

## MATH IN THE FIRST YEAR

### Introduction

In the early 2010s, about 21% of first-time students entering a Washington community or technical college (CTC) attempted five or more college-level math credits in their first year; approximately 18% completed their math coursework for credit. A decade later, after colleges have worked to improve math achievement, including implementation of the [Guided Pathways framework](#), the rate of first-time students attempting college-level math in their first year has nearly doubled, with 39% of the 2021-22 entering cohort attempting college-level math. About 33% of the students in the 2021-22 entering cohort earned five or more college-level math credits by the end of their first year.

Completing math coursework in the first year, among other milestones, [points to longer term success for CTC students](#) (Belfield et al., 2019). Despite some improvements in more recent years, not all students attempt math in their first year. [Practitioners of math pathways](#), however, suggest that when colleges work to break down math barriers and align the educational experience with the goals of the student, a higher rate of students will gain not only the math skills they need but also reach later academic or career-training milestones (Getz et al., 2016). This brief explores the implementation of math pathways practices in Washington state, discusses the improving trends in first-year math completion rates among first-time Washington CTC students, and examines how these trends appear for select demographic groups. This brief serves as a starting point and template for colleges to explore their own data

and evaluate first-year math outcomes at the campus level, as well as a primer for topics of future study.

### Background

The Charles A. Dana Center at the University of Texas (Dana Center) [identifies](#) the *traditional* postsecondary math course structure as a barrier to college completion, emphasizing the need for mathematics pathways to address systemic challenges and improve equitable outcomes (Getz et al., 2016). The two key barriers identified by the Dana Center are 1) a mismatch of content, wherein placement in math courses is disconnected with the student's desired program of study, and 2) long course sequences that decrease the student's chances of completing credit-bearing math.

The Guided Pathways framework seeks to address these barriers through pathways in which required math courses are appropriately aligned and contextualized to each program of study, among other design principles. Along with contextualized math, Guided Pathways requires colleges to redesign structures to enable the majority of students to earn pathway- or program-appropriate, college-level math and English credit *within one year of enrollment*. This one-year benchmark for college-level math and English is also mentioned in evaluation criteria from the Washington State Legislature ([RCW 28B.50.925\(3\)\(a\)](#)).

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The emphasis on completing math within the first year is further supported by evidence from Washington's CTCs, which suggests that if students are going to earn credit for math, it's likely earned within the first year. Of students who entered a community or technical college in 2019-20, about 44% earned credit in college-level math within four years, with 29% of the cohort earning the credit in their first year. 11% of the 2019-20 cohort earned math credit in their second year, 3% in the third year, and 1% in their fourth year. The cascading rate at which students complete math coursework, skewing toward the first year, underlines the importance of supporting students to achieve math milestones earlier in their academic careers.

## Methodology

Data for this brief use entering cohorts of students who are new to college. Students in these cohorts do not have a credential recorded in the National Student Clearinghouse and have no, or very minimal, prior college credits. Further, students in the cohorts:

- have no record of being awarded five or more math credits at the CTC prior to entering;
- have an entry quarter of fall, winter, or spring; or the student has an entry quarter of summer and continued on to fall quarter;
- are enrolled in at least one credit that is not basic skills or self-support;
- are award-seeking or enrolled in Alternative High School, College in the High School, or Running Start; and
- are not in one of the following groups:
  - International Students,
  - Department of Corrections Contract Students,
  - Applied Baccalaureate, or
  - Apprenticeship.

Demographics reflect values the student reported in their first quarter.

Math courses include any course with a 27-series Classification of Instructional Program (CIP) code,

courses with a 33-series CIP code and a "MATH" department code, or PHIL 117 or 120. Courses with a course number of 100 or greater are coded as "college-level," with those below 100 classified as below college-level. Students will count toward math enrollment metrics if they enrolled in five or more credits within the first four quarters of enrollment. Because the SBCTC Data Warehouse snapshots the data as of the census date, students who withdraw or drop the course(s) after the census date will still be included when measuring whether the student attempted math. Earning credit in math courses means credit for the class is included in the "credits earned" calculation in the SBCTC Data Warehouse, and the student earned a decimal grade greater than or equal to 1.0 or a grade of:

- Satisfactory;
- Pass; or
- Earned Credit.

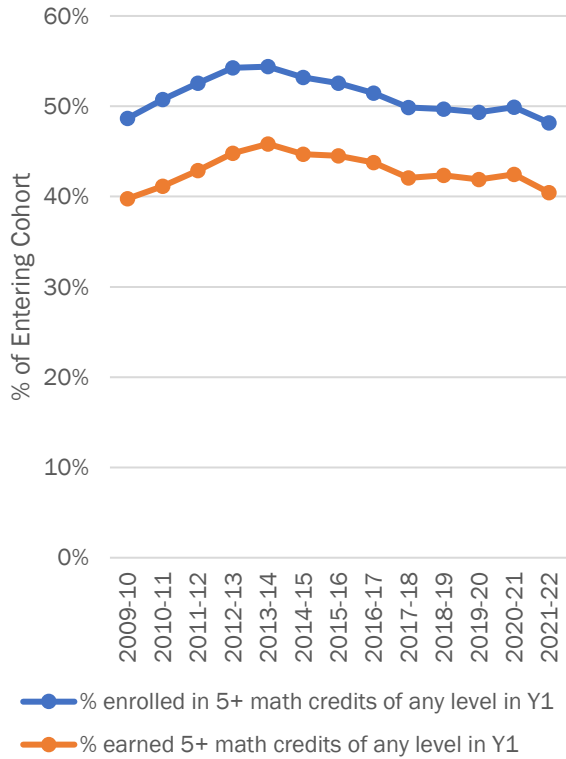
These criteria reflect the existing structure of courses recorded in the SBCTC Data Warehouse. This data structure does not account for math corequisite or supplemental instruction models. We recommend colleges consider coding mechanisms when implementing new course models, like corequisite math, to help track the success of their students.

## First-year math outcomes at Washington community and technical colleges

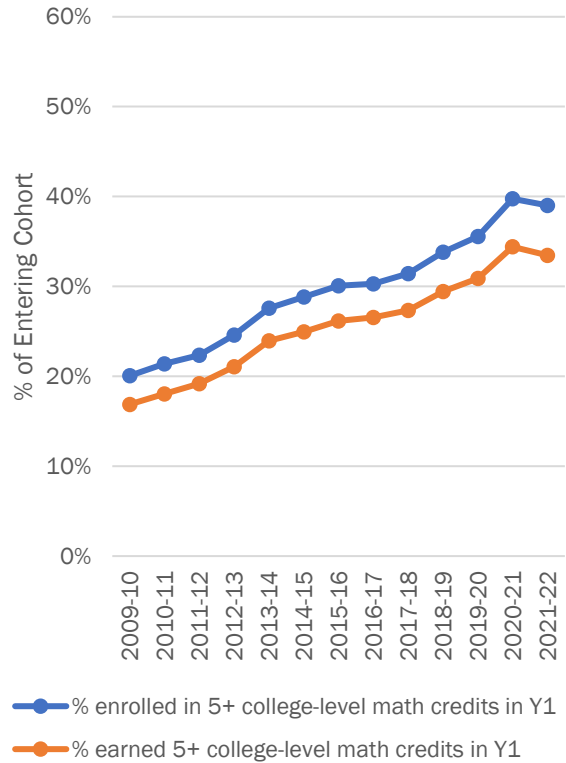
### Leaning into college-level math

About half of students who entered college for the first time at a Washington CTC attempt any math course, including below college-level math, within their first year. Figure 1 shows the rate attempting any math course within the first year, beginning with the 2009-10 entering cohort. Rates vary each year, topping out in 2012-13 and 2013-14 at 54%, and bottoming out with the 2021-22 cohort at 48%, likely an effect related to the COVID-19 pandemic. Between 40% and 46% of the entering cohort earned any math credit.

**Figure 1.** Percent of students enrolling in/earning five or more math credits of any level (pre-college or college-level) in their first year



**Figure 2.** Percent of students enrolling in/earning five or more college-level math credits in their first year

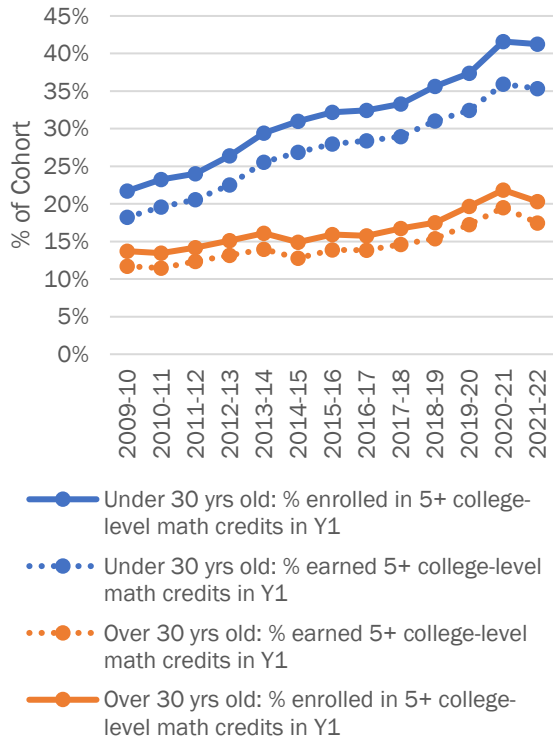


Narrowing in on college-level math, in recent years a higher proportion is both attempting and completing college-level math credits within the first year of enrollment. As shown in Figure 2, just one in five students entering a CTC in 2009-10 attempted college-level math in their first year. The 2020-21 cohort demonstrates a marked improvement, with 40% of new students enrolling in college-level math within one year. About 33% of students in the most recent entering cohort, 2021-22, earned credit in the courses they attempted. This compares to just 17% in the 2009-10 cohort.

**Demographic disaggregation**

Age appears to be the most significant factor when reviewing math attainment rates in the first year, specifically when disaggregating by those over and under the age of 30. In 2020-21, for example, 42% of students below the age of 30 attempted college-level math. This compares with 22% of students above the age of 30. Additionally, while the trend of students under 30 enrolling in college-level math has increased significantly over time – up from 22% in 2009-10 – the rate of those over 30 years of age has seen more modest improvements, from 14% in 2009-10 to 20% or more in recent years.

**Figure 3.** Percent of students under/over 30 years of age enrolling in/earning five or more college-level math credits in their first year



This brief focuses on the timeframe of one year, and therefore the attainment rate for part-time students under the 45-credit goal noted above is not captured in math enrollment and completion rates in this brief. We suggest exploration of part-time students taking math within their first 45 credits as a point of future study.

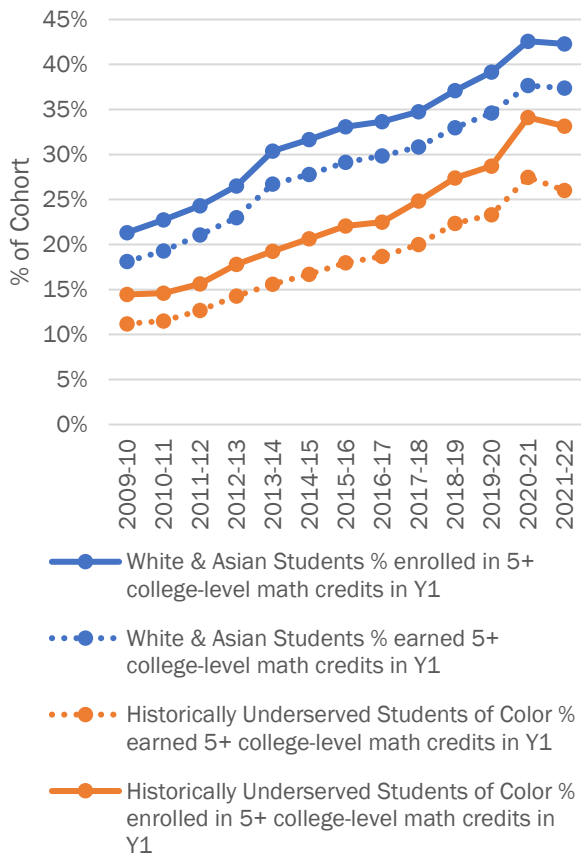
Historically underserved students of color<sup>1</sup> enroll and complete math at lower rates than White and Asian students (see Figure 4). However, a more appropriate measure may be to explore whether various demographic groups are over-represented among the population of students who *do not* enroll in math in their first year. This allows us to examine race- or ethnicity-specific math attainment rates without resorting to a specific race or ethnic group(s) as a measure of comparison.

Several factors may explain the lower math enrollment rates among students ages 30 and over, but the most likely explanation is the part-time tendency of students in the older age groups, as many are also working and caring for families. For example, 70% of CTC students over the age of 30 enrolled part time in fall 2022, compared with 43% of their counterparts under the age of 30.

To account for part-time students, Washington’s Guided Pathways Student Experience Essential Practices carry the aim that “[M]ost students (including basic skills/transitional studies students) earn pathway/program appropriate college-level English and degree math credit within one year of enrollment (*for part time students, within 45 credits*)” (emphasis added).

<sup>1</sup> Historically, or systematically, underserved students of color include American Indian/Alaska Native, Black/African American, Hispanic/Latino, or Native Hawaiian/Pacific Islander students.

**Figure 4.** Percent of historically underserved students of color and White and Asian students enrolling in/earning five or more college-level math credits in their first year



**Table 1.** Breakout of students who did not enroll in college-level math in the first year, 2017-18 to 2021-22 entering cohorts, by race/ethnicity

Student Race/Ethnicity	% of Cohorts Not Enrolling in College-Level Math	% of Entering Cohorts	% Difference
American Indian or Alaska Native	1.2%	1.0%	0.1%
Asian	7.5%	9.6%	-2.1%
Black or African American	6.3%	5.5%	0.8%
Hispanic or Latino	12.0%	10.8%	1.2%
Native Hawaiian or Other Pacific Islander	0.9%	0.8%	0.1%
2+ Races	16.0%	15.6%	0.4%
White	48.8%	49.5%	-0.8%
Not Reported	7.5%	7.3%	0.2%

Table 1 breaks out the percent of two populations by race/ethnicity for cohorts 2017-18 to 2021-22: 1) the percent of students by race/ethnicity who *did not* enroll in math in their first year at a CTC, and 2) the composition of each race/ethnicity group as a percent of the total entering cohort. Black or African American students and Hispanic or Latino students have the largest percent difference among students not enrolled in college-level math in the first year when compared to their representation among the total entering cohort. These students comprise 5.5% and 10.8% of the entering cohorts, respectively; however, they represent a higher percent among the population who did not enroll in math, 6.3% and 12%, respectively.

Female students are less likely to enroll in college-level math in the first year. Of students entering in the cohorts between 2017-18 and 2021-22, female students had the largest gap between students who did not enroll in at least five college-level math credits and their representation across the entire cohort.

**Table 2.** Breakout of students who did not enroll in college-level math in the first year, 2017-18 to 2021-22 entering cohorts, by sex

Student Sex	% of Cohort Not Enrolling in College-Level Math	% of Entering Cohorts	% Difference
Female	53.8%	52.4%	1.4%
Male	41.1%	42.6%	-1.5%
Not Exclusively Male or Female <sup>2</sup>	0.1%	0.1%	0.0%
Unknown/Not reported	5.1%	5.0%	0.1%

The demographically disaggregated data suggests that, while there is a rising rate of students both attempting and completing college-level math across the Washington CTC system, not all students are benefiting equally. The levels of disaggregation within the scope of this brief represent a small portion of the various ways these data should be sliced to better understand math achievement in Washington CTCs. Colleges looking to dive deeper into their own data may also consider disability status, first-generation students, rurality, or whether the student is receiving needs-based aid or benefits.

### Limitations and Additional Considerations

This brief evaluates math enrollment and completion within the student’s first year for first-time students, based on existing coding structures. It is important to acknowledge, however, this does not provide a picture of every student’s interaction with math coursework across the CTC system. Math progression does not look

the same for every student, and more research and attention should be dedicated to transitions to college-level math from less so-called traditional academic journeys, such as basic education for adults, adult re-engagement, and part-time students.

Existing data structures also limit the ability to view students’ math attainment at other institutions. For example, a student may have previously earned math credits at another college. However, unless those credits were transferred to the Washington community or technical college, the student will appear as not having previously earned math credits in the SBCTC Data Warehouse. This inhibits our ability to narrow in on true first-time math students, particularly for students in older age groups.

The high-level data in this brief offers a broad picture, but ultimately it can only shed light on one outcome – a student either did or did not enroll in, or complete, math coursework. Additional qualitative research outside the scope of this project is needed to understand why.

Colleges are implementing math innovations aimed at removing barriers, many of which are focused on historically underserved students of color. These include co-requisites, challenges to traditional math placement practices, culturally responsive and sustaining teaching and learning practices, and curriculum contextualized to college pathways. As colleges rework math offerings to support the diverse needs of students, more nuanced coding is needed to differentiate and measure the effect of these innovations. This includes the need for coding improvement for co-requisites, students with transferred-in credits, college-specific courses and programs, and supports not visible from the state-wide Data Warehouse.

Notwithstanding the data limitations and math innovations noted above, less than half of CTC students complete degree-appropriate math

<sup>2</sup> Not exclusively male or female sex category was implemented per [Data Governance Committee recommendations](#) in 2020.

within their first year. Colleges are encouraged to explore math achievement data independently, taking into consideration how current efforts may disproportionately affect historically underserved groups of students. SBCTC staff will continue to support colleges in this work.

## Sources

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