1968, has created an unusually strong math department in the past decade. Only 11 years ago, in 2004, Park East was on the state's list of schools in need of improvement, in part because of its low pass rate on the Algebra 1 Regents. But by 2013 some 98 percent of 9th-graders passed the exam on the first try.⁴

Top Park East students may take Advanced Placement Calculus, but even the struggling students take four years of math. And the very best teachers willingly work with the students who need the most help: Lauren Brady, who won the Sloan Award for Excellence in Teaching in 2014, teaches basic algebra as well as a class in statistics for students who aren't prepared to take calculus.

Another version of front-loading is to offer summer support. Bronx Center for Science and Mathematics, for example, is a successful, unscreened school that manages to challenge kids at the top while giving extra support to kids who struggle. Before starting high school at Bronx Center, rising 9th-graders spend four weeks shoring up their foundational skills in English and math. While participation in this "bridge" program is not mandatory, most students attend. Ninety-three percent of Bronx Center students who took the 2013–14 Algebra 1 Regents exam passed it and roughly half scored 80 or higher on the Integrated Algebra exam, which was the Board of Regents' college-readiness threshold at the time.

Two-Year Algebra: Many principals feel strongly that struggling learners need two years to get the grounding they need to pass

the Regents and do well in higher-level math. The Center's review of transcript data found many high schools offered two-year algebra 1 sequences to at least some students.

Midwood High School in Brooklyn, for example, serves a wide range of students—some in the highly selective and competitive Medical Science Institute, others who are new immigrants from war-torn countries with little formal education. The students with poor preparation are assigned to a four-semester algebra course, which allows them to catch up on basic skills before tackling the material needed to pass the Algebra 1 Regents exam—particularly important considering how difficult the new Common Core Algebra exam is.



Nearly everyone passes the Algebra 1 Regents on the first try at Park East High School

A giant school with more than 3,700 students, Midwood, like the similarly sized Francis Lewis High School in Queens, has the room and staff to make this strategy easily practicable. Many such schools follow the time-honored practice of putting stronger students on one math track and weaker students on another, slower track. And while the city's new small

high schools operate with far smaller staff and less space, some are finding ways to follow this approach too.

Other educators, however, question whether this practice is either equitable or fruitful. Some are experimenting with alternatives aimed at introducing all students to advanced math, such as the one below.

Open Access to Advanced Math: At Sunset Park High School in Brooklyn, all 9th-graders take both algebra and statistics. Whether or not they pass the Algebra 1 Regents exam, all 10th-graders take geometry, all 11th-graders take algebra 2 and all 12th-graders take pre-calculus. Students of different abilities are placed in the same class.

"Why would I hold you back in algebra when you might be better at geometry?" says Principal Victoria Antonini, arguing that students don't need to master algebra before trying out the proofs and logic taught in geometry. "And there are topics in algebra 2/trig," she adds, "that actually help" students still working to pass the Algebra 1 Regents exam in the junior year. "If we kept them in the algebra 1 whirlpool, we wouldn't have known that."

So far, she feels the approach has been working. One out of every three Sunset Park students fails the Algebra 1 Regents as a freshman, but she says nearly all eventually pass it, graduating with their Regents credits—and plenty of practice doing higher-level math. "We like to think of math as a process in the same way we think of writing as a process," she adds. "Students learn resiliency, problem solving and flexible thinking. Being able to think that way is really important."

The approach, of course, has downsides. The school offers no Advanced Placement math

courses. And it can be tough to teach a math class to students of such varying abilities, as Antonini's own teachers freely admit. "I feel like I am sort of teaching to the middle. I am trying to reach everyone and I am not sure I am reaching anyone," says Rebecca Kunce, who teaches pre-calculus. She adds, however, that her students clearly benefit from being exposed to the upper-level math and to her class projects. "Students never think, 'I'm in the stupid class,'" she says. "Math is the same for everybody."



Sunset Park High School mixes students of different abilities in the same class.

COMING SOON: MUCH TOUGHER GRADUATION STANDARDS

Unfortunately, there's no track record yet on the comparative success of these various strategies when it comes to Common Core algebra. The introduction of the Common Core algebra 1 curriculum is still a work in progress, and so is the school-level adaptation to it. What is clear is that as the Common Core moves into high schools, the New York City Department of Education will need a strategy for helping schools and students meet the

new demands. The new Algebra 1 Regents is just the first of several new challenges for high school students, but it's a big one. Principals must quickly adjust their curricula so students can have a reasonable expectation of passing the exam. They must also begin looking down the road three years, when this year's 6th-graders—the Class of 2022—arrive. All those students will need to pass Algebra 1 at New York State's "college aspirational" level which is far above the 65 now required to pass the exam. Currently, only about 39 percent of students in the 2022 graduating cohort are doing math at this level, as measured by results on the Common Core-aligned standardized tests they've already taken in ele-

mentary school. Within three years' time, the mathematical skills of these sixth graders will have to improve dramatically if the city's high schools are to have much hope of maintaining their current graduation rates, let alone improving them.

On the positive side, scores on the new Common Core-aligned achievement tests in grades 3–8 have improved substantially over the first two years of testing. Math pass rates went up by almost five percentage points overall from 2013 to 2014. "If we could continue to see that increase over the coming years, we would be very, very happy," says the Department of Education's Linda Curtis-Bey, executive director

STRUGGLING STUDENTS POST DRAMATICALLY LOWER PASS RATES ON THE COMMON CORE ALGEBRA 1 REGENTS EXAM

Students Taking Algebra 1 Regents for the First Time in 2014	Number	Integrated Algebra: Current Pass Rate	Integrated Algebra: College Aspirational Pass Rate	Common Core Algebra: Current Pass Rate	Common Core Algebra: College Aspirational Pass Rate
Overall	68,933	72.5%	31.5%	58.2%	14.3%
Free Lunch Not Eligible	17,095	81.3%	43.3%	71.7%	23.1%
Free Lunch Eligible	50,964	69.7%	27.4%	53.6%	11.5%
Non English Language Learners	59,164	75.5%	33.5%	61.5%	15.9%
English Language Learners	8,895	53.7%	17.6%	30.7%	4.6%
General Education	58,405	78.4%	35.5%	63.6%	16.5%
Special Education	9,654	37.4%	6.8%	20.5%	1.7%
Asian	11,807	91.1%	64.5%	85.3%	39.5%
Black	19,986	64.4%	17.4%	43.4%	4.5%
Hispanic	25,672	64.9%	20.1%	47.5%	6.3%
White	9,294	86.6%	50.0%	78.3%	26.2%

The new Common Core Algebra 1 Regents exam is challenging for all students, but it poses particularly stiff challenges for students who have traditionally struggled with the Regents exam. Pass rates for English language learners and students in special education are more than 20 percentage points lower. This year's 6th-graders (the Class of 2022) will be required to pass at the "college aspirational" level to graduate. Pass rates at the college aspirational level are currently very low among students who struggle in school.

in charge of science, technology and math. But she admits such a continued rate of growth may be unrealistic. She says her team has been piloting a number of new math instructional approaches at the middle and high school level that show promise. "We'll see if their numbers hold up," she says.

The Department of Education's math coaches will also need to play a big role going forward. In January 2015, Chancellor Fariña announced that she would disband former mayor Michael Bloomberg's Children First Networks, teams chosen by principals to provide instructional and operational support to their schools. The networks are being replaced with superintendents who directly oversee the principals and support staff to be based in new "Borough Field Support Centers." Those centers were opened in July and the new instructional support teams are now mostly in place. Instructional coaches at the field offices will be working with principals, assistant principals and department heads to roll out new approaches to math instruction that emphasize more dialogue about underlying math concepts and giving students an opportunity to apply the math they are learning in real-world projects, says Curtis-Bey. "For many, it's a shift in how they have taught mathematics," she says.

The education department's Weinberg adds that he is hopeful that schools will have the

ability to help themselves, learning from each other. New York City has the advantage of a large pool of schools doing experimentation and innovation. It is also home to some of the strongest math high schools in the nation as well as to immigrant students who've learned different approaches to math in their home countries. These are all assets, he says.

"Right now, the standards are just words. They won't have flesh and bones until schools start to work with them deeply," he says. "Schools need time to study New York State's goals and develop new approaches with their kids before we can expect to see meaningful differences in how the Common Core is taught throughout the system."

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1. Many students took the Integrated Algebra test as well; roughly 63 percent passed it.
 2. This figure includes all students in grades 9 through 12 despite significant changes in how proficiency was measured over the past four years. Freshmen entering high school in 2013 were evaluated in 8th grade with the new Common Core-aligned exams introduced in the 2012-13 school year, which resulted in lower average proficiency levels than the cohorts preceding them.
 3. All students must pass one Regents exam in these four categories: English Language Arts, math, science and social studies. Students may then choose a fifth Regents exam or a "state-approved assessment" in career- or arts-related coursework.
 4. Website of the Institute for Student Achievement: <http://www.studentachievement.org/park-east-high-school-math-teacher/>.

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REGARDING THE CENTER'S DATA ANALYSIS:

- All longitudinal data referring to the "Class of 2014" pertains to the students who entered high school in the fall of 2010 and were expected to graduate by summer 2014. Scrambled student ID numbers and graduation outcomes as of August 2014 were taken from the NY State Education Department's 2014 Graduation Reporting Dataset.

- Regents Exam achievement data were taken from the NYC Department of Education's 2010–2014 Regents Datasets and matched to graduation data by scrambled student ID numbers. Comparisons of Integrated Algebra scores to Common Core Algebra scores were limited to those taking either exam for the first time, according to the previous four years of Regents data.
- Biographical data including free lunch eligibility and disability status were taken from the NYC Department of Education's 2014 June Biographic Dataset and matched to Regents and graduation data using scrambled student IDs.
- Incoming math proficiency at all NYC high schools was calculated using the NYC Department of Education's 2008–2013 Test and Biographical Datasets for Grades 3–8. Any students scoring less than "3.0" on the 8th-grade state achievement tests were considered "below state standards" when entering high school.
- Course titles were found in the 2014 NYC Department of Education's Courses and Credits Dataset.