UNIVERSITY OF CALIFORNIA Institutional Research and Academic Planning

Adapting introductory math instruction at UC

Early math preparation is unequal in California high schools. For example, while 87% of students attend high schools that offer a diverse range of AP courses, only 58% attend middle schools that offer algebra in eighth grade.[1] Taking algebra in eighth grade is often crucial for staying on track to complete precalculus in high school.

Disparities like these often reflect broader systemic patterns and are more likely to affect Black, Hispanic/Latinx, and Indigenous students, those from low-income backgrounds or rural areas, as well as other communities that have historically faced barriers to educational opportunity.

The COVID–19 pandemic further compounded these inequities with shifts to emergency remote instruction and frayed student systems. California Smarter Balanced Assessments for 2021-22 showed a 6.9 percentage point drop in the share of eighth graders meeting or exceeding math standards, compared to 2018-19.

UC 2030 goals

The University of California and its campuses strive to uphold its mission as a land grant university by continuing to adapt to meet the needs of California public high school students. As part of its UC 2030 goals, UC seeks to improve undergraduate outcomes: increasing degree attainment and improving timely graduation, particularly by eliminating disparities for these groups.

The UC 2030 Equity is Excellence report summarized innovative efforts campuses are taking to achieve these goals, in many cases through improving pedagogy and introducing curricular reforms. The Council of Vice Chancellors (COVC) asked the Institutional Research and Academic Planning (IRAP) team to do a deeper dive into efforts focused on Science, Technology, Engineering and Math (STEM) courses. A recently released report – Expanding Opportunity: Chemistry, Math and the Future of STEM at UC – describes campus efforts and innovative approaches and adaptations within these introductory courses and STEM Programs.

This brief focuses on **introductory mathematics courses**, providing an illustration of varying course offerings and approaches by campus, course enrollment trends compared to the incoming first-year classes, and how campuses allocate instructional resources across course types.

[1] Source: EdTrust, *Advanced Coursework in Your State*

Models for introductory math sequences vary across UC campuses

Campus approaches to supporting students and providing introductory courses[2] vary, as illustrated in the table below. UC Davis, UC Riverside, and UC San Diego provide preparatory mathematics (a course that precedes precalculus), typically for workload credit (i.e., credit for financial aid, not progress to degree). UC San Diego expanded its preparatory math sequence in 2024-25, adding an additional course (MATH 3B) which carries full credit. All UC undergraduate campuses offer precalculus courses, with the exception of UC Santa Barbara.

Table 1 Courses in introductory calculus sequence at UC undergraduate campuses (Source: IRAP Report Expanding Opportunity: Chemistry, Math, and the Future of STEM at UC, appendix 2.)

	Preparatory	Precalculus	Calculus			
			Default	Business / social sciences	Physical sciences	Life sciences
Berkeley		MATH 32 / 3	MATH 1 ** MATH 1A / 51 MATH 98 **	MATH 16A		MATH 10A
Davis	MAT 000B * MAT 000C * MAT 000D *	MAT 012	MAT 021A	MAT 019A		MAT 017A
Irvine		MATH 1A*	MATH 2A			
Los Angeles		MATH 1	MATH 31A MATH 31AL			MATH 3A LIFE SCI 30A
Merced		MATH 005 MATH 008	MATH 011		MATH 021	
Riverside	MATH 003*	MATH 004 MATH 004L** MATH 005A MATH 006A-B MATH 06LA**	MATH 005B MATH 009A	MATH 022		MATH 007A
San Diego	MATH 2* MATH 3B	MATH 3C MATH 4C	MATH 10A		MATH 20A	
Santa Barbara			MATH 2A MATH 3A			MATH 34A
Santa Cruz		MATH 2 MATH 3	MATH 11A		MATH 19A [3]	MATH 16A

* workload credit
** co-course

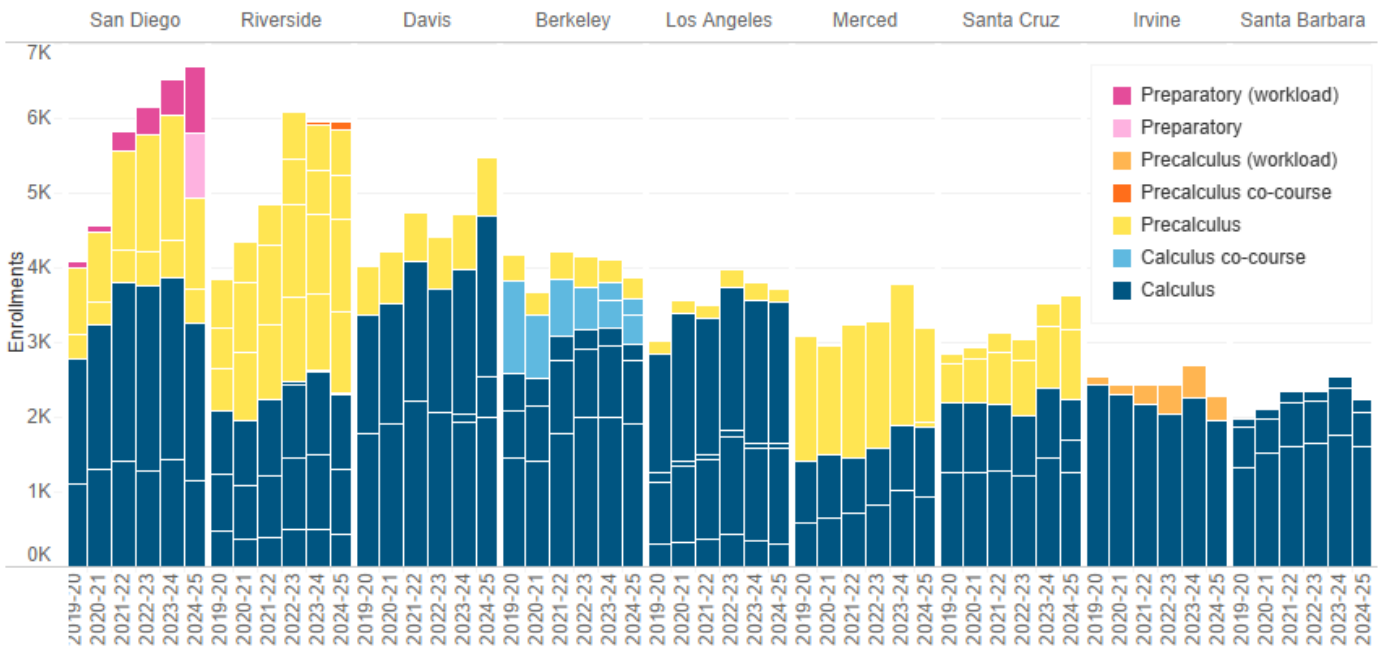
[2] For the purposes of this report, introductory math courses include the first course of calculus or precalculus in a sequence, together with any preparatory courses (courses that precede precalculus) and co-courses (support courses for which students co-enroll with precalculus or calculus).
[3] UC Santa Cruz's MATH 19A is available systemwide via cross-campus enrollment through UC Online. It is articulated for major credit at all nine undergraduate-serving campuses.

Some campuses have created calculus series for business/social science, physical science, and life science majors that focus on concepts and approaches that align with those disciplinary areas. Some further variation exists within the standard calculus courses. UC Berkeley, for example, created a short, half-semester co-course focused on precalculus concepts that runs alongside the calculus course.

Enrollment trends in introductory math courses vary across campuses

As noted above, entry points and pathways to completing introductory math vary. The following figure presents the trend in enrollment in introductory mathematics courses. While three UC campuses offer preparatory math courses (UC Davis, UC Riverside, and UC San Diego—see table on preceding page), UC San Diego is the only campus showing growing enrollment in preparatory courses over time. The sharp increase in preparatory enrollments at UC San Diego in 2024-25 reflects the introduction of an additional course to precede pre-calculus. The new course, which earns full credit, supplements an existing workload-credit course. UC Riverside and UC Santa Cruz have seen an increase in precalculus course enrollments. Also reflected below are changes in enrollments for a calculus co-course offered at UC Berkeley and an increase in precalculus enrollments at UC Irvine, where it is offered for workload credit.

Figure 1 Change in enrollments for preparatory and workload courses 2019-20 to 2024-25



Note: Data tables in the Appendix provide additional introductory math course enrollment detail by campus.

Growth in introductory math courses are only partly driven by larger incoming first-year classes

To some extent, the growth in entry level math enrollments follows from the growth of the classes of incoming first-year students that would take those courses. Between fall 2019 and fall 2024, incoming first-year students increased by 10 percent systemwide, with campuses highlighted in yellow below seeing the greatest growth (of between 12 and 22 percent). Those campuses saw corresponding increases in introductory math enrollment.

The greatest new first-year enrollment growth was seen at UC San Diego (an increase of 22 percent). UC San Diego also saw the largest increase in introductory math enrollment—which increased disproportionately compared to new first year enrollments—by 64 percent. Similar outsized increases for introductory math were seen at UC Davis, UC Riverside, and UC Santa Cruz.

Table 2 Change in undergraduate fall enrollments 2019 to 2024 and change in introductory math enrollments 2019-20 to 2024-25

	Fall new first-year enrollment			Academic year introductory math enrollment		
Campus	**Fall 2019**	**Fall 2024**	**Percent change**	**2019-20**	**2024-25**	**Percent change**
UC Berkeley	6,454	6,272	-2.60%	4,166	3,857	-7.40%
UC Davis	5,957	6,767	13.60%	4,015	5,486	36.60%
UC Irvine	6,069	6,736	11.00%	2,545	2,292	-9.90%
UCLA	5,919	6,610	11.70%	3,020	3,709	22.80%
UC Merced	2,105	2,093	-0.60%	3,081	3,204	4.00%
UC Riverside	4,780	5,422	13.40%	3,855	5,978	55.10%
UC San Diego	6,023	7,330	21.70%	4,081	6,683	63.80%
UC Santa Barbara	4,935	5,008	1.50%	1,983	2,235	12.70%
UC Santa Cruz	3,712	4,383	18.10%	2,839	3,636	28.10%
System	45,954	50,621	10.00%	29,585	37,080	25.30%

Share of enrollments by class type vary across UC campuses

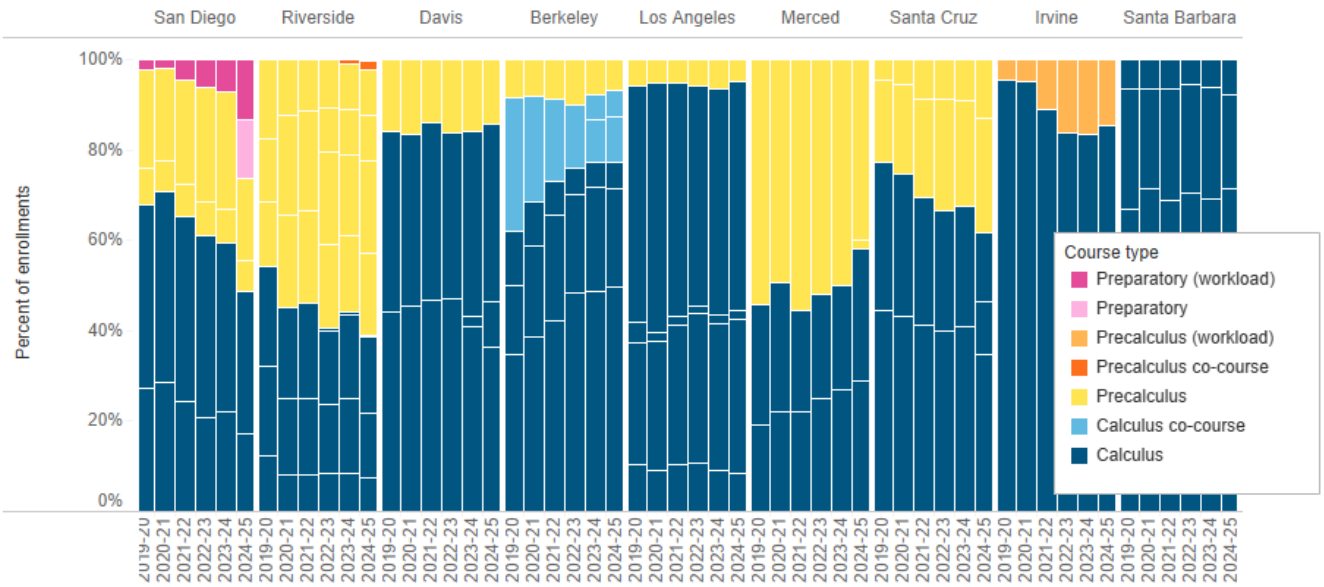
Another way to examine changes in introductory course offerings is to compare the concentration of enrollments across different course types (i.e., preparatory, precalculus, co-curricular courses, etc.). A comparison of campus course offerings by proportional enrollment across course types (Figure 2), reveals several trends. First, at UC San Diego, the only campus with a robust preparatory track,[4] introductory enrollment patterns for math have shifted dramatically since 2019-20, with an especially large jump in 2024-25,

[4] In 2025 UC Riverside converted an existing math "workshop" (a learning opportunity that did not earn course credit) to a workload-credit-bearing course, MATH 003, effectively launching its preparatory track. The data reported here do not reflect enrollments in its first fall instance, happening now, Fall 2025.

when a second preparatory course (MATH 3B) was introduced.[5] By contrast, at UC Berkeley, shares of enrollments for a calculus co-course have shrunk over the same period. At UC Davis, UCLA, and UC Merced shares of enrollments for calculus versus precalculus have remained largely stable, whereas shares for precalculus have increased at UC Irvine, UC Riverside, and UC Santa Cruz.

See data tables in the Appendix of this report for detailed enrollment information by campus.

Figure 2 Change in proportion of enrollments for preparatory and workload courses 2019-20 to 2024-25



Ongoing campus and systemwide reviews

Based on feedback from the Council of Vice Chancellors (COVC) in 2024, Institutional Research and Academic Planning (IRAP) met with campus representatives in 2024-2025 to understand and synthesize the current state and innovative efforts underway to support entry-level STEM courses. The report is being disseminated across campuses and is available on the UCOP Institutional Research and Academic Planning website. IRAP will also present its findings at an upcoming COVC meeting.

[5] UC San Diego, along with other campuses, has experimented with models to leverage online instruction to support this expansion. Their experience suggests that the post-pandemic shift to an instructional practice of video capture (recording video for in-class courses and posting online) has caused a lasting shift in student engagement patterns, decreasing in-person attendance (though evidence is largely anecdotal, as tools for attendance measurement are not robustly supported). While conceived as a method to increase engagement, offering flexibility and accessibility, the video capture model may be negatively impacting learning. Math faculty at San Diego have therefore been testing out models that supplement in-person instruction with significant online scaffolding (e.g. adaptive learning software, online guided practice) that supplements in-person learning. Similar online support is being deployed at other campuses, as described in the Expanding Opportunity report.

The report focuses on both chemistry and math instruction, curricula, and entry points, as these two courses are often critical junctures on the way to completion of a STEM major. The subject areas also show similarities in pass rates (typically lower than average) and in outcome disparities across student groups that align with prior high school experience (access AP courses, for example).

In addition, campuses have engaged in various efforts to examine how to adapt introductory math to support incoming students, following a variety of models. A sample includes:

- UC Berkeley created a math preparedness group[6] that focused on the transition from high school to college and explored placement, support strategies, and instructional design.
- UC Santa Barbara used its self-study[7] for reaccreditation to launch an exploratory initiative that examined student pathways and outcomes across four case study departments, resulting in departmental reforms.
- UC Davis, UC Irvine and UCLA through the HHMI Driving Change Learning Community[8] have been sharing institutional strategies that support reform.
- UC San Diego[9] has convened a senate-academic workgroup examining math preparation and the admissions process with findings expected at the end of this calendar year.

Conclusion

The findings reported in this brief illustrate how UC campuses are adapting introductory math offerings to meet the preparation levels and academic goals of increasingly diverse student cohorts. While course structures and enrollment trends differ, they share a common purpose: expanding access to the quantitative foundations of STEM. The following tables provide detailed campus-level enrollment data underlying these trends and can inform continued analysis.

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[6] The UC Berkeley task force was formed to investigate and advise on the high failure/repeat rates in the Math 1A course (calculus for STEM majors). Key documents & links: Response to Final Report (May 27, 2024), Strategic Recommendations for Math 1A: Fostering Inclusivity and Success (April 18, 2024), Final Report (March 16, 2024), Charge Letter (February 29, 2024)

[7] UC Santa Barbara was approved in 2022 for a pilot accreditation pathway called "Thematic Pathway for Reaffirmation" (TPR). Through TPR, UCSB designed and conducted an intensive study called "Designing for Access, Designing for Success." See Executive Summary.

[8] The HHMI Driving Change Initiative was rebranded in 2025 as the "Success in Science" initiative.

[9] UC San Diego's Senate-Administration Workgroup (SAWG) will then study and make recommendations regarding potential strategies to help address math preparation, writing preparation and distribution of students among the majors offered by the university.

Appendix: Data tables

UC Berkeley

Figure 3 UC Berkeley introductory math enrollments

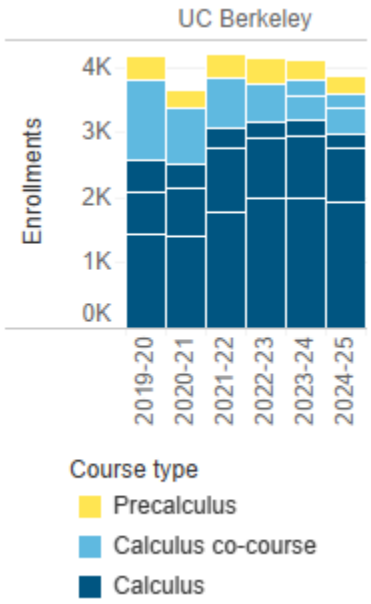

Table 3 UC Berkeley introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Precalculus	MATH 3 / MATH 32	349	290	368	412	310	264
Calculus co-course	MATH 1					233	216
Calculus co-course	MATH 98	1,233	858	757	577	382	397
Calculus	MATH 51 / MATH 1A	1,446	1,419	1,779	2,007	2,006	1,920
Calculus - Business / Social sciences	MATH 16A	646	731	980	909	954	843
Calculus - Life sciences	MATH 10A	492	365	325	249	226	217
	Total	4,166	3,663	4,209	4,154	4,111	3,857
Precalculus	MATH 3 / MATH 32	8.38%	7.92%	8.74%	9.92%	7.54%	6.84%
Calculus co-course	MATH 1					5.67%	5.60%
Calculus co-course	MATH 98	29.60%	23.42%	17.99%	13.89%	9.29%	10.29%
Calculus	MATH 51 / MATH 1A	34.71%	38.74%	42.27%	48.31%	48.80%	49.78%
Calculus - Business / Social sciences	MATH 16A	15.51%	19.96%	23.28%	21.88%	23.21%	21.86%
Calculus - Life sciences	MATH 10A	11.81%	9.96%	7.72%	5.99%	5.50%	5.63%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

UC Davis

Figure 4 UC Davis introductory math enrollments

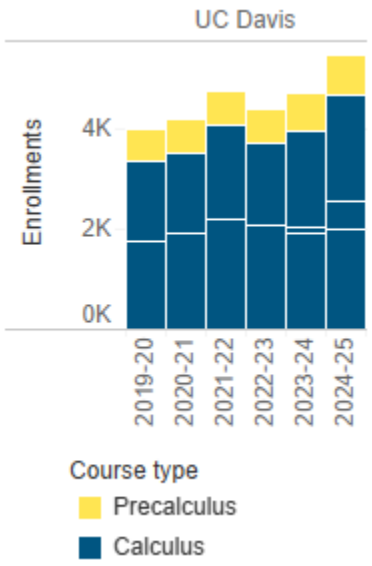

Table 4 UC Davis introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Precalculus	MAT 012	635	697	660	706	742	786
Calculus	MAT 021A	1,779	1,910	2,217	2,073	1,924	2,005
Calculus - Business / Social sciences	MAT 019A					115	537
Calculus - Life sciences	MAT 017A	1,599	1,601	1,866	1,634	1,930	2,155
	Total	4,013	4,208	4,743	4,413	4,711	5,483
Precalculus	MAT 012	15.82%	16.56%	13.92%	16.00%	15.75%	14.34%
Calculus	MAT 021A	44.33%	45.39%	46.74%	46.97%	40.84%	36.57%
Calculus - Business / Social sciences	MAT 019A					2.44%	9.79%
Calculus - Life sciences	MAT 017A	39.85%	38.05%	39.34%	37.03%	40.97%	39.30%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

UC Irvine

Figure 5 UC Irvine introductory math enrollments

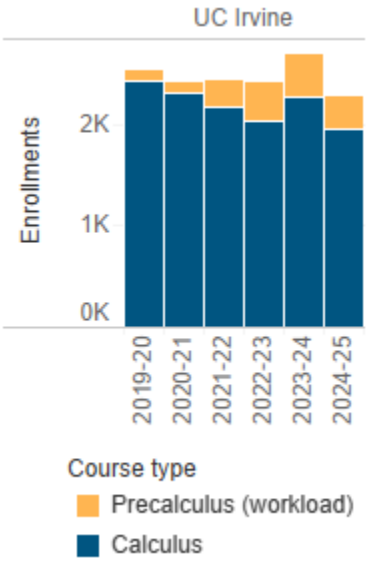

Table 5 UC Irvine introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Precalculus (workload)	MATH 1A	115	116	267	392	444	336
Calculus	MATH 2A	2,430	2,308	2,177	2,040	2,261	1,956
	Total	2,545	2,424	2,444	2,432	2,705	2,292
Precalculus (workload)	MATH 1A	4.52%	4.79%	10.92%	16.12%	16.41%	14.66%
Calculus	MATH 2A	95.48%	95.21%	89.08%	83.88%	83.59%	85.34%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

UCLA

Figure 6 UCLA introductory math enrollments

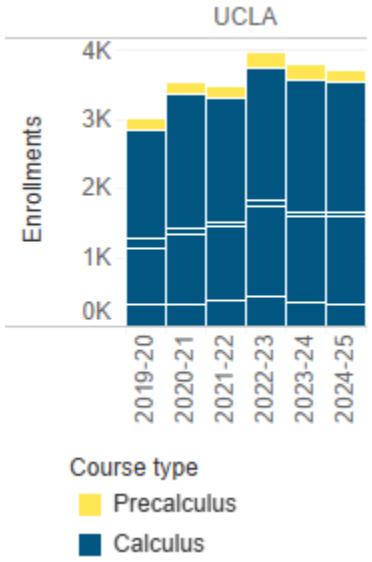

Table 6 UCLA introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Precalculus	MATH 0001	172	175	180	232	238	176
Calculus	MATH 0031A	823	1,013	1,074	1,313	1,243	1,275
Calculus	MATH 0031AL	310	324	365	430	341	308
Calculus - Life sciences	LIFESCI 30A	1,582	1,968	1,805	1,932	1,903	1,883
Calculus - Life sciences	MATH 0003A	133	74	71	73	70	67
	Total	3,020	3,554	3,495	3,980	3,795	3,709
Precalculus	MATH 0001	5.70%	4.92%	5.15%	5.83%	6.27%	4.75%
Calculus	MATH 0031A	27.25%	28.50%	30.73%	32.99%	32.75%	34.38%
Calculus	MATH 0031AL	10.26%	9.12%	10.44%	10.80%	8.99%	8.30%
Calculus - Life sciences	LIFESCI 30A	52.38%	55.37%	51.65%	48.54%	50.14%	50.77%
Calculus - Life sciences	MATH 0003A	4.40%	2.08%	2.03%	1.83%	1.84%	1.81%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

UC Merced

Figure 7 UC Merced introductory math enrollments

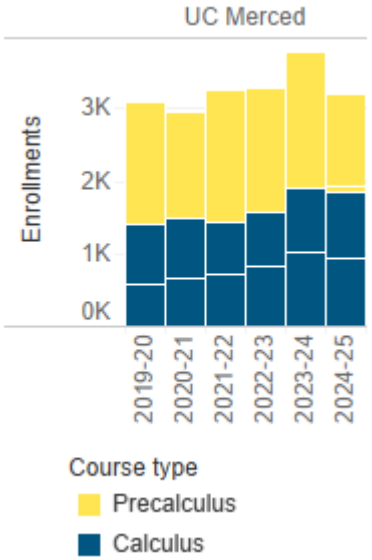

Table 7 UC Merced introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Precalculus	MATH 005	1,667	1,457	1,801	1,705	1,896	1,273
Precalculus	MATH 008						70
Calculus	MATH 011	821	837	733	763	865	931
Calculus - Physical sciences	MATH 021	593	657	714	818	1,028	930
	Total	3,081	2,951	3,248	3,286	3,789	3,204
Precalculus	MATH 005	54.11%	49.37%	55.45%	51.89%	50.04%	39.73%
Precalculus	MATH 008						2.18%
Calculus	MATH 011	26.65%	28.36%	22.57%	23.22%	22.83%	29.06%
Calculus - Physical sciences	MATH 021	19.25%	22.26%	21.98%	24.89%	27.13%	29.03%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

UC Riverside

Figure 8 UC Riverside introductory math enrollments

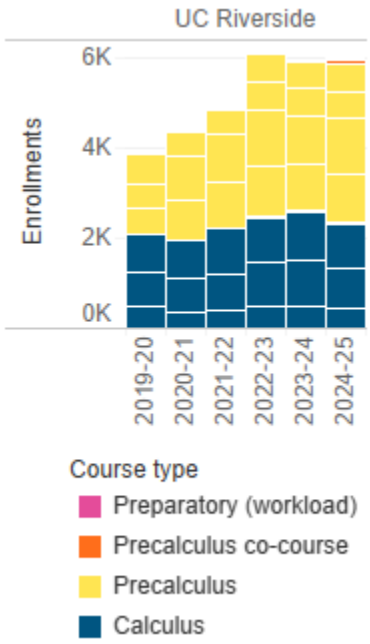

Table 8 UC Riverside introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Preparatory (workload)	MATH 003						11
Precalculus co-course	MATH 06LA					58	117
Precalculus	MATH 004	669	534	538	639	589	611
Precalculus	MATH 005A				600	598	588
Precalculus	MATH 006A	536	954	1,070	1,246	1,069	1,230
Precalculus	MATH 006B	555	898	1,002	1,124	1,011	1,089
Calculus	MATH 005B				40	36	18
Calculus	MATH 009A	762	735	820	937	997	871
Calculus - Business / Social sciences	MATH 022	478	360	393	508	498	439
Calculus - Life sciences	MATH 007A	855	866	1,019	995	1,103	1,004
	Total	3,855	4,347	4,842	6,089	5,959	5,978
Preparatory (workload)	MATH 003						0.18%
Precalculus co-course	MATH 06LA					0.97%	1.96%
Precalculus	MATH 004	17.35%	12.28%	11.11%	10.49%	9.88%	10.22%
Precalculus	MATH 005A				9.85%	10.04%	9.84%
Precalculus	MATH 006A	13.90%	21.95%	22.10%	20.46%	17.94%	20.58%
Precalculus	MATH 006B	14.40%	20.66%	20.69%	18.46%	16.97%	18.22%
Calculus	MATH 005B				0.66%	0.60%	0.30%
Calculus	MATH 009A	19.77%	16.91%	16.94%	15.39%	16.73%	14.57%
Calculus - Business / Social sciences	MATH 022	12.40%	8.28%	8.12%	8.34%	8.36%	7.34%
Calculus - Life sciences	MATH 007A	22.18%	19.92%	21.05%	16.34%	18.51%	16.79%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

UC San Diego

Figure 9 UC San Diego introductory math enrollments

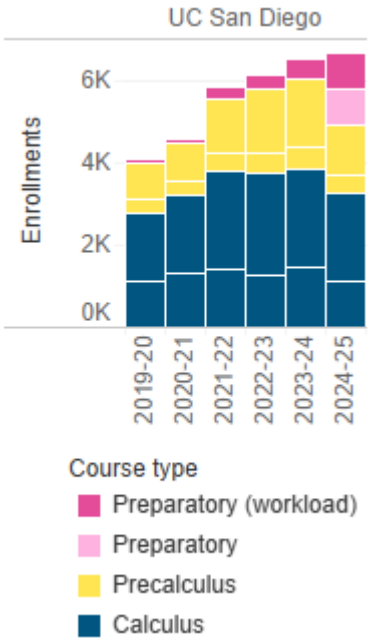

Table 9 UC San Diego introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Preparatory (workload)	MATH 2	85	86	256	364	462	878
Preparatory	MATH 3B						877
Precalculus	MATH 3C	892	934	1,340	1,555	1,686	1,212
Precalculus	MATH 4C	330	315	424	472	492	458
Calculus	MATH 10A	1,663	1,925	2,389	2,467	2,428	2,113
Calculus - Physical sciences	MATH 20A	1,111	1,308	1,417	1,283	1,442	1,145
	Total	4,081	4,568	5,826	6,141	6,510	6,683
Preparatory (workload)	MATH 2	2.08%	1.88%	4.39%	5.93%	7.10%	13.14%
Preparatory	MATH 3B						13.12%
Precalculus	MATH 3C	21.86%	20.45%	23.00%	25.32%	25.90%	18.14%
Precalculus	MATH 4C	8.09%	6.90%	7.28%	7.69%	7.56%	6.85%
Calculus	MATH 10A	40.75%	42.14%	41.01%	40.17%	37.30%	31.62%
Calculus - Physical sciences	MATH 20A	27.22%	28.63%	24.32%	20.89%	22.15%	17.13%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

UC Santa Barbara

Figure 10 UC Santa Barbara introductory math enrollments

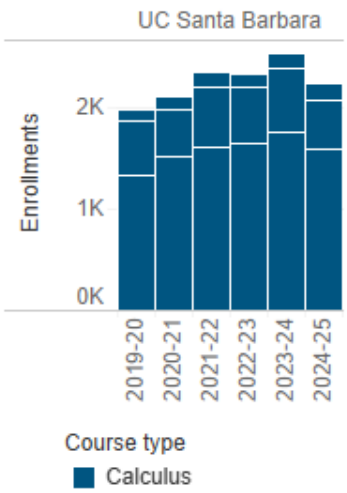

Table 10 UC Santa Barbara introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Calculus	MATH 2A	124	138	147	128	155	173
Calculus	MATH 3A	532	464	581	559	628	464
Calculus - Life sciences	MATH 34A	1,327	1,512	1,618	1,650	1,753	1,598
	Total	1,983	2,114	2,346	2,337	2,536	2,235
Calculus	MATH 2A	6.25%	6.53%	6.27%	5.48%	6.11%	7.74%
Calculus	MATH 3A	26.83%	21.95%	24.77%	23.92%	24.76%	20.76%
Calculus - Life sciences	MATH 34A	66.92%	71.52%	68.97%	70.60%	69.12%	71.50%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

UC Santa Cruz

Figure 11 UC Santa Cruz introductory math enrollments

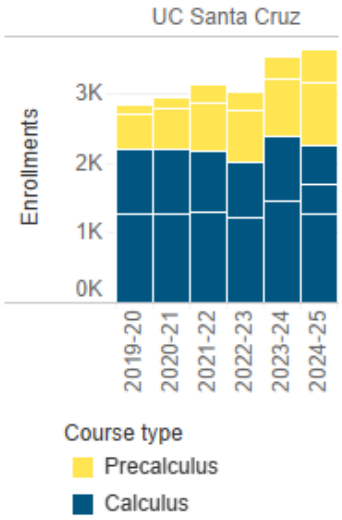

Table 11 UC Santa Cruz introductory math enrollments

		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Precalculus	MATH 2	124	158	266	267	311	474
Precalculus	MATH 3	517	583	687	745	829	919
Calculus	MATH 11A	938	931	881	812	941	554
Calculus - Life sciences	MATH 16A						429
Calculus - Physical sciences	MATH 19A	1,260	1,266	1,291	1,211	1,446	1,260
	Total	2,839	2,938	3,125	3,035	3,527	3,636
Precalculus	MATH 2	4.37%	5.38%	8.51%	8.80%	8.82%	13.04%
Precalculus	MATH 3	18.21%	19.84%	21.98%	24.55%	23.50%	25.28%
Calculus	MATH 11A	33.04%	31.69%	28.19%	26.75%	26.68%	15.24%
Calculus - Life sciences	MATH 16A						11.80%
Calculus - Physical sciences	MATH 19A	44.38%	43.09%	41.31%	39.90%	41.00%	34.65%
	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%