CollegeBoard

ACES (ADMITTED CLASS EVALUATION SERVICE™)

Advanced Placement® Validity Study for Sample University

Data in this report are not representative of any institution. All data are hypothetical and were generated for the sole purpose of creating this sample report.

HYPOTHETICAL DATA

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Introduction

The purpose of this Advanced Placement (AP®) Validity Study is to assist you in evaluating the success of your institution's AP placement policies. It provides you with information on how well your current policies for granting AP credit for introductory courses are working for each higher-level course you selected to study. To assess whether a particular policy is working as intended, the study compares the performance of students who entered the higher-level course through AP credit to the performance of students who entered the course by completing the introductory AP-equivalent course or courses at your institution.

In addition to Placement Validity studies, ACES makes available Admission Validity studies to examine relationships between College Board exam scores and college success. The ACES system will soon offer Retention and Completion Validity studies to examine relationships between College Board exam scores and student retention and graduation.

AP Placement Validity Studies are organized by higher-level course and contain several sections.

- *AP participation of students in your sample* presents information on the AP participation and performance of students in your study sample for the AP Exams included in this study and for all other AP Exams the College Board currently offers to students.
- *AP study design* specifies the higher-level courses you selected to study and explains how the study uses the course and policy information you supplied to form the comparison groups for the study.
- *Course Title/Course Label: Course AP Exam(s)* (results appear in up to four of the following sections for each higher-level course in your study):
    - *Section 1: Summary of student performance* provides descriptive information on how well students with and without AP credit for the introductory course(s) performed in the higher-level course. For each comparison group included in the study, this section presents the AP scores earned by students in the group, the number of students who earned each score, the mean and standard deviation of their course grades, and the percent who earned a final grade of C- or higher in the course.
    - *Section 2: Statistical comparison of student performance* in the higher-level course assesses whether the performance of students who entered the course with AP credit for the introductory course(s) differs significantly from the performance of students who entered the course without AP credit.
    - *Section 3: Summary of student performance in the AP-equivalent course(s)* provides descriptive information on how well students who took the AP-equivalent course(s) at your institution performed in the introductory course(s). For each AP-equivalent course, this section presents the AP Exam scores earned by students who took the course, the number of students who earned each score, the mean and standard deviation of their course grades in the introductory course(s), and the percent who earned a grade of C- or higher in the introductory course(s).
    - *Section 4: Summary of student characteristics* in the higher-level course presents a descriptive summary of the gender and racial/ethnic make-up of the comparison groups included in the study. For each comparison group, the tables display the number of students in each gender and race/ethnicity category and the mean and standard deviation of their grades in the higher-level course.
- *Following up on your placement decisions* provides you with resources to consult if you have any questions about the study.

A supplementary interactive graph file for this AP Validity Study can be downloaded from the ACES website. It contains dynamic versions of the tables and graphs in this study that can be viewed, manipulated, and exported using a browser. Instances in which the dynamic version of a table or graph contains more information than the version appearing in this PDF document are noted in the text.

Limitations and considerations concerning this information

The College Board makes every effort to ensure that the information provided in this report is accurate. Inaccurate findings may be the result of missing or inaccurate data provided by the institution or discrepancies in matching the institution's data to student records in the College Board database.

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AP participation of students in your sample

The 1,564 records of all students in your study sample were matched to records in the College Board database to provide you with information on the AP Exam participation of students in your sample. For each of the 43 AP Exams represented in the matched sample, the table below displays the number of students who took the AP Exam, and the mean and standard deviation (SD) of their scores on the exam. This information may help you identify other AP credit-granting policies you may wish to study in the future.

AP exam participation of students in your study sample

AP Exam	Number of Students	Mean AP Score (SD)
AP Art History	27	3.41 (1.05)
AP Music Aural Subscore	25	3.24 (1.39)
AP Music Non-Aural Subscore	25	3.40 (1.32)
AP Music Theory	26	3.27 (1.40)
AP Studio Art: 2-D Design	43	3.60 (0.66)
AP Studio Art: 3-D Design	4	
AP Studio Art: Drawing	21	3.86 (0.91)
AP Research	52	3.54 (0.90)
AP Seminar	89	3.40 (0.76)
AP English Language and Composition	677	3.32 (1.13)
AP English Literature and Composition	534	3.57 (1.03)
AP European History	116	3.68 (1.11)
AP Comparative Government and Politics	29	3.86 (1.33)
AP United States Government and Politics	367	3.48 (1.28)
AP Human Geography	265	3.43 (1.30)
AP Macroeconomics	151	3.42 (1.16)
AP Microeconomics	106	3.73 (1.16)
AP Psychology	424	3.23 (1.38)
AP United States History	593	3.15 (1.31)
AP World History	356	3.53 (1.11)
AP Chinese Language and Culture	13	
AP French Language and Culture	31	3.61 (1.02)
AP German Language and Culture	7	
AP Italian Language and Culture	2	
AP Japanese Language and Culture	2	
AP Latin	8	
AP Spanish Language and Culture	123	3.80 (1.04)
AP Spanish Literature and Culture	12	

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AP Exam	Number of Students	Mean AP Score (SD)
AP Calculus AB	840	3.30 (1.29)
AP Calculus BC	205	3.85 (1.24)
AP Calculus BC: AB Subscore	205	4.13 (1.09)
AP Computer Science A	97	3.05 (1.37)
AP Computer Science Principles	169	3.27 (1.14)
AP Statistics	366	3.25 (1.32)
AP Biology	369	3.59 (1.06)
AP Chemistry	237	3.49 (0.97)
AP Environmental Science	357	3.25 (1.16)
AP Physics 1: Algebra-Based	193	2.78 (1.29)
AP Physics 2: Algebra-Based	37	3.14 (1.16)
AP Physics C: Electricity and Magnetism	33	3.24 (1.30)
AP Physics C: Mechanics	75	3.23 (1.37)

Note:

- The entries in table reflect the participation and performance of students in your study sample who took the most recent version of each AP Exam. Students who took a retired version of an AP Exam are not included in the table.

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AP study design

When requesting the report, you indicated that you wished to study your placement decisions in relation to AP Exam scores for 1 higher-level course(s). You specified that you were interested in examining:

- Performance in MATH-202 as it relates to scores on the AP Calculus AB Exam and AP credit for MATH-201.

To evaluate the success of your placement policies, the study of each higher-level course compares the performance of students who entered the course through AP credit to the performance of students without AP credit who entered the course by completing the introductory AP-equivalent course(s) at your institution. To make the comparisons, each study assigns the individual students in your sample to groups corresponding to their path of entry into the higher-level course. The assignments take into account your institution's policy for granting AP credit, a student's course-taking history, and a student's AP Exam scores.

The comparison groups

As you look at the results of the studies, you may find that the comparison groups and paths of entry differ from study to study. This may be because each study only includes comparison groups with 15 or more students in your sample, or it may be because the number of groups in a study depends on your institution's policy for granting entry into the higher-level course.

If your policy requires a single introductory course for entry into a higher-level course, the study will assign students to two groups or paths of entry:

- Students who earned AP credit for the introductory course
- Students without AP credit who completed the introductory course at your institution

If your policy requires a single introductory course for entry and offers students a choice of completing one of two courses to satisfy the requirement, the study will assign students to three groups:

- Students who earned AP credit for the introductory course
- Students without AP credit who chose to complete a particular one of the two introductory courses at your institution
- Students without AP credit who chose to complete the other one of the two introductory courses at your institution

Finally, if your policy requires two introductory courses for entry, the study will assign students to three groups:

- Students who earned AP credit for both introductory courses
- Students who earned AP credit for one of the courses and completed the other course at your institution
- Students without AP credit who completed both introductory courses at your institution

If you opted to include a group of students who qualified for entry into the higher-level course through another path, such as dual enrollment or CLEP® Exam scores, the study will also include that group if it consists of at least 15 students. For the comparisons with that group to be meaningful, all students in the group must have entered the higher-level course through the same path. If the path you selected to study is CLEP credit, then all students in the group should have entered the higher-level course through CLEP credit. The group should not include students who entered the course through any other path.

Rules for forming the comparison groups

The procedure for forming the comparison groups relies on a set of rules to infer a student's path of entry into a higher-level course from the student's course-taking record and AP Exam score(s), and your institution's policy for granting AP credit for the introductory course(s). To be assigned to a group, students must have a valid final grade (A-F) in the higher-level course the first term they took the course and a course-taking record that is consistent with their AP Exam scores.

For students who entered the higher-level course with at least one introductory course, the rules also consider the term(s) in which the students completed the introductory course(s) and the final grade(s) they received the last time they took the introductory course(s) at your institution.

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In line with these considerations, the procedure assigns students to the group who entered the higher-level course with AP credit for the introductory course(s) if they have:

- An AP Exam score at or above the cut-off score for AP credit for the introductory course(s)
- No record of taking the introductory AP-equivalent course(s) at your institution

The procedure assigns students to the group who entered the higher-level course by completing the introductory course(s) if they have:

- No AP Exam score or a score below the cut-off score for AP credit for the introductory course(s)
- A valid grade in the introductory course(s) the last time they took the course(s) at your institution
- A record of completing the introductory course(s) at least one term before the first term they completed the higher-level course

When a policy requires two introductory courses, some students may have an AP score that qualifies them for AP credit for only one of the two introductory courses. The procedure assigns these students to the group who earned AP credit for one of the required courses and completed the other required course at your institution if they have:

- An AP Exam score at or above the cut-off score for AP credit for one of the introductory courses and below the cut-off score for the other introductory course
- No record of taking the introductory course for which they earned AP credit
- A valid grade in the other introductory course the last time they took the course at your institution
- A record of completing that introductory course at least one term before they completed the higher-level course

Finally, when a policy requires a single introductory course and offers students without AP credit the choice of taking one of two courses to satisfy the requirement, the procedure assigns students to a group corresponding to the particular course they took if they have:

- No AP Exam score or a score below the cut-off score for AP credit for the introductory course
- A record of taking one but not the other introductory course at your institution
- A valid grade in the introductory course they chose to take the last time they took the course at your institution
- A record of completing that introductory course at least one term before they completed the higher-level course

Students whose course-taking history and AP Exam scores do not follow one of the patterns described above are not included in the study of a higher-level course unless you have indicated that they entered the course through another path, such as dual enrollment or CLEP Exam scores. If you opted to include a path of that kind in the study of a higher-level course, the procedure examines the course-taking history and AP Exam scores of all students you assigned to that group and adjusts the assignments accordingly. The adjustment:

- Removes any student from the group who qualified for entry into the higher-level course through one of the other paths in your study and reassigns the student to the group corresponding to that path
- Removes any student from the group who not only completed the required introductory course(s) at your institution, but also qualified for AP credit for the course(s)

Notes:

- For purposes of this study, AP-equivalent courses are defined as introductory courses that students earn credit for with AP Exam scores and that students without qualifying AP Exam scores complete to gain entry into a higher-level course.
- Valid course grades are defined as grades that contribute to a student's GPA. Pass/fail and satisfactory/unsatisfactory grades do not qualify as valid grades nor do withdrawals or incompletes.
- Course grades were converted to numeric values according to the grading policy your institution specified during the submission of the datafile.
- The procedure does not consider AP parallel courses in the assignment of students to groups. This means that students who took a course parallel to the AP-equivalent course for which they earned AP credit, such as an honors version of the course, will be assigned to the group who entered the higher-level course with AP credit even though they completed an introductory course.

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- If a student took an AP Exam more than once or your placement policy relies on two interchangeable Exams to award AP credit, the assignments consider the highest score earned by the student on the exam(s).
- In general, the larger the size of the groups in your study, the more accurate the results of the study will be and the more power the statistical tests will have to detect differences in the performance of the groups when a true difference exists.

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Calculus II/MATH-202: AP MATH_CALCULUS_AB

Section 1: Summary of student performance in MATH-202

This section presents a descriptive summary of student performance in MATH-202 for each group in the study with at least 15 students in your sample. The tables and graph show how well students who entered the course with AP-credit performed relative to students who entered the course by completing the introductory course(s) at your institution.

For each comparison group included in the study, the tables below display the AP scores earned by students in the group, the number of students who earned each score, and the mean and standard deviation (SD) of their final grades in MATH-202 the first time they completed the course. If you indicated that you were interested in examining the performance of students who entered the higher-level course through another path, such as dual enrollment or CLEP Exam scores, this section will also include a table that displays the number of students in that group and the mean and SD of their final grades in MATH-202 if the group includes at least 15 students.

Performance of students who entered MATH-202 through an AP Exam score and no AP-equivalent courses

AP Exam Score	Number of Students	Mean Course Grade (SD)
5	163	3.33 (0.69)
4	256	2.96 (0.93)
3	209	2.73 (0.94)

Performance of students who entered MATH-202 through MATH-201

AP Exam Score	Number of Students	Mean Course Grade (SD)
No Score	707	2.72 (0.93)
2	92	2.69 (0.86)
1	115	2.57 (0.88)

Another way to examine the success of your placement decisions is to look at the percent of students who performed at or above a criterion of success. For purposes of this report, the criterion of success is a final grade of C- or higher the first time students completed the course. The bar chart shows the percent of students in each group who performed at or above that criterion of success in MATH-202. [The dynamic version of this chart available for download from the ACES website allows you to select any grade between C- and B+ as the criterion of success and view the percent of students in each group who earned a grade at or above the selected criterion.]

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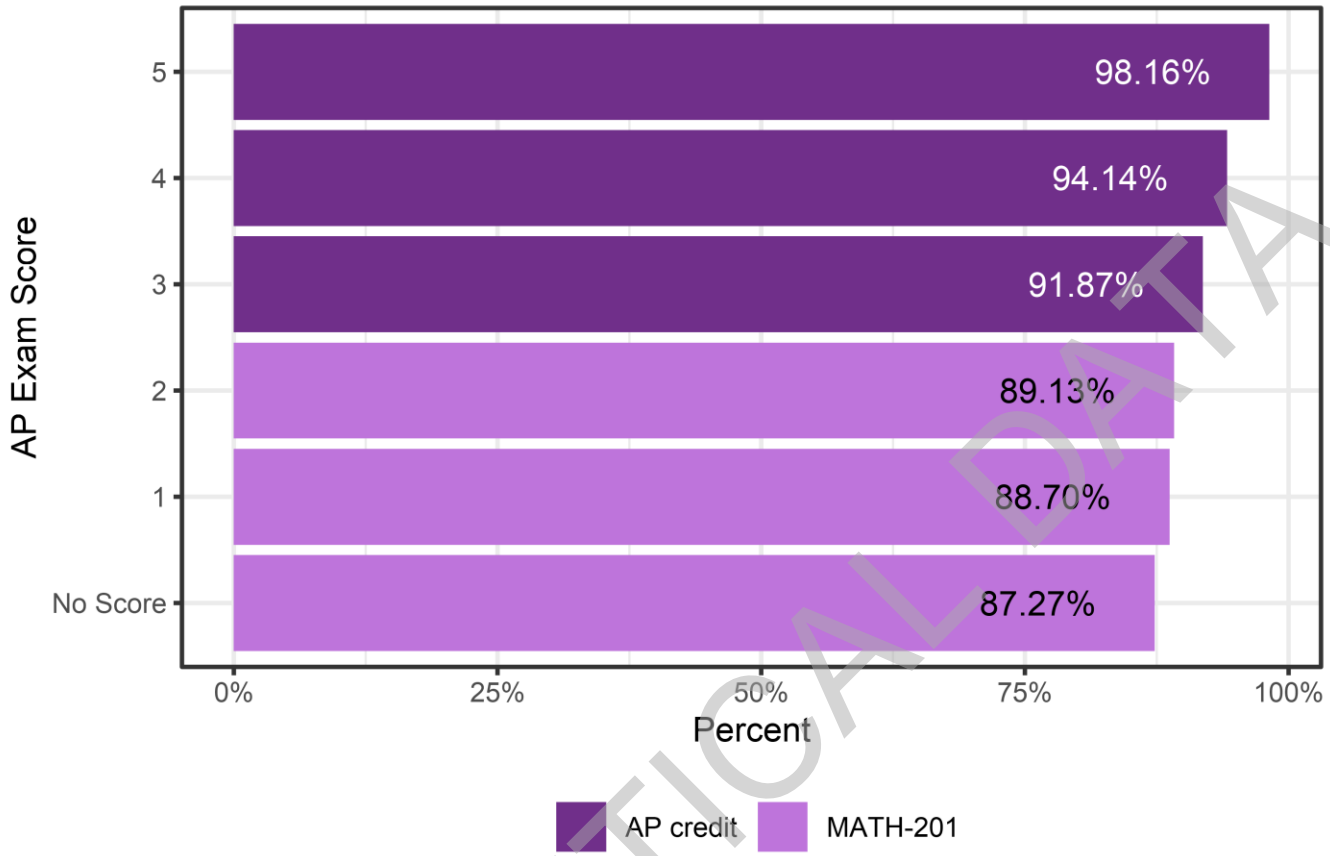
Percent of students who received a grade of C- or higher in MATH-202



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Notes:

- If your study includes students who did not take the AP Exam(s) associated with MATH-202, the tables and graphs include a "No Score" category to represent those students.
- If your study includes a group who entered the higher-level course through another path, such as dual enrollment or CLEP Exam scores, the graph will refer to that group as "Other".
- Descriptive statistics for categories with fewer than 15 students will not be shown in the table(s) or graph.

Section 2: Statistical comparison of student performance in MATH-202

This section of the report presents the results of a statistical analysis of the performance of students in MATH-202. The analysis assesses whether the mean course grade of students who entered MATH-202 with AP credit differs significantly from the mean course grade(s) of students who entered the course without AP credit. The analysis may provide you with valuable information on your policy for granting AP credit:

- If the mean course grade of AP-credit holders is not statistically different ($p > 0.05$) from the mean course grade(s) of the other group(s), this indicates that the AP credit-holding students are performing as well as students without credit who took the introductory course(s) at your institution. This result supports the use of your current AP credit and placement policy at your institution.
- If the mean course grade of AP-credit holders is statistically lower than the mean course grade(s) of the other group(s), the result would suggest that AP credit-holders are not performing as well as their classmates who took the introductory course(s) at your institution and your cut point for awarding AP credit may be too low.
- If the mean course grade of AP-credit holders is statistically higher than the mean course grade(s) of the other group(s), the result would suggest that your AP policy is awarding credit to students who are significantly better prepared for the next course than their classmates who took the introductory course(s) at your institution. If your cut score is above the recommended credit-granting score of 3, this result suggests that your cut score may be too high.

To perform the comparisons, the statistical analysis relies on two methods commonly used to test for significant differences between means, a t-test and an F-test from an analysis of variance (ANOVA). A t-test is designed to compare the means of two groups. An ANOVA is routinely used to compare the means of three or more groups.

In the context of this study, a statistically significant result from a t-test will indicate that the difference between the mean course grades of the two groups is larger than expected by chance. A statistically significant result from an ANOVA (as the method is applied in this report) will indicate that the differences among the mean course grades of the groups are larger than expected by chance.

If this study includes two paths of entry into the higher-level course, this section will report the finding from the t-test. If this study includes more than two paths, this section will report the finding from the F-test. If the F-test indicates that the differences among the mean course grades are statistically significant, then this section will also report findings from t-tests that look for significant mean course grade differences between pairs of the comparison groups.

The table below displays the number of students in each comparison group included in this study, the mean and standard deviation (SD) of their final course grades in MATH-202, and the results of the statistical test. The statistical test indicated that the mean course grades of these groups are significantly different.

Performance of the comparison groups in MATH-202

Path of Entry	Number of Students	Mean Course Grade (SD)	Test of Statistical Difference in Means
AP credit	628	2.98 (0.90)	t(1360.24) = 6.00, p = 0.00, statistically significant
MATH-201	914	2.70 (0.92)	

Note:

- All tests relied on a significance level of 0.05 for the means to be identified as statistically different.

Section 3: Summary of student performance in the AP-equivalent course(s) for MATH-202

This section of the report provides you with information on how well students who took the AP-equivalent course(s) at your institution to enter MATH-202 performed in the introductory course(s). For each AP-equivalent course associated with entry into MATH-202, the tables display the AP Exam scores earned by students who took the course, the number of students who earned each score, and the mean and standard deviation (SD) of their final grades in the introductory course the last time they completed the course at your institution. The bar chart displays the percent of students in each AP category who earned a grade of C- or higher in the introductory course. [The dynamic version of the bar chart available for download from the ACES website allows you to select any grade between C- and B+ as the criterion of success and view the percent of students in each AP category who earned a grade at or above the selected criterion.]

Summary of student performance in MATH-201

AP Exam Score	Number of Students	Mean Course Grade (SD)
No Score	707	2.91 (0.80)
2	92	3.09 (0.67)
1	115	2.67 (0.71)

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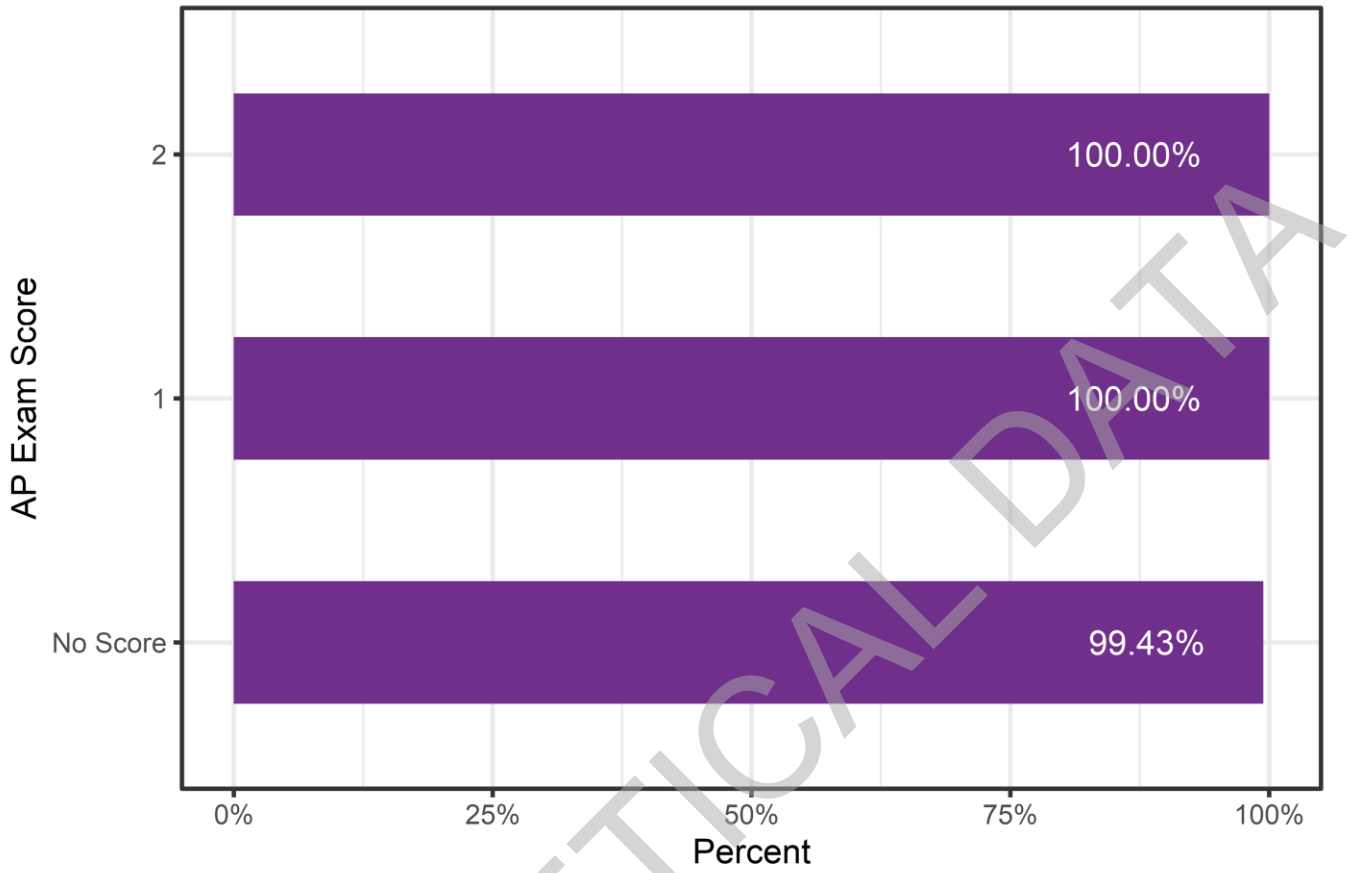
Percent of students who received a grade of C- or higher in MATH-201



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Notes:

- If your study includes students who did not take the AP Exam(s) associated with MATH-202, the tables and graphs in this section will include a "No Score" category to represent those students.
- Descriptive statistics for categories with fewer than 15 students will not be shown in the table(s) or graph(s).

Section 4: Characteristics of students in MATH-202

Using the information derived from the sample of students included in this study, you will want to generalize to a larger population of students. It is important that the characteristics of the sample of students included in this study are similar to the characteristics of the students you wish to generalize to in ways that are and are not measured by AP Exam scores. Two examples of such characteristics are gender and race/ethnicity.

The tables below display the gender and racial/ethnic make-up of each group of students included in your study by their path of entry into MATH-202. Each table displays the number of students in each gender and race/ethnicity category and the mean and standard deviation of their grades in MATH-202 the first time they completed the course.

Characteristics of students who entered MATH-202 through an AP Exam score and no AP-equivalent courses

Group	Number of Students	Mean Course Grade (SD)
All students	628	2.98 (0.90)
Gender: Female	308	3.06 (0.82)
Gender: Male	320	2.91 (0.97)

Group	Number of Students	Mean Course Grade (SD)
Race/Ethnicity: American Indian or Alaska Native	1	
Race/Ethnicity: Asian	125	3.02 (0.80)
Race/Ethnicity: Black/African American	19	3.01 (0.79)
Race/Ethnicity: Hispanic/Latino	76	2.96 (0.99)
Race/Ethnicity: No Response	15	3.11 (0.69)
Race/Ethnicity: Two or More Races	37	2.85 (1.11)
Race/Ethnicity: White	355	2.98 (0.92)

Characteristics of students who entered MATH-202 through MATH-201

Group	Number of Students	Mean Course Grade (SD)
All students	914	2.70 (0.92)
Gender: Female	514	2.69 (0.92)
Gender: Male	400	2.70 (0.91)
Race/Ethnicity: American Indian or Alaska Native	2	
Race/Ethnicity: Asian	34	2.69 (0.90)
Race/Ethnicity: Black/African American	27	2.92 (0.97)
Race/Ethnicity: Hispanic/Latino	67	2.74 (0.81)
Race/Ethnicity: No Response	31	2.55 (1.23)
Race/Ethnicity: Two or More Races	30	2.78 (0.71)
Race/Ethnicity: White	723	2.69 (0.92)

Note:

- Due to particular state privacy regulations, race / ethnicity values may have been set to “No Response” for any covered students in your study.
- The total number of students in each group may not be the same as the count of males and females or the count across the racial/ethnic categories due to missing values on gender or race/ethnicity.
- Descriptive statistics for categories with fewer than 15 students will not be shown in the table(s).

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Following up on your placement decisions

This report provides you with documentation you may use to support AP placement decisions at your institution. For additional help in understanding the study, follow this link to the ACES website: https://aces.collegeboard.org/

ACES staff is also available to assist you with any questions you may have about the study. In addition, the complete statistical output for this report is available upon request by contacting ACES. To contact ACES staff:

- Call: 1-800-439-8309
- Email: aces-collegeboard@norc.org

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