

# Aligned

# Expectations?

A Closer Look at  
College Admissions  
and Placement Tests

## About Achieve

Created by the nation's governors and business leaders, Achieve, Inc., is a bipartisan, non-profit organization that helps states raise academic standards, improve assessments and strengthen accountability to prepare all young people for postsecondary education, work and citizenship. Achieve has helped more than half the states benchmark their academic standards, tests and accountability systems against the best examples in the United States and around the world. Achieve also serves as a significant national voice for quality in standards-based education reform and regularly convenes governors, CEOs and other influential leaders at National Education Summits to sustain support for higher standards and achievement for all of America's schoolchildren.

In 2005, Achieve co-sponsored the National Education Summit on High Schools. Forty-five governors attended the Summit along with corporate CEOs and K-12 and postsecondary leaders. The Summit was successful in making the case to the governors and business and education leaders that our schools are not adequately preparing students for college and 21st-century jobs and that aggressive action will be needed to address the preparation gap. As a result of the Summit, 29 states joined with Achieve to form the American Diploma Project Network — a coalition of states committed to aligning high school standards, assessments, graduation requirements and accountability systems with the demands of college and the workplace.

For more information, visit Achieve's Web site at [www.achieve.org](http://www.achieve.org).

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## Executive Summary

College admissions and placement tests play a crucial role in the American education system. More than 2 million students each year take admissions tests (the ACT or SAT), and the results help postsecondary institutions make critical decisions about who will go to college, where they will be admitted and the likelihood of their success in a broad range of college courses. College placement tests, meanwhile, are used by a majority of the nation's colleges and universities to determine which courses young people are prepared to enter.

Now, as many states seek to raise high school standards to ensure that more students graduate prepared for the demands of college and the workplace, college admissions and placement tests are being called upon to serve new purposes for which they were not intentionally designed. Some states, for example, are using the SAT and ACT as their official statewide high school graduation exam, incorporating these tests into their state assessment and accountability systems. Other states are considering whether college placement tests could be given to students while still in high school to provide early feedback on their level of readiness. Still others are developing end-of-course tests that align with their high school curriculum and tap college-ready content or modifying their existing high school tests to make them better measures of college readiness.

Achieve launched this study to help inform the decisions states are making about high school assessments by providing greater insights into the world of college admissions and placement testing. Achieve analyzed more than 2,000 questions from college admissions and placement exams to determine how these tests compare to one another and how well they measure the college and work readiness benchmarks created by the American Diploma Project (ADP). These benchmarks are being used by 29 states to align high school standards, curriculum, assessments and accountability systems with the demands of college and work.

The study was conducted with the full cooperation of ACT (administrator of the ACT college admissions test and the COMPASS placement test) and the College Board

(administrator of the SAT and the ACCUPLACER placement test), both of whom provided Achieve with access to their admissions and placement exams. Achieve also acquired placement exams from a number of other organizations and postsecondary institutions around the country.

### Findings

Achieve's ADP research shows that college faculty across states and institutions have a fairly consistent view of the rigorous level of reading, writing and mathematics skills that incoming freshmen need to be successful in first-year, credit-bearing college courses. In mathematics, students need knowledge and skills typically learned in a four-year mathematics sequence including Algebra I and II, Geometry, data analysis, and statistics. They also need sophisticated mathematical reasoning and problem-solving skills. In English, students need to be able to write and communicate effectively to different audiences, understand and analyze various types of complex informational texts, and apply sophisticated analytic and reasoning skills.

Achieve's analysis reveals that college admissions and placement tests vary considerably — and do not fully measure the knowledge and skills that are included in the ADP benchmarks. Generally, admissions tests were found to be more demanding than the placement tests and better balanced in the types of questions asked.

- **Reading.** College admissions tests in reading are more rigorous than placement tests, though the reading passages on placement tests more accurately reflect

the types of reading material students will encounter in college across the disciplines.

- **Writing.** College admissions and placement tests in writing are rigorous — more rigorous than most high school tests — and they generally reflect the kind of writing students will be asked to do in college. Institution-developed placement tests are the strongest of the tests analyzed by Achieve.
- **Mathematics.** Admissions and placement tests in mathematics emphasize algebra, which is critical for credit-bearing mathematics courses. However, the algebra content assessed tends to favor prealgebra and basic algebra over the advanced algebraic concepts and skills essential for college readiness. Although placement tests are narrowly focused on algebra, admissions tests are broader, measuring a range of other important topics such as data analysis, statistics and geometry.

## Recommendations for K–12 Policymakers

To improve the preparation of high school students so that all graduates are prepared for college and work, states need a more rigorous and coherent system of assessments — one that is capable of measuring the standards students are expected to meet in high school and signaling readiness for postsecondary success. Very few states have such a system in place today.

What are the implications of Achieve’s study of admissions and placement exams for K–12 leaders as they seek to build college-ready tests into their high schools?

**Augment admissions tests when incorporating them into statewide testing systems.** The ACT and SAT are widely used by colleges and therefore have credibility with students, parents and the broader public. States that are considering incorporating these tests into their assessment and accountability systems, however, should proceed with caution. Achieve’s analysis reveals that although admissions tests do some things very well, there are gaps in what they measure. Neither the ACT nor the

SAT includes the full range of advanced concepts and skills reflected in the ADP benchmarks and, increasingly, in state high school standards. To be effective, states need to augment the ACT and SAT with additional test questions or with additional performance measures to ensure stronger alignment with state standards and to assess the more advanced concepts and skills. Achieve encourages states that are considering incorporating the ACT or SAT into their state assessment and accountability systems to conduct independent alignment studies first and then work with ACT and the College Board to supplement the assessments as needed to ensure greater coherence and alignment.

### **Consider using end-of-course tests to tap higher-level content and skills and place students into college courses.**

A growing number of states are pursuing end-of-course tests in high school as a strategy for measuring college readiness at the upper grades (e.g., Algebra II and 11th grade English) while also better aligning tests with the high school curriculum. There are multiple benefits to this approach. End-of-course tests can be tied closely to the curriculum and to the courses that states require for graduation. They also are more sensitive to instruction because they are taken right after a student completes a course, and they allow states to monitor performance and ensure consistency of rigor across the state. For end-of-course tests to serve as an indicator of college readiness, states will need to administer tests in higher-level courses, such as Algebra II and 11th or 12th grade reading and writing. It also is essential for higher education to play a role in developing and/or reviewing these exams to ensure they reflect the skills needed for college success. If postsecondary institutions participate in developing these exams, they can more readily use them for placement purposes in entry-level college courses. This will send a powerful signal to students and their parents and teachers that performance in high school pays off in college.

**Modify existing high school tests to measure college readiness.** Some states are considering adding questions to existing high school assessments to round out those tests and make them adequate measures of college readiness. If done well, this approach has the benefit of

streamlining the number of tests students take by serving the dual purpose of measuring student mastery of content in the state's standards as well as indicating readiness for credit-bearing college courses. The tests also can alert students if they need additional preparation for college in time to adjust their senior year coursework.

**Use existing college placement tests for diagnostic purposes only.** Some states are making college placement tests available for students to take voluntarily in high school. These exams can provide information to high school students about their readiness for credit-bearing, first-year college courses and allow teachers to work with students to address learning gaps in their senior year. However, placement tests should not be used as a substitute for building more comprehensive measures of college and work readiness into the state high school accountability system. The majority of the college placement tests reviewed by Achieve are narrowly focused on a subset of knowledge and skills; in math and reading in particular, they reflect relatively low levels of rigor. If states were to incorporate existing placement tests into their formal high school accountability systems, it might inadvertently lead to a narrowing and watering down of the curriculum.

## Recommendations for Higher Education Policymakers

Developing a coherent system of high school assessments capable of measuring college readiness will primarily be driven by state K–12 education leaders, but postsecondary leaders have a critical role to play.

**Clearly define expectations for incoming students.** Postsecondary systems and institutions must be clearer and more transparent about what it means to be college ready so that the K–12 system has something more concrete to aim for. In each state, colleges and universities should collaborate with the K–12 system to define and publicize the standards for transition from high school to college. These standards should be pegged to the knowledge and skills high school graduates need to succeed in credit-bearing, non-remedial courses. The standards must be tangibly articulated, much like the presentation

of K–12 academic content standards, so that they do not simply become represented by a score on an admissions or a placement test.

**Scrutinize placement tests given to incoming students to determine eligibility for entry into credit-bearing courses.** Once postsecondary institutions have clearly defined their expectations, it is important that they examine their existing placement tests (and admissions tests, if they are used to make placement decisions) to see whether they measure the content and skills needed to enter and succeed in credit-bearing courses — not just to avoid remediation. If, as Achieve found, the tests in use do not fully measure the rigor and breadth of college readiness expectations, college faculty should consider commissioning or developing placement tests that reflect the real demands of what it takes to succeed in college.

**Collaborate with K–12 on the development of high school tests that fully reflect the breadth and rigor of the content needed for success in postsecondary education.** In addition to incorporating more challenging placement tests, colleges should work with K–12 systems to develop stronger high school tests that tap the full range of college-ready content — and then use the results of those tests to place students in courses appropriate to their knowledge and skills. Colleges should then align their qualifying scores to establish a high standard of preparation that applies no matter where a student decides to go to college. This type of coordination would have two distinct benefits: It would reduce confusion about just what is required for college-level work, and it would do so in a way that reduces the number of tests a student takes.

**Support the development and use of K–16 longitudinal data systems.** Institutions of higher education need to work with K–12 systems to develop effective data systems that follow students from high school to college. Without data on how students perform once they arrive in college, no one can be sure which high school programs are effective and which need improvement. An effective longitudinal data system should include high school grades and assessment results, college course-taking patterns, success in first-year college courses, and persistence and completion rates.

# Introduction

Study after study shows that U.S. high schools prepare only a minority of students for success in college. A third or more of our students fail to graduate. An alarming number of those who do graduate are unprepared for college-level work. Approximately 30 percent of first-year college students are placed immediately into a remedial college course, and the odds are high that these students will never complete a postsecondary degree. In response to the “broken promise” of a high school diploma, Achieve (in partnership with The Education Trust and the Thomas B. Fordham Foundation) launched the American Diploma Project (ADP).

As its first step, ADP set out to identify the knowledge and skills necessary for success in college and on the job. Research in colleges, universities and high-performance workplaces across the country revealed that real-world expectations are significantly higher than what is currently expected of most high school graduates. ADP’s 2004 report *Ready or Not: Creating a High School Diploma that Counts* describes specific content and skills in English and mathematics that graduates must master by the time they leave high school if they expect to succeed in postsecondary education or in high-performance, high-growth jobs. These benchmarks are considerably more rigorous than current high school standards. Now, a growing number of states are working to close the gap between what colleges require and what high schools deliver. Through Achieve’s ADP Network, 29 states are in the process of aligning high school expectations with those of college and work.

Rigorous standards are an important first step, but often it is the tests that dictate what gets emphasized in classrooms. It is critical, therefore, that high schools measure whether their students have acquired the knowledge and skills important to college professors. Unfortunately, this rarely happens. In 2004, Achieve conducted a detailed analysis of high school graduation exams in mathematics and English language arts in six states (Florida, Maryland, Massachusetts, New Jersey, Ohio and Texas) that enroll a quarter of the nation’s high school students.<sup>1</sup> Achieve’s study shows that, on average, exit exams reflect very modest expectations. These tests are administered

to students in the 10th or 11th grade and tend to cover material that most students study in even earlier grades. The scores required to pass these tests can be achieved with the knowledge and skills expected of students in only 8th or 9th grade. The bottom line: These high school tests at best measure only a small fraction of the knowledge and skills that college professors say are needed to succeed beyond graduation.

Many states are seeking to build more rigorous college-ready measures into their testing systems, and they are trying a variety of approaches. A growing number of states are incorporating national college admissions tests — the ACT and SAT — into their assessment and accountability systems. Others are funding voluntary early indicator assessment programs through which high school students take college placement tests to identify gaps in their preparation for first-year, entry-level courses in English and mathematics. States also are considering using existing high school assessments given late in high school — such as Algebra II end-of-course or 11th or 12th grade English tests — to measure the readiness of high school students (tests that also might prove useful to colleges as placement tests).

## What Do Transition Tests Measure?

Achieve launched this study of the most frequently used college admissions and placement tests to help inform state decisionmaking regarding the inclusion of college

admissions and placement tests into their high school assessment and accountability systems. Achieve was interested in answering the following questions:

- What do the college admissions and placement tests measure?
- To what extent and how well do these tests measure the college- and work-ready benchmarks defined by Achieve’s ADP?
- What are the implications of Achieve’s analysis of college admissions and placement tests for K–12 policymakers as they design and build more robust and coherent systems of high school assessments?

To answer these questions, Achieve analyzed a variety of admissions and placement tests encountered by students in the transition from high school to college. The analysis was done to determine the extent of the exams’ alignment with what Achieve has learned are the knowledge and skills in English and mathematics that high school students need to acquire to meet the expectations colleges have for incoming students.

## Purposes of Admissions and Placement Tests

College admissions and placement tests were developed to serve different purposes.<sup>2</sup> Admissions tests — the ACT and SAT — are intended to indicate the likelihood a student will succeed in a broad range of college courses. Most selective colleges and universities use scores from admissions tests in conjunction with other information, such as course-taking and grade point averages from high school transcripts, to help them determine whether or not to admit a student. Often, scores on admissions tests also are used to place students into credit-bearing courses, allowing them to bypass placement tests if their subscores in reading, writing or mathematics meet certain thresholds.

In contrast, placement tests are designed specifically to ensure that incoming students possess the knowledge and skills in reading, writing and mathematics

necessary to gain access into *entry-level, credit-bearing courses*. Students who fare poorly on placement tests are assumed to have gaps in their preparation and are advised — and often required — to take one or more remedial courses to learn (or re-learn) important material prerequisite for credit-bearing courses. (In some cases, and especially in mathematics, additional rounds of placement testing are necessary to make a more refined placement decision, i.e., *which level* of remedial or credit-bearing course is most appropriate for the student.) Students who pass the placement test (or are exempted from the placement requirement) are granted access to the first college-level course in English and mathematics, *as well as to all credit-bearing, entry-level courses offered at the institution*. In this way, placement tests — or a set of placement tests — serve both the narrow function of identifying specific deficiencies in student preparation and the broad function of certifying that the student is ready for *all* college-level work.

## The Placement Process

Typically colleges offer students options for demonstrating the required competencies: achieving a satisfactory score on the SAT or ACT or on a placement exam — the most common of which are ACCUPLACER and COMPASS. Qualifying scores are set by each institution, often under the influence of guidelines provided by state agencies or test publishers. Placement procedures — and qualifying scores — at different colleges and universities are idiosyncratic, varying from campus to campus. Many involve multiple tests or sequenced decisions.

Recognizing that many students enter college unprepared for the first credit-bearing college writing or mathematics course and for college-level work in general, most colleges and universities offer several options to help students close their preparation gaps. Some of these options are strictly remedial in nature: They focus almost entirely on knowledge and skills that most students learn in grades 6–12. These preparatory courses, often termed “developmental,” typically do not offer credit that counts toward a college degree, although they may count for credit for

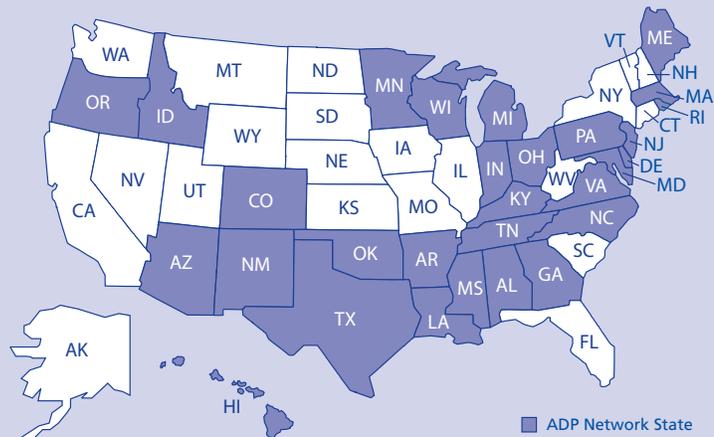
# The American Diploma Project Network

Research conducted by the American Diploma Project (ADP) in colleges, universities and high-performance workplaces across the country shows that real-world expectations are significantly more rigorous than current high school standards. Indeed, there is an “expectations gap” between what colleges expect of incoming freshmen and what high school graduates actually know and can do.

ADP’s 2004 report *Ready or Not: Creating a High School Diploma that Counts* describes specific content and skills in English and mathematics that graduates must master by the time they leave high school to succeed in postsecondary education or in high-performance, high-growth jobs. The ADP benchmarks are being used by a number of states to align high school expectations with those of college and work and close the expectations gap. **Twenty-nine states** — collectively responsible for the education of more than half of the students in the United States — have formed the ADP Network and are committed to four specific actions:

**Align high school standards and assessments with the knowledge and skills required for success after high school.** Too often, state high school standards are not anchored in the skills and knowledge employers and colleges now demand. As a result, high school graduates can believe they have done well but still be unprepared for productive work and further learning.

**Require all high school graduates to take challenging courses that actually prepare them for life after high school.** New research by ADP and ACT indicates that whether students go directly to college or into the workforce after graduation, they need the same level of knowledge and skills, particularly four years of rigorous English and mathematics. Other research suggests that more rigorous study reduces the gap in college completion rates between African American and Latino students and their white peers. Equally important, students who take more rigorous courses are significantly more likely to succeed in postsecondary education and the workplace.



**Build college- and work-ready measures into state-wide high school accountability systems.** According to Achieve’s research, very few states currently measure students’ readiness for college and work. High school exit exams measure content that students typically learn in early high school, which is only a subset of knowledge and skills they will need after graduation. To help ensure that students graduate prepared for college and work, states will need to build more rigorous measures into their accountability systems.

**Hold high schools accountable for graduating students who are ready for college or careers, and hold postsecondary institutions accountable for students’ success once enrolled.** The mission of high schools is to prepare all students for success in college, careers and citizenship. Yet in most states, high schools rarely are held accountable for ensuring that students achieve these goals. Colleges, meanwhile, have few incentives to improve retention and completion rates. With the number of jobs requiring at least some education beyond high school expanding rapidly, states must work closely with higher education systems to ensure that students who begin college actually graduate with a degree and a productive set of skills and knowledge.

purposes of full-time status and financial aid. Increasingly, four-year colleges and universities are neither willing nor permitted to teach developmental courses to their students. Instead, students often are sent to community colleges or other sub-baccalaureate institutions for remediation.

Other course options are designed to provide the added support required to help students succeed without the cost, lost time or stigma of repetition and remediation. These courses are typically versions of Comp 101 or College Algebra expanded in either duration or intensity to provide additional, targeted instruction.

In mathematics, placement testing and decisionmaking have several additional complications. Across the spectrum of “entry-level” courses offered at most institutions of higher education are five different mathematics courses that form a stairway from elementary to advanced. Two of these five — Arithmetic and Elementary Algebra (i.e., high school Algebra I) — are universally considered remedial. Often, but not always, the third (Intermediate Algebra) is as well. Intermediate Algebra is similar to high school Algebra II; so as more and more states require this course to be taken by all high school students, colleges may increasingly insist that it is remedial.

#### MATHEMATICS COURSE TITLES

High School	=	College
Algebra I	=	Elementary Algebra
Algebra II	=	Intermediate Algebra
Precalculus	=	College Algebra
Calculus	=	Calculus

*Trigonometry is sometimes included in Precalculus or College Algebra, but it also is often an optional supplement.*

The most common introductory college mathematics course taken at two- and four-year colleges is College Algebra,<sup>3</sup> sometimes called Precalculus. This course covers advanced topics that form the transition between Algebra II and Calculus. Some version of this course is taught in almost every high school; recent variations include versions that emphasize mathematical modeling. Accelerated high school students take Precalculus prior to Advanced Placement Calculus while other college-bound students take it in their senior year. Except at the most selective institutions, College Algebra is widely accepted as a transfer-worthy, credit-bearing college mathematics course. The syllabus of a typical College Algebra course covers topics that are prerequisite to Calculus, the fifth and top step in the ladder of introductory mathematics courses. It is worth noting that different major areas of study at higher education institutions have different prerequisites in mathematics, further complicating this picture. For students intending to major in mathematics or one of the many “mathematics-intensive” majors — such as business, engineering or the natural sciences — Calculus may be the first entry-level course that counts for mathematics credit.

Placing students satisfactorily into this broad range of mathematics courses requires a fairly complex system of placement exams — a system that typically involves more than one level of placement exam. Many forces influence the way placement tests are used, including admissions policies, political decisions and enrollment management (both for remedial and credit-bearing courses). A key factor is the establishment of “cut scores” that define the threshold for placement into one or more courses. Cut scores used for similar placement purposes often vary from institution to institution, representing different levels of preparation — even for courses with the same name.

# Achieve's Study

## Overview of Methodology

The method of analysis used for this study was developed for Achieve's earlier study of high school exit exams and adapted for use with admissions and placement tests, with the assistance of content experts from Michigan State University. ACT and the College Board also provided helpful feedback as protocols were revised. Two or more trained experts analyzed each test, coding each item on a number of dimensions of test quality. Experts worked independently and reconciled any differences in their judgments, resulting in a consensus on each item. These detailed analyses then were aggregated to build an overall picture of each test, which enabled comparisons.

The first dimension examined was the content measured by each test. In particular, Achieve wanted to know what content was being measured by each item and how advanced that content was. To determine this in mathematics, Achieve used an international scale created as part of the Third International Mathematics and Science Study (TIMSS). The framework provides a detailed, comprehensive taxonomy of mathematics content organized at its most general levels according to the following major domains of mathematics: number, algebra, geometry/measurement and data analysis/statistics. These broad categories then are broken down into smaller units to allow for finer-grained comparisons. For example, geometry content is divided into a variety of categories such as two-dimensional geometry and measurement; three-dimensional geometry and measurement; transformations, congruence and similarity; and trigonometry. In English language arts, Achieve developed a scale to categorize the content of each item, such as vocabulary or literary elements.

The second important dimension considered was the complexity (or cognitive demand) of each item — what the item asks students to do with their knowledge. In reading, for example, students can be asked to simply recall information from a text — a relatively low-level skill — or they might be expected to perform a more

complex task such as comparing an idea across two passages. In mathematics, they might be asked to perform a simple computation or procedural process, or they can be challenged to reason through a multistep problem.

A third dimension, relevant only to the reading tests, is the complexity of the reading passages. This dimension figured prominently into the analysis because the interaction of the cognitive demand of an item and the difficulty of a passage contributes to the overall rigor of the test. To address this dynamic, Achieve developed a Reading Rigor Index (RRI). In addition, the genre of reading passages was considered using the National Assessment of Educational Progress (NAEP) 2009 Reading Framework, which recommends two types of texts be included on the assessment: literary texts, which include fiction, literary non-fiction and poetry; and informational texts, which include exposition, argumentation and persuasive text, and procedural text and documents.

A fourth dimension, relevant only to the multiple-choice writing items, is the level of challenge of each item, which captures the interplay between the specific skill targeted by the item and the context in which it is used. This lens was adapted from the ACT Standards for Transition for Writing and includes skills in a number of categories (e.g., topic development, organization and word choice) at varying levels of complexity. Direct writing assessments were examined more holistically, with attention to those elements most necessary for success in the college classroom as delineated in the ADP English benchmarks.

To assess the difficulty of mathematics items, Achieve used the International Grade Placement (IGP) index, a composite among the 40 TIMSS countries (other than the United States) that shows when the curriculum focuses on different mathematics content — at which point the highest concentration of instruction on a topic occurs. The average international grade level for each test then is calculated by averaging the IGP indices of each item.

Finally, Achieve determined the ways in which the tests reflect the content and skills in the ADP benchmarks,

which college faculty from across the disciplines agree are necessary for success in postsecondary pursuits. In mathematics, these benchmarks represent content found in a rigorous four-year course sequence that includes content found in courses like Algebra I and II and Geometry, as well as considerable data analysis and statistics. The English benchmarks demand strong oral and written communication skills and considerable research and analysis. Logic and reasoning skills also are a critical element of the benchmarks. To identify the English and mathematics knowledge and skills that high school graduates need to be prepared for success in college and work, Achieve worked with more than 300 faculty members from two- and four-year institutions from a variety of academic disciplines (as well as front-line managers from high-skilled jobs).

For a detailed description of Achieve’s methodology in reading, writing and mathematics, see Appendices B–D.

## The Tests Analyzed by Achieve

Admissions and placement exams in English (reading and writing) and mathematics can be grouped broadly into four categories, each of which was included in this study:

- **National Admissions Tests.** Each year, more than 2 million college applicants in the United States take one of two national admissions tests — the SAT (developed by the College Board) or the ACT (developed by ACT). Colleges and universities use these admissions tests as one factor in admissions decisions. Many colleges and universities also permit results on the SAT and ACT to exempt students from taking subsequent placement tests or to substitute for a placement test score. According to the College Board, the SAT is intended to measure critical thinking skills required for academic success in college. In contrast, the ACT is explicitly curriculum based, designed to assess what students have learned in their high school courses.
- **National Placement Tests.** Colleges and universities use placement tests to help determine the appropriate course level for students. Two nationally distributed tests — ACCUPLACER (developed by the College

Board) and COMPASS (developed by ACT) — are widely used for placement purposes, especially by community colleges, which often use them to place students in developmental courses. Both the ACCUPLACER and the COMPASS are computer-adaptive tests, meaning they are able to adapt to a test taker’s ability level by successively selecting questions from a large pool of items based on whether the previous question was answered correctly. Typically, a computer-adaptive test begins with a question of moderate difficulty. If answered correctly, it is followed by a more difficult question; if answered incorrectly, it is followed by an easier question. In this way, it appears to the test taker that the difficulty of the exam is tailored to his or her level of ability. Compared to a non-adaptive test with a fixed set of items, computer-adaptive tests require fewer test items to arrive at a final score, which in turn requires less time.<sup>4</sup>

For this study, Achieve examined a sample of the test questions from the total item pool of these computer-adaptive tests, focusing in particular on the tests that are most commonly used by institutions for placement into entry-level, credit-bearing courses in English (e.g., Comp 101) and mathematics (e.g., College Algebra). The College Board helped identify the ACCUPLACER tests most commonly used for placement into such courses: in English, the ACCUPLACER Reading Composition and Sentence Skills tests; in mathematics, the ACCUPLACER Elementary Algebra. To confirm this — and to identify which ACT tests are most commonly used for placement into entry-level, credit-bearing courses — Achieve surveyed postsecondary institutions from a number of states in the ADP Network. The results of Achieve’s survey indicate that the ACT computer-adaptive placement tests most commonly used for placement into entry-level, credit-bearing courses are the COMPASS Reading, Writing and Algebra tests. Achieve’s survey found that the ACCUPLACER College Level Math test and the COMPASS College Algebra test also are used for this purpose — *and* they are used for placement into Calculus. For this reason, those tests are included in the group of advanced-level

tests. Although both ACT and the College Board offer additional tests (including ACCUPLACER’s Arithmetic and COMPASS’ Numerical Skills, Geometry and Trigonometry), Achieve chose to analyze only those tests that are most commonly used for placement into entry-level, credit-bearing courses. Thus, there are items from both vendors’ item pools that are not captured in this study.

- **State or Systemwide Tests.** Some states (e.g., Texas) and higher education systems (e.g., California State University and Washington state) have developed placement tests for common use across institutions. Generally, these tests are designed to match and support articulation agreements for credit transfer among institutions of higher education.
- **Institution-Level Tests.** Many colleges prepare their own placement tests and procedures to fit their unique

curricular needs. Several institution-level mathematics placement tests are (with permission) modeled on or are minor variations of the Mathematical Association of America (MAA) placement tests. The MAA (in conjunction with MapleSoft) is now adapting its placement tests to a computer-based environment.

For this study, Achieve analyzed examples of each type of test, which were generously provided by the companies and institutions that volunteered to participate. The tables below and on page 12 list all of the tests included in the study; Appendix A describes the tests in greater detail. For mathematics, separate placement tests often are developed to assess readiness for College Algebra and Calculus. Although the bulk of this report focuses on tests that assess readiness for College Algebra — typically the first credit-bearing course in college mathematics — both levels of the tests were examined and are included in the table below.

#### TESTS INCLUDED IN STUDY: MATHEMATICS

Test Category	Mathematics: College Algebra	Mathematics: Calculus
National Admissions Tests	<ul style="list-style-type: none"> <li>■ ACT Assessment — Math (two forms)</li> <li>■ SAT Reasoning Test — Math (two forms)</li> </ul>	
National Placement Tests	<ul style="list-style-type: none"> <li>■ ACCUPLACER — Elementary Algebra</li> <li>■ COMPASS — Algebra</li> </ul>	<ul style="list-style-type: none"> <li>■ ACCUPLACER — College Level Mathematics</li> <li>■ COMPASS — College Algebra</li> </ul>
State or Systemwide Tests	<ul style="list-style-type: none"> <li>■ Texas Higher Education Assessment</li> <li>■ Washington Intermediate Mathematics Placement Test</li> </ul>	<ul style="list-style-type: none"> <li>■ Washington Advanced Mathematics Placement Test</li> </ul>
Institution-Level Tests	<ul style="list-style-type: none"> <li>■ Mathematical Association of America Algebra Placement Test</li> <li>■ Purdue University–North Central Student Assessment and Measurement Placement Test</li> <li>■ Temple University Mathematics Placement Test</li> <li>■ University of Minnesota College Math Readiness Test</li> </ul>	<ul style="list-style-type: none"> <li>■ Louisiana State University College Algebra Placement/Credit Exam</li> <li>■ Mathematical Association of America Calculus Readiness Placement Test</li> <li>■ University of Maryland–College Park Math Placement Test</li> <li>■ University of Minnesota Calculus Readiness Test</li> </ul>

## TESTS INCLUDED IN STUDY: ENGLISH LANGUAGE ARTS

Test Category	Reading	Direct Writing	Indirect Writing
National Admissions Tests	<ul style="list-style-type: none"> <li>ACT Assessment — Reading (two forms)</li> <li>SAT Reasoning Test — Critical Reading (two forms)</li> </ul>	<ul style="list-style-type: none"> <li>ACT Assessment — Writing</li> <li>SAT Reasoning Test — Writing</li> </ul>	<ul style="list-style-type: none"> <li>ACT Assessment — English (two forms)</li> <li>SAT Reasoning Test — Writing (two forms)</li> </ul>
National Placement Tests	<ul style="list-style-type: none"> <li>ACCUPLACER — Reading Comprehension</li> <li>COMPASS — Reading</li> </ul>	<ul style="list-style-type: none"> <li>ACCUPLACER WritePlacer</li> <li>COMPASS e-Write</li> </ul>	<ul style="list-style-type: none"> <li>ACCUPLACER — Sentence Skills</li> <li>COMPASS — Writing Skills</li> </ul>
State or Systemwide Tests	<ul style="list-style-type: none"> <li>Texas Higher Education Assessment</li> </ul>	<ul style="list-style-type: none"> <li>California State University Early Assessment Program — Direct Writing</li> <li>Texas Higher Education Assessment</li> </ul>	<ul style="list-style-type: none"> <li>Texas Higher Education Assessment</li> </ul>
Institution-Level Tests		<ul style="list-style-type: none"> <li>The College of New Jersey Writing Exemption and Placement Test</li> <li>Louisiana State University Writing Test</li> <li>Purdue University–North Central English Composition Placement Essay</li> <li>Temple University English Placement Test — Essay Component</li> <li>University of Maryland–Baltimore County English Composition Placement Essay</li> <li>University of Massachusetts–Amherst Writing Placement Exam</li> <li>Youngstown State University Composition Placement Test</li> </ul>	

## Findings: *Reading*

### SUMMARY

To be ready for college, students need to be able to read and interpret a variety of complex texts, both fiction and non-fiction. In fact, the majority of what students read in college is informational in nature, such as textbooks and articles from periodicals, which may contain technical information, charts and graphs. Admissions and placement tests should reflect the full range of diverse and challenging reading students are likely to do in college.

Achieve’s analysis of admissions and placement tests revealed that:

- Reading passages on admissions tests are complex and reflect the demands of college and work, but placement tests include less challenging passages that are more in line with the level of reading done in middle school and early high school.
- Placement tests emphasize informational text — the types of reading students tend to do in college and on the job. Admissions tests are more balanced between informational and literary texts.
- Overall, admissions tests present a far greater level of rigor than the placement tests.

Because reading is the focus of early education, it is often somewhat taken for granted in high school and college curricula. College educators, however, expect a variety of sophisticated reading skills that develop only through extensive and disciplined study of varied texts. ADP embeds many of these reading skills in its English benchmarks. A few of many examples include the need for high school graduates to be able to identify interrelationships between and among ideas and concepts within a text; analyze the ways in which a text’s organizational structure supports its meaning; evaluate the quality of evidence used to support an argument; and interpret information presented in maps, tables and diagrams.<sup>5</sup>

Because the ability to read and to learn through reading is so central to college education, many colleges require entering students to demonstrate a minimum level of competence in reading. In some institutions this competence is assessed during the admissions process, most commonly by scores on the SAT or ACT tests.

Because factors other than test scores contribute to admissions decisions, many admitted students (especially those for whom English is not their native language) may not possess the reading skills required for college work. Reading placement tests provide a second opportunity for colleges to identify students who may need special help.

With rare exceptions, colleges do not give academic credit for courses in reading. The goal of a reading placement test is solely to identify students whose reading skills are so weak that they are not likely to do well in any credit-bearing course. Typically, students who score poorly on a reading placement test are advised (and sometimes required) to take special refresher courses during the summer between high school and college or various non-credit remedial reading courses during their first semester of college. Most postsecondary institutions limit either the number or kind of regular credit courses that students who require remedial reading may take until this deficiency is overcome.

For this study, Achieve analyzed reading tests that are used for placement purposes by colleges and universities, including: ACT; SAT; sets of items that sampled both the ACCUPLACER and COMPASS (placement tests that are used by numerous institutions across the country); and the Texas Higher Education Assessment, which is a state-level placement instrument.

In total, the reading tests analyzed for this study include more than 500 items. Achieve’s experts coded items on each of these tests in several categories: the overall difficulty of the reading passages, the genre of the reading passages, and the content and cognitive demand of the questions. Additionally, the cognitive and reading passage demand scores were combined into an index that measures overall rigor. Reading passages on the ACCUPLACER average only a few sentences in length; therefore, they were not given difficulty ratings (or a rigor score) because the scale is designed to measure longer passages.

The result of this extensive analysis is a rich database of information with which to evaluate the tests and compare their characteristics. The following sections describe broad patterns that emerged from this analysis. The Texas assessment — a particularly strong test — is the only statewide placement test in the study; thus, it is highlighted in a sidebar (see page 18).

#### TESTS ANALYZED IN READING

Test Category	Reading
National Admissions Tests	<ul style="list-style-type: none"> <li>■ ACT Assessment — Reading (two forms)</li> <li>■ SAT Reasoning Test — Critical Reading (two forms)</li> </ul>
National Placement Tests	<ul style="list-style-type: none"> <li>■ ACCUPLACER — Reading Comprehension</li> <li>■ COMPASS — Reading</li> </ul>
State or Systemwide Tests	<ul style="list-style-type: none"> <li>■ Texas Higher Education Assessment</li> </ul>

### ***How challenging are the reading passages?***

College students will read a rich array of complex texts. To judge the complexity of reading passages on admissions and placement tests, Achieve’s reading experts created a six-point scale describing texts from the relatively simple to the very complex. Simple texts (Level 1) tend to be concrete, use a straightforward organizational structure and basic vocabulary, and most closely resemble an upper-elementary school reading level. At the highest level of complexity (Level 6), texts are more abstract. They can include specialized vocabulary and complex organization and syntax. Level 5 and 6 texts represent late high school reading. Students who can read and comprehend texts at these top levels have a solid foundation and likely are prepared for college-level reading.

#### ***Admissions Tests***

Achieve’s analysis showed that the ACT and SAT on average target two-thirds of their items at the upper-level passages (Levels 5 and 6), which — as late high school reading — are sophisticated and complex reading.

#### ***Placement Tests***

In contrast, less than one-quarter of the COMPASS reading items analyzed in Achieve’s study are directed at upper-level passages, and nearly half are Level 3 — late middle school. (The ACCUPLACER items were not included in these data because the test presents shorter texts that were not given a reading level on the Achieve scale.)

### ***Do the passages reflect the types of texts students will read in college?***

In addition to complex reading passages, a true test of college readiness ought to include a variety of genres that reflect the full range of reading required throughout the college curriculum, including informational texts (e.g., expository and persuasive/argumentative) similar to what students will encounter in business, science and history courses, and literary texts (e.g., fiction/poetry and literary non-fiction). That said, most of what students read in college is informational in nature, such as textbooks,

primary source documents and articles from periodicals, which may contain technical information, charts and graphs.

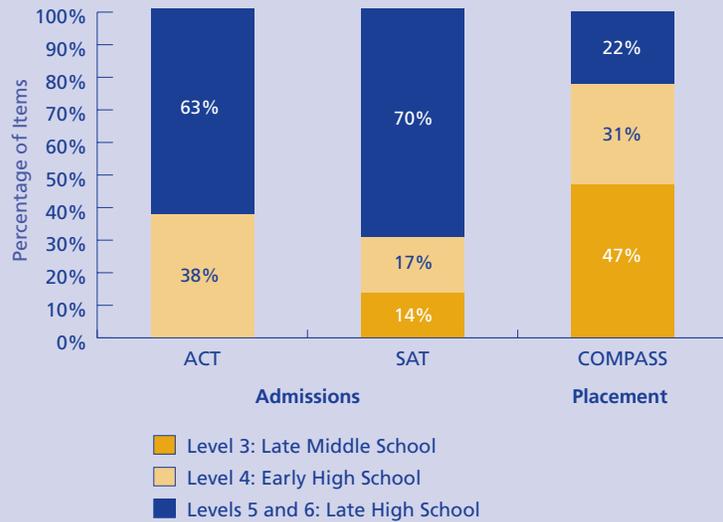
### Admissions Tests

Both the ACT and SAT emphasize literary texts, with more than 60 percent of their items attributed to literary passages. In this regard, they resemble the high school exit exams analyzed by Achieve in its earlier study, which reflected an emphasis on literary study that remains the focus of most high school English courses.<sup>6</sup> College students likely will need to read and interpret the quality of information and evidence presented in a wide range of materials. The reading passages on the ACT and SAT currently do not reflect the full range of these materials. Neither, in large part, do high school English courses, which continue to emphasize literature at the expense of informational text.

### Placement Tests

In contrast, Achieve’s analysis indicates that ACCUPLACER and COMPASS both emphasize informational texts, with more than three-quarters of the sample of items targeting the kinds of reading students will encounter in classes other than literature.<sup>7</sup> This balance is in line with the frameworks for the 2009 National Assessment of Educational Progress (NAEP) 12th Grade Reading Test,<sup>8</sup> which have recently been revised to better reflect readiness for college, work and the military. These new frameworks designate that the distribution of NAEP passages will be 70 percent

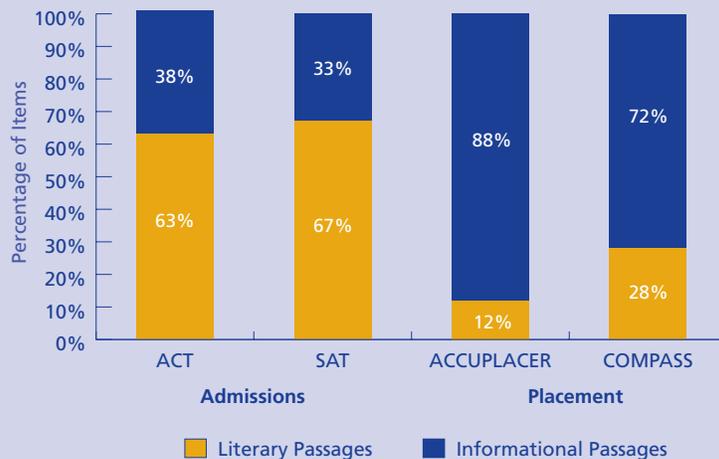
## Complexity of Passages on Reading Tests



Note: The ACCUPLACER items were not included in these data because the test presents only sentences or short paragraphs that were not given a reading level on the Achieve scale.

Totals may not equal 100 percent due to rounding.

## Content on Reading Tests



Totals may not equal 100 percent due to rounding.

informational and 30 percent literary, a balance that matches the relative emphasis of the postsecondary world.

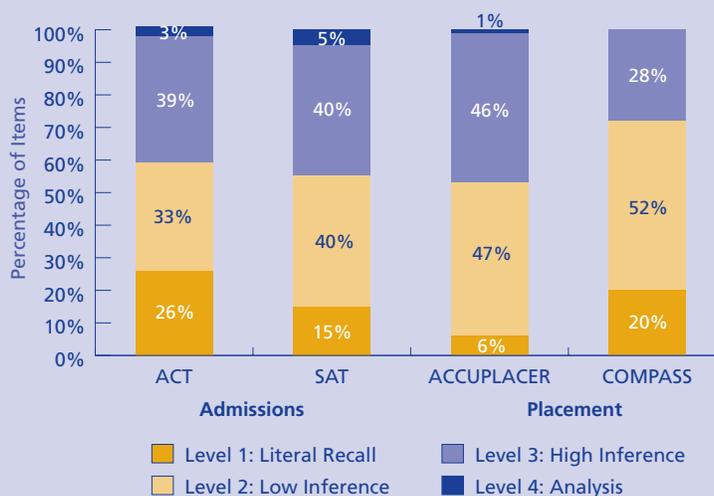
### ***How challenging are the reading questions?***

In addition to its reading passages, the character of a reading test depends on the level of cognitive challenge of the questions asked about those passages. To analyze cognitive demand of the questions on the admissions and placement tests, Achieve used a four-point scale with Level 1 (literal recall of information) being the lowest and Level 4 (analysis of ideas) the highest.<sup>9</sup> For example, a Level 1 item might ask students to recall specific facts or figures from the passage and choose among them in the answer choices. A Level 4 question might ask students to speculate about what assumptions influenced the author’s central argument. According to ADP research, the ability to analyze and develop ideas and to understand persuasive arguments — assessed by Level 4 questions — is critically important for college students.

#### ***Admissions Tests***

Achieve found that 40 percent of the questions on the admissions tests measure higher-level inference skills (Level 3 on the four-point scale), such as making complex inferences, making comparisons or providing examples. Very few questions ask students to analyze texts (Level 4), while more than 50 percent of the items on admissions tests focus on what Achieve considers to be basic reading skills: literal recall and low inference. Literal-recall questions ask students to locate explicit information in the text; low-inference questions require a slight interpretation or a straightforward generalization.

### **Cognitive Demand of Reading Tests**



Totals may not equal 100 percent due to rounding.

#### ***Placement Tests***

Achieve found that the ACCUPLACER and COMPASS tests vary in their cognitive demand. The ACCUPLACER has a high proportion of high-inference questions — nearly half — and very few literal-recall questions. In contrast, more than 70 percent of the analyzed COMPASS items address basic literal-recall and low-inference reading skills. Very few items on either test require analysis, which is regarded as the most demanding performance and is cited as an important skill by college professors.

### ***Overall, how rigorous are the reading tests?***

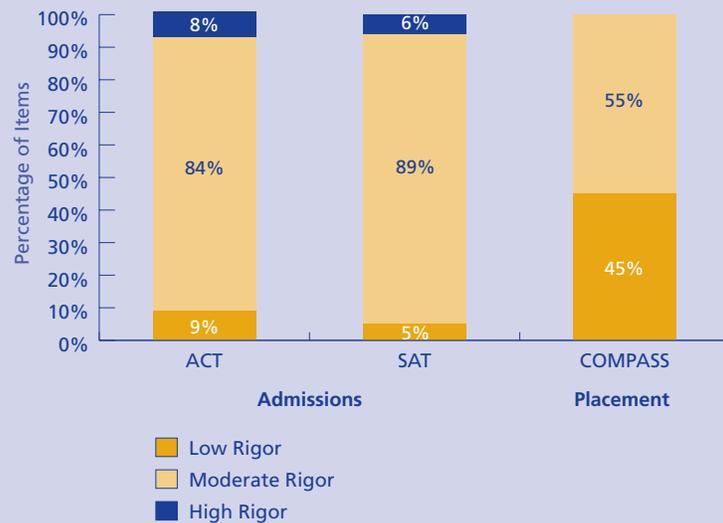
It is likely that college students will be asked to perform high-level cognitive tasks — such as analyzing and interpreting — in association with reading complex texts. Thus, tests that pose cognitively challenging questions

about rigorous reading passages are useful in determining whether a student is ready for the robust reading she or he will likely do in college courses. To capture this important interplay between the question and the passage, Achieve developed a Reading Rigor Index (RRI), a continuum on which the lower levels represent less demanding questions about less complex reading passages and the higher levels reflect challenging questions about complex texts.<sup>10</sup>

### Admissions Tests

Generally, the ACT and SAT present a moderate RRI, with the bulk of their items falling in the middle of the continuum. This is a result of the fact that these tests tend to include relatively complex reading passages even though the passages may be coupled with questions that are less cognitively challenging. On average, only 7 percent of the items on the ACT and SAT fall at the upper end of the RRI continuum, where the questions and the reading passages are the most complex; an equal proportion falls at the lower end, reflecting less demanding questions about less complex reading passages.

## Rigor Levels of Reading Tests



Totals may not equal 100 percent due to rounding.

### Placement Tests

Achieve’s analysis found that nearly half of the analyzed COMPASS questions fall at the lower third of the RRI — an indication that the questions tend to combine low cognitive challenge with low-level texts. (As stated earlier, the ACCUPLACER was not given an RRI score due to the brevity of its passages.)

# The Texas Higher Education Assessment

Since 1989, Texas colleges and universities have administered the Texas Higher Education Assessment in reading, writing and mathematics to assess the skills of entering freshman-level students. The test is notable for the higher-level cognitive demand of its items in both reading and indirect writing.

## Reading

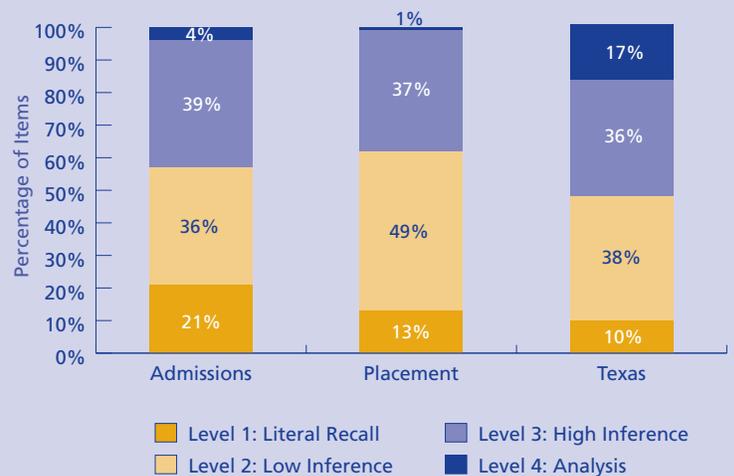
Like the national placement tests, the Texas assessment includes a large proportion of informational texts. Yet the test is unique in the range, variety and authenticity of its informational passages. Each passage is an example of the kind of reading students are likely to encounter in college. From a section in a sociology textbook to a student letter in the college newspaper, the reading passages acknowledge the realities of college-level demands.

The reading levels of the test passages are not as demanding as the national admissions tests reviewed by Achieve; however, the Texas assessment includes a high proportion of questions (17 percent) that require *analysis* of those texts. As a result, the average level of cognitive demand of the Texas test is higher than that of any other test in Achieve’s study. Typically, analysis questions require the test taker to analyze the basis of an argument or a position implied in a reading selection, going beyond merely identifying the author’s argument. This type of “deep reading” is vital to understanding and appreciating the myriad viewpoints encountered in college courses.

## Indirect Writing

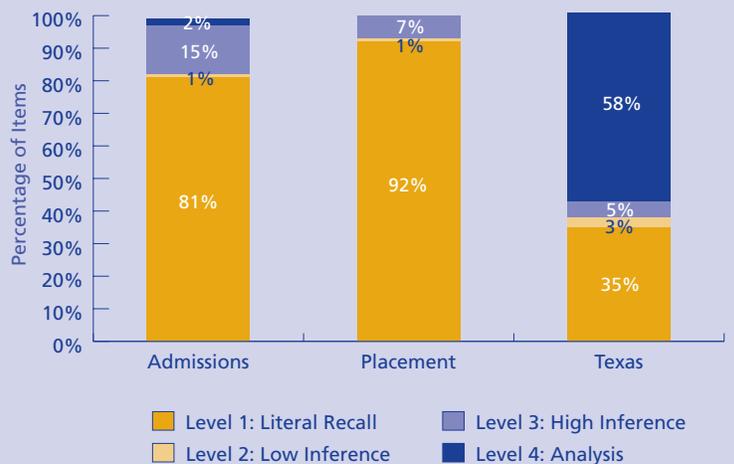
In contrast to the national admissions and placement tests, which place their heaviest emphasis on items at the lower levels of the cognitive demand scale, the majority of items on the Texas assessment (58 percent) call for analysis. In general, these analysis items require the test taker to analyze an entire passage to determine its tone and purpose and choose the correct answer. This

## Cognitive Demand of Reading Tests



Totals may not equal 100 percent due to rounding.

## Cognitive Demand of Indirect Writing Tests



Totals may not equal 100 percent due to rounding.

kind of consideration of purpose and audience is a task that every writer must grapple with, and answering this kind of question involves making a critical judgment. The Texas assessment is unusual in the set of tests examined in Achieve’s study because it includes such a high percentage of critical judgment items, although a few of these kinds of items also were found in the admissions tests.

## Findings: *Writing*

### SUMMARY

To be prepared for college, students need to be strong writers, capable of using evidence and clear reasoning to stake out a position and persuade their readers. Students also need a solid foundation in writing fundamentals, such as grammar and punctuation, word choice, sentence structure, organization, and style.

Achieve’s analysis of admissions and placement tests in which students were asked to produce a sample of writing revealed that:

- Admissions and placement tests require students to take a position or develop a point of view — important skills valued by college professors.
- Institution-based placement tests are particularly strong — and reflect “real-world” writing situations by requiring students to use provided reading passages as evidence.
- Most scoring rubrics and anchor papers examined reflect the college-ready writing expectations of institutions of higher education.

Achieve’s analysis of admissions and placement tests in which students answered multiple-choice items regarding editing and revising revealed that:

- In general, these tests — while useful measures of students’ facility with editing and revising — tend to focus on less challenging editing tasks rather than on more advanced issues of organization or development of ideas.

In nearly all colleges and universities, the first credit-bearing course in English is a required course devoted primarily to composition.<sup>11</sup> The goal of this course is to introduce students to college-level writing, a fundamental skill that will be used without much further instruction throughout students’ college careers. Some students place out of this requirement based on an Advanced Placement course taken in high school; many more need extra instruction to fully prepare for the demands of Comp 101. Colleges typically use a placement test to advise new students about their preparation for Comp 101. Permission to take Comp 101 also allows students to enroll in other entry-level courses, some of which may have heavy writing requirements. For all practical

purposes, to be ready for Comp 101 is to be a college-ready writer, although Comp 101 also is intended to further hone students’ writing skills.

Writing tests measure students’ writing ability in two very different ways: directly by asking students to write a short passage and indirectly by using multiple-choice questions to evaluate students’ knowledge of grammar, organization and style. Although direct assessments more accurately reflect students’ ability to compose, indirect assessments are more widely used because they rely exclusively on multiple-choice questions and are much easier, faster and cheaper to grade. Indirect assessments often focus on elemental aspects of writing, such as grammar, usage, sentence structure and punctuation. Rarely do

items focus on more subtle aspects, such as strategies, organization, style and word choice. Achieve analyzed the direct and indirect writing assessments separately.

## Direct Writing Assessments

For a direct writing test to reveal whether students possess the ability to write at the college-ready level, it must challenge students to produce the type of writing called for in college courses. Much of college writing demands that students analyze evidence and persuasively argue in favor of a position based on that evidence. Scoring rubrics and sample papers set the bar for whether a student's writing is at the college-ready level. Achieve's writing experts examined a number of direct writing assessments, including national admissions tests (SAT and ACT), national placement tests (ACCUPLACER WritePlacer and COMPASS e-Write), and a sample of placement tests developed at the state and institution levels.

### ***Do writing tests reflect the type(s) of writing college students must be able to produce?***

College students are asked to write about a multitude of topics in a variety of subject areas, including literature, history, science, economics and even mathematics. Some assignments may call for students to summarize information from their assigned readings or describe a lab experiment, others may ask students to compare and contrast opposing positions, and still others may require analysis of literary themes. What professors expect in almost all college writing, regardless of the disciplines, is that students will need to establish a thesis and argue a position using evidence to support it in an attempt to persuade the reader. These skills are valued by college professors and are emphasized in the ADP benchmarks.

### ***Admissions and Placement Tests***

The majority of the admissions and placement writing tests examined by Achieve require students to take a stand and back it up with clear reasoning and convincing evidence, something they will be called upon to do throughout their college education and into their careers. In this

## TESTS ANALYZED IN DIRECT WRITING

Test Category	Direct Writing
National Admissions Tests	<ul style="list-style-type: none"> <li>■ ACT Assessment — Writing</li> <li>■ SAT Reasoning Test — Writing</li> </ul>
National Placement Tests	<ul style="list-style-type: none"> <li>■ ACCUPLACER WritePlacer</li> <li>■ COMPASS e-Write</li> </ul>
State or Systemwide Tests	<ul style="list-style-type: none"> <li>■ California State University Early Assessment Program — Direct Writing</li> <li>■ Texas Higher Education Assessment</li> </ul>
Institution-Level Tests	<ul style="list-style-type: none"> <li>■ The College of New Jersey Writing Exemption and Placement Test</li> <li>■ Louisiana State University Writing Test</li> <li>■ Purdue University–North Central English Composition Placement Essay</li> <li>■ Temple University English Placement Test — Essay Component</li> <li>■ University of Maryland–Baltimore County English Composition Placement Essay</li> <li>■ University of Massachusetts–Amherst Writing Placement Exam</li> <li>■ Youngstown State University Composition Placement Test</li> </ul>

regard, the tests are different than what most high school students are used to seeing. Although writing assessments at the high school level sometimes require students to take a position (e.g., a prompt from a state writing test asks students to write an essay convincing the school principal to accept his or her point of view on how watching television affects grades), they just as often ask students to write

a personal narrative or create a fictional story. Although narrative writing is certainly appropriate for students to engage in during the course of their education, it generally is not the kind of writing college students will employ in the majority of their coursework.

### ***Do college admissions and placement writing tests ask students to produce written text in the same way they will be asked to in college?***

In general, college students write about the content they are learning. To do so, they likely are called upon to comprehend and engage with ideas conveyed through written text.<sup>12</sup> Thus, Achieve sought to understand the extent to which admissions and placement tests approximate the actual writing situations students will face in college. Achieve reviewed the writing prompts and supporting materials to determine the extent to which students are called upon to take a position based on evidence and what the nature of that evidence tends to be. The findings show that although the admissions and placement tests often require students to produce similar *types* of writing, they take somewhat different *approaches*.

#### ***National Admissions and Placement Tests***

National admissions and placement tests (ACT, SAT, WritePlacer and e-Write) tend to provide a short quotation or synopsis of conflicting positions and ask students to use prior knowledge or experience as evidence in support of the position they decide to take. For the sake of fairness, these “prompts” must be easily understood and generic enough for students to relate to the topic and have a reasonable chance to produce effective writing. The evidentiary base of the resulting writing, therefore, is not often robust.

#### ***Institutional Placement Tests***

In contrast, most of the institution-level placement tests reviewed for this study include one or more reading passages and call on students to marshal evidence *from the passages* to argue a position or compare and contrast differing positions. The student is directed to refer to

the passage in his or her response and often is asked to explain the author’s point of view. The reading passages range from 65 to 800 words and are similar in complexity to the Level 5 and 6 reading passages discussed previously. By providing evidence to adjudicate, these writing tests push students to read, synthesize, analyze and respond to material that may be unfamiliar to them — very similar to the challenges they will face in their college courses.

### ***Do the scoring rubrics and anchor papers examined reflect the college-ready writing expectations of institutions of higher education?***

One way that writing assessments communicate the level of writing required is through accompanying scoring rubrics and anchor papers. Scoring rubrics provide a framework for considering the effectiveness of a student’s composition by providing a range of levels — usually six — from lowest to highest and describing the traits of writing at each of those levels. Anchor papers are actual samples of student writing at each level. They are used to show the level of writing required to reach each score point.

#### ***Admissions and Placement Tests***

The scoring rubrics and sample papers for most of the admissions and placement tests examined in this study emphasize characteristics of strong writing, such as the ability to take a position and use evidence to present a point. They also tend to focus on proper use of grammar and syntax and the ability to use language effectively and fluently to express ideas. They underscore the importance of analytic skills and the writer’s ability to reason.

For example, the ACT rubric describes an essay with the highest score of six as one that “addresses complexity by examining different perspectives on the issue, or by evaluating the implications and/or complications of the issue, or by fully responding to counterarguments to the writer’s position.” Similarly, the SAT rubric describes a top essay as one that “effectively and insightfully develops a point of view on the issue and demonstrates

## TYPES OF WRITING AND APPROACHES ON DIRECT WRITING TESTS

	Test/Institution	Requires Students To Take a Position	Provides Students with Supporting Evidence To Use
National Admissions Tests	ACT	■	
	SAT	■	
National Placement Tests	ACCUPLACER WritePlacer	■	
	COMPASS e-Write	■	
State or Systemwide Tests	California	■	■
	Texas	■	
Institution-Level Tests	College of New Jersey	■	■
	Louisiana State University		■
	Purdue University–North Central	■	
	Temple University	■	■
	University of Maryland–Baltimore County	■	
	University of Massachusetts–Amherst	■	■
	Youngstown State University	■	■

outstanding critical thinking, using clearly appropriate examples, reasons and other evidence to support its position.” Slight variations on this are included in all of the scoring guides examined.

Overall, these rubrics and sample papers reflect relatively sophisticated writing in which students effectively present a position and supply evidence. These are skills that will serve them well in college and beyond. In many cases, the scoring rubrics and sample papers are available publicly via the Web, providing an opportunity for schools and teachers to help students better understand the expectations.

## Indirect Writing Assessments

Direct writing tests are the best way to assess students’ overall writing abilities, while indirect writing tests are better for assessing isolated skills. Nonetheless, although indirect writing tests may be insufficient for assessing students’ ability to produce written text, they can be effective in assessing specific elements of the writing process, such as the fundamentals of editing and revision. Grammar, usage, sentence structure and punctuation can be assessed indirectly, as can more sophisticated aspects of revision such as organization, strategy and word choice. A good indirect test of college-ready writing

ought to measure at high levels the full range of writing mechanics and structure valued by college faculty.

For this study, Achieve analyzed five indirect writing tests: the ACT and SAT admissions tests, a sampling of items from the computer-adaptive ACCUPLACER Sentence Skills and COMPASS Writing Skills placement tests, and the Texas Higher Education Assessment. Achieve’s experts coded each item on each test on the basis of content and cognitive demand. The tests incorporate more than 600 multiple-choice items that are included either as part of a general writing test or as a complement to the reading items in the admissions and placement tests.

### ***What skills are measured by indirect writing tests, and what do they reveal about a student’s ability to write?***

To be successful writers, students will need to use sophisticated vocabulary; appropriate and varied sentence structure; and coherent, developed paragraphs. Additionally, college professors cite correct grammar, usage, punctuation, capitalization and spelling as critically important. Although these abilities are best measured through actual writing, indirect writing tests do measure these valuable skills in isolation and can serve as approximations of a student’s writing ability.

All of the questions on the indirect writing tests examined in this study were identified as focusing on either editing or revision. Editing questions address issues of sentence structure, grammar and usage, while revision questions focus on rhetorical skills such as writing strategy, organization and style. All of these skills are important for successful preparation for college writing. However, questions that focus on word or sentence correctness can assess only specific applications of rules while revision items depend more on an understanding of the whole text. Therefore, generally speaking, revision questions challenge students’ logic and reasoning in a way that demands the critical thinking skills valued by college faculty.

### **TESTS ANALYZED IN INDIRECT WRITING**

<b>Test Category</b>	<b>Indirect Writing</b>
National Admissions Tests	<ul style="list-style-type: none"><li>■ ACT Assessment — English (two forms)</li><li>■ SAT Reasoning Test — Writing (two forms)</li></ul>
National Placement Tests	<ul style="list-style-type: none"><li>■ ACCUPLACER — Sentence Skills</li><li>■ COMPASS — Writing Skills</li></ul>
State or Systemwide Tests	<ul style="list-style-type: none"><li>■ Texas Higher Education Assessment</li></ul>

#### ***Admissions Tests***

Each of the admissions tests of indirect writing targets a range of writing skills, from editing for punctuation and grammar errors to concerns with organization and use of details. However, considerable differences in emphasis exist. The SAT predominantly targets editing skills — 85 percent — while the ACT addresses editing and revision almost evenly. In large part, this difference in emphasis is the result of their different formats. The ACT test uses full passages, which enables questions about revisions to tone, style and organization. The SAT, on the other hand, uses sentences more often than full passages, which invites questions about editing only at the sentence level.

#### ***Placement Tests***

Interestingly, these priorities are reversed in the two companies’ placement tests: ACT’s COMPASS focuses slightly less than three-fourths of its items on editing, while nearly two-thirds of College Board’s ACCUPLACER measures revision skills.

### ***How cognitively challenging are the indirect writing test questions?***

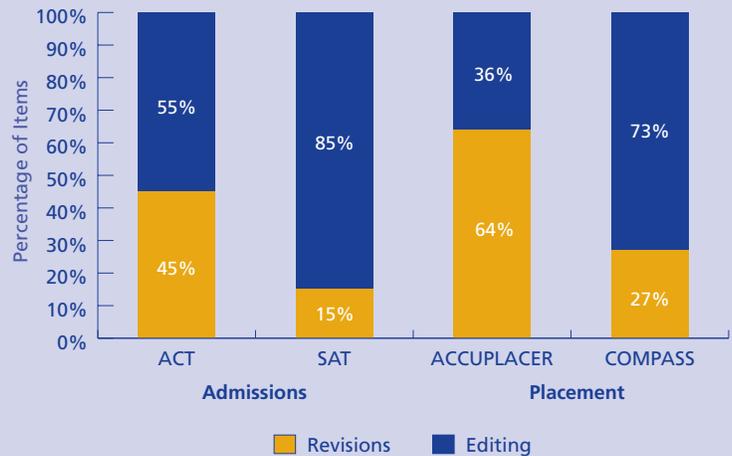
To analyze these tests, Achieve’s experts coded the questions along a continuum of cognitive demand similar to

that used for reading. Items that require only knowledge of a rule, such as choosing the correct form of a verb or correcting a sentence fragment, were coded as literal recall. If a test taker had to apply some understanding of the meaning of the sentence or text to correctly answer a question — or consider the impact of a particular device on the meaning of the sentence or passage — the item was coded at low inference or high inference. For example, items that required choosing a word appropriate for the tone of a text were coded as low inference; items requiring the determination of whether or not to include or delete information from a text, based on an understanding of how that decision would affect meaning, were coded as high inference. Analysis was reserved for situations in which the test taker had to analyze a passage to determine the correct answer.

### Admissions and Placement Tests

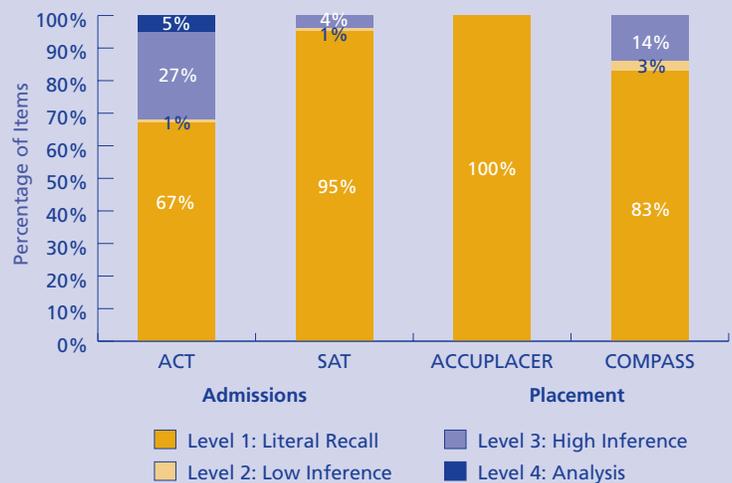
The vast majority of editing items analyzed from the admissions and placement tests rely only on recognizing and applying a memorized rule about usage or mechanics; therefore, they were coded at the lowest level of cognitive demand — literal recall. Collectively, there appears to be an emphasis on lower-level cognitive skills, lacking the ability to reveal a fuller sense of students' abilities.

## Skills Measured on Indirect Writing Tests



Totals may not equal 100 percent due to rounding.

## Cognitive Demand of Indirect Writing Tests



Totals may not equal 100 percent due to rounding.

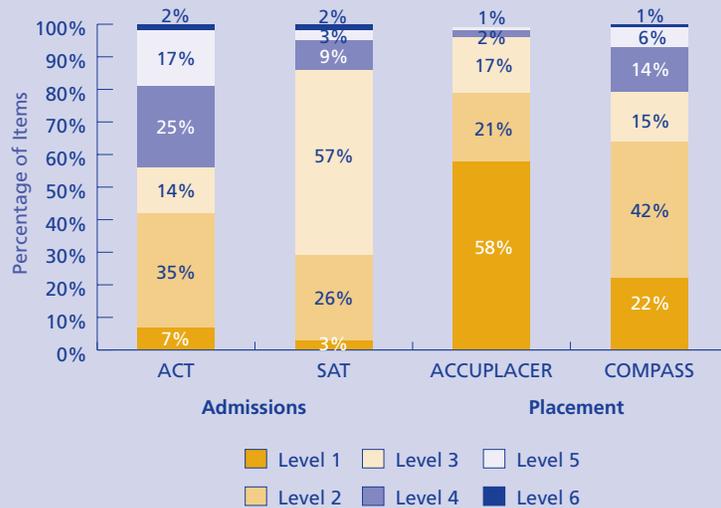
## Overall, how rigorous are the indirect writing tests?

To gauge the overall challenge of the admissions and placement indirect writing tests, Achieve used a scale that ranged from low challenge (Level 1) to high challenge (Level 6). This scale was based on the ACT assessment frameworks for tests administered to students in grades 8–9, 10 or 11–12. The level of an item takes into account both what the item is measuring (for example, punctuation or organization) and the difficulty of that skill based on empirical evidence from thousands of test takers (for example, from using a comma in a series to using a semicolon to indicate a relationship between closely related independent clauses). On this scale, a test for students in grades 11 and 12 theoretically should include a heavy component of Level 5 and 6 questions and a smaller component of questions at Levels 1 and 2, which tend to be middle school level.

### Admissions Tests

Overall, the ACT and SAT are relatively rigorous: 59 percent and 71 percent, respectively, of the questions on the ACT and SAT tap skills at Levels 3–6. The ACT is particularly challenging with nearly 20 percent of its items at Levels 5 and 6. Questions at the upper end of the scale might require the student to use logic in thinking through the process of reorganizing a paragraph to accomplish a specific purpose or to use

## Level of Challenge of Indirect Writing Tests



Note: Scale ranges from Level 1 (low challenge) to Level 6 (high challenge). Totals may not equal 100 percent due to rounding.

sentence-combining techniques to improve flow. Students frequently will use these skills in their college writing assignments.

### Placement Tests

The vast majority of the questions on the placement tests fall at the lower levels of the scale (Levels 1 and 2). A typical Level 2 question asks students to choose the correct possessive pronoun (“its” versus “your”), use the appropriate spelling of “its/it’s” or check for subject-verb agreement. These are skills that ideally students should master well before high school.

## Findings: *Mathematics*

### SUMMARY

To be successful in college and on the job, high school graduates need to be able to use mathematics to solve challenging problems. Achieve's ADP research with college professors from diverse institutions found that incoming freshmen need to have mastered the content taught in a four-year course sequence that includes courses such as Algebra I, Algebra II and Geometry, as well as significant data analysis and statistics.

Achieve's analysis of admissions and placement tests found that:

- The admissions and placement tests put their heaviest emphasis on algebra — content that is important to colleges and high-skilled workplaces. However, the algebra content assessed tends to favor prealgebra and basic algebra over the advanced algebra concepts and skills essential for college readiness and placement into College Algebra.
- Placement tests in particular are narrow and do not reflect the full range of content — such as data analysis, statistics and geometric reasoning — college students need in a wide variety of courses. Admissions tests are more balanced across topics.
- Too few questions on admissions and placement tests tap higher-level cognitive skills critical to success in college.

In contrast to the unique role of Comp 101 as the nearly universal first credit-bearing course in English, most colleges offer students several options for their first credit-bearing course in mathematics, the most common of which is College Algebra (see discussion on page 8). Other courses include Elementary Statistics, Mathematics for Liberal Arts,<sup>13</sup> Mathematics for Elementary Teachers and Calculus.

With the exception of Calculus, these courses build on the knowledge and skills normally acquired in three years of high school mathematics. College Algebra and Elementary Statistics make extensive use of techniques taught in Algebra II, while other introductory credit-bearing mathematics courses depend less on mastery of techniques than on mathematical habits of mind. With few exceptions, college courses that cover topics normally taught in high school Algebra II or earlier, such as Intermediate Algebra, do not carry credits that count toward an associate or a bachelor's degree.

For this study, Achieve analyzed a variety of mathematics tests that are used for placement purposes by colleges and universities. These tests include examples of four different types: national admissions tests, national placement tests, state or systemwide tests and institution-level tests (see table on the next page). In addition, included in the analysis was a small pool of science items identified by ACT analysts as assessing mathematics content as it arises in natural applications. Although mathematics-intensive items on the ACT science test are incorporated into a composite score useful in making college admission decisions, such items are not reported as part of the ACT mathematics score and, therefore, are not incorporated into decisionmaking about course placement in mathematics.

As shown on page 27, Achieve's analysis of placement tests included those used for determining placement into College Algebra and Calculus. Because College Algebra is the most common introductory college mathematics

## TESTS ANALYZED IN MATHEMATICS

Test Category	Mathematics: College Algebra	Mathematics: Calculus
National Admissions Tests	<ul style="list-style-type: none"> <li>ACT Assessment — Math (two forms)</li> <li>SAT Reasoning Test — Math (two forms)</li> </ul>	
National Placement Tests	<ul style="list-style-type: none"> <li>ACCUPLACER — Elementary Algebra</li> <li>COMPASS — Algebra</li> </ul>	<ul style="list-style-type: none"> <li>ACCUPLACER — College Level Mathematics</li> <li>COMPASS — College Algebra</li> </ul>
State or Systemwide Tests	<ul style="list-style-type: none"> <li>Texas Higher Education Assessment</li> <li>Washington Intermediate Mathematics Placement Test</li> </ul>	<ul style="list-style-type: none"> <li>Washington Advanced Mathematics Placement Test</li> </ul>
Institution-Level Tests	<ul style="list-style-type: none"> <li>Mathematical Association of America Algebra Placement Test</li> <li>Purdue University–North Central Student Assessment and Measurement Placement Test</li> <li>Temple University Mathematics Placement Test</li> <li>University of Minnesota College Math Readiness Test</li> </ul>	<ul style="list-style-type: none"> <li>Louisiana State University College Algebra Placement/Credit Exam</li> <li>Mathematical Association of America Calculus Readiness Placement Test</li> <li>University of Maryland–College Park Math Placement Test</li> <li>University of Minnesota Calculus Readiness Test</li> </ul>

*Achieve’s analysis focuses on the tests used for placement into College Algebra; for an analysis of the tests used for placement into Calculus, see sidebar on page 33.*

course taken at two- and four-year colleges, the focus of this report is on the first-tier tests. Those are the tests that differentiate students who are ready for a credit-bearing College Algebra course from students in need of remediation.

Achieve’s experts analyzed more than 1,200 items (including 22 ACT science items), coding them for their mathematical content and cognitive demand (e.g., whether students are called upon to recall knowledge, reason or generalize). In addition, using a taxonomy developed from the Third International Mathematics and Science Study (TIMSS), Achieve was able to determine a typical grade level for each item. This level, called

an International Grade Placement (IGP) index, can be thought of as a kind of composite among the 40 TIMSS countries (other than the United States) to show when the curriculum focuses on different mathematics content — at which point the highest concentration of instruction on a topic occurs. The average international grade level for each test then is calculated by averaging the IGP indices of each item.

Achieve’s investigation revealed both predictable and surprising features of these tests. Because national admissions tests tend to sample all mathematics taught in the first three years of high school, they typically are broader with respect to content coverage and sometimes

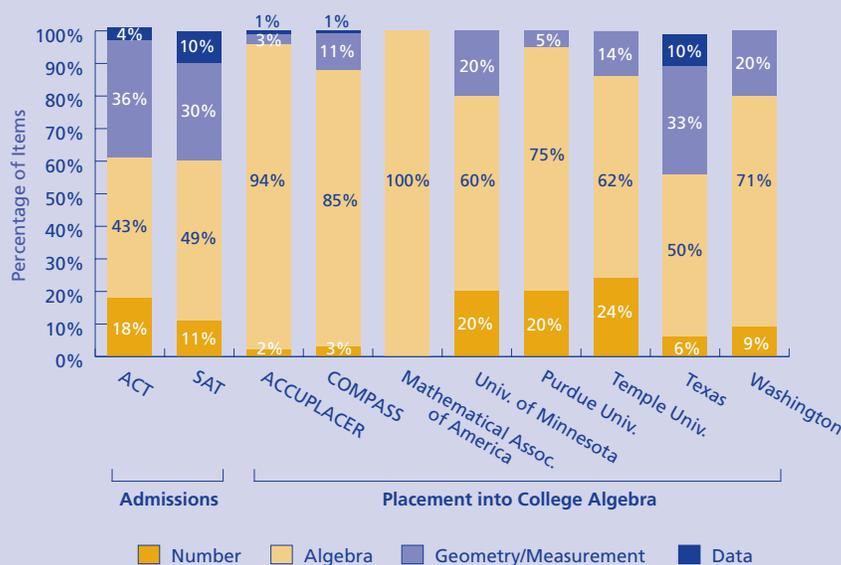
are more cognitively challenging than tests designed specifically for placement purposes. In contrast, placement tests generally focus on a narrower range of knowledge and often employ less cognitively demanding skills to determine which students are likely to succeed in particular courses.

Because most colleges and universities offer entering students four or five different mathematics courses requiring different levels of mathematical preparation — College Algebra being the most common — some placement tests are arranged in multiple tiers, with topics ranging from arithmetic to precalculus. Even though this study focuses primarily on placement tests that are used to place students into College Algebra, Achieve also examined tests designed to indicate readiness for Calculus.

***Do college admissions and placement tests measure the full range of knowledge and skills described in the ADP benchmarks?***

ADP found that, to meet the demands of the many different university and college programs, high school graduates need to master a broad range of mathematical skills that are particularly important to professors from a variety of disciplines. In addition to algebraic concepts, professors identify geometry, measurement, data analysis and statistics as vital for success in credit-bearing courses. These topics are included in the ADP benchmarks and in most state standards. Achieve analyzed the admissions and placement tests to determine the distribution of topics, including algebra, geometry/measurement, data analysis/statistics and number concepts.

**Content on Math Tests**



Totals may not equal 100 percent due to rounding.

***Admissions Tests***

Both the ACT and the SAT mathematics tests place the greatest emphasis on algebra, with nearly half of their collective items assessing algebraic content. Secondary emphasis is placed on geometry, with more than 30 percent of the questions across the ACT and SAT addressing geometry and measurement. Substantially less emphasis is given to number concepts (14 percent) and to data analysis and statistics (7 percent).<sup>14</sup> This distribution of math content is more balanced than that of placement tests.

***Placement Tests***

Achieve’s analysis shows that three-quarters of the items on the placement tests measure algebra.<sup>15</sup> Tests designed for placement into College Algebra courses collectively attribute only 13 percent of their items to geometry and measurement, with institution-level tests providing somewhat greater emphasis than national

tests. Treatment of data and statistics is particularly lacking on placement tests, with only 1 percent of items assessing these concepts. Assessment of number sense and numerical operations also is minimal on placement tests, with 11 percent of items collectively addressing such topics. Emphasis on number concepts is slightly more prevalent on state and institution-level placement tests than on national placement tests.

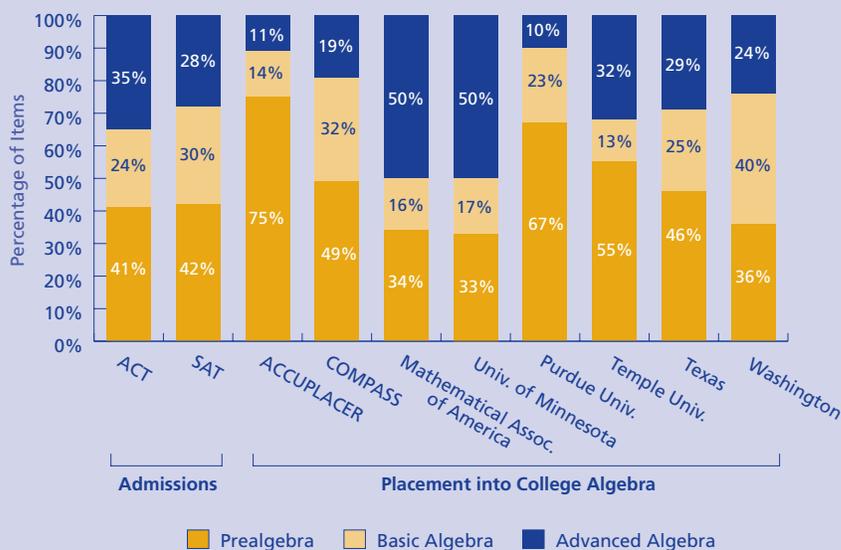
### How challenging is the algebra measured by the admissions and placement tests?

As previously indicated, what is considered a credit-bearing course in mathematics varies by major and across institutions. College Algebra — which also is called Precalculus because it bridges Algebra II and Calculus — is generally accepted as a transfer-worthy, credit-bearing college course; it is at this point where course placement becomes critical for students entering college. In theory, high school students should be able to demonstrate mastery of Algebra II-level content to be placed into a College Algebra course. Achieve’s detailed coding of the admissions and placement test items made it possible to group the many algebra items into levels that approximately correspond to typical courses: “prealgebra” (middle school), “basic algebra” (Algebra I), and “advanced algebra” (Algebra II). See the table to the right for more details.

### ACHIEVE ALGEBRA LEVELS

Algebra Level	Course Equivalent	Examples of Topics Covered
Prealgebra	Middle School Math/Prealgebra	Working with integers, rational numbers, patterns, representation, substitution, basic manipulation and simplification
Basic Algebra	Algebra I	Linear equations and basic functions and relations
Advanced Algebra	Algebra II	Non-linear equations or inequalities and an understanding of real and complex numbers

### Algebra Content on Math Tests



Totals may not equal 100 percent due to rounding.

### Admissions Tests

Nearly one-third of the ACT and SAT collectively assess more rigorous advanced algebra concepts and skills typically encountered in a course such as Algebra II. Most of the advanced algebra items found on the admissions tests address solving quadratic equations and systems of equations. Of the remaining items, slightly more than 25 percent of the ACT and SAT assesses basic algebra topics typically encountered in courses such as Algebra I, and the remaining 40 percent covers prealgebra concepts. Although the ACT and SAT are more rigorous than most of the placement tests with respect to algebra, many important higher-level algebra topics included in the ADP benchmarks — such as advanced functions and modeling — are barely addressed on either of these tests.

### Placement Tests

On average, the items Achieve analyzed from the placement tests emphasize prealgebra knowledge and skills. Fewer than one in four items assess knowledge and skills typically encountered in courses like Algebra I. Less than 30 percent of the algebra items across all placement tests tap advanced algebra knowledge and skills typically encountered in a course such as Algebra II. There are a few notable exceptions: The Minnesota and Mathematical Association of America (MAA) Algebra tests actually place their greatest emphasis (50 percent of each) on advanced algebra knowledge and skills. More so than on the admissions tests, nearly all of the advanced algebra items on the placement tests — including the Minnesota and MAA Algebra tests — ask students to solve quadratic equations and systems of equations.

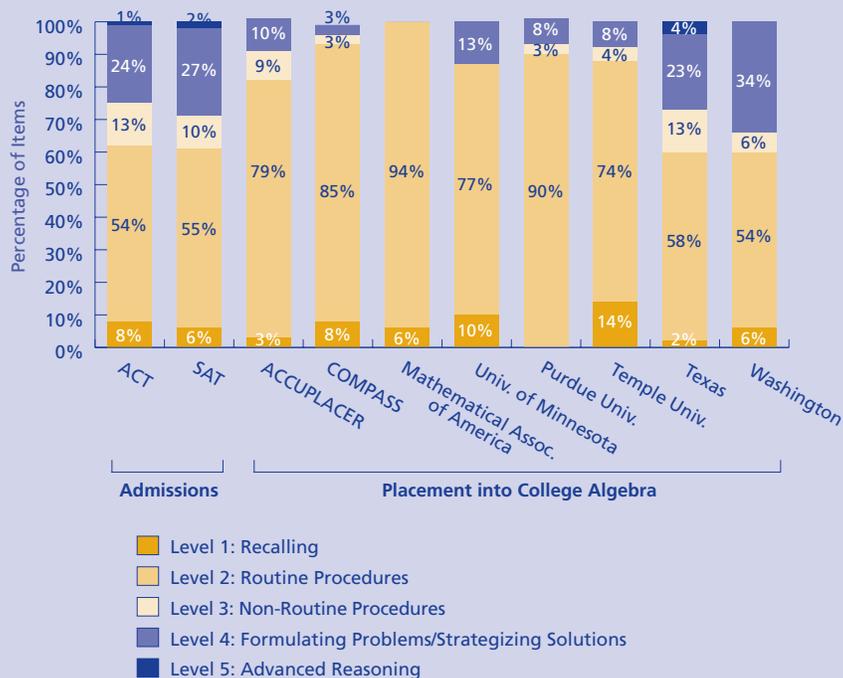
### How cognitively challenging are the mathematics test questions?

The content measured by an item reveals only one aspect of a test's character. A more complete understanding also requires consideration of the cognitive demand of the questions. For example, are students asked to develop a mathematical model to solve a complex, multistep problem? Or is the question framed in such a way that students need apply only a basic procedure, such as solving a simple linear equation? To analyze cognitive demand, Achieve used a five-point scale with Level 1 (recalling) being the lowest and Level 5 (advanced reasoning) the highest.

### Admissions Tests

The ACT and SAT are the most cognitively demanding of all the tests examined in this study, with nearly 40 percent of their items categorized as Level 3 or above. Level 3 items require students to use non-routine procedures,

## Cognitive Demand of Math Tests



Totals may not equal 100 percent due to rounding.

Level 4 items ask students to formulate problems and strategize solutions, and Level 5 items call on students to use advanced reasoning. Although mathematics-intensive items on the ACT science test are not counted for mathematics placement purposes, they are particularly noteworthy because Achieve’s analysis identified all of these items as Level 3 or 4, given the cognitive complexity of reading, analyzing and interpreting scientific data. In addition, it is worth mentioning that nearly 20 percent of items on the SAT are gridded-response items in which no answer choices are given. Students must produce their own answers to these questions and bubble in their answers on a special answer grid. The SAT is the only mathematics test in this study that includes such items; the remaining tests rely exclusively on multiple-choice questions.

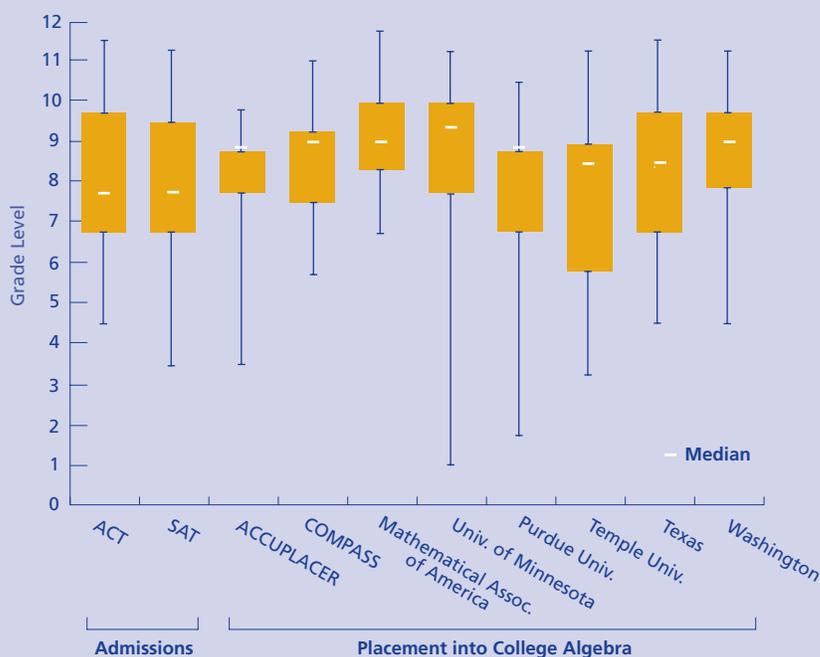
### Placement Tests

Achieve’s analysis showed that placement tests do not tap the higher levels of cognitive demand. In fact, collectively across all placement tests examined, more than three-quarters of the questions are categorized as Level 2 — calling for students to apply routine procedures to solve problems. Seventeen percent of the questions fall at Levels 3 and 4. Only two questions (on the Texas assessment) across all of the placement tests call for students to use advanced reasoning (Level 5), even though research indicates it is necessary for success in college. Interestingly, state and institution-level placement tests on average tend to be more cognitively demanding than the national placement tests, placing greater emphasis on items rated as Level 3 or above. The Washington Intermediate Mathematics Placement Test and the Texas assessment are particularly notable for their considerable emphasis on assessing higher levels of cognitive demand.

### How rigorous is the content on the college admissions and placement tests on an international scale?

As part of its earlier study of high school exit tests, Achieve examined the International Grade Placement (IGP) of each item on each test. The IGP, an index developed by Michigan State University, represents the average grade in which a mathematics topic typically appears in the curriculum of the 40 nations (other than the United States) that took part in the Third International Mathematics and Science Study (TIMSS). The IGP rating of a test is calculated by averaging the IGP levels of the items on the test. TIMSS data show that students in other countries typically study mathematical topics a year earlier than in most U.S. school districts; therefore, the IGP index is approximately one year lower than corresponding U.S. averages. Ideally, admissions and placement tests

**Content on Math Tests on International Grade Scale**



would place greater emphasis on content taught later in high school and less emphasis on prealgebra.

### *Admissions and Placement Tests*

Achieve’s analysis indicates that although some questions on admissions and placement tests do measure advanced content, overall they place too much emphasis on content that is taught earlier in a student’s high school career.

The average IGP for the set of items from all of the institution-level placement tests is 8.4, indicating that — on average — the tests focus on content that is taught in the 8th grade in other countries but in early high school

in the United States. The average IGP for the national admissions and placement tests are comparable to the institution-level tests. This is largely because these tests include so many items that measure prealgebra and basic algebra content. As the box-and-whisker plot on page 31 indicates, the tests do measure *some* higher-level knowledge and skills that are prerequisites for success in college (as evidenced by the “whisker” extending upward toward the later high school years), but they tend to be weighted with large proportions of items categorized as assessing content at the 9th grade level or below internationally.

# Advanced-Level Placement Tests

Overall, Achieve’s analysis found that most placement tests for College Algebra measure relatively low-level content. Achieve also examined several advanced-level placement tests designed to place students *beyond* a first-year, credit-bearing course such as College Algebra — sometimes into Calculus. These advanced tests are similar to the basic-level tests in that they all emphasize algebra. They are different, however, in that they assess more advanced levels of algebra, including concepts such as non-linear functions and equations — the kind of content Achieve expected to see more of in the placement tests intended to determine readiness for the first credit-bearing college mathematics course.

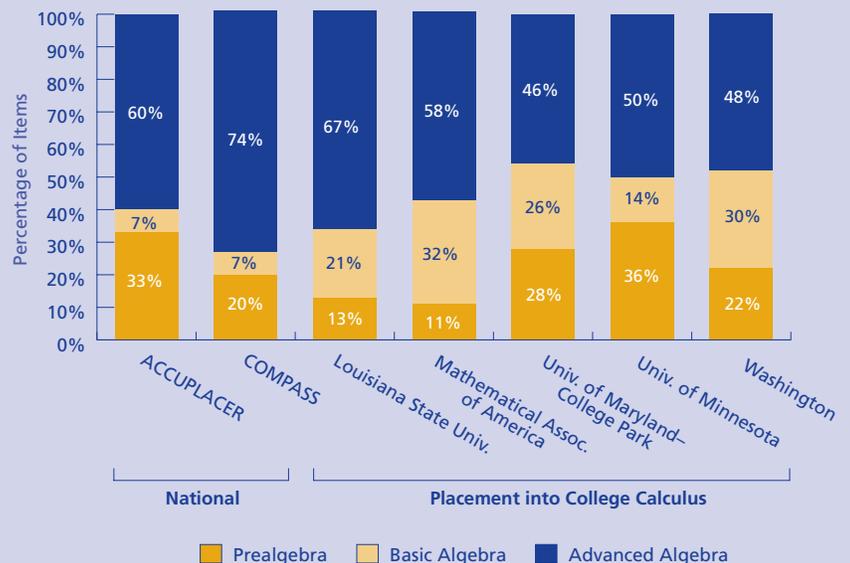
Collectively, the algebra items from the advanced-level tests examined by Achieve emphasize advanced algebra knowledge and skills, with 57 percent of the items assessing algebra at this level. Of the institution-level tests, the Louisiana State University College Algebra Placement/Credit Exam is particularly noteworthy for the large proportion of its algebra items (two-thirds) devoted to advanced algebra — probably because this test is used not only to place students but also to award credit for and placement *out of College Algebra*.

Overall, these higher-level tests are a better reflection of the mathematics that professors say are important for success in postsecondary endeavors. Nevertheless, the focus of the advanced tests is narrow, with a majority of the items covering algebra and some trigonometry. And like the regular placement tests, these advanced tests continue to call for a low level of cognitive demand, with little beyond the routine application of procedures. Thus, despite their coverage of more advanced content, these tests are unable to fully capture the breadth of content and skills needed by students if they are to be successful in the range of courses they will likely take in college.

## ADVANCED-LEVEL TESTS ANALYZED IN MATHEMATICS

Test Category	Mathematics: Calculus Placement
National Placement Tests	<ul style="list-style-type: none"> <li>ACCUPLACER — College Level Mathematics</li> <li>COMPASS — College Algebra</li> </ul>
State or Systemwide Tests	<ul style="list-style-type: none"> <li>Washington Advanced Mathematics Placement Test</li> </ul>
Institution-Level Tests	<ul style="list-style-type: none"> <li>Louisiana State University College Algebra Placement/Credit Exam</li> <li>Mathematical Association of America Calculus Readiness Placement Test</li> <li>University of Maryland–College Park Mathematics Placement Test</li> <li>University of Minnesota Calculus Readiness Test</li> </ul>

## Algebra on Calculus Placement Tests



Totals may not equal 100 percent due to rounding.

## Recommendations for Policymakers

High school students across the country take a lot of tests — particularly students planning to go to college. But as this study of college admissions and placement tests and Achieve’s earlier study of high school graduation exams reveal, high school and college exams send mixed signals about what students need to learn to be successful. If states are going to improve the preparation of high school students so that they graduate prepared for college, states will need a more rigorous and coherent system of assessments — one that is capable of measuring the standards students are expected to meet in high school *and* signaling readiness for postsecondary success.

A number of strategies are emerging as states work to build admissions and placement tests into their high school assessment and accountability systems. Some states are incorporating the ACT or SAT into their existing systems and requiring all students to take those exams. Others are considering using college placement tests as early indicators to signal to students whether they are ready for credit-bearing college courses. A growing number of states are developing end-of-course tests that align with their high school curriculum. Some are modifying their high school tests to make them better measures of college readiness and some are setting “college-ready” cut scores on existing tests.

Although it is too early to see which strategies hold the most promise for improving student preparation, whichever path states pursue, the assessments must meet two important goals: They must adequately measure college readiness, and they must be well aligned with the state high school standards. If either goal is sacrificed, the validity of the assessments will be compromised, and their impact on student preparation will be limited. With a growing number of states working hard to align their high school graduation standards with expectations of college faculty and employers, it is important for states to re-examine their high school and college assessments to ensure that the assessments clearly and consistently measure students’ college readiness.

### Recommendations for K–12 Policymakers

**Augment admissions tests when incorporating them into statewide testing systems.** A number of states are incorporating national college admissions tests — the ACT and SAT — into their high school assessment and accountability systems. They are requiring all students, not just the college bound, to take these tests. The argument is that the tests are widely used by colleges and universities for admissions and placement and therefore have credibility with students, parents and the general public. Giving all students the opportunity to take the tests will give them a leg up on the college preparation process and may encourage students who did not view themselves as college material to pursue postsecondary education. Because most college-bound students already take these tests in high school, incorporating them into a state’s assessment system will not significantly increase the test burden.

However, states taking this path should proceed with caution. Achieve’s analysis reveals that although admissions tests do some things very well, there are gaps in what they measure. Neither the ACT nor the SAT includes the full range of advanced concepts and skills reflected in the ADP benchmarks and, increasingly, in state high school standards. Therefore, simply incorporating these tests as they are into state high school testing

systems is an insufficient strategy. To be effective, states need to augment the ACT and SAT with additional test questions or with additional performance measures to ensure stronger alignment with state standards and to assess the more advanced concepts and skills that college faculty say are important.

States are approaching augmentation in different ways. Maine, for example, is administering a slightly augmented SAT to all 11th grade students. The state worked with the College Board to develop supplemental items in data and statistics — an area of mathematics that is covered in the state standards but not extensively assessed on the SAT. Similarly, Michigan administers the ACT and WorkKeys to all 11th graders, along with 15 additional mathematics items that measure content not covered on either test. Kentucky plans to administer both the ACT *and* the state assessment to all students. To reduce testing time, the state has analyzed both tests and will eliminate items from the state test that cover content measured by the ACT.

ACT and the College Board have shown great leadership in establishing standards for the transition from high school to college, and both organizations are actively involved in increasing not only the college-going rate, but also the level of student preparation for college success. Achieve encourages states that are considering incorporating the ACT or SAT into their state assessment and accountability systems to take stock of what these tests measure and how well aligned they are with state standards. Then, states can work with ACT and the College Board to augment the assessments as needed to ensure greater coherence and alignment.

**Consider using end-of-course tests to tap higher-level content *and* skills and to place students into college courses.** A growing number of states are pursuing end-of-course tests in high school as a strategy for measuring college readiness while also better aligning tests with the high school curriculum. There are multiple benefits to this approach. First, the tests can be tied closely to the curriculum and to the courses that states require

students to take to graduate. Second, end-of-course tests are more sensitive to instruction because they are taken right after a student completes a course. For these reasons, end-of-course tests can play the unique dual role of indicating student readiness *and* providing teachers with information to help them improve the curriculum and instruction. End-of-course tests also allow states to monitor performance and ensure consistency of rigor in courses taught across the state.

For end-of-course tests to serve as an indicator of college readiness, states will need to administer tests in higher-level courses, such as Algebra II and 11th or 12th grade reading and writing. Most states, including those with end-of-course assessments, do not currently have tests at this level. It also is essential for higher education to play a role in developing and/or reviewing these exams to ensure they reflect the skills needed for college success. If higher education participates in developing these exams, they can more readily use the tests for placement into entry-level college courses. This will send a powerful signal to students and their parents and teachers that performance in high school pays off in college.

There are challenges associated with end-of-course testing. First, this approach could increase the amount of testing required by a state, depending on the number of courses for which the state develops an assessment. Second, colleges may be willing to use end-of-course tests for placement only if they are administered in 11th or 12th grade. In the case of students taking Algebra II in the 10th grade — two years before entering college — higher education institutions would need to determine whether results could be used for placement or whether additional information (e.g., evidence of continued course-taking in advanced mathematics or additional tests) would be needed.

**Modify existing high school tests to measure college readiness.** Some states are considering adding questions to existing high school assessments to round out those tests and make them adequate measures of college readiness. California's education department took this

approach, working with the California State University (CSU) system and adding a short set of questions to the 11th grade standards-based tests in English and mathematics to measure the additional skills CSU faculty say incoming freshmen need to be successful in entry-level courses. Students who choose to take the CSU portion of the 11th grade test and score well on it are exempt from the CSU-required mathematics and English placement tests, as long as they continue to take challenging courses in their senior year of high school. The modified 11th grade exams also serve to alert students if they need additional preparation for college in time to adjust their senior year coursework.

Texas is another example. Since fall 2003, the Texas Success Initiative — created by the state Legislature and supported by the Texas Higher Education Coordinating Board — has allowed scores on the state 11th grade test (the TAKS) to be used for placement into freshman composition and mathematics courses. This is the same 11th grade exam that is used for graduation from high school. Students need to earn a certain score to graduate and a higher score to enter credit-bearing courses in Texas postsecondary institutions.

Of course, this strategy would be very difficult to pursue in states with 10th grade tests or tests that measure minimum, rather than college readiness, standards. It is more appropriate for states that give 11th grade tests, such as California and Texas, so they can measure more advanced content.

**Use existing college placement tests for diagnostic purposes only.** Some states, such as Ohio, are making their college placement tests available for students to take voluntarily in high school. These exams provide information to high school students about their readiness for credit-bearing, first-year college courses and allow teachers to work with students to address learning gaps in their senior year so that students are better prepared when they get to college.

This use of placement tests as an early signal of readiness makes sense, particularly if it can be used to engage

students who might not otherwise be considering college and to shore up students' skills. It is not, however, a substitute for building more comprehensive measures of college and work readiness into the state high school accountability system. The math placement tests reviewed by Achieve are more narrowly focused on algebra than the admissions tests, which measure a broader balance of content. They also tend to be less rigorous than admissions tests, as they fail to tap a number of the higher-level skills found in the ADP benchmarks. As a result, if these tests are used for school accountability purposes, they could narrow and water down the curriculum. Therefore, Achieve does not recommend that states consider incorporating these assessments into their high school accountability systems without supplementation or adaptation.

## The Role of Higher Education Policymakers

Postsecondary leaders have a critical role to play in developing a coherent system of high school assessments capable of measuring college readiness. In addition, although colleges and universities will continue to use admissions and placement tests for the important purposes they serve, they should not allow these tests to serve as a de facto standard of college readiness. Rather, they should clearly communicate their expectations and work with the K–12 leaders and the testing community to help ensure that college admissions, college placement and high school tests are more aligned with these expectations. Over time, as high school tests become better indicators of readiness for college, institutions should consider using them as a factor in placement decisions, streamlining the transition to college and reducing the number of tests students take overall.

**Clearly define expectations for incoming students.** Through ADP, Achieve has discovered that postsecondary faculty have a fairly consistent view of the mathematics and communications skills that incoming freshmen need to be successful in first-year, credit-bearing college courses. In mathematics, faculty reported that students

need knowledge and skills typically learned in a four-year mathematics sequence including Algebra I and II, Geometry, data analysis, and statistics. They also need sophisticated mathematical reasoning and problem-solving skills. In English, faculty stated that students need to be able to write and communicate effectively to different audiences, they need to be able to understand and analyze various types of complex informational texts, and they need to apply sophisticated analytic and reasoning skills. However, these expectations are rarely articulated publicly, nor are they reflected in the placement tests analyzed by Achieve; they reside in professors' minds and are reflected in their syllabi and course assignments. These expectations need to become more widely known by and communicated to K–12 educators, students and their parents.

Postsecondary systems and institutions must be clearer and more transparent about what it means to be college ready so that the K–12 system has something tangible to aim for. In each state, colleges and universities — in partnership with the K–12 system — should collaborate to define and publicize statewide standards for transition from high school to college. These standards should be pegged to the knowledge and skills high school graduates need to succeed in credit-bearing, non-remedial courses. They must be concretely articulated, much like K–12 academic content standards, so that they do not simply become represented by a score on an admissions or a placement test. And, as stated earlier, higher education should align admissions and placement tests to these articulated readiness standards.

Work to align expectations and define new standards for transition to college is under way in a growing number of states. These efforts hold great promise and should lead to more coherent and aligned assessments.

**Scrutinize placement tests given to incoming students to determine eligibility for entry into credit-bearing courses.** Once postsecondary institutions have clearly defined their expectations, it is important that they examine their existing placement tests (and admissions

tests, if they are used to make placement decisions) to see whether they measure the full range of content and skills important for success in college. Often, placement tests have been in place for a long time, either selected or created by previous faculty and rarely re-examined. In some cases, the tests may be pegged to the existing level of preparation of many students entering open admission or broad access institutions, rather than to the level they will need to be fully prepared for success once they arrive.

To ensure that placement tests are relevant and aligned with today's expectations, institutions should convene faculty from across the arts and sciences to analyze the placement tests to see whether they measure the content and skills necessary to enter and succeed in college — not just to avoid remediation. The faculty also should look at the cut scores on the tests to see whether they set meaningful targets for students. If, as Achieve found, the tests do not fully measure the rigor and breadth of college readiness expectations, college faculty should consider commissioning or developing placement tests that do. Although it is likely that there will always be a need for tests that determine whether remediation is necessary, colleges should work to ensure that the tests used to indicate readiness for credit-bearing courses actually reflect the real demands of what it takes to succeed in those courses. By setting a clear and accurate target, such tests can help improve student preparation in a way that less demanding tests cannot.

**Collaborate with K–12 on the development of high school tests that fully reflect the breadth and rigor of the content needed for success in postsecondary education.** In addition to incorporating more challenging placement tests, colleges also should work with K–12 to develop stronger high school tests. If states are building systems of end-of-course tests, postsecondary institutions should collaborate with them on the full range of tests — not just those at the end of high school, such as Algebra II or 11th grade English — to ensure that they cumulatively measure what it takes to succeed in college.

Colleges should use the results on a subset of the tests to place students in courses appropriate to their knowledge and skills. In addition, colleges should align their cut scores and establish a single standard that applies no matter where a student decides to go to college. Coordination of this type between the higher education and K–12 systems would have two distinct benefits: It would reduce confusion about what is required for college-level work, and it would do so in a way that reduces the number of tests a student takes.

**Support the development and use of K–16 longitudinal data systems.** Institutions of higher education need to work with K–12 systems to develop effective data systems that follow students from high school to college.

Without data on how students perform once they arrive in college — for example, their need for remediation and their success in first-year courses — no one can be sure which high school programs are effective and which need improvement. Because the consequences of high school education bloom several years after students have graduated, it is important that states follow the progress of students as they move through their education. An effective longitudinal data system would include elements such as high school grades and assessment results, college course-taking patterns, success in first-year college courses, and persistence and completion rates. It goes without saying that such a system should be able to capture these data in a manner that protects student privacy. Such confidentiality will be critical as states move forward.



*Achieve launched this study to help inform the decisions states are making about high school assessments by providing greater insights into the world of college admissions and placement testing. We hope that, armed with better information about the nature of these transition tests, states can make better decisions about the kinds of tests to employ to help ensure that all students graduate prepared to succeed beyond high school.*

## Appendix A: Tests Analyzed by Achieve

The following provides detailed information on each of the tests analyzed for this study. With the exception of the ACCUPLACER and COMPASS, Achieve analyzed the tests in their entirety. In the case of ACCUPLACER and COMPASS — which are computer-adaptive tests — Achieve analyzed a stratified sample of items that represents a large subset of the broader pool of items.

### National Admissions Tests

**ACT Assessment.** Begun in 1959 as a project of the American College Testing Program, the ACT Assessment is a curriculum-based achievement test that measures student knowledge and skills in four areas: English, reading, mathematics and science reasoning. An optional writing test measures skill in writing a short essay. The ACT consists of four multiple-choice tests — one in each area — with each scored on a scale of one to 36; the composite score reported by ACT is the average of the four test scores. The ACT is explicitly curriculum-based, designed to assess what students have learned in their high school courses.<sup>16</sup> Many colleges use ACT scores as surrogates for, or supplements to, other placement procedures. For this study, Achieve examined two separate forms of the ACT tests of English, reading, direct writing and mathematics. In addition, Achieve examined 22 items from the ACT science test that assess mathematical skills in contextual settings.

**SAT Reasoning Test.** Sponsored for more than seven decades by the College Board in New York City, the SAT Reasoning Test is intended to measure critical thinking skills required for academic success in college. Originally called the Scholastic Aptitude Test, the SAT historically consisted of two sections, verbal and mathematical, each scored on a scale of 200–800. (Each section is scaled so that 500 represents the average score with a standard deviation of 100 points.) Due to recent changes, the SAT currently consists of three sections: critical reading, which has sentence completion and passage-based questions; writing, which has multiple-choice questions and a written essay; and mathematics, which is based on

“topics from up through a third-year college preparatory course.”<sup>17</sup> Each section of the revised three-hour-and-45-minute SAT is scored on a scale of 200–800, with two writing subscores — one each for the multiple-choice and essay parts of the writing sections. Unlike most other tests examined in this study, the SAT mathematics test includes some items with student-constructed numerical answers. (These are encoded in a special grid for computer grading.) The College Board suggests that the SAT be used primarily for its intended purpose, namely admissions, but notes that SAT scores “may be helpful for identifying students in need of remedial training.”<sup>18</sup> Many colleges use SAT scores as criteria for placement or to exempt students from tests that are specifically designed for placement purposes. In this study, Achieve examined two separate forms each of the critical reading, writing and mathematics tests.

### National Placement Tests

**ACCUPLACER.** A computer-adaptive placement test sponsored by the College Board,<sup>19</sup> ACCUPLACER is delivered over the Internet and scored immediately. There are five assessments offered (reading comprehension, sentence skills, arithmetic, elementary algebra and college-level mathematics) and an optional essay section called WritePlacer. In regard to placement into introductory, credit-bearing mathematics courses, the institutions Achieve surveyed most commonly reported using elementary algebra and college-level mathematics. In a computer-adaptive environment, the selection and sequencing of questions presented to each student varies according to how students answered previous questions. ACCUPLACER can be set up to apply an institution’s

placement rules immediately and to produce a variety of diagnostic reports. It also allows colleges to edit problem banks to include institutional-specific questions. In this study, Achieve analyzed a large sample of items (stratified by domain and difficulty level) from ACCUPLACER's reading comprehension, sentence skills, elementary algebra and college-level mathematics tests. On the reading comprehension and the sentence skills tests, Achieve analyzed 90 and 86 items respectively; students answer 20 items on each of these tests. On the elementary algebra and college-level mathematics tests, Achieve analyzed 176 and 125 items respectively; students take 12 items on the elementary algebra test and 20 items on the college-level mathematics test. Because this is a computer-adaptive test, students taking the test answer different sets of questions. "The first question presented is of average difficulty and is chosen randomly from several starter questions of the same level of difficulty. If a student answers the question incorrectly, the next question to be administered is chosen from a group of easier questions, whereas a correct answer will cause the next question to be somewhat more difficult."<sup>20</sup>

**COMPASS.** Developed by ACT,<sup>21</sup> the COMPASS assessments are computer-adaptive placement tests designed to assist colleges in placing students into appropriate introductory or developmental (remedial) courses. The COMPASS tests produce scores in reading, writing (usage, mechanics), numerical skills (prealgebra), algebra, college algebra, geometry and trigonometry. The system also includes an electronically scored direct writing assessment called e-Write. Colleges that use COMPASS can select which tests are administered, as well as their order, length and cut scores. COMPASS is available as an onsite system and, recently, for delivery over the Internet. In this study, Achieve analyzed a large sample of items (stratified by domain and difficulty level) from four COMPASS tests: reading, writing, algebra and college algebra. Achieve analyzed 117 reading test items, 238 writing test items, 120 algebra test items and 100 college algebra test items. Students take varying numbers of test items and on average take 12 to 29 items in reading, 23 to 52 items in writing, eight to 20 items in algebra and eight to 20 items in college algebra. The number of test items fluctuates because

this is a computer-adaptive test with varying numbers of questions depending on the difficulty of the test. COMPASS draws from a pool of 2,400 test items, and the computer-adaptive format "adjusts the difficulty level to the skills of the individual student, eliminating items that are too easy or too difficult and that contribute little to the measurement."<sup>22</sup>

## State or Systemwide Tests

**California State University.** The Early Assessment Program (EAP) of California State University (CSU) is used as one of many placement tests in determining course placement. The EAP test is administered to 11th grade students in California by the California Department of Education for use at CSU in determining whether a student needs a course in remedial reading. Students also may avoid remedial reading with a score of 550 or higher on the SAT I verbal section, a score of 680 or above on the SAT II Writing Test, a score of 24 or higher on the ACT Assessment English test, a score of three or higher on the Advanced Placement Language and Composition or Literature and Composition tests, or previous college-bearing credit (with a grade of C or higher) in a course that satisfies the requirement in English composition. Achieve reviewed the writing portion of the EAP. It consists of a 45-minute essay on a topic given at the time of the test. Students are asked to explain the author's argument and discuss the extent to which they agree or disagree with the author's views.

**Texas Higher Education Assessment.** Since 1989, the Texas Higher Education Assessment (THEA) has provided Texas institutions of higher education with tests of reading, writing and mathematics designed to assess skills that entering freshman-level students should have if they are to perform effectively in undergraduate certificate or degree programs in Texas public colleges or universities. The test is offered in three forms: a paper-and-pencil test (which Achieve analyzed), a computer-administered test, and a "quick test" administered by colleges and universities to their entering students. The THEA writing test includes a brief writing sample. Test sessions last five hours, during which students can work on as few as one and as many as three sections of the test.

**Mathematics Placement Test (Washington).** Administered since 1984, Washington state’s Mathematics Placement Test was developed by mathematics faculty at Washington’s public baccalaureate institutions to assist students and their academic advisers in selecting first-year mathematics courses. The test is available at two levels. The Intermediate Math Placement Test, intended for students who have fewer than three or four years of high school mathematics, consists of 35 items covering elementary and intermediate algebra and the first part of Precalculus. The Advanced Math Placement Test is intended for students who have taken at least three or four years of high school mathematics and covers intermediate algebra and a full year of precalculus.

## Institution-Level Tests

**Louisiana State University.** Achieve considered two placement tests given by Louisiana State University (LSU) — one in writing, the other in mathematics. Incoming freshmen at LSU may challenge their placement into an entry-level English course — determined on the basis of ACT, SAT or Advanced Placement scores — by taking part in LSU’s On-Line Challenge Program, a 1,200–1,500 word essay submitted via the Internet. Students are encouraged to write multiple drafts before sending in the final essay, which they have three days to complete. The College Algebra Placement/Credit Exam is an optional test consisting of 25 multiple-choice questions. Initial placement in LSU mathematics courses is based on the mathematics section of the ACT or the SAT. A sufficient score on the ACT or SAT allows first-year students into College Algebra. However, students have the option of taking the LSU College Algebra Placement/Credit Exam either to improve their initial placement or to earn credit for and placement out of College Algebra. By validating credit for College Algebra — the first credit-bearing course — rather than merely verifying readiness for this course, the LSU test is more advanced than most others in this study.

**Mathematical Association of America Placement Tests.** Beginning in 1977, the Mathematical Association of America (MAA) developed a suite of placement tests intended to assist mathematics departments in

developing effective placement procedures. These tests covered arithmetic and basic skills, basic algebra, algebra, advanced algebra, trigonometry and elementary functions, and calculus readiness; most were offered in both calculator and non-calculator versions. Recently, MAA contracted with MapleSoft to develop computer versions of these tests. In this study, Achieve analyzed the paper-and-pencil, non-calculator versions of MAA’s algebra and calculus readiness tests. The MAA test is categorized as an “institution test” because it is used by individual institutions (rather than by systems) with the option of customizing the test to meet the needs of their programs.

**University of Maryland–Baltimore County.** Entering first-year students at the University of Maryland–Baltimore County must write an online English Composition Placement Essay. The scores on the test determine a student’s placement in an English composition course. The test can be administered to a student only once, and students are not allowed to appeal the results of the score of the essay or the course in which the student is placed.<sup>23</sup> Students have 40 minutes to complete the essay, which consists of writing on a topic given at the time of the test.

**University of Maryland–College Park.** During orientation at the University of Maryland–College Park, each new undergraduate takes the Mathematics Placement Test, which covers arithmetic, as well as content typically found in courses such as Algebra I, Algebra II and Trigonometry. The results are used to advise students on the appropriate mathematics course in which to enroll. Students who score poorly may take a non-credit survey of Algebra I and Algebra II for a special fee.<sup>24</sup> Students who fail to place into the course they desire are allowed to retake the placement test once during each semester.

**University of Massachusetts–Amherst.** Students at the University of Massachusetts–Amherst may either enroll in an entry-level writing course or take the Writing Placement Exam of the school’s Writing Program to place into a higher-level course. The 60-minute exam consists of an essay in which the student is asked to write on one of two topics given. Students are graded by eight Writing Program teachers, and the essay is graded on a

student's ability to demonstrate understanding of the passage, organize and focus on a thesis, develop the thesis, and exhibit an understanding of correct grammar and sentence structure.<sup>25</sup>

**University of Minnesota.** To help determine their placement in mathematics, most students (except those who have a previous college credit in Calculus) entering the University of Minnesota take one of two mathematics placement tests: the College Math Readiness Test or the Calculus Readiness Test. Which test a student takes is determined by the student's ACT score or, in some cases, the courses he or she took in high school. Each test is 60 minutes and consists of 30 multiple-choice items; calculators are not permitted on the test. Students take the test via the Internet. Although results on the tests do not guarantee placement in a specific course, they are used to help students and their advisers determine the appropriate level of first-year placement.

**The College of New Jersey.** An incoming student at The College of New Jersey who does not meet a threshold score on the SAT, the Advanced Placement English or history tests, or the college's Writing Exemption and Placement Exam is required to take an entry-level writing course. On the Writing Exemption and Placement Exam, students are scored on a six-point rubric and are placed accordingly.<sup>26</sup> The exam consists of an essay written on a word processor at a campus computer lab. The topic for the essay comes from a newspaper article, and students have 60 minutes to read the article, plan a response and write the essay.

**Purdue University–North Central.** The Student Assessment and Measurement system at Purdue's North Central campus is a series of three tests in English, mathematics and reading that places a sizable subset of incoming students into entry-level courses.<sup>27</sup> All students who graduated in the lower half of their high school class or have a GED are required to take all three tests; others are required to take specific tests based on a review of their high school record. For this study, Achieve looked at the

Form D mathematics test and the English Composition Placement Essay. The mathematics test is taken primarily by students who had less than three years of academic mathematics in high school or have been out of high school for several years. Their score places them into one of two lower-level algebra classes, neither of which counts toward college mathematics credit. The English Composition Placement Essay is a 45-minute writing assignment that consists of at least two single-spaced pages on an assigned topic given to students at the time of the test. On the basis of these results, students are placed into one of two lower-level English composition courses.

**Temple University.** Prior to their first semester of study, all entering students at Temple University in Philadelphia must take placement tests in English and mathematics. The English Placement Test is required for all freshmen and for transfer students who are not transferring a credit-bearing, college-level writing course. The test consists of an essay component (which Achieve analyzed) and a multiple-choice section that tests skills related to sentence structure, conventions of written English and reading comprehension. For the essay, students are asked to analyze an author's position on an issue and offer their own opinion. Scores on each section are used to aid in placement decisions. The Mathematics Placement Test is a three-part test consisting of 50 multiple-choice items beginning with elementary computation (whole numbers, fractions and ratios), progressing through algebra and concluding with calculus readiness. Placement depends on achievement levels on each part of the exam. The test analyzed for this study devotes the majority of questions (85 percent) in approximately equal parts to elementary computation and algebra. A revised test, to be introduced next year, will reduce the proportion of elementary questions and increase the proportion devoted to algebra.

**Youngstown State University.** Until recently, Youngstown State University (YSU) used a writing Composition Placement Test for incoming freshmen to determine placement in English courses. In the last year,

YSU switched to using the COMPASS Reading test.<sup>28</sup> Achieve reviewed the Composition Placement Test prior to this switch. Incoming students who did not meet a threshold on the ACT or SAT were preplaced into entry-level English courses. Such students could either accept their course placement or attempt to place into a

different course by taking the Composition Placement Test. The exam consisted of a 40-minute handwritten essay. During the exam, students were presented with a topic and then wrote an essay where they took a stance on the topic issue and demonstrated their understanding of the ideas expressed in the topic.

#### OVERVIEW OF MATHEMATICS TESTS ANALYZED BY ACHIEVE (in alphabetical order)

Name of Test	Form	Version Date	Multiple Choice	Constructed Response	Total Items	Calculator	Timing (Minutes)	Type
ACCUPLACER — Elementary Algebra	N/A	N/A	176	0	176*	Depends	None	National Placement
	<i>A computer-adaptive test; the test is undated. Student may use calculator when question allows it. *Represents number of test items reviewed. Students taking ACCUPLACER answer 12 test questions.</i>							
ACCUPLACER — College Level Mathematics	N/A	N/A	125	0	125*	Depends	None	National Placement
	<i>A computer-adaptive test; the test is undated. Student may use calculator when question allows it. *Represents number of test items reviewed. Students taking ACCUPLACER answer 20 test questions.</i>							
ACT Assessment — Math	60E/ 61D	2004– 05	60	0	60	Yes	60	National Admissions
COMPASS — Algebra	N/A	N/A	120	0	120*	Yes	None	National Placement
	<i>A computer-adaptive test. *Represents number of test items reviewed. Students taking COMPASS answer varying numbers of test questions averaging eight to 20 items, depending on a wide variety of factors.</i>							
COMPASS — College Algebra	N/A	N/A	100	0	100*	Yes	None	National Placement
	<i>A computer-adaptive test. *Represents number of test items reviewed. Students taking COMPASS answer varying numbers of test questions averaging eight to 20 items, depending on a wide variety of factors.</i>							
Louisiana State University College Algebra Placement/ Credit Exam	N/A	2002	25	0	25	No	None	Institution Level
Mathematical Association of America Algebra Placement Test	4H	1997	32	0	32	No*	40	Institution Level
	<i>*A calculator version also exists.</i>							

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Name of Test	Form	Version Date	Multiple Choice	Constructed Response	Total Items	Calculator	Timing (Minutes)	Type
Mathematical Association of America Calculus Readiness Placement Test	1G	1994	25	0	25	No*	30	Institution Level
	<i>*A calculator version also exists.</i>							
Purdue University–North Central Student Assessment and Measurement Placement Test	D	2006	40	0	40	No	45	Institution Level
SAT Reasoning Test — Math	4BSA08/ 4BSA01	2005	44	10	54	Graphing	70	National Admissions
	<i>In three sections: two are multiple choice and one is a mixture of multiple choice and constructed response.</i>							
Temple University Mathematics Placement Test	N/A	12/2005	50	0	50	No	60	Institution Level
Texas Higher Education Assessment	X	2003	53	0	53	4-Function	300*	Statewide
	<i>*Test sessions last five hours; a student may also use this time to complete either or both of the reading and writing sections of the test.</i>							
University of Maryland–College Park Math Placement Test	N/A	2003	63	0	63	Non-graphing	70	Institution Level
University of Minnesota Calculus Readiness Test	N/A	1995	30	0	30	No	60	Institution Level
University of Minnesota College Math Readiness Test	N/A	1995	30	0	30	No	60	Institution Level
Washington Intermediate Mathematics Placement Test	N/A	2000	35	0	35	No	60	Statewide
Washington Advanced Mathematics Placement Test	N/A	2000	30	0	30	No	60	Statewide

**OVERVIEW OF ENGLISH LANGUAGE ARTS TESTS ANALYZED BY ACHIEVE** (in alphabetical order)

Name of Test	Form	Version Date	Reading Items	Language (Indirect Writing) Items	Total Items	Direct Writing	Timing (Minutes)	Type
ACCUPLACER — Reading Composition	N/A	N/A	90*	0	90	N/A	None	National Placement
	<i>A computer-adaptive test. *Represents number of test items reviewed. Students taking ACCUPLACER answer 20 test questions.</i>							
ACCUPLACER — Sentence Skills	N/A	N/A	0	86*	86	N/A	None	National Placement
	<i>A computer-adaptive test. *Represents number of test items reviewed. Students taking ACCUPLACER answer 20 test questions.</i>							
ACT Assessment — English and Reading	60E/61D	2004–05	40	75	115	N/A	80	National Admissions
	<i>Seventy-five language questions in 45 minutes and 40 reading questions in 35 minutes.</i>							
ACT Assessment — Writing	10G	2005	N/A	N/A	N/A	Essay	30	National Admissions
California State University Early Assessment Program — Direct Writing	N/A	2005	N/A	N/A	N/A	Essay	45	Statewide
The College of New Jersey Writing Exemption and Placement Test	N/A	2006	N/A	N/A	N/A	Essay	60	Institution Level
COMPASS — Reading and Writing Skills	N/A	N/A	117*	238*	455	N/A	None	National Placement
	<i>A computer-adaptive test. *Represents number of test items reviewed. Students taking COMPASS take varying numbers of test questions. Students average 12 to 29 items in reading and 23 to 52 items in writing, depending on a wide variety of factors.</i>							
COMPASS e-Write	N/A	N/A	N/A	N/A	N/A	Essay	None	National Placement
Louisiana State University Writing Test	N/A	2006	N/A	N/A	N/A	1,200- to 1,500-word essay	None	Institution Level
	<i>Students read preselected essays and then write on a specified topic.</i>							

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Name of Test	Form	Version Date	Reading Items	Language (Indirect Writing) Items	Total Items	Direct Writing	Timing (Minutes)	Type
Purdue University–North Central English Composition Placement Essay	Topics A–P	2006	N/A	N/A	N/A	Two-page, single-spaced essay	45	Institution Level
SAT Reasoning Test — Critical Reading and Writing	4BSA08/ 4BSA01	2005	67	49	116	Essay	145	National Admissions
<i>Three critical reading sections, two at 25 minutes and one at 20 minutes. Two indirect writing sections, one with 35 questions and one with 14 questions, both at 25 minutes. One essay section is 25 minutes.</i>								
Temple University English Placement Test — Essay Component	W06-J/ W06-K	12/2005	N/A	N/A	N/A	350-word essays*	60	Institution Level
<i>*Student chooses one of two essay topics from two sets of topics. Students may prepare notes on the essay and bring them on the day of the test.</i>								
Texas Higher Education Assessment	X	2003	42	41	83	300- to 600-word essay	300*	Statewide
<i>*Test sessions last five hours, during which students may complete one or all sections of the test. The writing and reading sections of this test might be completed in separate five-hour sessions. The writing section includes multiple-choice writing questions and the essay.</i>								
University of Maryland–Baltimore County English Composition Placement Essay	N/A	2003	N/A	N/A	N/A	Essay	40	Institution Level
University of Massachusetts–Amherst Writing Placement Exam	N/A	2006	N/A	N/A	N/A	Essay	60	Institution Level
<i>Students write one essay from two given topics.</i>								
Youngstown State University Composition Placement Test	N/A	2006	N/A	N/A	N/A	Essay	40	Institution Level

## Appendix B: Reading Methodology

To analyze admissions and placement tests in reading, each item was coded according to a range of lenses designed to capture different characteristics of individual test items and the tests as a whole. To ensure the reliability of the data, at least two experts trained in the use of the criteria coded each test. Those experts reconciled any differences in coding before the data were analyzed. The following are descriptions of the various criteria.

### Content Expectations of an Item

To identify the content on admissions and placement tests of reading, Achieve augmented the framework that it used in its study of state exit exams in 2004 (*Do Graduation Tests Measure Up?*). What follows are descriptions of the original framework and the augmentations applied for this study.

For the 2004 study of state exit exams, Achieve adapted a comprehensive listing of the domain of reading, originally developed by the Council of Chief State School Officers (CCSSO) in collaboration with several states for its Survey of Enacted Curriculum. The list was intended to fully encompass all topics addressed in reading classes from the primary to the secondary level. Based on this framework, Achieve developed a taxonomy that included all the aspects of reading described in state standards — and therefore targeted on state tests — to describe as accurately as possible the content or topic that each item measured. The listing used in Achieve’s study was revised to more clearly reflect the topics addressed by test items at the secondary levels. Because the list was originally developed to cover all grades from kindergarten through grade 12, some codes that were irrelevant for higher-level tests have been deleted. In addition, the listing has been reorganized to clarify the relationship of the elements.

In Achieve’s 2004 study, the major reporting categories for reading were as follows:

- Basic comprehension (includes word definitions, main idea, theme and purpose)
- Literary topics (includes figurative language, poetic techniques, plot and character)

- Informational topics (includes structure, evidence and technical elements)
- Critical reading (includes appeals to authority, reason and emotion; validity and significance of assertion or argument; style in relation to purpose; and development and application of critical criteria)

For the current study of admissions and placement tests, Achieve regrouped some of the codes into more discrete categories to streamline reporting. For example, argument and assertion, formerly under critical reading, are both aspects of persuasive texts and are now grouped under informational/persuasive elements. Codes also were realigned into groupings that reflect all of the elements within them. For example, all the literary elements have been grouped together — narrative elements with the author’s craft elements. Additionally, some elements formerly included in the critical thinking category were deleted because they combined references to both content and cognitive demand, such as determining the validity of an assertion. Redundancies in the list also were eliminated.

This revision yields four revised major categories of codes for reading:

- Vocabulary (includes word definitions)
- General comprehension (includes purpose and main idea)
- Literary elements (includes figurative language, plot and character, theme, setting, and poetic language)

- Informational/persuasive elements (includes organization and structure, assertions, evidence, and technical elements)

## Cognitive Demand

In its 2004 study of state exit exams, Achieve used a taxonomy of performance expectations derived from CCSSO's description of performances in its Survey of Enacted Curriculum and influenced by Achieve's assessments-to-standards alignment protocol. This taxonomy was categorized into four levels of cognitive demand of reading items. The four levels provided information on the kind and complexity of reasoning required of students, ranging from simple recall of information to complex reasoning skills. The former categories were as follows:

1. Literal recall
2. Infer
3. Explain
4. Analyze

Some revisions have been made to the former categories, using a revised taxonomy based on Bloom that was developed by Anderson and Krathwohl in 2001.<sup>29</sup> The revised taxonomy retains much of Bloom's 1956 model. However, the original Bloom taxonomy combined content and performance while the revised taxonomy separates the content from the performance. Several of the original codes in the former Achieve cognitive demand scale also included content topics as well as processes, making the codes for some items redundant, such as "identifying main ideas or theme," where both main idea and theme are now coded with an appropriate content code. Additionally, the revised taxonomy differentiates low-level inference (called interpreting) from more complex inference (called inferring). Thus, the revised taxonomy appears to allow a cleaner, more specific categorization of test items' cognitive demands.

The revised scale retains some of the same headings as the original, with some expansion that allows for a better discrimination among cognitive processes typically assessed in reading tests:

1. Recall (includes locating and recognizing)
2. Low inference (includes paraphrasing and generalizing)
3. High inference (includes concluding, comparing and illustrating)
4. Analysis (includes discriminating and outlining)
5. Evaluating (includes critiquing)
6. Creating (includes designing and hypothesizing)

Categories five (evaluating) and six (creating) are not characteristic of items found on large-scale, on-demand state tests and are therefore not included in the related data charts.

## Demand of Reading Passages

Achieve analyzed the difficulty level of each reading passage according to a six-point scale ranging from straightforward text to more complex, challenging and abstract text. To develop the scale, reading experts examined a large collection of reading passages that appear on tests students take in the transition from high school to college. Using characteristics such as specialization of vocabulary, predictability of text organization, complexity of syntax, level of abstractness, familiarity of the topic and number of concepts introduced in the passage, they defined six levels of reading demand. Generally speaking, Level 1 represents upper-elementary reading levels, Levels 2 and 3 represent middle school-level reading, Level 4 represents early-stage high school reading, and Levels 5 and 6 represent late-stage high school reading.

Elements for consideration of reading passage difficulty include:

- **Structure**
  - Narration
  - Description
  - Explanation
  - Instruction
  - Argumentation

## ■ Vocabulary

- Poetic
- Idiomatic
- Technical
- Unusual/unfamiliar

## ■ Syntax/connectives

- Dialogue
- Sentence structure

## ■ Characters/ideas

## ■ Narrator/stance

## ■ Theme/message/moral

## ■ Literary effects

- Foreshadowing
- Flashback
- Irony

## ■ Familiarity

- Topic
- Place
- Time period

## Reading Rigor Index

The difficulty of an item on a reading test is determined both by the cognitive demand of the question and by the complexity of the reading passages the question addresses. To capture this important interplay, Achieve developed a Reading Rigor Index (RRI) that combines the cognitive level of a question with the difficulty level of the passage to which the question refers. Specifically, the RRI of a reading item is defined to be the sum of the cognitive demand and the reading demand levels of the item. Since the cognitive demand scale ranges from one to five, and the reading passage demand scale from one to six, the RRI has 10 levels ranging from two to 11. The low end of the scale reflects less demanding questions about less complex reading passages; the high end reflects challenging questions about complex texts.

## Genre

In its 2004 study of state exit exams, Achieve coded the reading passages into three categories: narrative, informational and visual media. For the purposes of this study, the consideration of genre was informed by the National Assessment of Educational Progress 2009 Reading Framework that recommends two types of texts be included on the assessment: literary texts, which include fiction, literary non-fiction and poetry; and informational texts, which include exposition, argumentation and persuasive text, and procedural text and documents. These genres were coded into seven categories as shown below.

### ■ Literary text

- Short stories/novel excerpts
- Poetry
- Drama

### ■ Literary non-fiction

- Essays
- Autobiographies/biographies
- Literary speeches

### ■ Exposition

- News stories
- Textbooks/informational articles

### ■ Argumentation/persuasive

- Editorials
- Political speeches
- Persuasive essays

### ■ Procedural text/documents

- Manuals
- Directions

### ■ Media

- Photographs
- Advertisements

### ■ Graphics

- Tables
- Maps

## Appendix C: Writing Methodology

To analyze admissions and placement tests in writing, Achieve reviewed two types of questions: multiple-choice questions, which are indirect measures of writing ability, and writing prompts and supporting materials, which are direct measures of writing ability.

### Indirect Writing Methodology

Multiple-choice questions (indirect measures of writing ability) were coded for three elements: content, cognitive demand and level of challenge.

#### Content

To analyze the content focus of indirect writing items in its 2004 study of state exit exams (*Do Graduation Tests Measure Up?*), Achieve adapted the content descriptions originally developed by the Council of Chief State School Officers (CCSSO). The resulting taxonomy was divided into three categories:

- Writing process
- Writing applications
- Language study

In the current study, it was necessary to revisit the categories to ensure that the items are clearly described in terms of their content targets. A major revision to content categories was in regard to the writing process category, which was originally conceived as describing what is *taught* in this area, such as prewriting, rather than what is typically *tested*, such as editing skills. This category was revised to more accurately capture the elements that are assessed commonly on high school and college exams; it was renamed “Strategies, Organization and Style” to better represent the elements now included in the category. The former language study category also was renamed as “Grammar, Usage, Mechanics” to more accurately describe the items coded to it. The writing applications category was not used in the analysis of multiple-choice items; therefore, it was deleted from the set. (Writing applications/direct writing assessments were evaluated holistically. See next section.)

The revised content categories for indirect writing items are as follows:

- **Strategies, Organization and Style**
  - Transitions and topic sentences
  - Adding/deleting details and evidence
  - Purpose — whole text
  - Sentence reorganization
  - Paragraph reorganization
  - Passage reorganization
  - Redundancies/wordiness
  - Word choice, tone
- **Grammar, Usage, Mechanics**
  - Spelling
  - Mechanics (capitalization, italicizing, underlining)
  - Punctuation (commas, apostrophes, semicolons, parentheses, dashes, end punctuation)
  - Sentence structure (connecting and transition words, subordinate/dependent clauses, sentence fragments, comma splices, run-on sentences, misplaced modifiers, parallelism)
  - Grammatical analysis (identification of word part, naming of word part)
  - Language usage (subject/verb agreement, pronoun/antecedent agreement, pronoun case, verb tense, adjective/adverb use, idioms, comparative/superlative modifiers)

#### Cognitive Demand

The scale for cognitive demand for indirect writing items is the same as that used for analyzing reading items. For example, Level 1 (recall) includes the skill of recognizing

or identifying, matching knowledge in long-term memory that is consistent with presented material (e.g., identify literary terms, correct sentence errors).

See page 49 for a full description.

### **Level of Challenge**

Achieve adapted the ACT Standards for Transition for Writing, which are based on evidence derived from student responses to indirect writing items. These descriptions of skills refer not only to the specific skill but also to its use in a simple-to-complex context. Divided into seven levels, these standards describe skills in such areas as topic development, organization, word choice, sentence structure, conventions of usage and punctuation. At each level within these categories are examples of skills at varying levels of complexity.

The categories include:

- Topic development in terms of purpose and focus
- Organization, unity and coherence
- Word choice in terms of style, tone, clarity and economy
- Sentence structure and formation
- Conventions of usage
- Conventions of punctuation
- Grammatical analysis

See page 52 for examples of the three most advanced levels of three of the above categories from the ACT Standards for Transition for Writing. (For a full description, see [www.act.org/standard/planact/english/index.html](http://www.act.org/standard/planact/english/index.html).)

## **Direct Writing Methodology**

### **Direct Writing Assessment**

The majority of admissions and placement tests of writing analyzed by Achieve measure writing directly by asking students to produce an essay. Unlike the reading

and indirect writing multiple-choice items that can be considered individually and the data aggregated to reveal trends, samples of student writing are given one score based on the scoring guides developed by each testing vendor or institution. Although an indirect writing item may focus on one independent skill such as word choice, the many and various parts that contribute to a piece of writing are considered interdependently.

The vast majority of direct writing assessments are composed of three parts:

- The writing prompt that sets the task for the writer and often describes aspects of the topic. In some cases a text or quote is provided for student response.
- Scoring guides or rubrics that describe the score levels, usually either four or six levels, listing for each level a description of the elements that characterize writing at that level.
- Anchor or sample papers that are examples of student responses to the topic at a variety of score levels.

For all of the direct writing assessments reviewed by Achieve, each of these elements was collected (as available) and examined. The prompts were characterized in terms of the type of writing they intended to elicit, such as personal narrative, defense of a point of view or description. The scoring guides then were reviewed to determine the kinds of criteria being examined by the raters of the assessments, with particular attention to the inclusion of reading criteria when such texts were provided as part of the writing task, and the inclusion of elements of argumentation when this type was specified in the writing task. Sample papers and commentary on them also were reviewed as an aid to exemplifying the elements in the respective scoring guides. Finally, the direct writing assessments were examined with attention to those skills most necessary for success in the college classroom as delineated in the ADP English benchmarks.

### Sentence Structure and Formation

- |         |                                                                                                                                                                                                     |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level 4 | Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence.                                                                                                 |
| Level 5 | Maintain a consistent and logical use of verb tense and pronoun person on the basis of information in the paragraph or essay as a whole.                                                            |
| Level 6 | Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses. |

### Organization, Unity and Coherence

- |         |                                                                                                                                                                               |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level 4 | Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward.                                     |
| Level 5 | Add a sentence to introduce or conclude a fairly complex paragraph.                                                                                                           |
| Level 6 | Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay. |

### Conventions of Usage

- |         |                                                                                                                                                                |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level 4 | Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences.                                                          |
| Level 5 | Ensure that a verb agrees with its subject in unusual situations (e.g., when the subject-verb order is inverted or when the subject is an indefinite pronoun). |
| Level 6 | Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas.                       |

## Appendix D: *Mathematics Methodology*

To analyze admissions and placement tests in mathematics, each item was coded according to a range of lenses designed to capture different characteristics of individual test items and the tests as a whole. Some of the criteria in English language arts and mathematics are similar, although there are important differences that stem from the distinct natures of the disciplines. To ensure the reliability of the data, at least two experts trained in the use of the criteria coded each test. Those experts reconciled any differences in coding before the data were analyzed. The following are summaries of the various criteria.

### Content Expectations of the Item

This lens compares the content of admissions and placement tests, using the Third International Mathematics and Science Study (TIMSS) Mathematics Framework adapted for use in this study by the U.S. TIMSS National Research Center at Michigan State University and Achieve experts. The framework provides a detailed, comprehensive taxonomy of mathematics content, organized at its most general levels according to the following major domains of mathematics:

- Number
- Algebra
- Geometry/measurement
- Data

These domains are further broken down into smaller units to allow for finer-grained comparisons. For example, geometry content is divided into a variety of categories such as two-dimensional geometry and measurement; three-dimensional geometry and measurement; transformations, congruence and similarity; and trigonometry. These categories are subdivided even further to facilitate a high degree of content specificity in coding. Item coders for this study assigned up to three primary content codes — and sometimes secondary content codes — to each test item. In many cases, the multiple content codes aligned with the same reporting category (e.g., geometry/measurement or algebra), but this was not always the case. Items that aligned with

more than one reporting category were re-examined, and one primary code was identified for reporting purposes.

The content codes included in the original TIMSS Mathematics Framework (used by Achieve for its study of state exit exams, *Do Graduation Tests Measure Up?*, in 2004) address content that ranges from that typically taught at the elementary school level to that taught at high school and even beyond. However, the taxonomy of content codes from the original TIMSS Mathematics Framework is most specific and detailed at the elementary, middle school and early high school levels. Therefore, for the purposes of this study, staff from the TIMSS National Research Center worked with Achieve staff and the trained coders to revise and refine the taxonomy to include content codes that would describe content in the full range of items being seen in the admission and placement exams included in this study, particularly content typically taught at the Algebra II level and beyond. For example, the original TIMSS Mathematics Framework lacked detail with respect to matrices, the variety of functions typically encountered in Algebra II and above (such as logarithmic, exponential and trigonometric functions), and more advanced trigonometry and analytic geometry (including polar coordinates and their graphs). Although not all tests analyzed for this study included such advanced content, it was essential to be able to identify and track it when it did occur. Therefore, codes corresponding to such content were assigned and reporting categories associated with each code were defined.

## Approximate Grade-Level Demand of Each Item

This lens provides a scale to rate the approximate grade level of the mathematics content included in tests according to the TIMSS International Grade Placement (IGP) index. This index was developed by the TIMSS National Research Center at Michigan State University to facilitate comparison of what is expected of students in the United States with what is expected of students in other countries.

The IGP index represents an average, or composite, among the 40 countries (other than the United States) that participated in the TIMSS and includes both high-performing and low-performing countries. An IGP is available for each content code within the original TIMSS Mathematics Framework and represents the average grade level in which a mathematics topic is focused on — the point at which the highest concentration of instruction on a topic occurs.

Using their nation’s content standards document, education ministry officials and curriculum specialists in each TIMSS country identified the grade level at which a math topic is introduced into the curriculum, focused on and completed. The IGP index is a weighted average of those determinations.

For those content codes that were added for purposes of this analysis, staff from the TIMSS National Research Center used their expertise in curricula from the various countries to approximate an average IGP index for each. An IGP index of 10.8, for example, should be understood to mean that the associated content topic is typically covered internationally toward the end of 10th grade. An average across all the IGP values associated with all of the items on a test gives a proxy rating for the difficulty of the content encountered on the test. For items that span more than one content category and were subsequently assigned a single code for reporting purposes, the retained content code tended to be that with the highest IGP value.

The following are examples of the IGP ratings of various mathematics topics.

Content Description	IGP Index
Concept of absolute value	6.8
Operations with real numbers and absolute values	8.8
Complex numbers	11.8
Inequalities and their graphical representations	9.8
Relations and their properties	6.8

## Cognitive Demand of Each Item

This lens provides a taxonomy for what students are expected to “do” with the mathematics content in an item. As was the case with content, a detailed catalog of performance codes was defined by the TIMSS National Research Center. For purposes of this study, the coders found the range of codes defined in the TIMSS Mathematics Framework adequately comprehensive, so no additional codes needed to be added. In the process of coding test items, coders often found it necessary to assign multiple performance codes to an item since students are often called upon to employ multiple skills in solving a problem — ranging from recalling basic facts to performing computations to developing generalizations.

For reporting purposes, the performance codes from the TIMSS Framework were collapsed into five categories that are somewhat hierarchical. The reporting schema devised for this analysis was based on a synthesis of the TIMSS Mathematics Framework and Achieve’s assessment-to-standards alignment protocol used in its standards alignment work. Sometimes the multiple performance codes assigned to an item spanned two or more reporting levels, and in those cases, the item was classified into the highest corresponding reporting category

to most accurately reflect the level of cognitive demand required of students to answer an item correctly. The reporting levels used to report the cognitive demand of items and for computing the average cognitive demand of tests are as follows:

- Level 1 includes demonstrating basic knowledge or recall of a fact or property.
- Level 2 includes routine problem solving that asks students to do such things as compute, graph, measure or apply a mathematical transformation.
- Level 3 includes estimating, comparing, classifying and using data to answer a question, or requiring students to make decisions that go beyond a routine problem-solving activity.
- Level 4 includes asking students to formulate a problem or to strategize or critique a solution method.
- Level 5 includes asking students to develop algorithms, generalizations, conjectures, justifications or proofs.

## Appendix E: ACT and College Board Descriptions of Tests

Following are descriptions provided by administrators of the national admissions and placement tests reviewed by Achieve in this study.

### ACT

The ACT Assessment is a timed instrument, with four discrete multiple-choice components and an optional direct writing component. It was designed to measure secondary instruction and college readiness and, as such, may be used for admissions and placement decisions. As an admissions instrument, the ACT Assessment focuses on broader domain decisions. COMPASS is an untimed, computer-adaptive program, with content components that mirror the ACT Assessment, but configurable features that target postsecondary requirements for efficient and effective college placement. As a placement instrument, the COMPASS focus, by definition, is on narrow domain decisions.

### ACT Assessment

The ACT® Assessment Program (AAP) is a comprehensive system of data collection, processing and reporting designed to assist high school students and postsecondary institutions in educational planning and decisionmaking. The ACT Assessment is one component of the AAP and was developed to assess high school students' educational development and their ability to complete college-level work. The ACT Assessment tests of educational development include multiple-choice tests that cover content knowledge within four skill areas: English, mathematics, reading and science. The optional Writing Test is a 30-minute essay test that measures students' writing skills in English. These tests are designed to measure skills that are acquired in secondary programs and that are most important for success in postsecondary education programs. ACT Assessment data are used by high schools in academic advising and counseling and by colleges for recruitment, admissions and course placement.

The ACT Assessment tests of educational development emphasize reasoning, analysis, problem solving and the integration of learning from various sources, as well as the application of these proficiencies to the kinds of tasks college students are expected to perform. The following is excerpted from the *ACT Assessment Technical Manual* (1997):

*Underlying the ACT Assessment tests of educational development is the belief that students' preparation for college is best assessed by measuring, as directly as possible, the academic skills that they will need to perform college-level work. The required academic skills can be most directly assessed by reproducing as faithfully as possible the complexity of college-level work. Therefore, the tests of educational development are designed to determine how skillfully students solve problems, grasp implied meanings, draw inferences, evaluate ideas and make judgments in subject-matter areas important to success in college.*

One of the primary purposes of the ACT Assessment is to assist in college admission decisions. However, given ongoing research and development related to aligning ACT Assessment content with secondary and postsecondary curricula and standards, the tests of educational development are also used by postsecondary institutions for course placement decisions and by secondary schools for program and curricula evaluation. The program- and curricula-evaluation use of the ACT Assessment is emerging as an important element in analyzing and addressing course rigor at the secondary level to ensure that students are appropriately prepared for postsecondary work. The ACT Assessment tests of educational development focus on the complexity of college-level

courses. This can be contrasted with other instruments that focus primarily on academic aptitude.

## **COMPASS**

The ACT Computer-Adaptive Placement Assessment and Support System (COMPASS™) is a comprehensive system that assists postsecondary institutions in placing students into appropriate courses. COMPASS offers placement and diagnostic tests in mathematics, reading and writing. COMPASS e-Write provides direct writing assessments used to evaluate student writing. The COMPASS program also includes placement testing for English as a Second Language (ESL) students. The ESL components include ESL Reading, ESL Grammar/Usage, ESL Listening and ESL e-Write — a direct writing assessment specifically designed for ESL students. COMPASS/ESL tests are untimed and computer adaptive.

The COMPASS program emerged as an outgrowth of the ACT Assessment to meet postsecondary institution needs specifically relating to course placement. While the ACT Assessment is widely used by four-year institutions, two-year institutions with open-enrollment options and highly fluid student populations have particular need for assistance with course placement. These postsecondary institutions want to focus testing as efficiently as possible to target specific disciplines and accommodate placement testing in a short period of time. COMPASS was developed to meet these needs — a computer-adaptive program that allows for testing specific subjects or sets of subjects based on institution-specific requirements and configurations.

The COMPASS program allows customization of the tests or sets of tests given (e.g., routing across subject areas, routing within subject areas, routing from placement tests to diagnostic tests). The COMPASS features can be used to test multiple subjects, including five discrete mathematics domains; set institution-specific cut scores; produce institution-specific placement scores and messages; and provide additional diagnostic testing if necessary. The COMPASS program was specifically developed to meet a myriad of postsecondary course

placement needs; however, the COMPASS test content was developed to mirror the content articulated within the ACT Assessment. The COMPASS mathematics domains (Numerical Skills/Prealgebra, Algebra, College Algebra, Geometry and Trigonometry) are identical to the ACT Assessment math domains. The COMPASS Writing Skills test includes items that are comparable in content to the ACT Assessment English component, although the computer-based format is specifically designed as an editing task. The COMPASS Reading test includes the same passage types (Prose Fiction, Humanities, Social Sciences and Natural Sciences) as found within the ACT Assessment reading component. The only COMPASS difference is that, at the request of client institutions, a fifth reading passage type (Practical Reading) was added.

In terms of course placement decisions, the COMPASS item pools align with all levels of postsecondary courses. For example the COMPASS Numerical Skills/Prealgebra pool aligns with Basic College Mathematics and Elementary Algebra courses; the COMPASS Algebra pool aligns with Elementary Algebra and Intermediate Algebra courses; and the COMPASS College Algebra pool aligns with Intermediate Algebra, College Algebra and Beginning Calculus courses. The COMPASS Writing Skills pool aligns with Developmental Writing, Freshman Composition and College Composition. The COMPASS Reading pool accommodates interdisciplinary reading requirements (i.e., reading across the curriculum) and aligns with reading courses such as Developmental Reading, Intermediate Reading, Reading in Literature, Reading in History and Critical Reading.

## **Find Out More**

The ACT Web site includes comprehensive research reports ([www.act.org/research/reports/](http://www.act.org/research/reports/)) dating from 1965 to the present related to numerous instruments, including the ACT Assessment and COMPASS. The ACT research reports are scholarly reports intended to inform the community of educational testing professionals. The ACT Web site also includes information briefs

([www.act.org/research/briefs/index.html](http://www.act.org/research/briefs/index.html)) intended to inform general audiences about educational issues highlighted through ACT research. In addition to the ACT research reports and information briefs, the ACT Web site includes detailed information on the ACT National Curriculum Survey® ([www.act.org/research/curricsurvey.html](http://www.act.org/research/curricsurvey.html)). The ACT National Curriculum Survey comprises a comprehensive review of state educational standards documents, survey of educators and consultation with content area experts across the curriculum. ACT invites readers to access ACT research reports, information briefs and curriculum survey specifics at the above links to obtain validity evidence for admission and course placement uses and in-depth information regarding ACT instruments and their purposes.

## College Board

### SAT

For almost 80 years, the SAT has been a vital tool for students and families as they begin the college admissions process and has helped admissions officers make fair and informed college admissions decisions. The most widely used and most rigorously researched college admissions test in history, the SAT Reasoning Test is a measure of the critical thinking skills students need for academic success in college. The SAT is strongly aligned with current curriculum and institutional practices in high school and college and assesses how well students analyze and solve problems — skills that are needed in college.

Typically taken by high school juniors and seniors, the SAT is a three-hour-and-45-minute test that measures critical reading, mathematical reasoning and writing skills that students have developed over time and that they need to be successful in college. The SAT consists of three sections: Critical Reading, which has sentence completion and passage-based questions; Mathematics, which is based on the math that college-bound students typically learn during their first three years of high school; and Writing, which has multiple-choice questions

and a written essay. By including the measure of writing skills, the SAT reinforces the importance of writing throughout a student's education and helps colleges make better admissions and placement decisions. The SAT with the writing section was administered for the first time in March 2005 for the class of 2006.

### ACCUPLACER

Colleges use ACCUPLACER test scores in conjunction with other information about a student's academic background to help determine the most appropriate course placements for students.

Most institutions have a number of developmental courses as well as college-level courses in which entering students are enrolled. Institutions have developed cut scores that are used to determine in which courses students can enroll. Students who do not attain the required score for placement into a college-level course are placed into a developmental course.

Many colleges have multiple levels of developmental courses, especially in mathematics. Because ACCUPLACER scores are used to place students into developmental courses as well as college-level courses, the tests' content areas cover a broad range of skills, not just prerequisite skills for entry into college-level courses.

There are three ACCUPLACER math tests: Arithmetic, Elementary Algebra and College Level Math. Most colleges use a combination of scores to place students into the various math courses offered on their campus.

- Students with low scores on the Arithmetic and Elementary Algebra tests are usually placed in a low-level developmental math class that deals with basic concepts of arithmetic.
- Students with scores in the middle to high range of Arithmetic but low scores on Elementary Algebra are usually placed into an Elementary Algebra class that deals with high school Algebra I concepts.

- Students with scores in the middle to high range on the Elementary Algebra test but low scores on the College Level Math test are generally placed into an Intermediate Algebra class that deals with high school Algebra II concepts.
- Students with scores in the middle range of College Level Math are generally placed into college-level math courses. Higher College Level Math test scores are used to place students into higher-level math courses depending on the prerequisite skills deemed necessary for success in the course.

Some colleges may use only Arithmetic and/or Elementary Algebra test scores for placement into some college-level courses such as Math for Liberal Arts Majors because the prerequisite skills for success are sufficiently measured by Arithmetic and/or Elementary Algebra tests.

The ACCUPLACER is a computer-adaptive test.<sup>30</sup> In an adaptive test there is a pool of test items that have been calibrated for difficulty and content. The first question presented is of average difficulty and is chosen randomly from several starter questions of the same level

of difficulty. If a student answers the question incorrectly, the next question to be administered is chosen from a group of easier questions, whereas a correct answer will cause the next question to be somewhat more difficult.

The test delivery system continues this process throughout the test, choosing the next question that is expected to yield the most information about examinees. To ensure that the test is balanced in content and that the kinds of questions presented do not differ greatly from one student to another except in difficulty, a number of constraints are built into the program. These constraints guide the selection of questions to be administered so that balance is achieved regardless of the skill level of the individual. Although fewer questions are presented for each test than would be given in a paper-and-pencil test, great accuracy is maintained with challenging tests corresponding to each student's skill level. Because of the adaptive nature of the tests, the questions presented on successive tests will vary, greatly reducing the effects of repeated practice on the tests. The elimination of repeated questions will be even more marked as time passes and the student's skills change.

## Endnotes

1. Achieve, Inc. *Do Graduation Tests Measure Up?* American Diploma Project, 2004. Subsequently, Achieve applied the same methodology to exit exams in Washington and Hawaii.
2. It is not the purpose of this study to analyze college admissions and placement policies or to critique the use of these tests by higher education institutions. Any discussions of higher education policies are included here only to explain how Achieve selected the tests included in the analysis.
3. Lutzer, et al. *Statistical Abstract of Undergraduate Programs in the Mathematical Sciences in the United States*. Fall 2000 CBMS Survey. Mathematical Association of America, 2002.
4. Chrest, Jason. "Computer-Adaptive Testing." *Encyclopedia of Educational Technology*. Bob Hoffman, Ed. <http://coe.sdsu.edu/eet/articles/cat/index.htm>.
5. Achieve, Inc. *Ready or Not: Creating a High School Diploma that Counts*. American Diploma Project, 2004. pp. 28–37.
6. Conley, David. "The Dilemma of Accountability in Higher Education in the U.S.: A Systems Perspective." Remarks to the National Commission on the Future of Higher Education, Feb. 7, 2006. [www.ed.gov/about/bdscomm/list/hiedfuture/1st-hearing/index.html](http://www.ed.gov/about/bdscomm/list/hiedfuture/1st-hearing/index.html).
7. Despite the brevity of its passages, the ACCUPLACER test was included in this genre analysis because the characteristics of informational or literary texts were evident.
8. National Assessment Governing Board. *Reading Framework for the 2009 National Assessment of Educational Progress*. 2005. [www.nagb.org/frameworks/reading\\_fw\\_08\\_05\\_prepub\\_edition.doc](http://www.nagb.org/frameworks/reading_fw_08_05_prepub_edition.doc).
9. Literal recall, low inference, high inference and analyze. "Low inference" refers to items that require a slight interpretation or an obvious generalization.
10. Formally,  $RRI = CD + RD - 1$ , where CD is a number between 1 and 5 representing cognitive demand and RD is a number between 1 and 6 representing reading demand. The RRI index varies from 1 to 10.
11. In some institutions, these courses are taught not by the English department but by departments or programs devoted to composition.
12. Achieve, Inc. *Ready or Not: Creating a High School Diploma that Counts*. American Diploma Project, 2004. p. 36. English benchmarks F2 ("Identify the main ideas of informational text and determine the essential elements that elaborate them") and F6 ("Identify interrelationships between and among ideas and concepts within a text, such as cause-and-effect relationships").
13. Courses with many different titles and goals fit in this category. Typically, these courses focus more on the nature and epistemology of mathematics than on practical applications that require proficiency in algebra.
14. The ACT includes a separate science section that relies heavily on students' abilities to analyze and interpret a variety of data displays. The total does not include the ACT science items because scores on the science portion of the ACT are not used for placement purposes. Placement decisions for mathematics courses are made on the basis of the mathematics score alone. With the inclusion of the ACT science items in this analysis, 15 percent of items assess data analysis and statistics.

15. Both the COMPASS and ACCUPLACER have an extensive pool of mathematics items that cover a wide range of content. COMPASS consists of five tests — Numerical Skills, Geometry, Algebra, Trigonometry and College Algebra — and ACCUPLACER consists of three — Arithmetic, Elementary Algebra and College Level Math. The purpose of this study was to analyze not the entire pool of items for these computer-adaptive tests, but only items from the sections most relevant to the placement of students in the most common entry-level, credit-bearing courses in mathematics — namely, College Algebra. Accordingly, Achieve focused on the test sections used by institutions for this specific purpose: COMPASS Algebra and ACCUPLACER Elementary Algebra. For more information, see discussion of computer-adaptive tests on pages 10–11 and 39–40.
16. ACT, Inc. “Facts about the ACT.” [www.act.org/news/aapfacts.html](http://www.act.org/news/aapfacts.html).
17. College Board. “SAT Reasoning Test.” [www.collegeboard.com/student/testing/sat/about/SATI.html](http://www.collegeboard.com/student/testing/sat/about/SATI.html).
18. College Board. “Predictive Placement Validity Studies.” *Advisement, Placement & Retention*. [www.collegeboard.com/highered/apr/aces/vhandbook/predictive.html](http://www.collegeboard.com/highered/apr/aces/vhandbook/predictive.html).
19. College Board. “ACCUPLACER.” *Advisement, Placement & Retention*. [www.collegeboard.com/highered/apr/accu/accu.html](http://www.collegeboard.com/highered/apr/accu/accu.html).
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22. ACT, Inc. “COMPASS Works to Your Advantage.” [www.act.org/compass/advant/index.html](http://www.act.org/compass/advant/index.html).
23. See [www.umbc.edu/orientation/freshmen/placement.html](http://www.umbc.edu/orientation/freshmen/placement.html).
24. See [www.math.umd.edu/undergraduate/credit/placement.shtml](http://www.math.umd.edu/undergraduate/credit/placement.shtml).
25. See [writingprogram.hfa.umass.edu/univ\\_writing\\_reqs/placement\\_tests.asp](http://writingprogram.hfa.umass.edu/univ_writing_reqs/placement_tests.asp).
26. See [www.tcnj.edu/~writing/students/placement/index.html](http://www.tcnj.edu/~writing/students/placement/index.html).
27. See [www.pnc.edu/learningcenter/pa.html](http://www.pnc.edu/learningcenter/pa.html).
28. See [www.ysu.edu/rdg-studyskills/crpt-compass.htm](http://www.ysu.edu/rdg-studyskills/crpt-compass.htm).
29. Anderson, Lorin W. and David Krathwohl, Eds. *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives*. New York: Addison Wesley Longman, 2001.
30. College Board. “ACCUPLACER OnLine Coordinator’s Guide.” Sept. 2006. p. 1.

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ACT, Inc.  
California State University  
College Board  
The College of New Jersey  
Louisiana State University  
Mathematical Association of America  
National Evaluation Systems, Inc.  
Purdue University–North Central  
Temple University  
Texas Education Agency  
University of Maryland–Baltimore County  
University of Maryland–College Park  
University of Massachusetts–Amherst  
University of Minnesota  
Washington Academic Placement Testing Program  
Youngstown State University

In addition, a number of institutions responded to Achieve’s survey on placement tests, which provided us with background information on placement policies.

Ball State University  
Bowie State University  
Bridgewater State College  
Camden County College  
Central State University  
Coppin State University  
Cuyahoga Community College District  
Florida International University  
Houston Community College  
Indiana Commission for Higher Education  
Indiana State University  
Indiana University  
Ivy Tech Community College of Indiana  
Miami Dade College  
Middlesex Community College  
Montclair State University  
Montgomery College  
Ohio Board of Regents  
Purdue University  
St. Petersburg College  
Salisbury University  
Sam Houston State University  
Shawnee State University  
Stephen F. Austin State University  
Sul Ross State University  
Towson University

University of Maryland–Baltimore County  
University of Massachusetts–Amherst  
University of South Florida  
University of Southern Indiana  
University of Texas at El Paso  
University System of Maryland  
Vincennes University  
Youngstown State University

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