Arizona Standard Setting for the ACT

July 6–7, 2022

Technical Report

Joann L. Moore and Shalini Kapoor, ACT, Inc.

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Introduction

ACT staff conducted an empirical standard setting at the request of the Arizona Department of Education (ADE) on July 6–7, 2022. The process resulted in three recommended cut scores (for Level 2, Level 3, and Level 4) on the ACT® test, defining four performance levels (Level 1, Level 2, Level 3, and Level 4) for three subject areas: mathematics, science, and English Language Arts (ELA). Following the standard setting meeting, the cut score recommendations for mathematics and ELA were provided to the Arizona State Board of Education for review and approval. The recommended cut scores were approved on July 11, 2022. The cut scores for mathematics and ELA will be applied beginning in the 2021–2022 school year. The cut scores for science will not be used for federal accountability but will be used by the state.

Context for New Cut Scores

As part of the Arizona State Board of Education's Five-Year Assessment Plan, ADE has transitioned to the ACT test as the new high school statewide assessment for mathematics and ELA starting in the 2021–2022 school year. Prior to adopting the ACT statewide, many local education agencies were already administering the ACT through the school day option. ACT conducted an abbreviated empirical standard setting in 2019 to set cut scores for ACT mathematics, science, and English + Reading for the Menu of Assessments. The purpose of the 2022 standard setting is to set cut scores to meet federal accountability requirements. The resulting cut scores will be used as part of Arizona's accountability system.

Beginning in the 2017–2018 school year, the Every Student Succeeds Act (ESSA) allows states to use college admissions tests such as the ACT or SAT instead of traditional standards-based tests as an accountability measure in high school. This use requires an evidence-based peer review process to establish that the state meets federal guidelines, including evidence of alignment between the assessment and states' standards, and the use of a technically sound method to set cut scores defining the boundaries between performance levels, involving panelists who have appropriate experience and expertise, including content, students with disabilities, and English Learners (US Department of Education, 2018).

ADE requested that ACT conduct a standard setting to establish cut scores on the ACT in mathematics, science, and ELA for their accountability system. The resulting cut scores for mathematics and ELA can be used to satisfy the federal accountability requirements of ESSA. This report is one of several documents that will be submitted to the federal government in June 2023 for peer review. The cut scores for science will not be used for federal accountability but will be used by the state. ADE will be using the AzSCI assessment for state and federal science accountability requirements.

Methodology

Recommended cut scores for the ACT were determined using an empirical standard setting process rather than a traditional content-based standard setting. In a content-based standard setting, cut scores and performance levels are established based on test content and content standards, and they are described in that context. In an empirical standard setting, panelists make judgments based on established relationships between test scores and a variety of educational outcomes. To inform the selection of ACT cut scores for Arizona 11th graders, panelists viewed comparative evidence from the ACT, Arizona's state assessments in grade 8 and high school, and NAEP assessments, including the percentages of students classified in different performance levels for several national and Arizona-specific ACT-tested student populations, and impact on college success outcomes. This evidence is described in detail in the *Orientation, Context, and Discussion* section below.

Empirical standard setting approaches have been the primary method used to establish cut scores and benchmarks on admissions tests for several reasons. The primary purpose of college admissions tests is to identify students who are likely to succeed in postsecondary academic environments. Such assessments are used for admissions, placement, recruitment, and talent identification because they predict GPA and grades in specific college courses. Educators in secondary schools use the tests to determine if students are on track to being college ready at the end of high school, to identify academic weaknesses that can be addressed, and to aid in postsecondary planning for students. This type of evidence prioritizes the empirical relationship between test scores and outcomes such as postsecondary enrollment, course grades, GPA, and retention. College readiness benchmarks for the ACT and SAT have been established exclusively on such empirical relationships (e.g., 50% chance of a B or higher in college algebra or other first-year credit-bearing college course), and ACT has employed empirical standard setting methods when assisting states to set upper and lower cut scores, as well as validating or establishing their own College Readiness Benchmarks.

A typical standard setting panel consists of 8–12 participants per subject area, including a mix of teachers, administrators, and higher education faculty. Panelists are selected to represent the state in terms of the variety of school districts (including large and small, urban, and rural) and panelist expertise including content, special education, and English language learners. Typically, the standard setting meeting lasts two days and involves multiple rounds of ratings. Panelists are presented with relevant information about the ACT and other assessments, participate in group discussions about the evidence, and participate in several rounds of ratings, resulting in their final recommended cut scores.

ACT College Readiness Benchmarks

The primary evidentiary sources for standard setting on the ACT are the ACT College Readiness Benchmarks and the probabilities of earning a grade of C or higher, B or higher, or A in first-year credit-bearing college courses derived in the research undergirding the development of the Benchmarks.

In 2005, ACT established College Readiness Benchmarks reflecting the ACT scores of 11th and 12th grade students associated with a 50% chance of earning a B or higher grade in common first-year credit-bearing courses at a typical postsecondary institution (Allen and Sconing, 2005). The Benchmarks also correspond to an approximate 75% chance of earning a C or higher grade in these courses.

The courses selected to establish the Benchmarks were based on courses commonly taken by students in their first year of college, including English Composition for English, College Algebra for mathematics, Social Science courses (including American History, Other History, Psychology, Sociology, Political Science, and Economics) for reading, and Biology for science. The original Benchmarks corresponded to scores of 18 on the English test, 22 in mathematics, 21 in reading, and 24 in science.

The Benchmarks were updated in the fall of 2013 (Allen, 2013) to address possible changes in college grading standards, student performance, course taking patterns of first-year college students, and alignment between secondary and postsecondary course content that transpired since the original benchmarks were established. Using a large sample of first-year students attending two- and four-year institutions, the study detected no changes in the English and Mathematics Benchmarks (18 and 22, respectively), the Reading Benchmark increased from 21 to 22, and the Science Benchmark decreased from 24 to 23.

The updated Benchmark development sample included a greater number of institutions in states that typically enroll higher proportions of ACT-tested students (i.e., states in the South and Midwest) and fewer institutions from states that typically enroll fewer ACT-tested students (i.e., states on the East and West coasts). Compared to ACT-tested students nationally who enroll in college, students in the Benchmark development samples were more likely to be female, less likely to be Hispanic or African American, less likely to have extremely high or low ACT Composite scores, and more likely to have higher high school GPAs. Moreover, fewer students in the samples enrolled at selective and highly selective institutions. To address this issue, the samples were adjusted statistically to make the results approximate what would be observed with a nationally representative sample of ACT-tested college-enrolled students. Table 1 summarizes the characteristics of the institutions used in the 2013 study.

Table 1. Institutional Samples Used to Update the ACT Benchmarks

Characteristic	College Course			
	English Composition I	College Algebra	Social Science	Biology
N (Institutions)	136	125	129	90
N (Students)	96,583	70,461	130,954	41,651
Type				
2-year	50%	42%	42%	44%
Less selective 4-year	43%	48%	49%	46%
More selective 4-year	7%	10%	9%	10%
Control				
Public	88%	92%	92%	87%
Private	13%	8%	8%	13%

Table 2 illustrates the overall success rates by course, which ranged from 47% in Biology (ACT Science Benchmark) to 59% in English Composition I (ACT English Benchmark) for the B or higher criterion and from 72% in College Algebra (ACT Math Benchmark) to 81% in English Composition I for the C or higher criterion. Across all courses, B was the modal course grade. For additional details about the regression models, see Allen (2013).

Table 2. Success Rates by Course, Updated Benchmark Development Sample

College Course Type	Percentage of Course Grades					Success Criteria	
	A	B	C	D	F	≥ B	≥ C
English Composition I	27%	32%	22%	7%	13%	59%	81%
College Algebra	24%	25%	23%	11%	18%	49%	72%
Social Science	25%	27%	23%	10%	14%	53%	76%
Biology	20%	27%	26%	12%	16%	47%	73%

ACT uses the B or higher grade criterion for the benchmarks for several reasons. First, the statistical models used to develop the benchmarks are affected by courses and institutions where grades below a C are uncommon. In particular, courses in English and the social sciences frequently have 80% to 90% of students earning grades of C or higher. In addition, establishing a policy wherein students with only a 50% chance of earning a C or higher are placed into a class could be problematic because students would also have a 50% chance of earning a D or F. Moreover, the B or higher criterion best reproduces the original grade distribution.

In 2015, ACT began reporting an English Language Arts (ELA) score, which is the average of the ACT English, reading, and writing scores (after the writing score is transformed from a 2–12 scale to a 1–36 scale). Students must take the ACT writing test to obtain an ELA score. In 2017, ACT developed an ELA Benchmark (Radunzel, Westrick, Bassiri, and Li, 2017). The methodology used to develop the ELA Benchmark was similar to that used to develop the benchmarks for the four ACT section tests. The ELA Benchmark is the score associated with a 50% chance of earning a B or higher grade in English Composition I, American History, Other History, Psychology, Sociology, Political Science, and Economics courses (the same courses used to develop the English and Reading Benchmarks, respectively). The ELA Benchmark also corresponds to an approximate 75% chance of earning a C or higher grade in these courses. The resulting ELA Benchmark is a score of 20. Table 3 summarizes the institutional samples used to develop the ELA Benchmark. The institutions represented in ACT research used to set the benchmarks approximately reflected the composition of colleges and universities in the United States in terms of selectivity and two-year vs. four-year institutions. It should be noted that few differences have been detected between two-year and four-year institutions in setting college readiness benchmarks (Steedle, Radunzel, and Mattern, 2019a).

Table 3. Institutional Samples Used to Develop the ACT ELA Benchmark

Characteristic	College Course		
	English Composition I	Combined Social Science	Total Sample
N (Institutions)	200	154	233
N (Students)	107,142	91,133	198,275
Type			
2-year	42%	43%	40%
Less selective 4-year	51%	50%	53%
More selective 4-year	7%	7%	7%
Control			
Public	89%	94%	88%
Private	11%	6%	12%

Table 4 shows the overall success rates by course in the ELA benchmark study. Across all courses, B was the modal grade. The overall percentage of students earning a B or higher was approximately 52%, and the overall percentage of students earning a C or higher was approximately 77%.

Table 4. Success Rates by Course, ELA Benchmark Development Sample

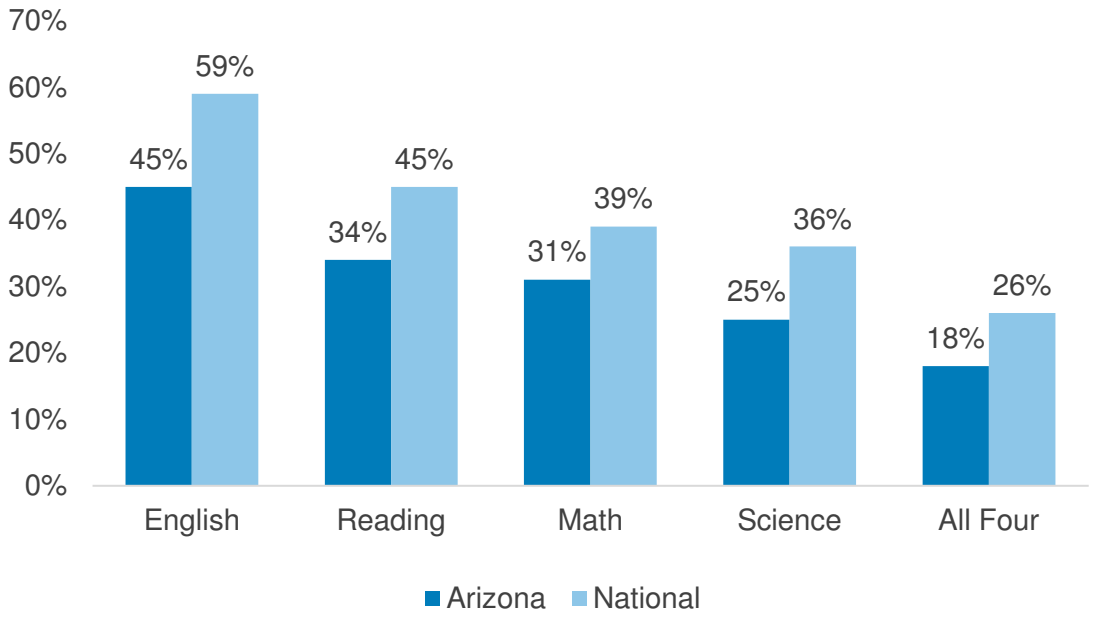
	Percentage of Course Grades					Success Criteria	
College course type	A	B	C	D	F	≥ B	≥ C
English Composition I	20%	35%	26%	7%	12%	55%	81%
Social Science	21%	28%	25%	11%	16%	49%	73%
Total Sample	20%	32%	25%	9%	14%	52%	77%

ACT Performance in Arizona

Figure 1 compares the percentages of students in the 2019 ACT-tested high school graduating cohort who met or exceeded the ACT Benchmarks in Arizona and the nation. The 2019 cohort is presented because it represents student performance before the COVID-19 pandemic disrupted student learning and performance. The graduation cohort represents all students in a state or the nation who completed the ACT at any point during high school. This includes students attending private or public high schools. Students' most recent ACT test score is used when reporting results for graduate cohorts. Therefore, results from the Arizona graduating cohort differ from results reported for all juniors who tested in public schools as part of state testing in 11th grade.

An estimated 73% of Arizona's 2019 graduates (n = 50,446) took the ACT, compared to 52% of 2019 graduates who took the ACT nationally. Arizona's average performance was lower than the national average. It should be noted that the aggregate performance of students in states with higher ACT participation rates tends to be lower than that of students in states with lower ACT participation rates, as students who take the ACT in states with lower participation rates tend to be higher achieving, college-bound students. *The Condition of College and Career Readiness 2019* state report contains additional information about the performance of Arizona graduates on the ACT (ACT, 2019).

Figure 1. Percentages of 2019 Arizona and National ACT-Tested High School Graduates Meeting ACT's College Readiness Benchmarks by Test Section



Panelists

ADE and Pearson were responsible for recruiting panelists, securing the meeting site, communicating with panelists about the event, securing panelist accommodations, and reimbursing participants for their travel expenses. Panelists were invited to participate in the spring of 2022. This process yielded 21 panelists, 9 in mathematics, 4 in science, and 8 in ELA. A list of panelists, facilitators, and observers can be found in the Appendix.

Panelists included high school teachers (48%), higher education faculty (10%), administrators (19%), district curriculum/assessment coordinators (33%), and one counselor (5%). Three panelists (14%) held more than one position. One panelist (10%) indicated experience teaching English Learners, five panelists (50%) indicated experience teaching special education, and 2 panelists (20%) indicated experience teaching gifted and talented students.

In terms of demographics, the panel was 86% female, 90% Non-Hispanic, and 10% Hispanic or Latino, with one Asian panelist and one Black/African American panelist. The panel was highly educated; 75% of panelists held a master's degree, and 25% held a bachelor's degree. Most panelists (80%) had 11 or more years of experience working in education, and 55% had been in their current position for at least six years. The background questionnaire and summary of results can be found in the Appendix.

Process

The standard setting process was structured as follows:

Day 1:

- Present context for standard setting
- Describe empirical standard setting methodology
- Explain ACT College Readiness Benchmarks and probabilities of success in first-year college courses
- Provide training to identify borderline Level 3 achievement in terms of probability of success
- Discussion
- Make Round 1 ratings: Level 3
- Review results of Round 1 ratings
- Impact of COVID-19 on student performance
- Present impact and comparative impact data (percent at/above each score point on the ACT; performance on Arizona state assessments, NAEP assessments, college enrollment, college degree completion)
- Discussion of Round 1 results and impact data
- Make Round 2 ratings: Level 3

Day 2:

- Recap/debrief of day 1
- Review results of Round 2 ratings
- Provide training to identify borderline Level 2 (lower cut) and Level 4 (upper cut) achievement in terms of probability of success
- Discussion
- Make Round 3 ratings: Level 2 and Level 4
- Review results of Round 3 ratings
- Discussion
- Make final ratings for all 3 cut scores
- Present final results
- Concluding comments

An agenda, slides, and other reference materials presented during the standard setting can be found in the Appendix.

Day 1

Orientation, Context, and Discussion

The standard setting meeting began with introductions of the key organizations and staff, followed by panelist introductions. The purpose and context of the meeting was summarized by ADE staff, as described above. ACT staff described the empirical standard setting methodology and information about the ACT test and the standard setting task. A summary of information

was provided about the ACT test, including descriptions of the four section tests (English, mathematics, reading, and science) and the optional writing test, and how the ACT English, reading, and writing section scores are combined to produce an ELA score.

College and Career Readiness

Several slides provided information about the importance of college and career readiness. ESSA requires that all students are taught to high academic standards that will prepare them to succeed in college and their careers (US Department of Education, 2018). A national study found that the majority (63%) of 2020 high school graduates in the US enrolled in college immediately after completing high school (NCES, 2022a). A similar trend was seen when looking at ACT-specific data; 59% of 2020 ACT-tested high school graduates in the US enrolled in college in the fall of 2020, and in Arizona 52% of 2020 ACT-tested high school graduates enrolled in college in the fall of 2020. Eighty-seven percent of 2020 ACT-tested Arizona high school graduates indicated that they aspired to earn a bachelor's degree or higher.

Additional information from NCES and the US Bureau of Labor Statistics highlighted relationships between college degree completion, earnings, and unemployment rates. In 2020, the median annual earnings of 25- to 34-year-olds who completed high school was $36,600, compared to $44,100 for those who earned an associate degree, $59,600 for those who earned a bachelor's degree, and $69,700 for those who earned a master's degree or higher (NCES, 2022b).

Similarly, the median weekly earnings of full-time wage and salary workers aged 25 or older in 2021 was $1,057 across all workers but was lower for workers who had earned a high school diploma ($809) or less ($626) and higher for workers who had earned a bachelor's degree ($1,334), master's degree ($1,574), professional degree ($1,924) or doctoral degree ($1,909). The unemployment rate was also much lower for workers who had earned a bachelor's degree (3.5%), master's degree (2.6%), professional degree (1.8%) or doctoral degree (1.5%) compared to those who earned a high school diploma (6.2%) or less (8.3%; US Bureau of Labor Statistics, 2021).

Information was also provided about the consequences of remedial coursework for students who enroll in college and are not college ready. Students who take remedial courses often accrue debt without earning college credit. A research report from ACT showed how remedial course rates are higher for students with lower ACT scores and lower for students with higher ACT scores (Noble and Sawyer, 2013). Thirty-one percent of students at four-year colleges and 66% of students at two-year colleges take remedial courses, and those who take remedial coursework are less likely to complete a bachelor's degree (43%) compared to 69% of students who do not take remedial coursework (NCES, 2020).

College Course Placement

ACT provided a summary of the ACT scores used for postsecondary course placement, both nationally and in a sample of Arizona colleges. The national data were obtained from a published study (Fields and Parsad, 2012) in which 23% of institutions reported using ACT Math

scores for placement, and 16% reported using ACT Reading scores for placement. Arizona-specific data were gathered by searching the websites of postsecondary institutions in Arizona using the terms “ACT” and “placement.” Thirteen institutions were found that reported the ACT scores used for first-year course placement. The sample included nine community colleges, three four-year public institutions, and one four-year private institution. The results indicate that College Algebra placement scores are typically close to the ACT College Readiness Benchmark of 22 in math, while lower scores of 18–21 could place a student into lower level credit-bearing math courses. In English, placement scores for first-year Composition were close to or higher than the ACT College Readiness Benchmark of 18. It should be noted that the Arizona-specific data were a small convenience sample of all of Arizona’s two-year and four-year colleges based on data available on their websites and may not be representative of all Arizona postsecondary institutions.

ACT Benchmarks

ACT staff presented background information to the panelists about the ACT College Readiness Benchmarks, as described above. Additional information about the variability of ACT scores associated with a 50% chance of earning a B or higher grade in first-year credit-bearing courses across colleges and college types was also noted, as well as standard errors of measurement in each subject area. In general, the variability of score values associated with a 50% chance of earning a B or higher grade was small across colleges, with score ranges falling within one or two points of the ACT Benchmarks for the middle 50% of colleges examined. Moreover, little variability was observed across two-year, four-year, and selective four-year colleges; scores associated with a 50% chance of earning a B or higher grade in two-year colleges were, on average, the same as or in some cases higher than those for four-year colleges.

ACT staff then presented the probabilities of earning a grade of A, B or higher, or C or higher in first-year credit-bearing mathematics, science, and English and social science courses. The probabilities for math and science were developed as part of the Benchmark update study (Allen, 2013), and a subsequent analysis calculated the probabilities for ELA in the same sample used to develop the ACT ELA Benchmark (Radunzel, Westrick, Bassiri, and Li, 2017). Understanding the relationship between ACT scores and the probability of success associated with each score is vital to the standard setting task.

Round 1 Rating

Instructions were given for the first round of making cut score judgments. Table 5 contains an excerpt from the Round 1 Rating Form for math; the full form and corresponding forms for ELA and science can be found in the Appendix. Panelists were instructed to think about their conception of a minimally Level 3 (Proficient) student in their subject area and to highlight the row of corresponding probabilities. After the panelists made their judgments, the session ended, and the panelists broke for lunch. The first rating task was completed without access to how the probabilities of success correspond to ACT scores or impact data. ACT believes it is important to have initial ratings based on grades and probabilities of success to ensure that initial ratings are not influenced by rater’s perceptions about the meaning of specific ACT scores or the impact data.

Table 5. Sample from Round 1 Rating Sheet: Mathematics

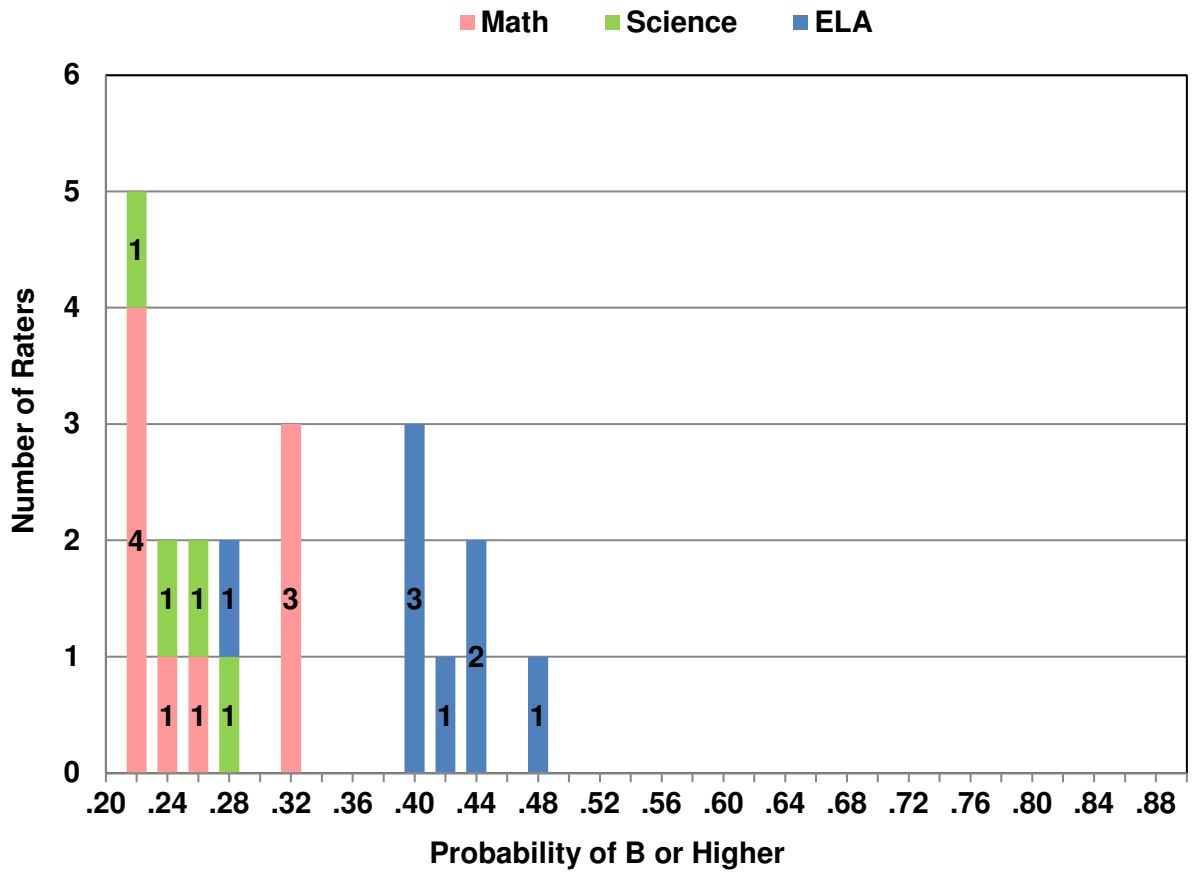
Probability of Success		
A prob	B or higher prob	C or higher prob
0.32	0.62	0.80
0.29	0.60	0.79
0.27	0.58	0.78
0.25	0.56	0.77
0.24	0.54	0.76
0.22	0.52	0.74
0.20	**0.50**	**0.73**
0.19	0.48	0.72
0.17	0.46	0.71
0.16	0.44	0.69
0.15	0.42	0.68
0.13	0.40	0.67

Round 1 Results and Discussion

The afternoon session began with a review of the Round 1 results, followed by a review of the subject area-specific comparative and impact evidence. Figure 2 shows the results of the first round of ratings. Median probability ratings were calculated within subject areas, and in the case of a tie, the higher value was used. The resulting medians reflected some variability across subject areas.

The median probability of earning a B or higher grade was 0.22 for Mathematics, 0.27 for Science, and 0.43 for ELA, corresponding to ACT scores of 16, 18, and 18, respectively. Probabilities of earning an A or C or higher grade were also provided in the data books (see Table 5 or the Appendix), and panelists were instructed to use the probabilities that made the most sense to them when making judgments. Because panelists were instructed to highlight the entire row on the rating form, it ultimately did not matter in terms of the medians which probability (A, B or higher, or C or higher) was their focus.

Figure 2. Round 1 Level 3 Ratings by B or Higher Grade Probabilities.



COVID-19 Impact on Student Learning

Before presenting impact data, a summary was provided to set the context about the impact of the COVID-19 pandemic on student performance and learning loss. In March of 2020, schools were closed worldwide, and the duration of closures varied widely across the US and the world. During the pandemic, there has been wide variation in the extent to which online, in-school, or hybrid learning has occurred and wide variation in the extent to which students had access to the internet or online learning at home. Schools reopened at various times during the pandemic, but not all students returned to class in person, and learning was further disrupted as additional shutdowns occurred due to COVID-19 outbreaks during the 2020-2021 and 2021-2022 school years. As a result of all these interruptions to education due to the pandemic, many students were unable to fully participate in school and experienced learning loss relative to what they would have experienced prior to the pandemic.

Several studies have examined the extent of learning loss attributable to the pandemic, and general, impacts on student learning were found to be more pronounced in math, in lower grade levels, and for low-income students (Konig and Frey, 2022). ACT also published several studies of the impact of the COVID-19 pandemic on student learning on the ACT. Table 6 contains the

average adjusted score declines from two studies of ACT State and District tested students (Allen, 2021; Hayes, 2021) as well as analyses specific to Arizona State and District testing. These studies compared the average scores of students in schools that were able to administer the ACT both before (fall 2019) and after the beginning of the pandemic. It was found across all analyses that students tended to exhibit average score declines for all sections of the ACT as well as the ACT Composite. The fall 2020 and spring 2021 analyses found larger score declines in English, whereas the Arizona-specific analyses found larger declines in math. In general, these declines translated to approximately two or three months of learning loss compared to student learning prior to the pandemic. This information was provided to set the expectation for panelists that the impact data for students tested during the pandemic will show lower performance than would have been expected before the pandemic.

Table 6. Impact of COVID-19 on Student Performance: ACT State and District Testing

Subject	Fall 2020	Spring 2021	Arizona Spring 2021	Arizona Spring 2022
English	-0.88	-0.72	-0.37	-0.37
Math	-0.49	-0.63	-0.51	-0.74
Reading	-0.44	-0.63	-0.46	-0.63
Science	-0.26	-0.58	-0.45	-0.54
Composite	-0.52	-0.64	-0.45	-0.57

Impact Data

Data books were provided to panelists after the Round 1 rating. The data books contained impact evidence by subject area and ACT test score, as well as descriptive information about the impact data samples, and comparative impact on Arizona's state assessments and the NAEP assessments. The data books contained secure information and panelists were not allowed to remove them from the meeting rooms, but they could reference and take notes in them throughout the standard setting process. Complete data books are included in the Appendix.

The ACT impact data samples were based on several ACT-tested student populations of interest. The focal data sample was the results from Arizona statewide-tested juniors in the spring of 2022, which will ultimately be used for federal accountability purposes. Additional data samples included statewide ACT-tested juniors in other states in 2019, 2020, 2021, and 2022. These samples included states that tested in all four years so that year-to-year fluctuations and COVID-19 impact could be observed across the same populations of students. Six states' data were included in the samples for math and science: Kentucky, Mississippi, Nevada, North Carolina, Utah, and Wisconsin. Two states' data were included in the samples for ELA: Nevada and Wisconsin. Only two states were included for the ELA samples because they were the only states who administered the ACT writing test across all four years, and writing scores are

required to produce an ELA score. Data were aggregated across states, and no state-specific data was shared with panelists.

Table 7 contains descriptive statistics for the impact data samples, including demographics, percent meeting the ACT Benchmarks, and average ACT scores for the math and science samples, and Table 8 contains descriptive statistics for the impact data samples, including demographics, percent meeting the ACT Benchmarks, and average ACT scores for the ELA samples.

The 2022 ACT-tested juniors in Arizona ("AZ Census Juniors") were the population of primary interest since these results will be reported for federal accountability. The other census state juniors samples were provided for comparison. Multiple years of data were provided to illustrate how impact data can fluctuate from year to year due to differences in the student cohorts and to prevent panelists from overly focusing on a specific percentage. The impact of the COVID-19 pandemic can also be seen when comparing the census state juniors across years in terms of the declines in participation rates in 2020 and 2021 and the declines in student performance on the ACT in 2021 and 2022.

Comparing students in Arizona to the other census states in 2022, Arizona had larger percentages of American Indian and Hispanic/Latino students and smaller percentages of Black/African American and White students. Arizona's students also had somewhat lower performance than students in the other census states.

Table 7. Summary of Demographics and Test Results by Student Population: Math and Science Samples

	AZ Juniors Census	Census State Juniors	Census State Juniors	Census State Juniors	Census State Juniors
	2022	2022	2021	2020	2019
Number of Students Tested	77,159	310,224	289,674	292,685	316,965
Participation Rate	90%	90%	86%	86%	93%
Tested 11th Grade	98%	99%	99%	100%	100%
Took writing	98%	31%	31%	65%	75%
Female	47%	45%	49%	46%	49%
Male	48%	46%	48%	46%	49%
Gender Other/Missing/NR	5%	9%	3%	8%	2%
Black/African American	5%	13%	11%	13%	14%
American Indian	3%	1%	1%	1%	1%
White	32%	52%	52%	52%	52%
Hispanic/Latino	44%	13%	15%	15%	15%
Asian	3%	3%	3%	3%	3%
Native Hawaiian/Pacific Islander	0%	0%	0%	0%	0%
Two or more races	4%	5%	5%	5%	4%
Race/Ethnicity Missing/NR	8%	13%	14%	11%	11%
Met ACT English Benchmark	39%	43%	43%	46%	45%
Met ACT Math Benchmark	21%	24%	24%	28%	25%
Met ACT Reading Benchmark	28%	34%	33%	35%	33%
Met ACT Science Benchmark	19%	25%	24%	27%	26%
Met ACT ELA Benchmark	32%	35%	35%	34%	34%
Average ACT Composite	17.5	18.3	18.3	18.7	18.6
Average ACT English	16.6	17.1	17.2	17.7	17.5
Average ACT Math	17.7	18.2	18.3	18.9	18.7
Average ACT Reading	17.8	19.0	18.9	19.3	19.3
Average ACT Science	17.7	18.8	18.7	19.3	19.0
Average ACT ELA	17.1	17.4	17.6	17.3	17.3

Table 8. Summary of Demographics and Test Results by Student Population: ELA Samples

	AZ Juniors Census	Census State Juniors	Census State Juniors	Census State Juniors	Census State Juniors
	2022	2022	2021	2020	2019
Number of Students Tested	75,354	95,957	89,514	94,711	96,600
Participation Rate	90%	94%	89%	95%	97%
Tested 11th Grade	98%	97%	99%	99%	99%
Took writing	98%	100%	100%	100%	100%
Female	47%	46%	48%	44%	49%
Male	48%	48%	49%	45%	50%
Gender Other/Missing/NR	5%	5%	3%	11%	1%
Black/African American	5%	7%	5%	6%	7%
American Indian	3%	1%	1%	1%	1%
White	32%	51%	52%	50%	51%
Hispanic/Latino	44%	22%	19%	20%	21%
Asian	3%	4%	4%	4%	4%
Native Hawaiian/Pacific Islander	0%	%	%	%	1%
Two or more races	4%	5%	5%	5%	5%
Race/Ethnicity Missing/NR	8%	10%	15%	13%	11%
Met ACT English Benchmark	39%	44%	44%	48%	47%
Met ACT Math Benchmark	21%	25%	25%	30%	27%
Met ACT Reading Benchmark	28%	33%	33%	35%	34%
Met ACT Science Benchmark	19%	26%	26%	30%	28%
Met ACT ELA Benchmark	32%	35%	35%	37%	35%
Average ACT Composite	17.5	18.4	18.4	18.9	18.8
Average ACT English	16.6	17.3	17.3	18.0	17.7
Average ACT Math	17.7	18.3	18.5	19.0	18.9
Average ACT Reading	17.8	19.0	18.9	19.4	19.4
Average ACT Science	17.7	19.0	19.0	19.5	19.3
Average ACT ELA	17.1	17.4	17.6	17.8	17.6

Table 9 shows the ACT scores associated with the Round 1 ratings, the probabilities of success associated with those ACT scores, and impact data for several ACT-tested populations. Note that the probabilities of earning a B or higher in Table 9 are slightly different from the probabilities reported above resulting from the Round 1 ratings. The reason is that the Round 1 ratings were anchored to probabilities of earning a B or higher, in increments of 0.02, which were then mapped onto the ACT score scale, and multiple probabilities may correspond to a single ACT score. All evidence presented *after* the Round 1 ratings were anchored to ACT

scores rather than the success probabilities alone because, ultimately, the objective was to recommend ACT cut scores for the Level 2, 3, and 4 achievement levels.

Table 9. Round 1 Level 3 Ratings with ACT Scores and Impact Data

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
		Mathematics							
Round 1	16	0.05	0.22	0.51	59	64	66	69	71
		Science							
Round 1	18	0.06	0.27	0.61	46	57	56	59	58
		ELA							
Round 1	18	0.14	0.43	0.71	44	47	48	50	48

Panelists reviewed impact data from Arizona's state accountability system in 2019 and 2021. State testing was canceled in 2020 due to the pandemic. The percentages of students scoring at or above each cut score were provided for state assessments in grade 8, high school, and districts that administered the ACT in 2019 for all three subject areas, and the grade 8 and grade 10 assessments in 2021 for math and ELA. Impact data for the science assessments administered in 2021 was not available, as standards for the state assessment had not been set at the time of the ACT standard setting. The impact data from the Arizona state assessments can be found in the Data Books in the Appendix.

Impact data from the National Assessment of Educational Progress (NAEP) was also provided. NAEP is a nationally representative assessment of math, science, reading, and other subject areas in grades 4, 8, and 12, and results are provided at both the national and state level for grades 4 and 8. The most recent NAEP impact data was presented to panelists, including Arizona-specific and national grade 8 and national data in grade 12. The NAEP data for math and reading was from 2019, and the most recent grade 8 Arizona-specific science data was from 2015. The impact data from NAEP can be found in the Data Books in the Appendix.

Post-secondary impact data, including college enrollment rates and long-term college outcomes, was also provided. College enrollment rates by ACT score were provided for the ACT-tested graduating classes of 2018, 2019, and 2020, both nationally and for Arizona graduates. ACT obtains college enrollment data each year from the National Student Clearinghouse (*www.studentclearinghouse.org*) and calculates the percentages of ACT-tested graduates who enroll in college the fall after they graduate high school. College enrollment rates were provided for each subject area; while the math panelists reviewed college enrollment rates by ACT math score and the science panelists reviewed college enrollment rates by ACT science score, the ELA panel reviewed college enrollment rates by ACT English and reading scores.

This is because the ELA score requires students to take the optional ACT writing test, and non-representative samples of the graduating classes of 2018-2020 took the writing test (9-15% of Arizona graduates and 41-47% of the national graduates). There is a positive relationship between ACT scores and college enrollment such that higher ACT scores are associated with higher percentages of students who enroll in college. The tables containing college enrollment rates can be found in the Data Books in the Appendix.

Long-term college outcomes data was based on a study by ACT that followed a national sample of nearly 200,000 students who enrolled in college through six years of post-secondary education (Noble and Radunzel, 2012). Four outcomes were provided by ACT section test score: second year retention for students enrolled at a two-year college, second year retention for students enrolled at a four-year college, six-year bachelor's degree completion rates for students enrolled at a four-year college, and six-year associate or bachelor's degree completion rates for students enrolled at a two- or four-year college. Math panelists reviewed college outcomes by ACT math scores, science panelists reviewed college outcomes by ACT science scores, and ELA panelists reviewed college outcomes based on ACT English and reading scores (the ELA score had not been created at the time the study was conducted). While this data is somewhat outdated, it provides information about the positive relationships between ACT scores and long-term post-secondary outcomes. The tables containing long-term college outcomes can be found in the Data Books in the Appendix.

After the comparative and impact evidence was presented, panelists were given the opportunity to discuss their ratings and the impact data. Panelists were instructed to focus their discussion on how their cut score judgments compared to others within and across subject areas, how the impact information may cause them to reconsider their initial cut score judgments, and which information is the most important in deciding the Level 3 cut score.

Common discussion themes included the definition of just barely Proficient and whether to focus on a grade of B or higher or C or higher. Several panelists indicated that a C grade is a reasonable expectation for a just barely Proficient student. Panelists also questioned the differences between college ready and career ready, with one panelist indicating that fewer than half of the students in their district were college bound. Another point raised was that the ACT only measures academic achievement, whereas soft skills such as motivation and showing up on time are also important. The amount of growth expected between the spring of 11th grade when their students are tested for accountability and the fall of 12th grade when students submit college applications was also discussed, as well as whether all students are motivated to try their best when taking the ACT. The math panelists pointed out that the first-year college course used to establish the ACT Math Benchmark is college algebra, but most first-year college students in Arizona take a lower-level credit-bearing course. Panelists also indicated wanting to have more Arizona-specific data rather than the national data that ACT shared. There was also a question about the lowest scores that students can earn on the ACT, and what score would be associated with a student guessing on all items across the assessment. While the lowest score is a 1, the standard setting materials did not provide scores below a 12. ACT staff indicated that very few students earn a 12 or lower. The College Readiness Standards, providing information about what students know and can do at ACT score bands, do not start until a score of 13, and

indicate that scores in the 1-12 range “are most likely beginning to develop the knowledge and skills assessed in the other ranges” (ACT, 2022).

Round 2: Level 3–Identifying Borderline Achievement by Probability of Success and ACT Score

A second round of Level 3 ratings followed the discussion. The Round 2 rating process followed the same general procedures as the Round 1 ratings, with panelists highlighting a single row of scores and their associated probabilities on the rating sheet. The rating sheets for Round 2 differed from the rating sheets for Round 1 in that, in addition to the probabilities of success, ACT scores and impact data were now included, with each row representing a unique ACT score. An excerpt from the Round 2 math rating sheet is shown in Table 10, and the full rating sheets for Round 2 can be found in the Appendix.

Table 10. Sample Round 2 Rating Sheet: Mathematics

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55

Day 2

Day two began with a debriefing, during which panelists discussed the standard setting process so far and voiced any concerns or issues. Based on some of the discussion topics raised the previous day, ACT staff presented additional slides to address panelists’ concerns. One slide provided a summary of the cut scores that other states have selected as their Proficient cut scores for federal accountability. Nine states have set Proficient cut scores in math, with a minimum of 19, a maximum of 22, and a median of 21 (one point below the ACT Math Benchmark of 22). Seven states have set Proficient cut scores in science, with a minimum of 19, maximum of 23, and median of 23, which is the ACT Science Benchmark. Four states have set Proficient cut scores in ELA, with a minimum of 19, a maximum of 22, and a median of 20, which is the ACT ELA Benchmark.

Other slides were presented summarizing two previous studies conducted by ACT looking at the relationship between college readiness and career readiness. A 2006 study measured the levels of reading and mathematics skills needed for occupations that, according to the US Department of Labor, required less than a bachelor's degree, paid a wage sufficient to support a family of four ($39,066), and offered the potential for career advancement (ACT, 2006). The occupations considered were classified as Occupational Information Network (O*NET) Job Zone 3, which included electricians, construction workers, upholsterers, and plumbers). The study found that these occupations were profiled to have a work readiness level of 5 for both the Reading for Information and Applied Mathematics, which were comparable to ACT score ranges of 19-23 in reading (where the ACT Reading Benchmark was a 21 at the time) and 18-21 in math (where the ACT Math Benchmark was and currently is a 22).

A second study compared college readiness benchmarks for different college majors at two-year colleges (Steedle, Radunzel, and Mattern, 2019a; 2019b). Majors were classified as "middle-skills majors" if they resulted in occupations that typically require a certificate or associate degree, and "high-skills majors" if they resulted in occupations that typically require a bachelor's degree. Middle-skills majors included computer support specialist, dental hygienist, medial assistant, loan officer, tax preparer, teacher assistant, and web developer. The benchmarks were defined as the ACT scores associated with a 50% chance of earning a B or higher first year college GPA. The study found that the benchmarks were similar for middle- and high-skills majors and were very close to the ACT College Readiness Benchmarks. These two studies together illustrated that college readiness and career readiness require essentially the same levels of academic preparation.

Discussion during the debriefing session reiterated some of the issues that were raised previously, including concerns that setting the cut scores too high will mean that schools will be judged negatively, but setting cut scores too low could result in schools being determined to not be in need of assistance, and they may not receive the resources that they need to improve.

Round 2 Results and Discussion

The primary data sources of interest were briefly reviewed, then panelists reviewed the Round 2 results shown in Figure 3 and Table 11. Compared to Round 1, there was a greater consensus within each subject area group. A score increase of 3 was seen in both math (from 16 to 19) and science (from 18 to 21), while the recommended cut score in ELA remained at 18.

Figure 3. Round 2 Level 3 ratings by ACT score

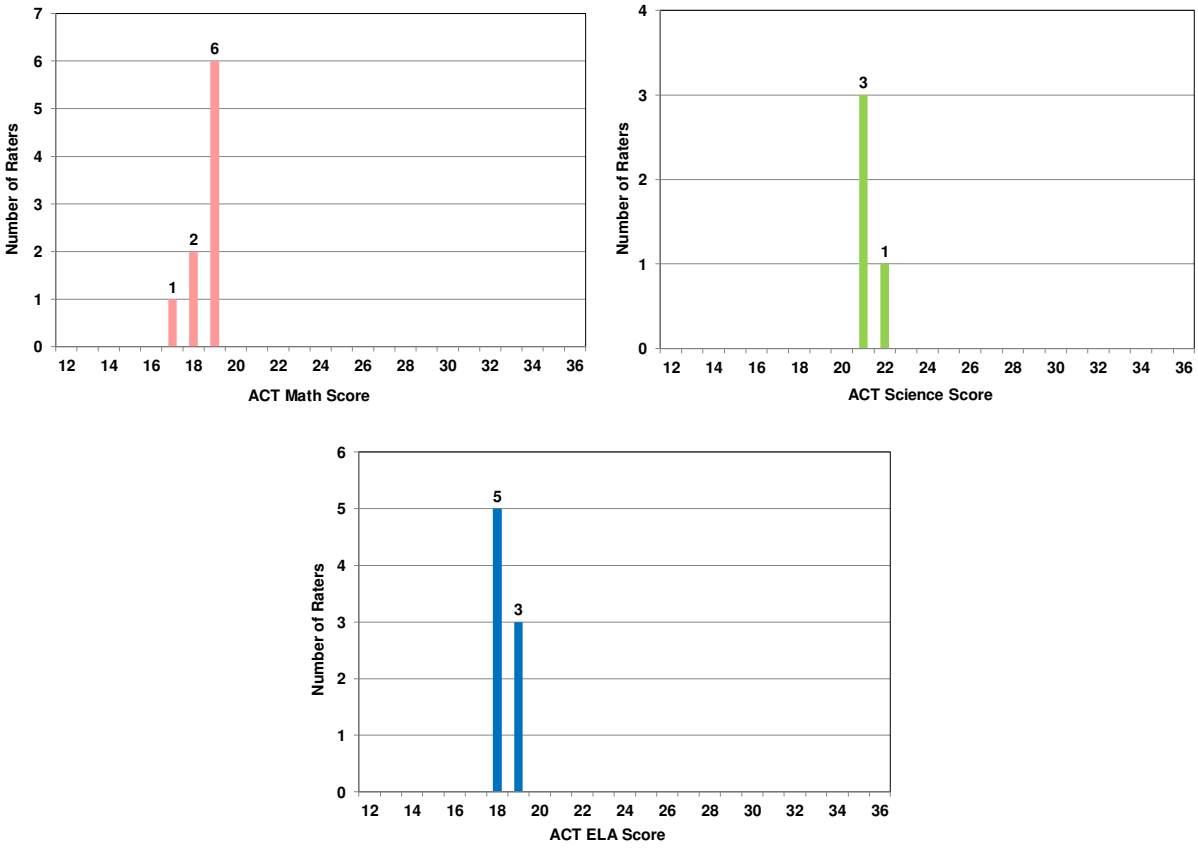


Table 11. Probabilities of Success and Impact Data Associated with Round 1 and Round 2 Level 3 Cut Scores and ACT Benchmarks (ACTB)

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
		Mathematics							
Round 1	16	0.05	0.22	0.51	59	64	66	69	71
Round 2	19	0.11	0.35	0.63	32	34	36	40	38
ACTB	22	0.20	0.51	0.73	21	24	24	28	25
		Science							
Round 1	18	0.06	0.27	0.61	46	57	56	59	58
Round 2	21	0.12	0.41	0.71	28	36	35	39	37
ACTB	23	0.18	0.51	0.79	19	25	24	27	26
		ELA							
Round 1	18	0.14	0.43	0.71	44	47	48	50	48
Round 2	18	0.14	0.43	0.71	44	47	48	50	48
ACTB	20	0.19	0.51	0.76	32	35	35	37	35

Round 3: Setting Level 2 and Level 4 Cut Scores—Identifying Borderline Achievement by Probability of Success and ACT Score

After discussing Round 3 ratings, the meeting transitioned to setting the upper (Level 4) and lower (Level 2) cut scores. Similar to setting the first round of cut scores, panelists were asked to consider what it means to be at the borderline between levels with respect to their probabilities of success in first-year credit-bearing college courses. Panelists were provided with ample opportunity for discussion.

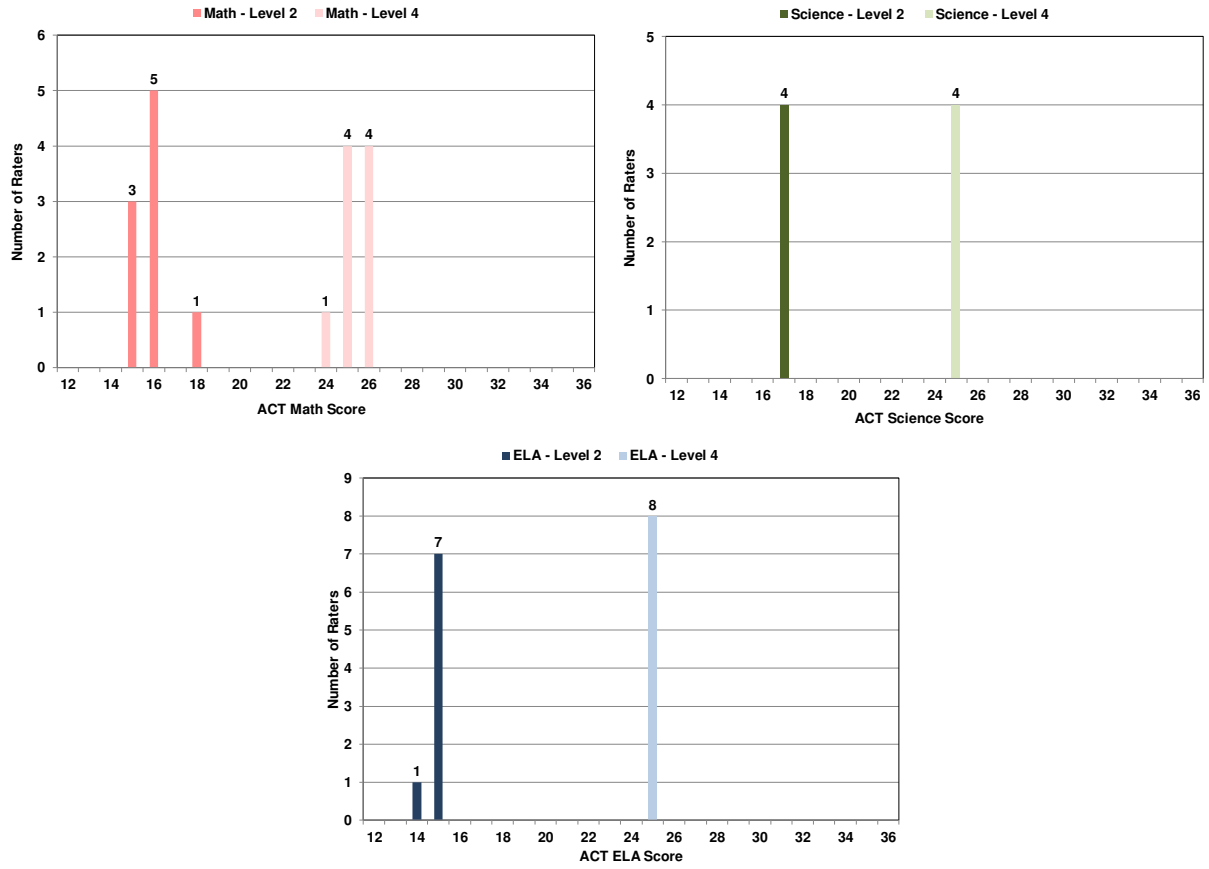
Discussion topics were mainly centered around the Level 2 and Level 4 cut scores, and most panelists agreed that the Level 4 cut score determination was easier to make than the Level 2 cut. For the Level 4 cut score, panelists considered the average ACT scores associated with admissions to Ivy League colleges. Panelists also considered whether the range of scores were similar across levels.

The Round 3 rating process followed the same general procedure as previous rounds, and the rating sheet contained the same information as the Round 2 rating sheet as shown in Table 10 (ACT scores, probabilities of success, and impact). For this round, panelists highlighted the two rows on the rating sheet reflecting their recommended cut scores and their associated probabilities, one for the Level 2 cut score and one for the Level 4 cut score.

Round 3 Results and Discussion

Panelists reviewed the Round 3 results shown in Figure 4 and Table 12. There was complete consensus in science, near consensus in ELA, and a fair amount of variability in math, with Level 2 recommendations ranging from 15 to 18 and Level 4 recommendations ranging from 24 to 26.

Figure 4. Round 3 Level 2 and Level 4 Ratings by ACT Score



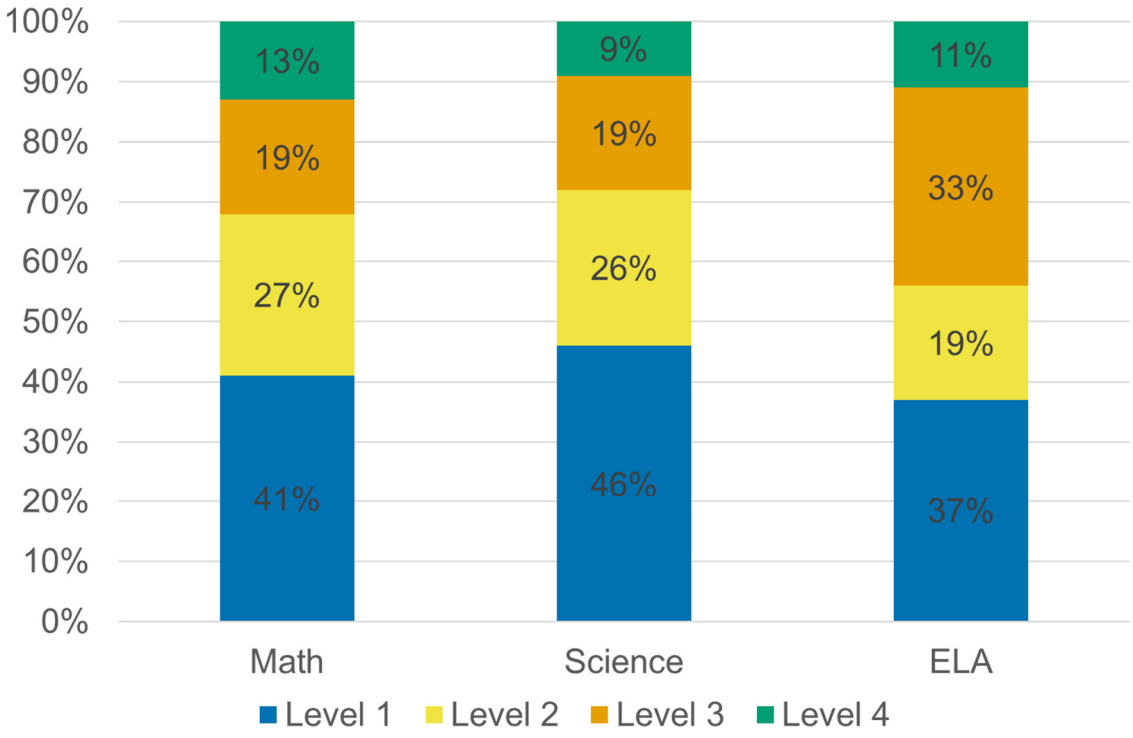
An examination of Table 12 shows that the Level 4 cut score was 25 across all three subject areas, with a fair amount of consistency in the probabilities of success. A minimally Level 4 student would be expected to have a 0.25–0.36 probability of earning an A, a 0.60–0.70 probability of earning a B or higher, and a 0.80–0.86 probability of earning a C or higher. Results were also fairly consistent for the Level 2 ratings. A minimally Level 2 student would have a 0.05–0.09 probability of earning an A or higher, a 0.22–0.31 probability of earning a B or higher, and a 0.51–0.61 probability of earning a C or higher. The percentages of Arizona juniors in 2022 who would score at or above each cut score were similar across subject areas, with 9-13% scoring at Level 4 and 54-63% scoring at or above Level 2.

Table 12. Probabilities of Success and Impact Data associated with Round 2 and Round 3 Cut Scores

		Probability			Percentage At or Above				
	ACT Score	A	**B or higher**	C or higher	**AZ Census Juniors 2022**	**Census State Juniors 2022**	**Census State Juniors 2021**	**Census State Juniors 2020**	**Census State Juniors 2019**
		Mathematics							
Level 4	25	0.34	0.64	0.80	13	14	14	17	16
Level 3 (R2)	19	0.11	0.35	0.63	32	34	36	40	38
Level 2	16	0.05	0.22	0.51	59	64	66	69	71
		Science							
Level 4	25	0.25	0.60	0.84	9	13	12	16	14
Level 3 (R2)	21	0.12	0.41	0.71	28	36	35	39	37
Level 2	17	0.05	0.23	0.57	54	63	63	68	65
		ELA							
Level 4	25	0.36	0.70	0.86	11	12	12	13	12
Level 3 (R2)	18	0.14	0.43	0.71	44	47	48	50	48
Level 2	15	0.09	0.31	0.61	63	66	68	69	68

Panelists were also shown Figure 5, which contains the percentages of students who would be classified at each performance level based on the Round 2 ratings for Level 3 and the Round 3 ratings for Level 2 and Level 4. The percentages of students scoring within each performance level were similar across subject areas, with the exception of ELA, where a larger percentage of students would score at Level 3 and a smaller percentage of students would score at Level 2.

Figure 5. Percentages of 2022 Arizona Census Juniors At Each Performance Level, Round 2 and 3 Ratings



Panelists were given an additional opportunity to discuss how their ratings compared within and across subject areas, how the impact data influenced their ratings, and which data were most influential in making their ratings. The ELA table indicated that they had determined that they were going to adjust their Level 3 cut score up by one point during the final round of ratings, and the information provided in Figure 5 provided additional evidence to them that this was the correct decision.

Final Ratings and Results

After discussion, ACT staff gave instructions for the final round of ratings, wherein panelists would provide recommendations for ACT cut scores for all three levels in each subject area. The rating sheets for Round 4 were identical to those used for Rounds 2 and 3 and can be found in the Appendix. Panelists were instructed to highlight three rows: one for their Level 2 rating, one for their Level 3 rating, and one for their Level 4 rating.

Figure 6 shows the distributions of the final ratings. There was complete consensus for both science and ELA across all three cut scores. In math, there were clear majorities for the Level 2 and Level 4 ratings, but less consensus for Level 3.

Figure 6. Final Level 2, Level 3, and Level 4 Cut Score Recommendations by ACT Score

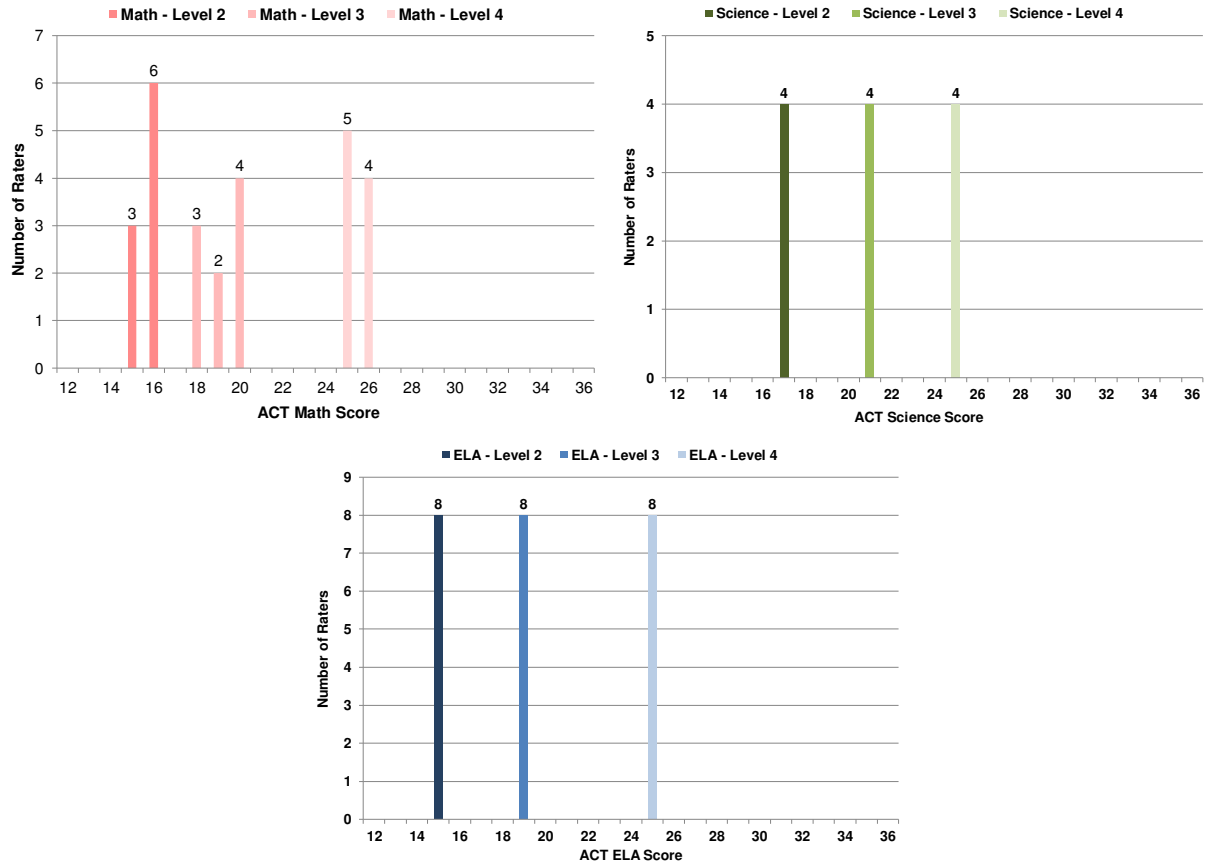


Table 13 contains the final recommended cut scores based on the median ratings in each subject area. Across subject areas, the Level 2 and Level 4 ratings were unchanged from the previous round. The Level 3 cut scores did not change in math or science from the previous ratings. In ELA, the Level 3 cut score increased from 18 to 19.

There were some differences across subject areas with respect to the probabilities of success, with the math cut scores for Level 3 being associated with slightly lower probabilities of earning a B or higher or C or higher than the corresponding cut scores in math and science. The impact data show similar percentages of Arizona juniors in 2022 scoring at or above each cut score across subject area, and the percentages of students at each performance level can be seen in

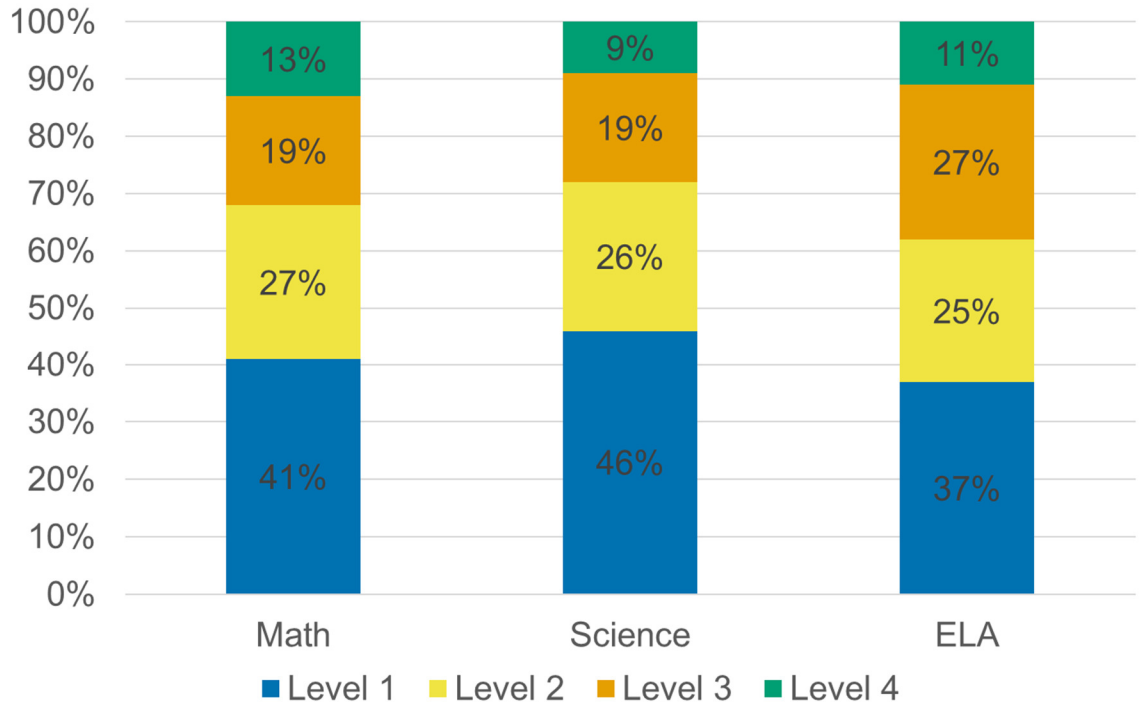
Figure 7.

After presenting the final results, panelists were given an opportunity to voice any comments or concerns prior to adjourning the meeting.

Table 13. Final Cut Score Recommendations and Impact

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
		Mathematics							
Level 4	25	0.34	0.64	0.80	13	14	14	17	16
Level 3	19	0.11	0.35	0.63	32	34	36	40	38
Level 2	16	0.05	0.22	0.51	59	64	66	69	71
		Science							
Level 4	25	0.25	0.60	0.84	9	13	12	16	14
Level 3	21	0.12	0.41	0.71	28	36	35	39	37
Level 2	17	0.05	0.23	0.57	54	63	63	68	65
		ELA							
Level 4	25	0.36	0.70	0.86	11	12	12	13	12
Level 3	19	0.16	0.47	0.73	38	41	41	44	42
Level 2	15	0.09	0.31	0.61	63	66	68	69	68

Figure 7. Percentages of 2022 Arizona Census Juniors At Each Performance Level, Final Recommendations



Process Evaluation Questionnaire Results

After completing the final round of ratings, all panelists completed a Process Evaluation Questionnaire. This questionnaire was intended to gauge the level of understanding of panelists, evaluate the standard setting process, and gather feedback that can be used to improve the process in future studies. Panelists responded to the questionnaire items on a 1–5 scale. In general, panelists reported that they understood the purpose and the process, and most found the resulting cut scores defensible and reasonable. A copy of the evaluation form and a summary of the results can be found in the Appendix.

Adoption of Cut Scores

The recommended cut scores were approved by the Arizona State Board of Education on July 11, 2022.

Summary and Conclusions

ACT conducted a standard setting for the Arizona Department of Education on July 6-7, 2022, to recommend cut scores on the ACT for use in the state's accountability system and to satisfy federal reporting requirements.

Twenty-one panelists participated in the standard setting (9 in mathematics, 4 in science, and 8 in ELA) and reviewed information about the ACT, including probabilities of success in first-year, credit-bearing college courses and impact data for several samples of ACT-tested students in Arizona and nationally. Comparative impact data were also considered for Arizona state assessments and NAEP assessments. Panelists provided recommendations for three cut scores defining four performance levels in mathematics, science, and ELA, and were approved by the Arizona State Board of Education on July 11, 2022.

References

ACT. (2006). *Ready for college and ready for work: Same or different?* Iowa City, IA: Author. Retrieved from *https://www.act.org/content/dam/act/unsecured/documents/ReadinessBrief.pdf*.

ACT. (2019). *The condition of college and career readiness 2019: Arizona key findings*. Iowa City, IA: Author. Retrieved from *https://www.act.org/content/dam/act/unsecured/documents/cccr-2019/Arizona-CCCR-2019.pdf*

ACT. (2022). *ACT College and Career Readiness Standards.* Iowa City, IA: Author. Retrieved from *https://www.act.org/content/act/en/college-and-career-readiness/standards.html*.

Allen, J. (2013). Updating the ACT College Readiness Benchmarks. (ACT Research Report No. 2013-6). Iowa City, IA: ACT, Inc. Retrieved from *http://www.act.org/content/act/en/research/pdfs/updating-the-actcollegereadinessbenchmarks.html*

Allen, J. (2021). *Have ACT scores declined during the COVID-19 pandemic? An examination of fall State and District testing data* (Working Paper 2021-02). Iowa City, IA: ACT. Retrieved from *https://www.act.org/content/dam/act/unsecured/documents/2021/COVID-Impact-Fall-ACT-State-and-District-2021-5.pdf*.

Allen, J., & Sconing, J. (2005). *Using ACT Assessment scores to set benchmarks for college readiness*. (ACT Research Report No. 2005-3). Iowa City, IA: ACT, Inc. Retrieved from *http://www.act.org/content/act/en/research/pdfs/using-act-assessmentscorestosetbenchmarksforcollegereadiness.html*

Fields, R., & Parsad, B. (2012). *Tests and Cut Scores Used for Student Placement in Postsecondary Education: Fall 2011.* Washington, DC: National Assessment Governing Board. Retrieved from *https://www.nagb.org/content/nagb/assets/documents/commission/researchandresources/test-and-cut-scores-used-for-student-placement-in-postsecondary-education-fall-2011.pdf*.

Hayes, S. (2021). *Learning opportunities: Understanding scores from ACT's assessment suite during the COVID-19 pandemic*. Iowa City, IA: ACT. Retrieved from

https://www.act.org/content/dam/act/unsecured/documents/2021/Learning-Opportunities-Understanding-Scores-Assessment-Pandemic-Accessible.pdf.

Konig, C., & Frey, A. (2022). The impact of COVID-19-related school closures on student achievement–A meta-analysis. *Educational Measurement: Issues and Practice, 41*(1), 16-22. Retrieved from *https://onlinelibrary.wiley.com/doi/epdf/10.1111/emip.12495*.

NCES. (2020). Courses taken, credits earned, and time to degree: A first look at the postsecondary transcripts of 2011-12 beginning postsecondary students. Washington, DC: National Center for Education Statistics. Retrieved from *https://nces.ed.gov/pubs2020/2020501.pdf*.

NCES. (2022a). *Immediate college enrollment rate*. Washington, DC: National Center for Education Statistics. Retrieved from *https://nces.ed.gov/programs/coe/indicator/cpa/immediate-college-enrollment-rate?tid=74*.

NCES. (2022b). Annual earnings by educational attainment. *Condition of education.* Washington, DC: National Center for Education Statistics. Retrieved from *https://nces.ed.gov/programs/coe/indicator/cba/annual-earnings*.

Noble, J., & Radunzel, J. (2012). Predicting long-term college success through degree completion using ACT Composite score, ACT Benchmarks, and high school grade point average (ACT Research Report No. 2012(5)). Iowa City, IA: ACT. Retrieved from *https://www.act.org/content/dam/act/unsecured/documents/ACT_RR2012-5.pdf*.

Noble, J., & Sawyer, R. (2013). A study of the effectiveness of developmental courses for improving success in college. (ACT Research Report No. 2013-1). Iowa City, IA: ACT, Inc.

Radunzel, J., Westrick, P., Bassiri, D., & Li, D. (2017). Development and validation of a preliminary ELA readiness benchmark based on the ACT ELA score. (ACT Research Report No. 2017-9). Iowa City, IA: ACT, Inc.

Steedle, J. T., Radunzel, J., & Mattern, K. (2019a). Comparing academic readiness for different postsecondary pathways: What admissions tests tell us. *Journal of Educational Measurement*. *56*(2), 331–360. Retrieved from *https://web.p.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=2&sid=85916f1b-7a33-4084-be02-5afcf0da8033%40redis*.

Steedle, J. T., Radunzel, J., & Mattern, K. (2019b). *Understanding the preparation levels needed for different postsecondary pathways: A rigorous academic foundation is critical for all*. Iowa City, IA: ACT. Retrieved from *https://www.act.org/content/dam/act/unsecured/documents/R1739-readiness-any-degree-2019-03.pdf*.

US Bureau of Labor Statistics. (2021). Education pays: Earnings and unemployment rates by educational attainment, 2021. *US Bureau of Labor Statistics, Current Population Survey.* Retrieved from *https://www.bls.gov/emp/chart-unemployment-earnings-education.htm*.

US Department of Education (2018). *A state's guide to the US Department of Education's assessment peer review process.* Washington, DC: US Department of Education, Office of Elementary and Secondary Education. Retrieved from *https://www2.ed.gov/admins/lead/account/saa/assessmentpeerreview.pdf*

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Elisa	Sanchez	Pearson

ELA Panel

Kevin	Sanchez	Rose Academies// Leona Group
Tracey	Rowley	Tucson Unified
Deborah	Johnson	DVUSD
Tara	Garcia	Glenview College Prep
Kelsey	Tomlinson	Tempe Union High School District
Melissa	Maakestad	Charter
Erin	Henderson	Phoenix Union High School District
Kendra	Gaines	American Charter Schools Foundation d.b.a South Pointe High School

Mathematics Panel

Rebecca	Coons	Peoria Unified School District
Jennifer	Griner	Marana Unified School District
Kristine	Cunningham	Phoenix Union High School District
Phuong Mai	Pham	American Charter Association - Leona Group
Melissa	Hosten	University of Arizona
Jane	Gaun	Flagstaff Unified School District
Jeanette	Scott	Phoenix Union High School District
Matthew	Griffith	Glendale Union High School District
Kristi	Peterson	Gilbert Public Schools

Science Panel

Marcus	Berkshire	J.O. Combs USD
Kimberly	Adkins	YUHSD
Cynthia	Messieha	Agua Fria Union HS District
Danee	Bertram	Valley union high school district

Background Questionnaire
Arizona Standard Setting July 6-7, 2022

1. What is your gender?	Female	Male	Another Gender	Prefer not to respond			Total
	18	3	0	0			21
	86%	14%	0%	0%			100%
2. What is your ethnicity?	Hispanic or Latino	Not Hispanic or Latino	Prefer not to respond				
	2	19	0				21
	10%	90%	0%				100%
3. What is your race?	American Indian or Alaskan Native	Asian	Black or African American	Native Hawaiian or Other Pac Islander	White	Prefer not to respond	Total
	0	1	1	0	19	0	21
	0%	5%	5%	0%	90%	0%	100%
4. Which of the following best describes you?[1]	Principal/ Administrator	District Curriculum/ Assessment Coordinator	Counselor	Classroom Teacher	Higher Ed Faculty	Other	Total
	4	7	1	10	2	0	24
	19%	33%	5%	48%	10%	0%	114%
4a. Which grade levels do you currently teach?[2]	9	10	11	12			Total
	8	7	10	6			10
	80%	70%	100%	60%			48%
4b. Do you teach special populations of students?[2]	Developmental	ELL	Special Education	Gifted and Talented			Total
	0	1	5	2			10
	0%	10%	50%	20%			48%
5. How many years have you worked in education?	Less than 1 year	1-5 years	6-10 years	11-15 years	16-20 years	20+ years	Total
	0	1	3	3	2	11	20
	0%	5%	15%	15%	10%	55%	95%
6. How many years have you worked in Arizona?	Less than 1 year	1-5 years	6-10 years	11-15 years	16-20 years	20+ years	Total
	0	0	4	3	5	8	20
	0%	0%	20%	15%	25%	40%	95%
7. How many years have you been in your current position?	Less than 1 year	1-5 years	6-10 years	11-15 years	16-20 years	20+ years	Total
	3	6	9	0	0	2	20
	15%	30%	45%	0%	0%	10%	95%
8. Indicate the highest degree you hold.	Associate degree	Bachelor's degree	Master's degree	Professional degree	Doctoral degree		Total
	0	5	15	0	0	0	20
	0%	25%	75%	0%	0%	0%	95%

Notes:
1. Panelists may have reported more than one role (e.g., administrator and curriculum coordinator).
2. Grades and student populations taught is counted only for HS classroom teachers.

Probability of Success **Round 1 Rating Sheet**

ACT Subject: Mathematics

College Course: Algebra

Probability of Success		
A prob	B or higher prob	C or higher prob
0.79	0.90	0.94
0.74	0.88	0.93
0.70	0.86	0.92
0.66	0.84	0.91
0.62	0.82	0.90
0.58	0.80	0.89
0.54	0.78	0.88
0.51	0.76	0.87
0.48	0.74	0.86
0.45	0.72	0.85
0.42	0.70	0.84
0.39	0.68	0.83
0.36	0.66	0.82
0.34	0.64	0.81
0.32	0.62	0.80
0.29	0.60	0.79
0.27	0.58	0.78
0.25	0.56	0.77
0.24	0.54	0.76
0.22	0.52	0.74
0.20	**0.50**	**0.73**
0.19	0.48	0.72
0.17	0.46	0.71
0.16	0.44	0.69
0.15	0.42	0.68
0.13	0.40	0.67
0.12	0.38	0.65
0.11	0.36	0.64
0.10	0.34	0.62
0.09	0.32	0.60
0.08	0.30	0.59
0.07	0.28	0.57
0.07	0.26	0.55
0.06	0.24	0.53
0.05	0.22	0.51
0.04	0.20	0.48

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: Mathematics **Round 2 Rating Sheet**
College Course: Algebra

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.89	0.94	0.96	0	0	0	0	0
35	0.86	0.93	0.95	1	0	1	1	1
34	0.83	0.92	0.95	1	1	1	1	1
33	0.78	0.90	0.94	2	1	1	1	1
32	0.74	0.88	0.92	2	2	2	2	2
31	0.70	0.86	0.91	3	2	2	3	3
30	0.64	0.83	0.90	4	3	3	4	3
29	0.58	0.80	0.89	4	4	4	5	5
28	0.51	0.77	0.87	5	6	5	7	6
27	0.45	0.73	0.85	7	8	7	10	9
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55
16	0.05	0.22	0.51	59	64	66	69	71
15	0.04	0.19	0.46	73	78	80	83	82
14	0.03	0.16	0.43	84	89	90	92	94
13	0.02	0.13	0.39	92	95	96	97	98
12	0.02	0.11	0.35	95	97	98	99	99
N-count	70,461			77,159	310,224	289,674	292,685	316,965

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: Mathematics **Round 3 Rating Sheet**
College Course: Algebra

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.89	0.94	0.96	0	0	0	0	0
35	0.86	0.93	0.95	1	0	1	1	1
34	0.83	0.92	0.95	1	1	1	1	1
33	0.78	0.90	0.94	2	1	1	1	1
32	0.74	0.88	0.92	2	2	2	2	2
31	0.70	0.86	0.91	3	2	2	3	3
30	0.64	0.83	0.90	4	3	3	4	3
29	0.58	0.80	0.89	4	4	4	5	5
28	0.51	0.77	0.87	5	6	5	7	6
27	0.45	0.73	0.85	7	8	7	10	9
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55
16	0.05	0.22	0.51	59	64	66	69	71
15	0.04	0.19	0.46	73	78	80	83	82
14	0.03	0.16	0.43	84	89	90	92	94
13	0.02	0.13	0.39	92	95	96	97	98
12	0.02	0.11	0.35	95	97	98	99	99
N-count	70,461			77,159	310,224	289,674	292,685	316,965

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: Mathematics **Round 4 Rating Sheet**
College Course: Algebra

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.89	0.94	0.96	0	0	0	0	0
35	0.86	0.93	0.95	1	0	1	1	1
34	0.83	0.92	0.95	1	1	1	1	1
33	0.78	0.90	0.94	2	1	1	1	1
32	0.74	0.88	0.92	2	2	2	2	2
31	0.70	0.86	0.91	3	2	2	3	3
30	0.64	0.83	0.90	4	3	3	4	3
29	0.58	0.80	0.89	4	4	4	5	5
28	0.51	0.77	0.87	5	6	5	7	6
27	0.45	0.73	0.85	7	8	7	10	9
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55
16	0.05	0.22	0.51	59	64	66	69	71
15	0.04	0.19	0.46	73	78	80	83	82
14	0.03	0.16	0.43	84	89	90	92	94
13	0.02	0.13	0.39	92	95	96	97	98
12	0.02	0.11	0.35	95	97	98	99	99
N-count	70,461			77,159	310,224	289,674	292,685	316,965

Probability of Success **Round 1 Rating Sheet**

ACT Subject: Science

College Course: Biology

Probability of Success		
A prob	B or higher prob	C or higher prob
0.74	0.90	0.96
0.70	0.88	0.95
0.65	0.86	0.94
0.61	0.84	0.94
0.57	0.82	0.93
0.53	0.80	0.92
0.50	0.78	0.91
0.46	0.76	0.90
0.43	0.74	0.90
0.41	0.72	0.89
0.38	0.70	0.88
0.35	0.68	0.87
0.33	0.66	0.86
0.31	0.64	0.85
0.29	0.62	0.84
0.27	0.60	0.83
0.25	0.58	0.82
0.23	0.56	0.81
0.22	0.54	0.80
0.20	0.52	0.79
0.19	**0.50**	**0.78**
0.17	0.48	0.76
0.16	0.46	0.75
0.15	0.44	0.74
0.14	0.42	0.73
0.13	0.40	0.71
0.12	0.38	0.70
0.11	0.36	0.68
0.10	0.34	0.66
0.09	0.32	0.65
0.08	0.30	0.63
0.07	0.28	0.61
0.06	0.26	0.59
0.06	0.24	0.57
0.05	0.22	0.54
0.04	0.20	0.52

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: Science **Round 2 Rating Sheet**
College Course: Biology

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.83	0.93	0.97	0	0	0	0	0
35	0.79	0.92	0.97	1	1	1	1	1
34	0.75	0.90	0.96	1	1	1	1	1
33	0.70	0.88	0.95	2	2	2	2	2
32	0.65	0.86	0.95	2	2	2	3	3
31	0.59	0.83	0.93	2	3	3	4	4
30	0.53	0.80	0.92	3	4	4	5	5
29	0.47	0.77	0.91	4	5	4	6	5
28	0.41	0.73	0.89	4	6	6	7	7
27	0.36	0.69	0.88	5	7	7	9	8
26	0.30	0.64	0.86	7	10	9	11	11
25	0.25	0.60	0.84	9	13	12	16	14
24	0.21	0.55	0.81	14	18	18	21	20
23	**0.18**	**0.51**	**0.79**	**19**	**25**	**24**	**27**	**26**
22	0.14	0.46	0.75	23	29	30	33	31
21	0.12	0.41	0.71	28	36	35	39	37
20	0.10	0.36	0.68	33	41	41	46	42
19	0.08	0.31	0.65	39	49	50	53	50
18	0.06	0.27	0.61	46	57	56	59	58
17	0.05	0.23	0.57	54	63	63	68	65
16	0.04	0.19	0.52	61	72	71	74	73
15	0.03	0.16	0.47	69	78	77	80	78
14	0.03	0.14	0.42	79	84	83	85	84
13	0.02	0.11	0.38	86	89	89	90	89
12	0.02	0.09	0.34	91	92	93	94	92
N-count	41,651			77,159	310,224	289,674	292,685	316,965

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: Science **Round 3 Rating Sheet**
College Course: Biology

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.83	0.93	0.97	0	0	0	0	0
35	0.79	0.92	0.97	1	1	1	1	1
34	0.75	0.90	0.96	1	1	1	1	1
33	0.70	0.88	0.95	2	2	2	2	2
32	0.65	0.86	0.95	2	2	2	3	3
31	0.59	0.83	0.93	2	3	3	4	4
30	0.53	0.80	0.92	3	4	4	5	5
29	0.47	0.77	0.91	4	5	4	6	5
28	0.41	0.73	0.89	4	6	6	7	7
27	0.36	0.69	0.88	5	7	7	9	8
26	0.30	0.64	0.86	7	10	9	11	11
25	0.25	0.60	0.84	9	13	12	16	14
24	0.21	0.55	0.81	14	18	18	21	20
23	**0.18**	**0.51**	**0.79**	**19**	**25**	**24**	**27**	**26**
22	0.14	0.46	0.75	23	29	30	33	31
21	0.12	0.41	0.71	28	36	35	39	37
20	0.10	0.36	0.68	33	41	41	46	42
19	0.08	0.31	0.65	39	49	50	53	50
18	0.06	0.27	0.61	46	57	56	59	58
17	0.05	0.23	0.57	54	63	63	68	65
16	0.04	0.19	0.52	61	72	71	74	73
15	0.03	0.16	0.47	69	78	77	80	78
14	0.03	0.14	0.42	79	84	83	85	84
13	0.02	0.11	0.38	86	89	89	90	89
12	0.02	0.09	0.34	91	92	93	94	92
N-count	41,651			77,159	310,224	289,674	292,685	316,965

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: Science **Round 4 Rating Sheet**
College Course: Biology

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.83	0.93	0.97	0	0	0	0	0
35	0.79	0.92	0.97	1	1	1	1	1
34	0.75	0.90	0.96	1	1	1	1	1
33	0.70	0.88	0.95	2	2	2	2	2
32	0.65	0.86	0.95	2	2	2	3	3
31	0.59	0.83	0.93	2	3	3	4	4
30	0.53	0.80	0.92	3	4	4	5	5
29	0.47	0.77	0.91	4	5	4	6	5
28	0.41	0.73	0.89	4	6	6	7	7
27	0.36	0.69	0.88	5	7	7	9	8
26	0.30	0.64	0.86	7	10	9	11	11
25	0.25	0.60	0.84	9	13	12	16	14
24	0.21	0.55	0.81	14	18	18	21	20
23	**0.18**	**0.51**	**0.79**	**19**	**25**	**24**	**27**	**26**
22	0.14	0.46	0.75	23	29	30	33	31
21	0.12	0.41	0.71	28	36	35	39	37
20	0.10	0.36	0.68	33	41	41	46	42
19	0.08	0.31	0.65	39	49	50	53	50
18	0.06	0.27	0.61	46	57	56	59	58
17	0.05	0.23	0.57	54	63	63	68	65
16	0.04	0.19	0.52	61	72	71	74	73
15	0.03	0.16	0.47	69	78	77	80	78
14	0.03	0.14	0.42	79	84	83	85	84
13	0.02	0.11	0.38	86	89	89	90	89
12	0.02	0.09	0.34	91	92	93	94	92
N-count	41,651			77,159	310,224	289,674	292,685	316,965

Probability of Success **Round 1 Rating Sheet**

ACT Subject: ELA

College Course: English Composition I and Social Sciences

Probability of Success		
A prob	B or higher prob	C or higher prob
0.61	0.90	0.95
0.56	0.88	0.94
0.51	0.86	0.93
0.47	0.84	0.93
0.44	0.82	0.92
0.40	0.80	0.91
0.37	0.78	0.90
0.35	0.76	0.89
0.32	0.74	0.88
0.30	0.72	0.88
0.28	0.70	0.87
0.26	0.68	0.86
0.24	0.66	0.85
0.22	0.64	0.84
0.21	0.62	0.83
0.19	0.60	0.82
0.18	0.58	0.81
0.17	0.56	0.80
0.16	0.54	0.79
0.15	0.52	0.78
0.14	**0.50**	**0.77**
0.13	0.48	0.75
0.12	0.46	0.74
0.11	0.44	0.73
0.10	0.42	0.71
0.09	0.40	0.70
0.09	0.38	0.69
0.08	0.36	0.67
0.07	0.34	0.65
0.07	0.32	0.64
0.06	0.30	0.62
0.06	0.28	0.60
0.05	0.26	0.58
0.04	0.24	0.56
0.04	0.22	0.54
0.04	0.20	0.51

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: ELA **Round 2 Rating Sheet**
College Course: English Composition I and Social Sciences

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.78	0.93	0.96	0	0	0	0	0
35	0.76	0.92	0.96	0	0	0	0	0
34	0.72	0.91	0.95	0	0	0	0	0
33	0.69	0.89	0.95	1	0	0	0	0
32	0.65	0.88	0.94	1	1	1	1	1
31	0.62	0.86	0.93	2	2	1	2	2
30	0.58	0.84	0.92	2	2	2	3	3
29	0.53	0.82	0.91	3	4	3	4	4
28	0.49	0.79	0.90	5	5	5	6	5
27	0.45	0.77	0.89	6	7	7	8	7
26	0.40	0.73	0.87	8	9	9	10	9
25	0.36	0.70	0.86	11	12	12	13	12
24	0.32	0.66	0.84	14	15	15	16	15
23	0.29	0.62	0.82	18	19	19	21	19
22	0.25	0.58	0.80	22	24	24	26	24
21	0.22	0.55	0.78	27	29	29	31	29
20	**0.19**	**0.51**	**0.76**	**32**	**35**	**35**	**37**	**35**
19	0.16	0.47	0.73	38	41	41	44	42
18	0.14	0.43	0.71	44	47	48	50	48
17	0.12	0.39	0.68	50	53	54	56	55
16	0.11	0.35	0.65	56	60	61	63	62
15	0.09	0.31	0.61	63	66	68	69	68
14	0.08	0.28	0.58	70	73	75	75	75
13	0.07	0.25	0.54	77	79	81	81	81
12	0.06	0.23	0.51	83	85	87	86	86
	198,275			75,354	95,957	89,514	94,711	96,600

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: ELA **Round 3 Rating Sheet**
College Course: English Composition I and Social Sciences

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.78	0.93	0.96	0	0	0	0	0
35	0.76	0.92	0.96	0	0	0	0	0
34	0.72	0.91	0.95	0	0	0	0	0
33	0.69	0.89	0.95	1	0	0	0	0
32	0.65	0.88	0.94	1	1	1	1	1
31	0.62	0.86	0.93	2	2	1	2	2
30	0.58	0.84	0.92	2	2	2	3	3
29	0.53	0.82	0.91	3	4	3	4	4
28	0.49	0.79	0.90	5	5	5	6	5
27	0.45	0.77	0.89	6	7	7	8	7
26	0.40	0.73	0.87	8	9	9	10	9
25	0.36	0.70	0.86	11	12	12	13	12
24	0.32	0.66	0.84	14	15	15	16	15
23	0.29	0.62	0.82	18	19	19	21	19
22	0.25	0.58	0.80	22	24	24	26	24
21	0.22	0.55	0.78	27	29	29	31	29
20	**0.19**	**0.51**	**0.76**	**32**	**35**	**35**	**37**	**35**
19	0.16	0.47	0.73	38	41	41	44	42
18	0.14	0.43	0.71	44	47	48	50	48
17	0.12	0.39	0.68	50	53	54	56	55
16	0.11	0.35	0.65	56	60	61	63	62
15	0.09	0.31	0.61	63	66	68	69	68
14	0.08	0.28	0.58	70	73	75	75	75
13	0.07	0.25	0.54	77	79	81	81	81
12	0.06	0.23	0.51	83	85	87	86	86
	198,275			75,354	95,957	89,514	94,711	96,600

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: ELA **Round 4 Rating Sheet**
College Course: English Composition I and Social Sciences

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.78	0.93	0.96	0	0	0	0	0
35	0.76	0.92	0.96	0	0	0	0	0
34	0.72	0.91	0.95	0	0	0	0	0
33	0.69	0.89	0.95	1	0	0	0	0
32	0.65	0.88	0.94	1	1	1	1	1
31	0.62	0.86	0.93	2	2	1	2	2
30	0.58	0.84	0.92	2	2	2	3	3
29	0.53	0.82	0.91	3	4	3	4	4
28	0.49	0.79	0.90	5	5	5	6	5
27	0.45	0.77	0.89	6	7	7	8	7
26	0.40	0.73	0.87	8	9	9	10	9
25	0.36	0.70	0.86	11	12	12	13	12
24	0.32	0.66	0.84	14	15	15	16	15
23	0.29	0.62	0.82	18	19	19	21	19
22	0.25	0.58	0.80	22	24	24	26	24
21	0.22	0.55	0.78	27	29	29	31	29
20	**0.19**	**0.51**	**0.76**	**32**	**35**	**35**	**37**	**35**
19	0.16	0.47	0.73	38	41	41	44	42
18	0.14	0.43	0.71	44	47	48	50	48
17	0.12	0.39	0.68	50	53	54	56	55
16	0.11	0.35	0.65	56	60	61	63	62
15	0.09	0.31	0.61	63	66	68	69	68
14	0.08	0.28	0.58	70	73	75	75	75
13	0.07	0.25	0.54	77	79	81	81	81
12	0.06	0.23	0.51	83	85	87	86	86
	198,275			75,354	95,957	89,514	94,711	96,600

Arizona State Test Performance for Previous Years/Grades

Percent At or Above							
Math Achievement Level	2019					2021	
	Grade 8	Algebra I	Algebra II	Geometry	ACT Math	Grade 8	Grade 10
Level 4	18	15	14	9	14	11	5
Level 3	41	43	40	37	33	26	26
Level 2	59	61	61	58	50	43	46
Level 1	41	39	40	42	50	56	53

Percent At or Above				
Science Achievement Level	2019			
	Grade 8	2022 Cohort	2021 Cohort	ACT Science
Level 4	24	22	13	11
Level 3	50	45	30	24
Level 2	72	66	48	48
Level 1	27	34	52	51

Percent At or Above						
ELA Achievement Level	2019				2021	
	Grade 8	Grade 10	Grade 11	ACT ELA	Grade 8	Grade 10
Level 4	13	10	13	13	11	9
Level 3	38	33	33	29	34	33
Level 2	59	48	49	51	55	50
Level 1	40	51	51	49	45	51

https://www.azed.gov/accountability-research/data

Arizona National Assessment of Educational Progress (NAEP) Performance

	Percent At or Above		
Mathematics Achievement Level	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	9	10	3
Proficient	31	34	24
Basic	68	69	59
Below Basic	32	31	40

	Percent At or Above		
	2015 Grade 8	2019 Grade 8	2019 Grade 12
Science Achievement Level	AZ	National public	National public
Advanced	1	2	2
Proficient	25	35	22
Basic	61	67	59
Below Basic	39	33	41

	Percent At or Above		
Reading Achievement Level	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	3	4	6
Proficient	30	33	37
Basic	69	72	70
Below Basic	31	27	30

https://www.nationsreportcard.gov/mathematics/nation/achievement/?grade=8
https://www.nationsreportcard.gov/mathematics/nation/achievement/?grade=12
https://www.nationsreportcard.gov/science/nation/achievement/?grade=8
https://www.nationsreportcard.gov/science/nation/achievement/?grade=12
https://www.nationsreportcard.gov/reading/nation/achievement/?grade=8
https://www.nationsreportcard.gov/reading/nation/achievement/?grade=12

https://www.nationsreportcard.gov/reading/states/achievement/?grade=8
https://www.nationsreportcard.gov/mathematics/states/achievement/?grade=8
https://nces.ed.gov/nationsreportcard/subject/publications/stt2015/pdf/2016157AZ8.pdf

Descriptives for Impact Data Samples

		AZ Juniors Census 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
Number of Students Tested	Count	77,159	310,224	289,674	292,685	316,965
Participation Rate	Percent	90%	90%	86%	86%	93%
Tested 11th Grade		98%	99%	99%	100%	100%
Took writing		98%	31%	31%	65%	75%
Female		47%	45%	49%	46%	49%
Male		48%	46%	48%	46%	49%
Gender Other/Missing/NR		5%	9%	3%	8%	2%
Black/African American		5%	13%	11%	13%	14%
American Indian		3%	1%	1%	1%	1%
White		32%	52%	52%	52%	52%
Hispanic/Latino		44%	13%	15%	15%	15%
Asian		3%	3%	3%	3%	3%
Native Hawaiian/Pacific Islander		0%	0%	0%	0%	0%
Two or more races		4%	5%	5%	5%	4%
Race/Ethnicity Missing/NR		8%	13%	14%	11%	11%
Met ACT English Benchmark		39%	43%	43%	46%	45%
Met ACT Math Benchmark		21%	24%	24%	28%	25%
Met ACT Reading Benchmark		28%	34%	33%	35%	33%
Met ACT Science Benchmark		19%	25%	24%	27%	26%
Met ACT ELA Benchmark		32%	35%	35%	34%	34%
ACT Composite (1-36)	Mean	17.5	18.3	18.3	18.7	18.6
ACT English (1-36)		16.6	17.1	17.2	17.7	17.5
ACT Math (1-36)		17.7	18.2	18.3	18.9	18.7
ACT Reading (1-36)		17.8	19.0	18.9	19.3	19.3
ACT Science (1-36)		17.7	18.8	18.7	19.3	19.0
ACT ELA (1-36)		17.1	17.4	17.6	17.3	17.3

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: Mathematics
College Course: Algebra

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.89	0.94	0.96	0	0	0	0	0
35	0.86	0.93	0.95	1	0	1	1	1
34	0.83	0.92	0.95	1	1	1	1	1
33	0.78	0.90	0.94	2	1	1	1	1
32	0.74	0.88	0.92	2	2	2	2	2
31	0.70	0.86	0.91	3	2	2	3	3
30	0.64	0.83	0.90	4	3	3	4	3
29	0.58	0.80	0.89	4	4	4	5	5
28	0.51	0.77	0.87	5	6	5	7	6
27	0.45	0.73	0.85	7	8	7	10	9
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55
16	0.05	0.22	0.51	59	64	66	69	71
15	0.04	0.19	0.46	73	78	80	83	82
14	0.03	0.16	0.43	84	89	90	92	94
13	0.02	0.13	0.39	92	95	96	97	98
12	0.02	0.11	0.35	95	97	98	99	99
N-count	70,461			77,159	310,224	289,674	292,685	316,965

College Enrollment at Each ACT Score
ACT Subject: Mathematics

ACT Score	AZ Graduates 2020	AZ Graduates 2019	AZ Graduates 2018	National Graduates 2020	National Graduates 2019	National Graduates 2018
36	74	78	82	77	84	84
35	81	83	78	79	85	85
34	78	83	81	80	86	85
33	78	87	86	80	87	86
32	82	84	81	81	87	86
31	81	86	82	82	87	86
30	83	85	83	82	87	87
29	82	84	84	82	87	87
28	79	82	81	81	87	87
27	74	79	82	80	85	86
26	72	79	80	79	84	84
25	69	73	78	77	82	83
24	67	70	73	76	80	80
23	63	73	71	74	79	78
22	**60**	**66**	**68**	**72**	**76**	**77**
21	57	65	63	67	74	74
20	56	65	67	69	74	74
19	53	58	58	65	70	69
18	46	56	57	61	67	66
17	41	48	48	56	59	60
16	33	41	40	47	52	50
15	26	31	31	38	40	40
14	21	27	25	28	34	34
13	17	25	21	24	29	29
12	13	20	20	22	26	27
N-count	48,776	50,446	45,468	1,670,497	1,782,820	1,914,817
Overall Enrollment Rate	46%	52%	53%	59%	65%	65%

Average High School Subject Area GPA at Each ACT Score
ACT Subject: Mathematics

ACT Score	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	3.98	3.98	3.98	3.96	3.97
35	3.92	3.95	3.96	3.96	3.95
34	3.90	3.93	3.93	3.94	3.92
33	3.89	3.92	3.92	3.90	3.91
32	3.83	3.92	3.91	3.88	3.89
31	3.83	3.91	3.90	3.88	3.87
30	3.80	3.89	3.88	3.86	3.86
29	3.76	3.87	3.86	3.83	3.84
28	3.76	3.84	3.84	3.79	3.80
27	3.71	3.81	3.81	3.74	3.75
26	3.65	3.76	3.78	3.69	3.70
25	3.57	3.71	3.72	3.64	3.64
24	3.55	3.64	3.66	3.56	3.55
23	3.48	3.60	3.60	3.49	3.49
22	**3.43**	**3.52**	**3.57**	**3.43**	**3.42**
21	3.38	3.47	3.50	3.34	3.39
20	3.30	3.44	3.44	3.33	3.33
19	3.21	3.36	3.37	3.23	3.23
18	3.09	3.28	3.28	3.11	3.14
17	2.98	3.15	3.13	2.95	2.97
16	2.78	2.94	2.93	2.72	2.70
15	2.52	2.71	2.69	2.48	2.47
14	2.37	2.53	2.52	2.32	2.31
13	2.29	2.45	2.42	2.25	2.21
12	2.22	2.41	2.37	2.25	2.25
N-count	32,665	109,084	124,188	91,732	112,314

Mathematics Courses

Algebra 1
Algebra 2
Geometry
Trigonometry
Beginning Calculus
Other Advanced Math
Computer Math/Computer Science

Long Term College Outcomes from 2012 Study
National Samples
ACT Subject: Mathematics

ACT Score	Returned to any college year 2: 2-year students	Returned to any college year 2: 4-year students	Complete Bachelor's Degree in 6 years: 4-year students	Complete Associate's or Bachelor's Degree in 6 years
36	91	98	88	80
35	90	97	87	78
34	90	97	86	76
33	89	97	84	74
32	88	96	83	72
31	88	96	81	70
30	87	96	79	67
29	86	95	77	65
28	85	95	75	62
27	84	94	73	60
26	83	94	71	57
25	82	93	69	54
24	81	92	66	52
23	80	92	64	49
22	**79**	**91**	**61**	**46**
21	78	90	59	44
20	77	89	56	41
19	75	88	53	38
18	74	87	50	36
17	73	86	48	33
16	71	84	45	31
15	70	83	42	28
14	68	81	40	26
13	67	80	37	24
12	65	78	35	22

Arizona State Test Performance for Previous Years/Grades

Percent At or Above							
Math Achievement Level	2019					2021	
	Grade 8	Algebra I	Algebra II	Geometry	ACT Math	Grade 8	Grade 10
Level 4	18	15	14	9	14	11	5
Level 3	41	43	40	37	33	26	26
Level 2	59	61	61	58	50	43	46
Level 1	41	39	40	42	50	56	53

Percent At or Above				
Science Achievement Level	2019			
	Grade 8	2022 Cohort	2021 Cohort	ACT Science
Level 4	24	22	13	11
Level 3	50	45	30	24
Level 2	72	66	48	48
Level 1	27	34	52	51

Percent At or Above						
ELA Achievement Level	2019				2021	
	Grade 8	Grade 10	Grade 11	ACT ELA	Grade 8	Grade 10
Level 4	13	10	13	13	11	9
Level 3	38	33	33	29	34	33
Level 2	59	48	49	51	55	50
Level 1	40	51	51	49	45	51

https://www.azed.gov/accountability-research/data

Arizona National Assessment of Educational Progress (NAEP) Performance

	Percent At or Above		
Mathematics Achievement Level	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	9	10	3
Proficient	31	34	24
Basic	68	69	59
Below Basic	32	31	40

	Percent At or Above		
	2015 Grade 8	2019 Grade 8	2019 Grade 12
Science Achievement Level	AZ	National public	National public
Advanced	1	2	2
Proficient	25	35	22
Basic	61	67	59
Below Basic	39	33	41

	Percent At or Above		
Reading Achievement Level	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	3	4	6
Proficient	30	33	37
Basic	69	72	70
Below Basic	31	27	30

https://www.nationsreportcard.gov/mathematics/nation/achievement/?grade=8
https://www.nationsreportcard.gov/mathematics/nation/achievement/?grade=12
https://www.nationsreportcard.gov/science/nation/achievement/?grade=8
https://www.nationsreportcard.gov/science/nation/achievement/?grade=12
https://www.nationsreportcard.gov/reading/nation/achievement/?grade=8
https://www.nationsreportcard.gov/reading/nation/achievement/?grade=12

https://www.nationsreportcard.gov/reading/states/achievement/?grade=8
https://www.nationsreportcard.gov/mathematics/states/achievement/?grade=8
https://nces.ed.gov/nationsreportcard/subject/publications/stt2015/pdf/2016157AZ8.pdf

Descriptives for Impact Data Samples

		AZ Juniors Census 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
Number of Students Tested	Count	77,159	310,224	289,674	292,685	316,965
Participation Rate	Percent	90%	90%	86%	86%	93%
Tested 11th Grade		98%	99%	99%	100%	100%
Took writing		98%	31%	31%	65%	75%
Female		47%	45%	49%	46%	49%
Male		48%	46%	48%	46%	49%
Gender Other/Missing/NR		5%	9%	3%	8%	2%
Black/African American		5%	13%	11%	13%	14%
American Indian		3%	1%	1%	1%	1%
White		32%	52%	52%	52%	52%
Hispanic/Latino		44%	13%	15%	15%	15%
Asian		3%	3%	3%	3%	3%
Native Hawaiian/Pacific Islander		0%	0%	0%	0%	0%
Two or more races		4%	5%	5%	5%	4%
Race/Ethnicity Missing/NR		8%	13%	14%	11%	11%
Met ACT English Benchmark		39%	43%	43%	46%	45%
Met ACT Math Benchmark		21%	24%	24%	28%	25%
Met ACT Reading Benchmark		28%	34%	33%	35%	33%
Met ACT Science Benchmark		19%	25%	24%	27%	26%
Met ACT ELA Benchmark		32%	35%	35%	34%	34%
ACT Composite (1-36)	Mean	17.5	18.3	18.3	18.7	18.6
ACT English (1-36)		16.6	17.1	17.2	17.7	17.5
ACT Math (1-36)		17.7	18.2	18.3	18.9	18.7
ACT Reading (1-36)		17.8	19.0	18.9	19.3	19.3
ACT Science (1-36)		17.7	18.8	18.7	19.3	19.0
ACT ELA (1-36)		17.1	17.4	17.6	17.3	17.3

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: Science
College Course: Biology

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.83	0.93	0.97	0	0	0	0	0
35	0.79	0.92	0.97	1	1	1	1	1
34	0.75	0.90	0.96	1	1	1	1	1
33	0.70	0.88	0.95	2	2	2	2	2
32	0.65	0.86	0.95	2	2	2	3	3
31	0.59	0.83	0.93	2	3	3	4	4
30	0.53	0.80	0.92	3	4	4	5	5
29	0.47	0.77	0.91	4	5	4	6	5
28	0.41	0.73	0.89	4	6	6	7	7
27	0.36	0.69	0.88	5	7	7	9	8
26	0.30	0.64	0.86	7	10	9	11	11
25	0.25	0.60	0.84	9	13	12	16	14
24	0.21	0.55	0.81	14	18	18	21	20
23	**0.18**	**0.51**	**0.79**	**19**	**25**	**24**	**27**	**26**
22	0.14	0.46	0.75	23	29	30	33	31
21	0.12	0.41	0.71	28	36	35	39	37
20	0.10	0.36	0.68	33	41	41	46	42
19	0.08	0.31	0.65	39	49	50	53	50
18	0.06	0.27	0.61	46	57	56	59	58
17	0.05	0.23	0.57	54	63	63	68	65
16	0.04	0.19	0.52	61	72	71	74	73
15	0.03	0.16	0.47	69	78	77	80	78
14	0.03	0.14	0.42	79	84	83	85	84
13	0.02	0.11	0.38	86	89	89	90	89
12	0.02	0.09	0.34	91	92	93	94	92
N-count	41,651			77,159	310,224	289,674	292,685	316,965

College Enrollment at Each ACT Score
ACT Subject: Science

ACT Score	AZ Graduates 2020	AZ Graduates 2019	AZ Graduates 2018	National Graduates 2020	National Graduates 2019	National Graduates 2018
36	77	77	81	79	85	85
35	78	86	83	79	86	85
34	81	86	81	81	86	86
33	82	85	82	81	87	86
32	79	80	81	80	85	86
31	80	84	83	81	87	86
30	79	85	85	79	87	87
29	76	81	82	81	86	86
28	76	80	80	80	85	85
27	76	81	81	79	85	85
26	76	77	79	79	83	84
25	69	79	78	77	83	83
24	68	73	74	75	80	80
23	**63**	**71**	**73**	**72**	**78**	**79**
22	63	68	69	70	75	77
21	60	63	64	67	73	72
20	53	60	60	65	69	67
19	48	55	56	59	64	67
18	41	51	48	54	61	57
17	38	43	48	50	54	56
16	31	39	38	43	46	45
15	26	35	34	36	42	42
14	24	32	30	33	38	37
13	22	26	27	30	32	33
12	20	26	26	26	32	32
N-count	48,776	50,446	45,468	1,670,497	1,782,820	1,914,817
Overall Enrollment Rate	46%	52%	53%	59%	65%	65%

Average High School Subject Area GPA at Each ACT Score
ACT Subject: Science

ACT Score	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	3.92	3.90	3.90	3.92	3.91
35	3.83	3.89	3.88	3.89	3.88
34	3.85	3.89	3.90	3.88	3.84
33	3.85	3.87	3.87	3.82	3.87
32	3.75	3.84	3.85	3.86	3.81
31	3.84	3.86	3.85	3.82	3.80
30	3.79	3.84	3.82	3.79	3.76
29	3.71	3.80	3.83	3.76	3.73
28	3.73	3.83	3.80	3.75	3.74
27	3.72	3.78	3.77	3.70	3.71
26	3.68	3.75	3.75	3.68	3.67
25	3.65	3.71	3.72	3.63	3.64
24	3.61	3.66	3.66	3.58	3.56
23	**3.51**	**3.59**	**3.57**	**3.47**	**3.47**
22	3.43	3.48	3.50	3.41	3.38
21	3.35	3.43	3.43	3.32	3.32
20	3.27	3.33	3.34	3.19	3.21
19	3.20	3.27	3.23	3.11	3.15
18	3.10	3.13	3.12	2.99	3.00
17	2.96	2.99	3.05	2.87	2.90
16	2.86	2.92	2.89	2.79	2.79
15	2.78	2.83	2.83	2.68	2.68
14	2.71	2.73	2.78	2.65	2.64
13	2.65	2.70	2.71	2.54	2.54
12	2.55	2.68	2.65	2.51	2.48
N-count	32,253	109,557	125,828	91,651	112,302

Science Courses

General Science
Biology
Chemistry
Physics

Long Term College Outcomes from 2012 Study
National Samples
ACT Subject: Science

ACT Score	Returned to any college year 2: 2-year students	Returned to any college year 2: 4-year students	Complete Bachelor's Degree in 6 years - 4-year students	Complete Associate's or Bachelor's Degree in 6 years
36	89	96	88	71
35	89	96	87	69
34	88	96	85	67
33	88	95	84	65
32	87	95	83	63
31	86	94	81	61
30	85	94	80	59
29	85	94	78	57
28	84	93	76	54
27	83	93	74	52
26	82	92	73	50
25	81	91	70	48
24	80	91	68	46
23	**79**	**90**	**66**	**43**
22	78	89	64	41
21	77	88	62	39
20	76	88	59	37
19	75	87	57	35
18	74	86	54	33
17	73	85	52	31
16	72	84	49	29
15	70	83	47	27
14	69	81	44	25
13	68	80	42	24
12	67	79	39	22

Arizona State Test Performance for Previous Years/Grades

Percent At or Above							
Math Achievement Level	2019					2021	
	Grade 8	Algebra I	Algebra II	Geometry	ACT Math	Grade 8	Grade 10
Level 4	18	15	14	9	14	11	5
Level 3	41	43	40	37	33	26	26
Level 2	59	61	61	58	50	43	46
Level 1	41	39	40	42	50	56	53

Percent At or Above				
Science Achievement Level	2019			
	Grade 8	2022 Cohort	2021 Cohort	ACT Science
Level 4	24	22	13	11
Level 3	50	45	30	24
Level 2	72	66	48	48
Level 1	27	34	52	51

Percent At or Above						
ELA Achievement Level	2019				2021	
	Grade 8	Grade 10	Grade 11	ACT ELA	Grade 8	Grade 10
Level 4	13	10	13	13	11	9
Level 3	38	33	33	29	34	33
Level 2	59	48	49	51	55	50
Level 1	40	51	51	49	45	51

Arizona National Assessment of Educational Progress (NAEP) Performance

	Percent At or Above		
Mathematics Achievement Level	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	9	10	3
Proficient	31	34	24
Basic	68	69	59
Below Basic	32	31	40

	Percent At or Above		
	2015 Grade 8	2019 Grade 8	2019 Grade 12
Science Achievement Level	AZ	National public	National public
Advanced	1	2	2
Proficient	25	35	22
Basic	61	67	59
Below Basic	39	33	41

	Percent At or Above		
Reading Achievement Level	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	3	4	6
Proficient	30	33	37
Basic	69	72	70
Below Basic	31	27	30

https://www.nationsreportcard.gov/mathematics/nation/achievement/?grade=8
https://www.nationsreportcard.gov/mathematics/nation/achievement/?grade=12
https://www.nationsreportcard.gov/science/nation/achievement/?grade=8
https://www.nationsreportcard.gov/science/nation/achievement/?grade=12
https://www.nationsreportcard.gov/reading/nation/achievement/?grade=8
https://www.nationsreportcard.gov/reading/nation/achievement/?grade=12

https://www.nationsreportcard.gov/reading/states/achievement/?grade=8
https://www.nationsreportcard.gov/mathematics/states/achievement/?grade=8
https://nces.ed.gov/nationsreportcard/subject/publications/stt2015/pdf/2016157AZ8.pdf

Descriptives for Impact Data Samples

		AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
Number of Students Tested	Count	75,354	95,957	89,514	94,711	96,600
Participation Rate	Percent	90%	94%	89%	95%	97%
Tested 11th Grade		98%	97%	99%	99%	99%
Took writing		98%	100%	100%	100%	100%
Female		47%	46%	48%	44%	49%
Male		48%	48%	49%	45%	50%
Gender Other/Missing/NR		5%	5%	3%	11%	1%
Black/African American		5%	7%	5%	6%	7%
American Indian		3%	1%	1%	1%	1%
White		32%	51%	52%	50%	51%
Hispanic/Latino		44%	22%	19%	20%	21%
Asian		3%	4%	4%	4%	4%
Native Hawaiian/Pacific Islander		0%	%	%	%	1%
Two or more races		4%	5%	5%	5%	5%
Race/Ethnicity Missing/NR		8%	10%	15%	13%	11%
Met ACT English Benchmark		39%	44%	44%	48%	47%
Met ACT Math Benchmark		21%	25%	25%	30%	27%
Met ACT Reading Benchmark		28%	33%	33%	35%	34%
Met ACT Science Benchmark		19%	26%	26%	30%	28%
Met ACT ELA Benchmark		32%	35%	35%	37%	35%
ACT Composite (1-36)	Mean	17.5	18.4	18.4	18.9	18.8
ACT English (1-36)		16.6	17.3	17.3	18.0	17.7
ACT Math (1-36)		17.7	18.3	18.5	19.0	18.9
ACT Reading (1-36)		17.8	19.0	18.9	19.4	19.4
ACT Science (1-36)		17.7	19.0	19.0	19.5	19.3
ACT ELA (1-36)		17.1	17.4	17.6	17.8	17.6

Probability of Success and Percentage of Students At or Above Each ACT Score
ACT Subject: ELA
College Course: English Composition I and Social Sciences

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	0.78	0.93	0.96	0	0	0	0	0
35	0.76	0.92	0.96	0	0	0	0	0
34	0.72	0.91	0.95	0	0	0	0	0
33	0.69	0.89	0.95	1	0	0	0	0
32	0.65	0.88	0.94	1	1	1	1	1
31	0.62	0.86	0.93	2	2	1	2	2
30	0.58	0.84	0.92	2	2	2	3	3
29	0.53	0.82	0.91	3	4	3	4	4
28	0.49	0.79	0.90	5	5	5	6	5
27	0.45	0.77	0.89	6	7	7	8	7
26	0.40	0.73	0.87	8	9	9	10	9
25	0.36	0.70	0.86	11	12	12	13	12
24	0.32	0.66	0.84	14	15	15	16	15
23	0.29	0.62	0.82	18	19	19	21	19
22	0.25	0.58	0.80	22	24	24	26	24
21	0.22	0.55	0.78	27	29	29	31	29
20	**0.19**	**0.51**	**0.76**	**32**	**35**	**35**	**37**	**35**
19	0.16	0.47	0.73	38	41	41	44	42
18	0.14	0.43	0.71	44	47	48	50	48
17	0.12	0.39	0.68	50	53	54	56	55
16	0.11	0.35	0.65	56	60	61	63	62
15	0.09	0.31	0.61	63	66	68	69	68
14	0.08	0.28	0.58	70	73	75	75	75
13	0.07	0.25	0.54	77	79	81	81	81
12	0.06	0.23	0.51	83	85	87	86	86
	198,275			75,354	95,957	89,514	94,711	96,600

College Enrollment at Each ACT Score
ACT Subject: English

ACT Score	AZ Graduates 2020	AZ Graduates 2019	AZ Graduates 2018	National Graduates 2020	National Graduates 2019	National Graduates 2018
36	79	85	77	78	85	84
35	84	84	82	81	87	86
34	79	85	84	82	87	87
33	81	86	85	82	87	87
32	79	86	84	82	87	87
31	80	85	84	82	87	86
30	78	83	86	82	86	86
29	76	83	82	81	86	86
28	77	84	80	81	85	85
27	72	81	82	79	85	85
26	77	79	82	79	83	85
25	74	79	78	78	83	83
24	70	75	76	76	81	82
23	67	73	74	75	80	80
22	64	71	72	73	77	77
21	60	66	68	69	75	74
20	55	62	66	66	72	73
19	49	59	61	63	69	68
18	**49**	**57**	**57**	**60**	**65**	**65**
17	46	54	53	57	63	62
16	42	48	47	54	57	58
15	37	44	45	49	53	52
14	33	38	38	42	45	46
13	27	34	34	38	41	41
12	26	32	31	33	37	37
N-count	48,776	50,446	45,468	1,670,497	1,782,820	1,914,817
Overall Enrollment Rate	46%	52%	53%	59%	65%	65%

College Enrollment at Each ACT Score
ACT Subject: Reading

ACT Score	AZ Grad 2020	AZ Grad 2019	AZ Grad 2018	National Grad 2020	National Grad 2019	National Grad 2018
36	79	82	80	79	85	85
35	80	85	79	80	85	85
34	78	82	82	80	85	86
33	71	84	84	79	85	85
32	77	81	78	79	85	85
31	74	80	82	78	85	84
30	73	81	80	77	84	84
29	73	77	74	75	82	80
28	70	76	79	78	81	82
27	69	74	74	75	80	81
26	63	70	74	71	80	80
25	64	71	71	73	78	78
24	66	72	73	74	79	78
23	61	67	67	69	75	76
22	**59**	**67**	**70**	**70**	**75**	**74**
21	53	59	61	63	69	70
20	51	59	59	63	69	68
19	50	59	57	62	68	68
18	43	49	50	55	58	60
17	43	50	52	54	61	61
16	34	42	42	48	49	50
15	32	40	40	46	49	50
14	27	34	36	38	42	44
13	25	33	29	33	39	36
12	20	27	27	28	32	32
N-count	48,776	50,446	45,468	1,670,497	1,782,820	1,914,817
Overall Enrollment Rate	46%	52%	53%	59%	65%	65%

Average High School Subject Area GPA at Each ACT Score
ACT Subject: ELA

ACT Score	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
36	4.00	3.96	4.00	4.00	4.00
35	3.94	3.99	3.99	3.99	3.98
34	3.94	3.96	3.93	3.91	3.91
33	3.92	3.95	3.95	3.93	3.94
32	3.85	3.94	3.95	3.90	3.90
31	3.86	3.92	3.92	3.91	3.88
30	3.84	3.89	3.90	3.88	3.88
29	3.80	3.86	3.87	3.81	3.85
28	3.79	3.82	3.85	3.79	3.78
27	3.75	3.78	3.81	3.77	3.77
26	3.70	3.76	3.78	3.71	3.73
25	3.66	3.72	3.74	3.68	3.68
24	3.63	3.67	3.70	3.64	3.62
23	3.58	3.63	3.65	3.60	3.59
22	3.53	3.60	3.60	3.54	3.54
21	3.46	3.52	3.54	3.46	3.49
20	**3.39**	**3.46**	**3.47**	**3.40**	**3.41**
19	3.32	3.38	3.38	3.30	3.30
18	3.25	3.26	3.30	3.19	3.21
17	3.11	3.18	3.16	3.09	3.09
16	3.03	3.06	3.07	2.94	2.99
15	2.90	2.93	2.96	2.82	2.85
14	2.77	2.80	2.79	2.70	2.72
13	2.65	2.67	2.67	2.54	2.58
12	2.52	2.53	2.53	2.42	2.43
N-count	33,931	44,461	50,022	41,141	45,616

English Courses
English Composition 1

Social Sciences Courses
U.S. History
World History
Other History
American Government
Economics
Geography
Psychology

Long Term College Outcomes from 2012 Study
National Samples
ACT Subject: ELA

ACT Score	Returned to any college year 2: 2-year students		Returned to any college year 2: 4-year students		Complete Bachelor's Degree in 6 years - 4-year students		Complete Associate's or Bachelor's Degree in 6 years	
	English	Reading	English	Reading	English	Reading	English	Reading
36	88	82	97	94	88	76	76	61
35	87	82	97	94	87	75	74	60
34	86	81	96	94	86	74	72	58
33	86	81	96	93	84	73	70	57
32	85	81	96	93	83	72	69	55
31	85	80	95	93	81	71	67	54
30	84	80	95	92	80	69	65	52
29	83	79	95	92	78	68	62	51
28	82	79	94	92	76	67	60	50
27	82	78	94	91	75	65	58	48
26	81	78	93	91	73	64	56	47
25	80	77	93	90	71	63	54	45
24	79	76	92	90	69	61	51	44
23	79	76	92	90	66	60	49	42
22	78	**75**	91	**89**	64	**58**	47	**41**
21	77	75	90	89	62	57	45	39
20	76	74	90	88	59	55	43	38
19	75	74	89	88	57	54	40	36
18	**74**	73	**88**	87	**54**	52	**38**	35
17	73	73	87	86	52	51	36	34
16	72	72	86	86	50	50	34	32
15	71	71	85	85	47	48	32	31
14	70	71	84	85	45	47	30	30
13	69	70	83	84	42	45	28	28
12	68	69	82	83	40	44	27	27

Process Evaluation

Arizona Standard Setting July 6-7, 2022

Question	5	4	3	2	1	Mean Score	SD	N
1. How adequate were the advance communications you received for preparing you to fulfill your role in this meeting?	Extremely adequate 3	Very adequate 8	Moderately adequate 10	Slightly adequate 0	Not at all adequate 0	3.67	0.73	21
2. How well did you understand the purpose of this meeting?	Extremely well 12	Very well 7	Moderately well 1	Slightly well 1	Not at all well 0	4.43	0.81	21
3. How clear were the instructions on what you were to do during each round?	Extremely clear 11	Very clear 8	Moderately clear 2	Slightly clear 0	Not at All clear 0	4.43	0.68	21
4. How well did you understand the tasks you were to accomplish during each round?	Extremely well 12	Very well 9	Moderately well 0	Slightly well 0	Not at all well 0	4.57	0.51	21
5. How well did you understand the difference between borderline performance and typical performance within an achievement level?	Extremely well 7	Very well 10	Moderately well 3	Slightly well 1	Not at all well 0	4.10	0.83	21
6. How comfortable were you using the concept of performance at the lower borderline of Level 2?	Extremely comfortable 8	Very comfortable 10	Moderately comfortable 1	Slightly comfortable 2	Not at all comfortable 0	4.14	0.91	21
7. How comfortable were you using the concept of performance at the lower borderline of Level 3?	Extremely comfortable 8	Very comfortable 6	Moderately comfortable 5	Slightly comfortable 2	Not at all comfortable 0	3.95	1.02	21
8. How comfortable were you using the concept of performance at the lower borderline of Level 4?	Extremely comfortable 9	Very comfortable 10	Moderately comfortable 2	Slightly comfortable 0	Not at all comfortable 0	4.33	0.66	21
9. How confident were you in the cut score recommendations you provided?	Extremely confident 6	Very confident 12	Moderately confident 3	Slightly confident 0	Not at all confident 0	4.14	0.65	21
10. How well did you understand the median cut scores?	Extremely well 12	Very well 5	Moderately well 4	Slightly well 0	Not at all well 0	4.38	0.80	21
11. How well did you understand the concept of using a first-year credit-bearing college course to help set cut scores?	Extremely well 11	Very well 8	Moderately well 2	Slightly well 0	Not at all well 0	4.43	0.68	21
12. How well did you understand probabilities of success?	Extremely well 11	Very well 10	Moderately well 0	Slightly well 0	Not at all well 0	4.52	0.51	21
13. How well did you understand the difference between probability of success and percent at or above?	Extremely well 12	Very well 7	Moderately well 1	Slightly well 1	Not at all well 0	4.43	0.81	21

Question	5	4	3	2	1	Mean Score	SD	N
14. How comfortable were you using the impact data provided to evaluate the reasonableness of the cut scores?	Extremely comfortable 9	Very comfortable 10	Moderately comfortable 1	Slightly comfortable 1	Not at all comfortable 0	4.29	0.78	21
15. How would you describe the effectiveness of the performance level setting method?	Extremely effective 5	Very effective 12	Moderately effective 4	Slightly effective 0	Not at all effective 0	4.05	0.67	21
16. How did you feel about the amount of time allotted for explanation and discussion during Round 1 (Level 3)?	Far Too Long 2	Somewhat long 7	About Right 12	Somewhat short 0	Far Too Short 0	3.52	0.68	21
17. How did you feel about the amount of time allotted for explanation and discussion during Round 2 (Level 2 & Level 4)?	Far Too Long 1	Somewhat long 7	About Right 13	Somewhat short 0	Far Too Short 0	3.43	0.60	21
18. How did you feel about the amount of time allotted for explanation and discussion during Round 3 (Levels 2, 3, and 4)?	Far Too Long 1	Somewhat long 3	About Right 14	Somewhat short 3	Far Too Short 0	3.10	0.70	21
19. To what extent was your input valued and considered by others in your group?	Extremely valued 9	Very valued 8	Moderately valued 4	Slightly valued 0	Not at all valued 0	4.24	0.77	21
20. Did you feel pressured by others in your group to make your cut score recommendations agree with theirs?	Extremely pressured 0	Very pressured 0	Moderately pressured 4	Slightly pressured 3	Not at all pressured 14	1.52	0.81	21
21. Did you feel pressured by staff to make cut score recommendations higher or lower?	Extremely pressured 0	Very pressured 1	Moderately pressured 1	Slightly pressured 2	Not at all pressured 17	1.33	0.80	21
22. Did you feel pressured by staff to keep your cut score recommendations the same?	Extremely pressured 0	Very pressured 0	Moderately pressured 0	Slightly pressured 1	Not at all pressured 20	1.05	0.22	21
23. How well did this standard setting process provide you an opportunity to use your best judgment to recommend cut scores?	Extremely well 4	Very well 12	Moderately well 4	Slightly well 1	Not at all well 0	3.90	0.77	21
24. How defensible do you feel are the cut scores produced by this standard setting process?	Extremely defensible 5	Very defensible 10	Moderately defensible 6	Slightly defensible 0	Not at all defensible 0	3.95	0.74	21
25. How reasonable do you feel will the cut scores produced by this standard setting be considered?	Extremely reasonable 5	Very reasonable 13	Moderately reasonable 3	Slightly reasonable 0	Not at all reasonable 0	4.10	0.62	21

Standard Setting Detailed Agenda

DAY 1						
Item	**Time (Approx)**	**Est. Length**	**Presenter**	**Slide Deck**	**Slide No.**	**Notes**
Registration Panelists complete demographics questionnaire	8:30 AM	0:30	NA	NA	NA	Name tags, panelists arranged in tables by content area. **Collect demographics questionnaires.**
Welcome and Introductions ACT, State, Panelists Purpose of the meeting General guidelines	9:00 AM	0:20	Joann & Audra	R1	1	
Introduction and Background Purpose and Achievement levels - where we are now, where we were	9:20 AM	0:10	Audra	R1	10	
Empirical standard setting methodology and why this approach is appropriate for the ACT	9:30 AM	0:10	Joann	R1	13	
The ACT Test	9:40 AM	0:10	Joann	R1	17	
Focus on college readiness	9:50 AM	0:10	Joann	R1	30	
ACT for College Course Placement	10:00 AM	0:05	Joann	R1	37	
ACT Benchmarks	10:05 AM	0:10	Joann	R1	41	
Options for cut scores	10:15 AM	0:10	Joann	R1	49	
Probabilities of success	10:25 AM	0:15	Joann	R1	55	
BREAK	**10:40 AM**	**0:15**				
Minimally Proficient (Level 3) student/Identifying Borderline Achievement	10:55 AM	0:10	Joann	R1	63	
Discussion (whole room)	11:05 AM	0:30	All	R1	73	Discussion
Round 1 Ratings for Level 3 cut scores Math Science ELA	11:35 AM	0:30	Joann	R1	74	
LUNCH	**12:05 PM**	**1:00**				
Review Round 1 overall results and impact	1:05 PM	0:30	Joann	R2	1	
Covid Impact	1:35 PM	0:10	Joann	R2	4	
Impact data ACT in State and Nation State tests & ACT Aspire NAEP	1:45 PM	0:20	Joann	R2	7	
Discussion (within table 15 minutes, whole room 15 minutes) (assign speaker/recorder for each table)	2:05 PM	0:30	All	R2	20	Discussion
Break	**2:35 PM**	**0:15**			21	
Additional impact data	2:50 PM	0:15	Joann	R2	22	
Discussion (whole room)	3:05 PM	0:30	All	R2	28	Discussion
Round 2 Ratings of Level 3 cut scores Math Science ELA	3:35 PM	0:30	Joann	R2	29	
Adjourn	**4:05 PM**	**0:15**				

Standard Setting Detailed Agenda

DAY 2						
Item	**Time***	**Est. Length**	**Presenter**	**Slide Deck**	**Slide No.**	**Notes**
Check in	8:30 AM	0:30				
Review schedule and guidelines	9:00 AM	0:05	Joann	R3	1	
Debrief/discuss Day 1 (whole room)	9:05 AM	0:10	Joann	R3	4	
Review probabilities and data sources	9:15 AM	0:20	Joann	R3	5	
Review Round 2 results and impact	9:35 AM	0:30	Joann	R3	8	
Discussion (within table 15 minutes, whole room 15 minutes)	10:05 AM	0:30	All	R3	13	Discussion
Break	**10:35 AM**	**0:15**			14	
Introduce meaning of Level 2 (lower) and Level 4 (upper) cut scores	10:50 AM	0:15	Shalini	R3	15	
Discussion (within table 15 minutes, whole room 15 minutes) (split first 15 minutes into 7 minutes for Level 2, 7 minutes for Level 4)	11:05 AM	0:30	All	R3	25	Discussion
Round 3 Level 2 and Level 4 cut scores	11:35 AM	0:15	Shalini	R3	26	
Lunch	**11:50 AM**	**1:00**				
Review Round 3 results and impact	12:50 PM	0:20	Shalini	R4	1	
Discussion (within table 15 minutes, whole room 15 minutes)	1:10 PM	0:30	All	R4	17	Discussion
Coherence of cut scores across subjects and performance levels (whole room)	1:40 PM	0:10	Shalini	R4	18	Discussion
Final ratings, all 3 cuts	1:50 PM	0:15	Shalini	R4	21	
Break & Evaluation Form	**2:05 PM**	**0:15**				**Hand out evaluation forms**
Report final results	2:20 PM	0:20	Joann	Final	1	
Adjourn	2:40 PM					
ACT & State staff debrief; summarize process and results	2:40 PM	1:00	ACT/State			

ARIZONA STANDARD SETTING

JULY 6-7, 2022 • PHOENIX, AZ

WELCOME & INTRODUCTIONS

AUDRA AHUMADA, ADE

JOANN MOORE, ACT

KEY ORGANIZATIONS

ACT®

ARIZONA Department of Education

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KEY STAFF

- **ACT**
  - Patty Ferrel – State and Federal Programs
  - Shalini Kapoor – Research
  - Joann Moore – Research
- **State Department of Education**
  - Audra Ahumada – Deputy Assoc. Superintendent of Assessment
- **Observers**
- **Panelists**

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PANELISTS

- **Panelists include a mix of teachers, administrators, support staff, and higher education faculty**
- **Panelists were selected for representation across schools and districts, secondary and post-secondary education, and areas of expertise including content, administration, English learners, students with disabilities**
- **Brief panelist introductions**

5

PURPOSE OF THE MEETING

- **To recommend 3 cut scores defining four performance levels on the ACT Math, Science, and ELA assessments**

- **Level 4 (Highly Proficient)** ⇐ **Level 4 Cut Score**
- **Level 3 (Proficient)** ⇐ **Level 3 Cut Score**
- **Level 2 (Partially Proficient)** ⇐ **Level 2 Cut Score**
- **Level 1 (Minimally Proficient)**

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SCHEDULE FOR THIS MEETING DAY 1

- Context/Background Information
  - ACT College Readiness Benchmarks
  - Probability of Success
- Identify Borderline Achievement
- Training for Setting Recommended Cut Scores
- Round 1 Cut Scores for College Readiness (Level 3)
- Lunch Break
- Review Impact and Additional Evidence
- Discussion
- Round 2 Cut Scores for College Readiness (Level 3)

7

SCHEDULE FOR THIS MEETING DAY 2

- Debrief/Discuss Day 1
- Review Success Probabilities and Impact Evidence
- Review Round 2 Results
- Discussion
- Round 3 Upper (Level 4) and Lower (Level 2) Cut Scores
- Lunch Break
- Review Results, Impact, Discussion
- Final Cut Score Recommendations for Levels 2, 3, and 4

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GENERAL GUIDELINES

1. Be on time for all sessions!
2. Secure materials (printed on colored paper) should *never* leave the room.
3. Make note of your ID number; make certain the material you receive has *your* ID number on it.
4. Please hold questions until the end of each section, unless they are critical to the presentation or the associated activity.
5. Leave your materials on your table at the end of each day for staff to collect. Place materials that should be discarded in the center of the table.
6. If you finish a task before others, sit quietly until everyone has completed the task.
7. Please silence your phone and refrain from use during the meeting.

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INTRODUCTION & BACKGROUND

ARIZONA DEPARTMENT OF EDUCATION

ARIZONA PERSPECTIVE- SETTING THE CONTEXT

- As part of the State Board of Educations 5-Year Assessment Plan, ADE would transition to ACT as the new high school statewide assessment for ELA and Mathematics for the 2021-2022 school year.
- Many LEAs were already administering ACT through the school day option.
- ACT conducted an abbreviated empirical standard setting in 2019 to set cut scores for ACT math, science, and English+Reading for the Menu of Assessments. We are coming back to set standards as writing is a requirement for state assessments.
- The recommended cut score for performance levels will be used as a part of our Accountability system, ACT as our statewide assessment for high school.

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RESULTS FROM 2019 STANDARD SETTING

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Juniors State 2018	All AZ Juniors 2018	All AZ Juniors 2017	Census States Juniors 2018	National Grad Class 2018
		Mathematics							
Level 4	26	0.39	0.69	0.83	12	13	14	10	21
Level 3	21	0.16	0.46	0.70	33	32	33	27	43
Level 2	18	0.09	0.30	0.60	48	47	48	41	60
		Science							
Level 4	26	0.30	0.64	0.86	10	10	10	9	18
Level 3	23	0.18	0.51	0.79	25	23	25	23	36
Level 2	19	0.08	0.31	0.65	51	48	49	48	63
		English + Reading							
Level 4	53	0.37	0.70	0.85	10	11	12	10	22
Level 3	43	0.22	0.54	0.77	28	28	29	28	44
Level 2	35	0.13	0.41	0.69	52	49	50	50	65

Note that the 2019 standard setting included an English + Reading score instead of ELA.

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EMPIRICAL STANDARD SETTING METHODOLOGY

- Traditional standard setting focuses on estimating probabilities of students getting individual items correct
- Empirical approach focuses on probabilities of success in first-year credit bearing college courses

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TYPES OF STANDARDS

Content Standards: Content standards define the knowledge, concepts, and skills that students should acquire at each grade level.

Performance Standards: Performance standards specify how much understanding of content students need at each performance level (e.g., basic, proficient, advanced), relative to the content standards.

In an empirical standard-setting process, we use data to describe outcomes for students in various score ranges.

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TYPES OF JUDGEMENTS MADE IN EMPIRICAL STANDARD SETTING

- What is the appropriate outcome?
  - First-year credit-bearing college course grades?
  - First-year college GPA?
- What is the criteria of success?
  - Earning a B or higher?
  - Earning a C or higher?
- What is the probability of success?
  - 50%?
  - 60%?

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ACT BENCHMARKS

Primary

The ACT College Readiness Benchmarks are the ACT scores associated with a 50% chance of earning a B or higher grade in typical, first-year, credit-bearing college courses.

Secondary

The Benchmarks also correspond to an approximate 75% chance of earning a C or higher grade in these courses.

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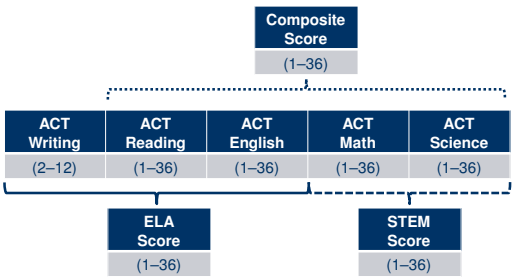
THE ACT



Note: Behind the scenes, the ACT Writing score is transformed to a 1–36 scale before being averaged with Reading and English. That score is never reported.

17

NATIONAL CURRICULUM SURVEY

- Conducted every 3 to 5 years (most recent 2020)
- Survey of K-12 teachers, administrators, college instructors, workforce supervisors & employees
- What entering college students should know and be able to do to be ready for first-year college-level coursework
- Importance of skills for entry-level success in the workplace

Area	Number of Respondents
Early elementary school	1,214
Upper elementary school	1,213
Middle school	1,623
High school	1,619
K–12 administrators	405
College instructors	2,883
Workforce supervisors	405
Workforce employees	406
TOTAL	9,768

https://www.act.org/content/act/en/research/reports/act-publications/national-curriculum-survey.html

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THE ACT ENGLISH TEST

The **ACT English test** puts an examinee in the position of a writer who makes decisions to revise and edit a text. Short texts and essays in different genres provide a variety of rhetorical situations. Passages are chosen for their appropriateness in assessing writing and language skills and to reflect students' interests and experiences.

19

THE ACT ENGLISH TEST

Table 3.2. Specification Ranges by Reporting Category for English

Reporting Category	Number of Items	Percentage of Test
Production of Writing	22–24	29–32%
Knowledge of Language	11–13	15–17%
Conventions of Standard English	39–41	52–55%
Total Number of Items	75	100%

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THE ACT MATHEMATICS TEST

The **ACT mathematics test** assesses the skills students typically acquire in courses taken through grade 11. The material covered on the test emphasizes the major content areas that are prerequisites to successful performance in entry-level courses in college mathematics. Knowledge of basic formulas and computational skills are assumed as background for the problems, but recall of complex formulas and extensive computation are not required.

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THE ACT MATHEMATICS TEST

Table 3.4. Specification Ranges by Reporting Category for Mathematics

Reporting Category	Number of Items	Percentage of Test
Preparing for Higher Mathematics	34–36	57–60%
Number & Quantity	5–7	8–12%
Algebra	7–9	12–15%
Functions	7–9	12–15%
Geometry	7–9	12–15%
Statistics & Probability	5–7	8–12%
Integrating Essential Skills	24–26	40–43%
Modeling	≥12	≥20%
Total Number of Items	60	100%

Notes: Each item reported in Modeling is also reported in either Preparing for Higher Mathematics (and the appropriate subcategory) or in Integrating Essential Skills.

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THE ACT READING TEST

The **ACT reading test** measures the ability to read closely, reason logically about texts using evidence, and integrate information from multiple sources. The test questions focus on the mutually supportive skills that readers must bring to bear in studying written materials across a range of subject areas. Specifically, questions will ask you to determine main ideas; locate and interpret significant details; understand sequences of events; make comparisons; comprehend cause-effect relationships; determine the meaning of context-dependent words, phrases, and statements; draw generalizations; analyze the author's or narrator's voice and method; analyze claims and evidence in arguments; and integrate information from multiple texts.

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THE ACT READING TEST

Table 3.6. Specification Ranges by Reporting Category for Reading

Reporting Category	Number of Items	Percentage of Test
Key Ideas & Details	21–24	53–60%
Craft & Structure	10–12	25–30%
Integration of Knowledge & Ideas	6–9	15–23%
Total Number of Items	40	100%

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THE ACT SCIENCE TEST

The **ACT science test** measures the interpretation, analysis, evaluation, reasoning, and problem-solving skills required in the natural sciences. The test presents several authentic scientific scenarios, each followed by a number of multiple-choice test questions. The content of the test includes biology, chemistry, Earth/space sciences (e.g., geology, astronomy, and meteorology), and physics. The questions require you to recognize and understand the basic features of, and concepts related to, the provided information; to examine critically the relationship between the information provided and the conclusions drawn or hypotheses developed; and to generalize from given information to gain new information, draw conclusions, or make predictions.

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THE ACT SCIENCE TEST

Table 3.8. Specification Ranges by Reporting Category for Science

Reporting Category	Number of Items	Percentage of Test
Interpretation of Data	16–20	40–50%
Scientific Investigation	8–12	20–30%
Evaluation of Models, Inferences & Experimental Results	10–14	25–35%
Total Number of Items	40	100%

Table 3.9. Specification Ranges by Science Content Area

Science Content Area	Number of Passages	Number of Items	Percentage of Test
Biology	2	11–15	28–38%
Chemistry	1–2	5–15	13–38%
Physics	1–2	5–15	13–38%
Earth and Space Science	1–2	5–15	13–38%
Total	6	40	100%

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THE ACT WRITING TEST

The optional **ACT writing test** is an essay test that measures writing skills taught in high school English classes and entry level college composition courses. The test consists of one writing prompt that describes a complex issue and provides three different perspectives on the issue. You are asked to read the prompt and write an essay in which you develop your own perspective on the issue. Your essay must analyze the relationship between your own perspective and one or more other perspectives. You may adopt one of the perspectives given in the prompt as your own, or you may introduce one that is completely different from those given.

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THE ACT WRITING TEST

- **The writing score is required to produce the ELA score**
- **The writing score does not affect other section test scores or the Composite score**
- **The overall writing score and each domain score are on a 2-12 scale**
- **The four writing domains are:**
  - Ideas & Analysis
  - Development & Support
  - Organization
  - Language Use & Conventions

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GOALS OF STANDARD SETTING

The goal of this meeting is to recommend three sets of performance standards:

1. English Language Arts	ACT English	ACT Reading	ACT Writing
2. Mathematics	ACT Math		
3. Science	ACT Science		

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WHY COLLEGE READINESS?

- The Every Student Succeeds Act (ESSA) requires that all students are taught to high academic standards that will prepare them to succeed in college and careers. For most students, this will be college.

https://www.ed.gov/essa?src=rn

ACT 30

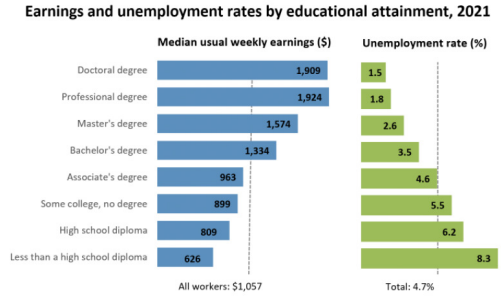
WHY COLLEGE READINESS?

- 63% of 2020 high school graduates enrolled in college
- Median earnings of 25 to 34-year-olds who
  - Completed HS: $36,600
  - Attained an associate's degree: $44,100
  - Attained bachelor's degree: $59,600
  - Attained a master's or higher: $69,700

https://nces.ed.gov/programs/coe/indicator/cpa/immediate-college-enrollment-rate?tid=74
https://nces.ed.gov/programs/coe/indicator/cba/annual-earnings

ACT 31

WHY COLLEGE READINESS?



https://www.bls.gov/emp/chart-unemployment-earnings-education.htm

ACT 32

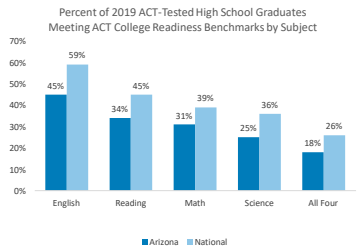
WHY COLLEGE READINESS?

- Nationally, 65% of ACT-tested 2019 high school graduates enrolled in college, 59% in 2020.
- In Arizona, 52% of ACT-tested 2019 high school graduates enrolled in college, 46% in 2020.
- In Arizona, 87% of ACT-tested 2019 & 2020 high school graduates aspired to earn a Bachelor's degree or higher.

ACT 33

WHY COLLEGE READINESS?

Nationally, only about 1 in 4 first-year ACT-tested college students are college ready



https://www.act.org/content/dam/act/unsecured/documents/cccr-2019/Arizona-CCCR-2019.pdf

ACT 34

WHY COLLEGE READINESS?

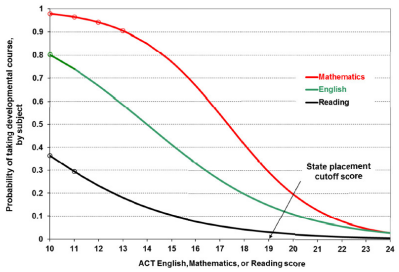


Figure 1. Probability of taking developmental English, mathematics, or reading, given ACT Test score.

Noble, J., & Sawyer, R. (2013). A study of the effectiveness of developmental course for improving success in college.

ACT 35

WHY COLLEGE READINESS?

- Remedial Coursework in College:
  - Debt without college credit.
  - 31% of students at 4-year colleges and 66% of students at 2-year colleges take remedial coursework.
  - Students who take remedial coursework are less likely to complete a Bachelor's degree.
    - Remedial Coursework: 43%
    - No Remedial Coursework: 69%

https://nces.ed.gov/pubs2020/2020501.pdf

ACT 36

ACT COURSE PLACEMENT SCORES IN ARIZONA

Type	Name	ACT Math	ACT English and Reading
2-year	Pima Community College	22 for Intermed. Algebra 22 for College Algebra	20 for English Comp. 22 for Critical Reading
2-year	Maricopa Community Colleges	Placement test required for ACT scores < 18 18 for Intermed. Algebra 22 for College Algebra	Placement test required for ACT scores < 18 18 for First Year Comp. 22 for Critical Reading
4-year	Arizona State University	24 Math competency	19-25 for English Comp. 21 English competency
4-year	University of Arizona	21 for Intermed. Algebra 22 for College Algebra	21 English proficiency for most majors
4-year	Northern Arizona University	24 for Algebra for Precalculus, Quant. Reasoning < 24 Intermed. Algebra	17-29 Critical reading < 17 Intensive Writing Lab

Note: This is a sample of Arizona's CCs and 4-year institutions.

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ACT COURSE PLACEMENT SCORES IN ARIZONA

- In Math, College Algebra placement scores were generally near the ACT College Readiness Benchmark (22), and lower scores (18-21) could place a student into lower-level credit-bearing courses (e.g., Intermediate Algebra).
- In English, placement scores for first-year Composition were close to or higher than the ACT College Readiness Benchmark (18-20).
- In Science, a score of 20 satisfies core competency requirements at Arizona, ASU, and NAU.
- Scores below 18 require students to take a placement test.

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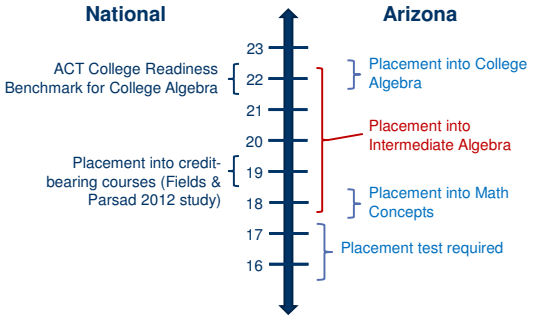
ACT MATH COURSE PLACEMENT SCORES



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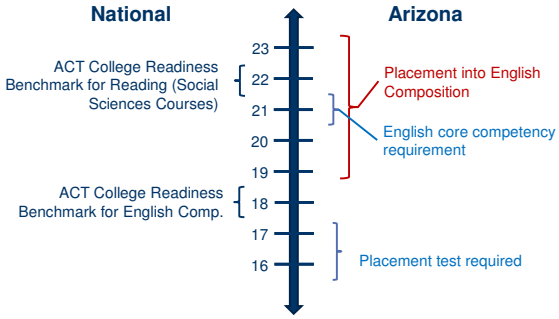
ACT ENGLISH COURSE PLACEMENT SCORES



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ACT COLLEGE READINESS BENCHMARKS

ACT BENCHMARKS

Primary

The ACT College Readiness Benchmarks are the ACT scores associated with a 50% chance of earning a B or higher grade in typical, first-year, credit-bearing college courses.

Secondary

The Benchmarks also correspond to an approximate 75% chance of earning a C or higher grade in these courses.

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BENCHMARKS LINK ACT SUBJECT AREA TEST SCORES TO COMMON FIRST-YEAR COURSES

ACT Subject -Area Test	College Course	Benchmark
English	English Composition	18
Mathematics	College Algebra	22
Reading	Social Science	22
Science	Biology	23
ELA	English Composition & Social Science	20

Social Science courses: Courses available to a first-year student that typically require a significant amount of reading (American History, Other History, Psychology, Sociology, Political Science, Economics).

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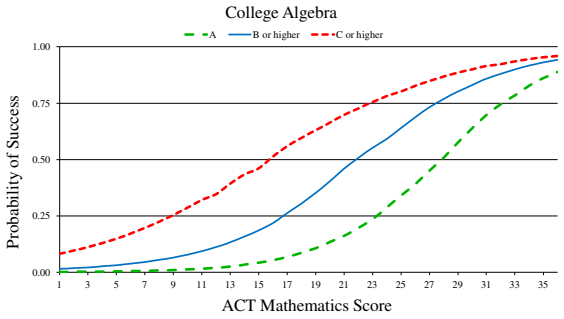
SUCCESS PROBABILITIES



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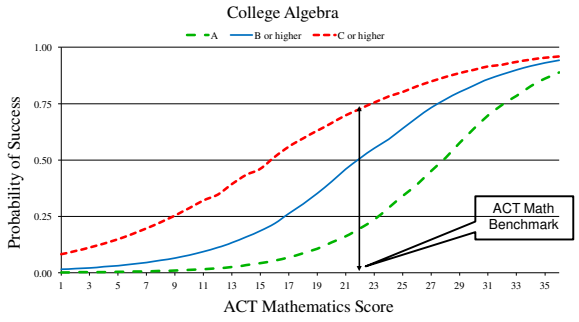
SUCCESS PROBABILITIES



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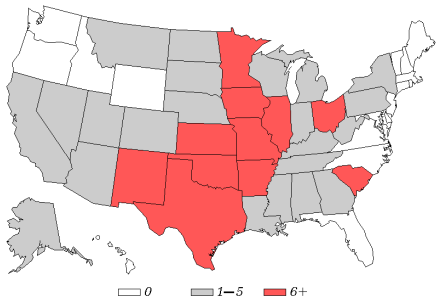
INSTITUTIONS IN BENCHMARK DEVELOPMENT SAMPLES

Characteristic	ELA	Math	Science
N (Institutions)	233	125	90
N (Students)	198,275	70,461	41,651
Type			
2-year	40%	42%	44%
Less selective 4-year	53%	48%	46%
More selective 4-year	7%	10%	10%
Control			
Public	88%	92%	87%
Private	12%	8%	13%

46

BENCHMARK DEVELOPMENT INSTITUTIONS BY STATE



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BENCHMARK DEVELOPMENT SUCCESS RATES BY COURSE

College Course Type	Percentage of Course Grades					Success Criteria	
	A	B	C	D	F	≥B	≥C
English Comp / Social Science	20%	32%	25%	9%	14%	52%	77%
College Algebra	24%	25%	23%	11%	18%	49%	72%
Biology	20%	27%	26%	12%	16%	47%	73%

48

OPTIONS FOR CUT SCORES BASED ON ACT DATA

(1) GRADE
WHY B OR HIGHER? (WHAT'S WRONG WITH A GRADE OF C?)

- This criterion seems to reproduce the current grading distribution fairly well.
- Policy implications of putting a student with a 50% chance of earning less than a C grade into a class.
- Stability of models is affected by courses/institutions where grades below C are uncommon.

50

(2) DISTRIBUTION ACROSS COLLEGES: TYPICAL STUDENT, TYPICAL COLLEGE

The score value for a 50% chance of a B grade varies from college to college, depending on course rigor and grading standards. In general, the values do not vary considerably.

Subject	1st Quartile	Median	3rd Quartile
ELA	18	20	22
Mathematics	21	22	24
Science	22	23	25

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TYPICAL STUDENT, TYPICAL COLLEGE

There is little variability in the ACT score associated with a 50% chance of earning a B or higher across institution types.

Subject	2 Year	4 Year, Less Selective	4 Year, More Selective
English	18	17	17
Mathematics	23	22	22
Reading	22	23	21
Science	23	23	24

ACT 52

(3) SCORE PRECISION

Often the standard error of measurement is used to capture a score's imprecision. Sometimes cut scores may be adjusted by .5, 1, 1.5 or even 2 SEMS

Subject	SEM	-1 SEM	Benchmark	+1 SEM
English	1.71	16	**18**	20
Mathematics	1.56	20	**22**	24
Reading	2.32	20	**22**	24
Science	1.99	21	**23**	25
ELA	1.44	18	**20**	22

https://www.act.org/content/dam/act/unsecured/documents/ACT_Technical_Manual.pdf

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ACT BENCHMARKS FOR PROFICIENT CUT SCORE?

Advantages

- ACT score reports show College Readiness levels, and scores will be reported in terms of ACT's benchmarks.
- Continuity across AZ and ACT reports, across states, and trend data.
- Facilitates comparisons across state lines.

Disadvantages

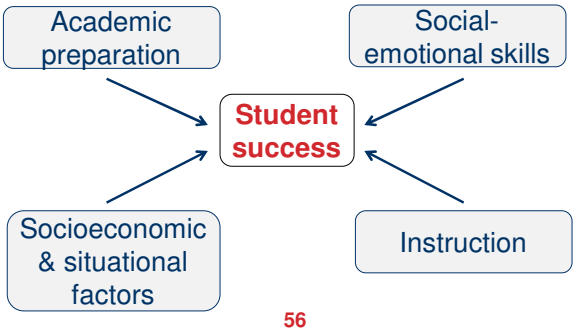
- Panelists are given no input in cut score.
- Cut score impact may be significantly different than in the past or in gr. 3–8.
- Reduces the opportunity to smooth or reconcile impact across grades.
- ACT resets benchmarks every 5–7 years.
- Reflects national impact, not just AZ.

ACT 54

PROBABILITY OF SUCCESS

WHY USE PROBABILITIES?

Components of College Student Success



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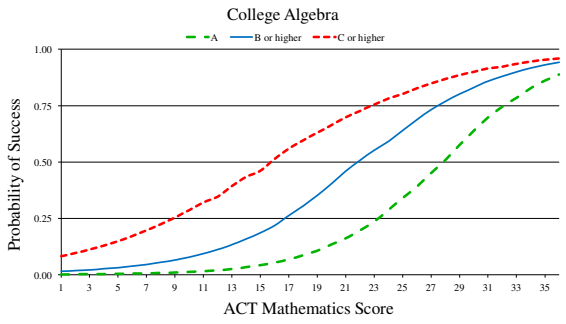
SUCCESS PROBABILITIES



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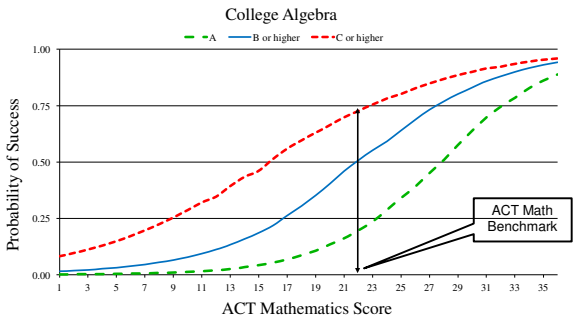
SUCCESS PROBABILITIES



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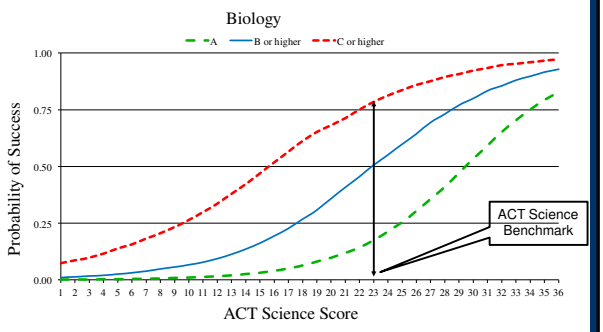
SUCCESS PROBABILITIES



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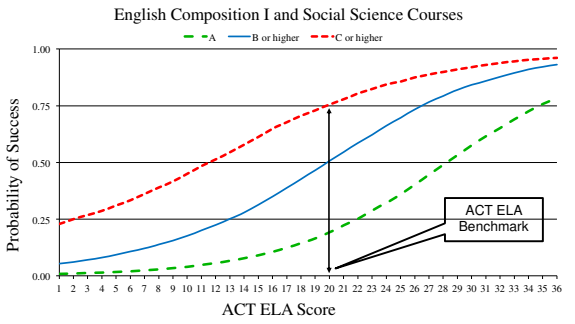
SUCCESS PROBABILITIES



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SUCCESS PROBABILITIES

Probability of First-Year Course Grade		
A	B or higher	C or higher
Mathematics		
0.22	0.52	0.74
0.20	0.50	0.73
0.19	0.48	0.72
Science		
0.20	0.52	0.79
0.19	0.50	0.78
0.17	0.48	0.76
ELA		
0.14	0.52	0.77
0.13	0.50	0.76
0.13	0.48	0.75

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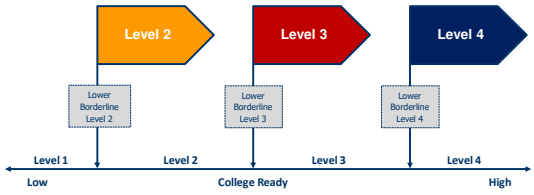
15 MINUTE BREAK

IDENTIFYING BORDERLINE ACHIEVEMENT

ESTABLISHING CUT SCORES FOR FOUR LEVELS OF ACHIEVEMENT

To divide the achievement scale into Level 1, Level 2, Level 3, and Level 4, we will focus on the lower borderline of each achievement level.



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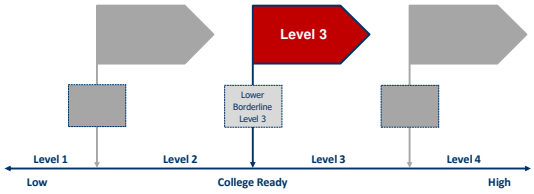
LEVEL 3 ACHIEVEMENT LEVEL

First, we will focus on the lower borderline of the Level 3 achievement level.



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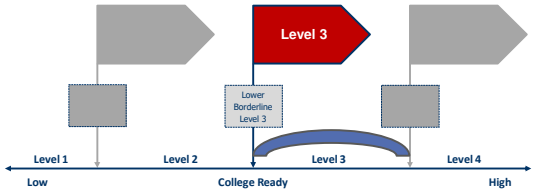
LEVEL 3 ACHIEVEMENT LEVEL

First, we will focus on the lower borderline of the Level 3 achievement level.



66

EMPIRICALLY-BASED PERFORMANCE LEVEL DESCRIPTORS

- Set cut scores corresponding to relevant empirical data or outcomes.
- ACT Benchmarks are based on established relationships between test scores and actual first-year college course outcomes.
- Probabilities of succeeding in first-year college courses.
- Does not necessarily reflect specific knowledge and skills in a particular subject area.

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EMPIRICALLY-BASED PERFORMANCE LEVEL DESCRIPTORS

Other relevant data may be considered in setting the college-ready level, such as

- Percentage of students college ready based on ACT Benchmarks
- Percentage of students proficient on NAEP
- Percentage of students enrolling in 2-year or 4-year colleges
- Other

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EMPIRICALLY-BASED PERFORMANCE LEVEL DESCRIPTORS

Example of an empirically-based PLD for college readiness:

Students performing at this level meet academic expectations for the knowledge, skills, and practices assessed at grade 11. They are very likely to engage successfully (0.75 probability of earning a grade of C or higher) in entry-level, credit-bearing courses in the corresponding content area or in technical courses requiring college-level skills. Students performing at this level are exempt from having to take and pass placement tests in two- and four-year public institutions of higher education designed to determine whether they are academically prepared for such courses without need for remediation.

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EMPIRICALLY-BASED PERFORMANCE LEVEL DESCRIPTORS

Arizona college ready Performance Level Descriptor:

Students performing at Level 3 are

???

ADE currently uses this language on student reports:

For each content area, student performance is also reported as one of four performance levels: Level 1 (Minimally Proficient), Level 2 (Partially Proficient), Level 3 (Proficient), and Level 4 (Highly Proficient). Students who score at Level 1 or Level 2 are likely to need support to be ready for the next grade or course. Students who score at Level 3 or Level 4 are proficient and likely to be ready for the next grade or course.

https://www.azed.gov/sites/default/files/2021/12/AzM2%20Family%20Report%20Guide.pdf

70

ADE POLICY PLDS FOR STATEWIDE ASSESSMENTS FOR ELA AND MATHEMATICS

Policy PLDs

Policy PLDs			
Minimally Proficient	**Partially Proficient**	**Proficient**	**Highly Proficient**
Minimally Proficient students demonstrate a modest understanding of and ability to apply the content knowledge and skills needed to be on track toward college and career readiness as specified in Arizona's Mathematics and English Language Arts Standards.	Partially Proficient students demonstrate a partial understanding of and ability to apply the content knowledge and skills needed to be on track toward college and career readiness as specified in Arizona's Mathematics and English Language Arts Standards.	Proficient students demonstrate a fundamental understanding of and ability to apply the content knowledge and skills needed to be on track toward college and career readiness as specified in Arizona's Mathematics and English Language Arts Standards.	Highly Proficient students demonstrate an advanced understanding of and ability to apply the content knowledge and skills needed to be on track toward college and career readiness as specified in Arizona's Mathematics and English Language Arts Standards.

71 https://slideplayer.com/slide/6347825/

WHAT DOES IT MEAN TO BE MINIMALLY LEVEL 3 (PROFICIENT)?

- **What should the *minimally qualified* student know and be able to do at the Level 3 achievement level?**
  - What's the chance that student will get a B?
  - What's the chance that student will get a C?
- **Important to keep *minimally qualified* in mind:**
  - Not the same as the average or typical student.
  - Of students who get a B grade in a first-year college course, what is their probability of success?
  - Of students who get a C grade in a first-year college course, what their probability of success?

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DISCUSSION

INSTRUCTIONS FOR SETTING ROUND 1 CUT SCORES

ROUND 1 LEVEL 3 RATING FORM FOR MATH

Probability of Success		
A prob	B or higher prob	C or higher prob
0.36	0.66	0.82
0.34	0.64	0.81
0.32	0.62	0.80
0.29	0.60	0.79
0.27	0.58	0.78
0.25	0.56	0.77
0.24	0.54	0.76
0.22	0.52	0.74
0.20	**0.50**	**0.73**
0.19	0.48	0.72
0.17	0.46	0.71
0.16	0.44	0.69
0.15	0.42	0.68
0.13	0.40	0.67
0.12	0.38	0.65
0.11	0.36	0.64

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ROUND 1 LEVEL 3 RATING FORM FOR SCIENCE

Probability of Success		
A prob	B or higher prob	C or higher prob
0.33	0.66	0.86
0.31	0.64	0.85
0.29	0.62	0.84
0.27	0.60	0.83
0.25	0.58	0.82
0.23	0.56	0.81
0.22	0.54	0.80
0.20	0.52	0.79
0.19	**0.50**	**0.78**
0.17	0.48	0.76
0.16	0.46	0.75
0.15	0.44	0.74
0.14	0.42	0.73
0.13	0.40	0.71
0.12	0.38	0.70
0.11	0.36	0.68

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ROUND 1 LEVEL 3 RATING FORM FOR ELA

Probability of Success		
A prob	B or higher prob	C or higher prob
0.24	0.66	0.85
0.22	0.64	0.84
0.21	0.62	0.83
0.19	0.60	0.82
0.18	0.58	0.81
0.17	0.56	0.80
0.16	0.54	0.79
0.15	0.52	0.78
0.14	**0.50**	**0.77**
0.13	0.48	0.75
0.12	0.46	0.74
0.11	0.44	0.73
0.10	0.42	0.71
0.09	0.40	0.70
0.09	0.38	0.69
0.08	0.36	0.67

77

SETTING A LEVEL 3 ACHIEVEMENT LEVEL

Task:

- Think about minimally Level 3 students in your subject area.
- Think about their likelihood of success in first-year, entry-level, college course in math (e.g., College Algebra, College Biology, English Composition or Social Science Course).
- Highlight the one row on the rating sheet that best reflects what you see as their probability of achieving an A, B, or C grade.
- Ratings should reflect your individual judgment.

78

ROUND 1 LEVEL 3 RATING FORM FOR MATH

Probability of Success		
A prob	B or higher prob	C or higher prob
0.36	0.66	0.82
0.34	0.64	0.81
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0.19	0.48	0.72
0.17	0.46	0.71
0.16	0.44	0.69
0.15	0.42	0.68
0.13	0.40	0.67
0.12	0.38	0.65
0.11	0.36	0.64

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ROUND 1 RATING AND LUNCH BREAK

- Highlight the one row on the rating sheet for each subject area that best reflects what you see as their probability of achieving an A, B, or C grade.
- Ratings should reflect your individual judgment.
- When finished, hand in the rating sheet to your facilitator and break for lunch.
- Return to this room for the afternoon session in one hour.

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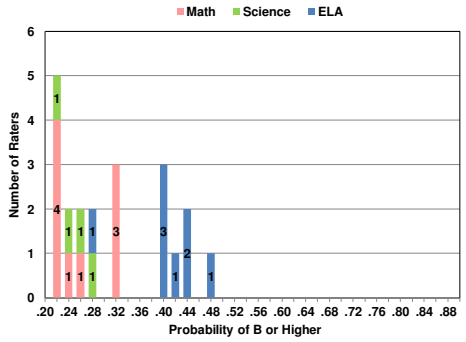
SCHEDULE FOR THIS AFTERNOON

- Review Overall Round 1 Results
- Review Other Evidence and Impact Data
- Discussion
- Round 2 Cut Scores for College Readiness (Level 3)

1

ROUND 1 RESULTS AND ADDITIONAL EVIDENCE

ROUND 1 SUCCESS PROBABILITIES



3

IMPACT OF COVID-19 ON STUDENT PERFORMANCE

Before discussing impact data, we need to acknowledge the impact of the Covid-19 pandemic on student learning

- Schools worldwide were shut down in March 2020
- Duration of closures varied
- Home internet access, access to online learning varied

4

IMPACT OF COVID-19 ON STUDENT PERFORMANCE

ACT State and District Research (Jeff Allen)

Subject	Fall 2020	Spring 2021	Arizona Spring 2021*	Arizona Spring 2022
English	-0.88	-0.72	-0.37	-0.37
Math	-0.49	-0.63	-0.51	-0.74
Reading	-0.44	-0.63	-0.46	-0.63
Science	-0.26	-0.58	-0.45	-0.54
Composite	-0.52	-0.64	-0.45	-0.57

https://www.act.org/content/dam/act/unsecured/documents/2021/COVID-Impact-Fall-ACT-State-and-District-2021-5.pdf
https://www.act.org/content/dam/act/unsecured/documents/2021/Learning-Opportunities-Understanding-Scores-Assessment-Pandemic-Accessible.pdf
*Revised estimates based on updated data and modified inclusion criteria

5

IMPACT OF COVID-19 ON STUDENT PERFORMANCE

Other Research

- More pronounced impacts for math than for reading (not supported by ACT data)
- More pronounced impacts in lower grades
- More pronounced impacts for low-income students (evidence was inconsistent for the ACT)
- Konig & Frey meta-analysis (2022) found -0.175 SD lower achievement due to school closures, larger impacts on younger students
- Sireci & Suarez-Alvarez (2022) warn that data from Covid years are not likely to be valid for accountability purposes but may be valid for making individual-level decisions

6

ACT IMPACT DATA SOURCES

AZ Census Tested Juniors, 2022

- In-school ACT testing in 11th grade
- 90% of total AZ public school juniors according to WICHE (2020) projections

Other Census Tested Juniors, 2019-2022

- In-school statewide ACT testing in 11th grade
- 6 states for math and science: KY, MS, NV, NC, UT, WI
- 2 states for ELA: NV, WI (ACT writing is required for ELA score)
- Multiple years to show year-to-year fluctuations, Covid impact

7

ROUND 1 SUCCESS PROBABILITIES

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
		Mathematics							
Round 1	16	0.05	0.22	0.51	59	64	66	69	71
		Science							
Round 1	18	0.06	0.27	0.61	46	57	56	59	58
		ELA							
Round 1	18	0.14	0.43	0.71	44	47	48	50	48

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AZ STATE TEST PERFORMANCE: MATH

	Percent At or Above						
Math Achievement Level	2019					2021	
	Grade 8	Algebra I	Algebra II	Geometry	ACT Math	Grade 8	Grade 10
Level 4	18	15	14	9	14	11	5
Level 3	41	43	40	37	33	26	26
Level 2	59	61	61	58	50	43	46
Level 1	41	39	40	42	50	56	53

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AZ STATE TEST PERFORMANCE: SCIENCE

	Percent At or Above			
Science Achievement Level	2019			
	Grade 8	2022 Cohort	2021 Cohort	ACT Science
Level 4	24	22	13	11
Level 3	50	45	30	24
Level 2	72	66	48	48
Level 1	27	34	52	51

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AZ STATE TEST PERFORMANCE: ELA

	Percent At or Above					
ELA Achievement Level	2019				2021	
	Grade 8	Grade 10	Grade 11	ACT ELA	Grade 8	Grade 10
Level 4	13	10	13	13	11	9
Level 3	38	33	33	29	34	33
Level 2	59	48	49	51	55	50
Level 1	40	51	51	49	45	51

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NAEP ASSESSMENTS

…the National Assessment of Educational Progress (NAEP) is the only nationally representative, continuing assessment of what America's students know and can do in various subject areas. NAEP provides a comprehensive measure of students' learning at critical junctures in their school experience…NAEP has two major goals: to reflect current educational and assessment practices and to measure change reliably over time.

Proficient Level

This level denotes solid academic performance for each grade assessed. Students reaching this level have demonstrated competency over challenging subject matter, including subject matter knowledge, application of such knowledge to real world situations, and analytical skills appropriate to the subject matter.

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NAEP ACHIEVEMENT LEVELS: MATH

Mathematics Achievement Level	Percent At or Above		
	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	9	10	3
Proficient	31	34	24
Basic	68	69	59
Below Basic	32	31	40

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NAEP ACHIEVEMENT LEVELS: SCIENCE

Science Achievement Level	Percent At or Above		
	2015 Grade 8	2019 Grade 8	2019 Grade 12
	AZ	National public	National public
Advanced	1	2	2
Proficient	25	35	22
Basic	61	67	59
Below Basic	39	33	41

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NAEP ACHIEVEMENT LEVELS: READING

Reading Achievement Level	Percent At or Above		
	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	3	4	6
Proficient	30	33	37
Basic	69	72	70
Below Basic	31	27	30

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SIDE BY SIDE COMPARISONS

Assessment	Percent At or Above		
	Math	Science	ELA
NAEP AZ Grade 8 Proficient (2015 Science, 2019 Math & ELA)	31	25	30
AZ State Test Grade 8 Level 3 (2019)	41	50	38
AZ State Test ACT Grade 11 Level 3 (2019)	33	24	29
ACT Benchmark AZ Jrs. Statewide (2022)	21	19	32
Round 1 Rating, AZ Jrs. Statewide (2022)	59	46	44

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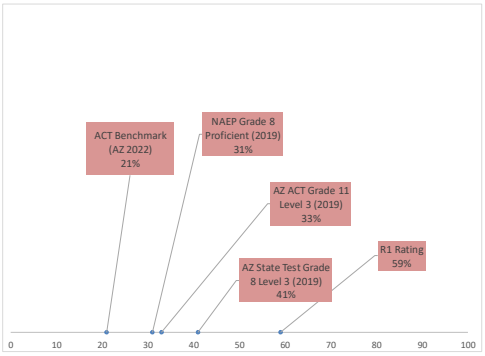
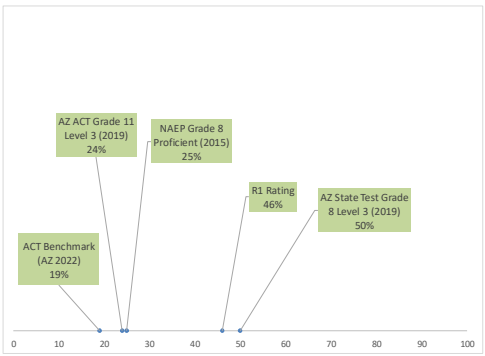
MATH COMPARISONS – PERCENT AT OR ABOVE



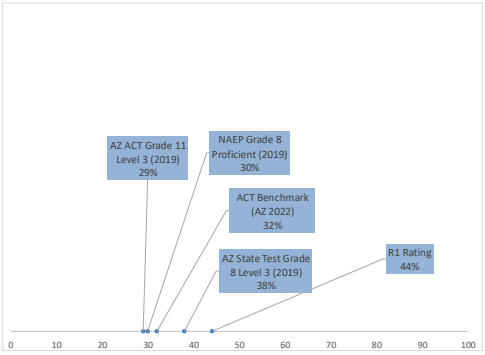
17

SCIENCE COMPARISONS – PERCENT AT OR ABOVE



18

ELA COMPARISONS – PERCENT AT OR ABOVE



19

DISCUSSION

- How did your initial ratings compare with those of others?
- How did ratings in each subject area compare with those in the other subject areas?
- How does the additional impact information provided influence your initial ratings of the Level 3 cut score?
- Which information is the most important in making your choice of Level 3 cut scores?
  - Math
  - Science
  - ELA

There will be an opportunity to make a final Level 3 rating

20

BREAK

Standard Setting will recommence in 15 Minutes

21

IMPACT OF ADJUSTING THE CUT SCORE - MATH

ACT Math Score		Percentage At or Above				
		AZ Census Juniors	Census State Juniors	Census State Juniors	Census State Juniors	Census State Juniors
Round 1 =	16	2022	2022	2021	2020	2019
If adjust up 2 points	18	37	40	42	46	43
If adjust up 1 point	17	47	51	51	55	55
Round 1 results	16	59	64	66	69	71
If adjust down 1 point	15	73	78	80	83	82
If adjust down 2 points	14	84	89	90	92	94

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IMPACT OF ADJUSTING THE CUT SCORE - SCIENCE

ACT Science Score		Percentage At or Above				
		AZ Census Juniors	Census State Juniors	Census State Juniors	Census State Juniors	Census State Juniors
Round 1 =	18	2022	2022	2021	2020	2019
If adjust up 2 points	20	33	41	41	46	42
If adjust up 1 point	19	39	49	50	53	50
Round 1 results	18	46	57	56	59	58
If adjust down 1 point	17	54	63	63	68	65
If adjust down 2 points	16	61	72	71	74	73

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IMPACT OF ADJUSTING THE CUT SCORE - ELA

ACT ELA Score		Percentage At or Above				
		AZ Census Juniors	Census State Juniors	Census State Juniors	Census State Juniors	Census State Juniors
Round 1 =	18	2022	2022	2021	2020	2019
If adjust up 2 points	20	32	35	35	37	35
If adjust up 1 point	19	38	41	41	44	42
Round 1 results	18	44	47	48	50	48
If adjust down 1 point	17	50	53	54	56	55
If adjust down 2 points	16	56	60	61	63	62

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ACT OUTCOMES DATA SOURCES

College Enrollment Rates

- **ACT-Tested Graduating Classes of 2018-2020**
- **All U.S. ACT-Tested high school graduates (ACT-tested rate varies from state to state; about 50% national and 70% AZ)**
- **Enrollment Data from National Student Clearinghouse**
- **Each student's most recent ACT scores**
- **ELA not presented because non-representative samples who took writing; English and reading are presented**
  - 9-15% of AZ graduates took writing in 2018-2020
  - 41-47% of national graduates took writing in 2018-2020

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COLLEGE ENROLLMENT RATES

	Percent Enrolled					
	AZ Grad	AZ Grad	AZ Grad	National Grad	National Grad	National Grad
Enrolled in College	2020	2019	2018	2020	2019	2018
ACT Math = 16	33	41	40	47	52	50
ACT Science = 18	41	51	48	54	61	57
ACT English = 18	49	57	57	60	65	65
ACT Reading = 18	43	49	50	55	58	60

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ACT OUTCOMES DATA SOURCES

Long Term Outcomes Study (Noble & Radunzel, 2012)

- **National sample of 194,000 ACT-tested students enrolled in college 2000-2006, at 43 2-year and 61 4-year colleges**
- **Second year retention & 6-year degree completion rates by ACT score**
- **ELA scores were not available at the time of this study; English and reading are presented**

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COLLEGE SUCCESS RATES BASED ON 2012 NATIONAL STUDY

	Math	Science	English	Reading
Round 1 Rating =	16	18	18	18
Returned to any college year 2: 2-year students	71	74	74	73
Returned to any college year 2: 4-year students	84	86	88	87
Completed Bachelor's Degree in 6 years: 4-year students	45	54	54	52
Completed Associate's or Bachelor's Degree in 6 years	31	33	38	35

28

DISCUSSION

- **How did your initial rating compare with those of others in your subject area?**
- **How did ratings in your subject area compare with those in the other subject areas?**
- **How does the additional impact information provided influence your initial rating of the Level 3 cut score?**
- **Which information is the most important in making your choice of Level 3 cut score?**

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INSTRUCTIONS FOR SETTING ROUND 2 CUT SCORES

ROUND 2 LEVEL 3 RATING FORM*

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55

* This is an excerpt of the math rating form. The ELA and science forms will have slightly different probabilities and impact.

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SETTING A LEVEL 3 ACHIEVEMENT LEVEL

Task:

- Think about a minimally Level 3 student in your subject area.
- Think about their likelihood of success in a first-year, entry-level, college course in your subject area (College Algebra, English Composition or Social Science course, or College Biology).
- Highlight the one row on the rating sheet that best reflects what you see as their probability of achieving an A, B, or C grade.
- When finished, hand in the rating sheet to your facilitator and adjourn.
- Return to room at 8:30 am.

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ARIZONA STANDARD SETTING

JULY 6-7, 2022 • PHOENIX, AZ

SCHEDULE FOR THIS MEETING DAY 2

- Debrief/Discuss Day 1
- Review Success Probabilities and Impact Evidence
- Review Round 2 Results
- Discussion
- Round 3 Level 4 (Upper) and Level 2 (Lower) Cut Scores
- Lunch Break
- Review Results, Impact, Discussion
- Final Cut Score Recommendations for Levels 2, 3, and 4

2

GENERAL GUIDELINES

1. Be on time for all sessions!
2. Secure materials (printed on colored paper) should *never* leave the room.
3. Make note of your ID number; make certain the material you receive has *your* ID number on it.
4. Please hold questions until the end of each section, unless they are critical to the presentation or the associated activity.
5. Leave your materials on your table at the end of each day for staff to collect. Place materials that should be discarded in the center of the table.
6. If you finish a task before others, sit quietly until everyone has completed the task.
7. Please silence your phone and refrain from use during the meeting.

3

DEBRIEF/DISCUSS DAY 1

WHAT CUT SCORES HAVE OTHER STATES SELECTED?

	Minimum	Median	Maximum
	Math		
Proficient	19	21	22
	Science		
Proficient	19	23	23
	ELA		
Proficient	19	20	22

9 states math, 7 states science, 4 states ELA

5

READY FOR COLLEGE AND READY FOR WORK: SAME OR DIFFERENT?

- 2006 study of reading and mathematics skills needed for entry-level jobs that require less than a bachelor's degree, pay a wage sufficient to support a family of 4 ($39,066), and offer the potential for career advancement (O*NET Job Zone 3, including electricians, construction workers, upholsterers, and plumbers)
- Compared student performance on ACT and WorkKeys

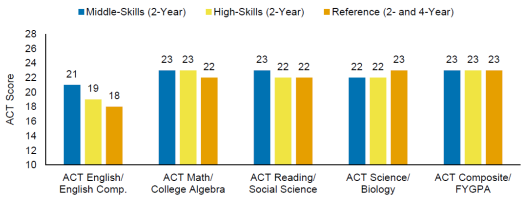
WorkKeys Test	WorkKeys Readiness Level	Comparable ACT Score Range
Reading for Information	5	19-23 (Benchmark = 22)
Applied Mathematics	5	18-21 (Benchmark = 22)

https://www.act.org/content/act/en/research/pdfs/ready-for-collegeandreadyforworksameordifferent.html

6

PREPARATION NEEDED FOR DIFFERENT POSTSECONDARY PATHWAYS

Figure 1. Readiness Benchmarks for Two-Year Middle-Skills and High-Skills Majors Compared to the ACT College Readiness Benchmarks

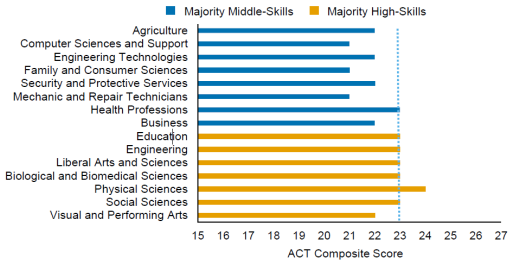


http://www.act.org/content/dam/act/unsecured/documents/R1739-readiness-any-degree-2019-03.pdf

7

PREPARATION NEEDED FOR DIFFERENT POSTSECONDARY PATHWAYS

Figure 2. FYGPA Readiness Benchmarks for College Major Families

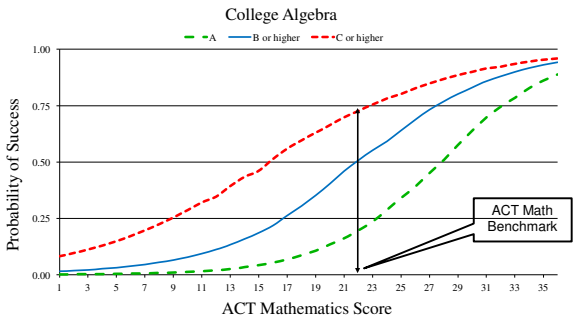


http://www.act.org/content/dam/act/unsecured/documents/R1739-readiness-any-degree-2019-03.pdf

8

REVIEW SUCCESS PROBABILITIES AND IMPACT DATA SOURCES

SUCCESS PROBABILITIES



10

ACT IMPACT DATA SOURCES

AZ Census Tested Juniors, 2022

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- **90% of total AZ public school juniors according to WICHE (2020) projections**

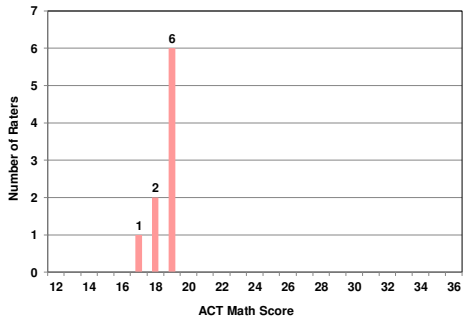
Other Census Tested Juniors, 2019-2022

- **In-school statewide ACT testing in 11th grade**
- **6 states for math and science: KY, MS, NV, NC, UT, WI**
- **2 states for ELA: NV, WI (ACT writing is required for ELA score)**
- **Multiple years to show year-to-year fluctuations, Covid impact**

11

ROUND 2 RESULTS

ROUND 2 LEVEL 3 RATINGS: MATH



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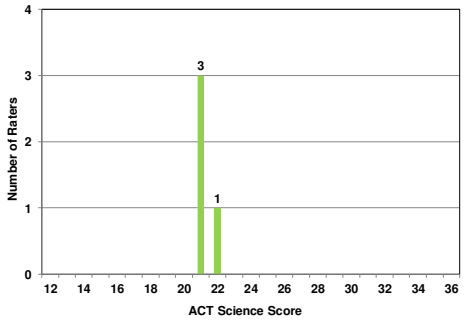
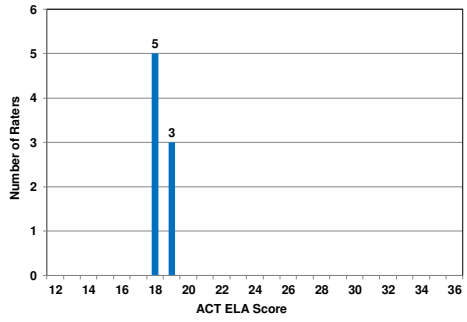
ROUND 2 LEVEL 3 RATINGS: SCIENCE



14

ROUND 2 LEVEL 3 RATINGS: ELA



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ACHIEVEMENT LEVEL IMPACT

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
				Mathematics					
Round 1	16	0.05	0.22	0.51	59	64	66	69	71
Round 2	19	0.11	0.35	0.63	32	34	36	40	38
ACTB	22	0.20	0.51	0.73	21	24	24	28	25
				Science					
Round 1	18	0.06	0.27	0.61	46	57	56	59	58
Round 2	21	0.12	0.41	0.71	28	36	35	39	37
ACTB	23	0.18	0.51	0.79	19	25	24	27	26
				ELA					
Round 1	18	0.14	0.43	0.71	44	47	48	50	48
Round 2	18	0.14	0.43	0.71	44	47	48	50	48
ACTB	20	0.19	0.51	0.76	32	35	35	37	35

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DISCUSSION

- **How did your rating compare with those of others?**
- **How did ratings in each subject area compare with ratings of the other subject areas?**
- **How does the additional impact information provided influence your round 2 recommendation?**
- **Which information is the most important in making your choice of cut scores?**
  - Percentage of students college ready on the ACT?
  - Percentage of students proficient on NAEP?
  - Percentage of students enrolling in college?
  - Other?

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BREAK

Standard Setting will recommence in 15 Minutes

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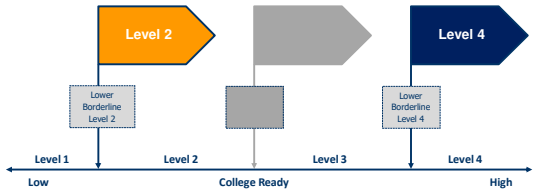
WHAT DOES IT MEAN TO BE LEVEL 2 OR LEVEL 4?

ESTABLISHING CUT SCORES FOR FOUR LEVELS OF ACHIEVEMENT

To divide the achievement scale into Level 1, Level 2, Level 3, and Level 4, we will focus on the lower borderline of each achievement level.



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BASIC AND ADVANCED DESCRIPTORS - NAEP

NAEP *Basic* Achievement Level:

This level denotes partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at each grade.

NAEP *Advanced* Achievement Level:

This level signifies superior performance beyond proficient.

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LEVEL 2 AND LEVEL 4 DESCRIPTORS - AZ

AZ college ready Level 2 Descriptor:

Students performing at Level 2 (Minimally Proficient) are ???

AZ college ready Level 4 Descriptor:

Students performing at Level 4 (Highly Proficient) are ???

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ADE POLICY PLDS FOR STATEWIDE ASSESSMENTS FOR ELA AND MATHEMATICS

Policy PLDs

Policy PLDs			
Minimally Proficient	**Partially Proficient**	**Proficient**	**Highly Proficient**
Minimally Proficient students demonstrate a modest understanding of and ability to apply the content knowledge and skills needed to be on track toward college and career readiness as specified in Arizona's Mathematics and English Language Arts Standards.	Partially Proficient students demonstrate a partial understanding of and ability to apply the content knowledge and skills needed to be on track toward college and career readiness as specified in Arizona's Mathematics and English Language Arts Standards.	Proficient students demonstrate a fundamental understanding of and ability to apply the content knowledge and skills needed to be on track toward college and career readiness as specified in Arizona's Mathematics and English Language Arts Standards.	Highly Proficient students demonstrate an advanced understanding of and ability to apply the content knowledge and skills needed to be on track toward college and career readiness as specified in Arizona's Mathematics and English Language Arts Standards.

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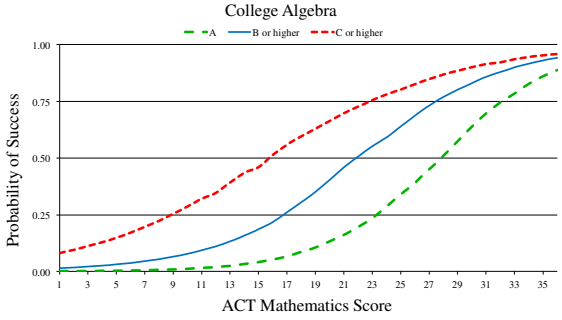
SUCCESS PROBABILITIES



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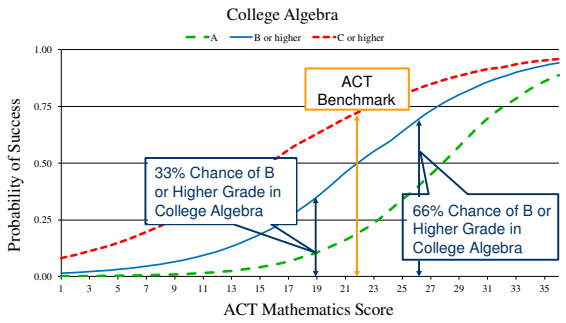
SUCCESS PROBABILITIES



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STEM BENCHMARK

- **40% of ACT-tested high school graduates indicate interest in a Science, Technology, Engineering, and Math (STEM) career area.**
- **ACT STEM score = average of ACT math and science scores**
- **STEM Benchmark = 50% chance of earning B or higher in first-year STEM math or science course**
- **STEM majors require higher levels of math and science coursework**

ACT Subject -Area Test	First-Year STEM Major College Courses	Benchmark
Mathematics	Calculus	27
Science	Biology, Chemistry, Engineering, and Physics	25
STEM	Calculus, Biology, Chemistry, Engineering, and Physics	26

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STEM BENCHMARK

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
		Mathematics							
Math (Calc)	27		0.50	0.74	7	8	7	10	9
Science (Bio, Chem, Eng, Phy)	25		0.49	0.76	9	13	12	16	14
		STEM							
STEM Bench.	26	0.23	0.54	0.78	9	10	10	13	11

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WHAT DOES IT MEAN TO BE MINIMALLY LEVEL 2?

- **What should a student who is minimally at Level 2 know and be able to do?**
  - What's the chance that student will get a B?
  - What's the chance that student will get a C?
  - Of students who get a B grade in a first-year college course,
    - Would you find a **Level 2** student among them?
  - Of students who get a C grade in a first-year college course,
    - What would a minimally **Level 2** student know? Where would that minimally **Level 2** student rank among them?
  - What differentiates a minimally **Level 2** student from a Level 1 student? At which score?

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WHAT DOES IT MEAN TO BE MINIMALLY LEVEL 4?

- **What should a student who is minimally at Level 4 know and be able to do?**
  - What's the chance that student will get a B?
  - What's the chance that student will get a C?
  - Of students who get a B grade in a first-year college course,
    - Would you find a **Level 4** student among them?
  - Of students who get a C grade in a first-year college course,
    - What would a minimally **Level 4** student know? Where would that minimally **Level 4** student rank among them?
  - What differentiates a minimally **Level 4** student from a Level 3 student? At which score?

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DISCUSSION

INSTRUCTIONS FOR SETTING ROUND 3 CUT SCORES

SETTING LEVEL 2 AND LEVEL 4 ACHIEVEMENT LEVELS

Task:

- Think about minimally *Level 2* and a minimally *Level 4* students in each subject area.
- Think about their likely success in their first-year, entry-level college course in that subject area (College Algebra, Social Science course, or College Biology).
- Highlight the one row for *Level 2* and the one row for *Level 4* on the rating sheet that best reflect what you see as their probabilities of achieving an A, B, or C grade.
- Ratings should reflect your individual judgment.

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ROUND 2 LEVEL 2 AND LEVEL 4 RATING FORM IN MATH

	Probability of Success			Percentage At/Above				
ACT Score	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
28	0.51	0.77	0.87	5	6	5	7	6
27	0.45	0.73	0.85	7	8	7	10	9
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55
16	0.05	0.22	0.51	59	64	66	69	71
15	0.04	0.19	0.46	73	78	80	83	82

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ROUND 2 LEVEL 2 AND LEVEL 4 RATING FORM IN SCIENCE

	Probability of Success			Percentage At/Above				
ACT Score	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
28	0.41	0.73	0.89	4	6	6	7	7
27	0.36	0.69	0.88	5	7	7	9	8
26	0.30	0.64	0.86	7	10	9	11	11
25	0.25	0.60	0.84	9	13	12	16	14
24	0.21	0.55	0.81	14	18	18	21	20
23	**0.18**	**0.51**	**0.79**	**19**	**25**	**24**	**27**	**26**
22	0.14	0.46	0.75	23	29	30	33	31
21	0.12	0.41	0.71	28	36	35	39	37
20	0.10	0.36	0.68	33	41	41	46	42
19	0.08	0.31	0.65	39	49	50	53	50
18	0.06	0.27	0.61	46	57	56	59	58
17	0.05	0.23	0.57	54	63	63	68	65
16	0.04	0.19	0.52	61	72	71	74	73
15	0.03	0.16	0.47	69	78	77	80	78

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ROUND 2 LEVEL 2 AND LEVEL 4 RATING FORM IN ELA

	Probability of Success			Percentage At/Above				
ACT Score	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
28	0.49	0.79	0.90	5	5	5	6	5
27	0.45	0.77	0.89	6	7	7	8	7
26	0.40	0.73	0.87	8	9	9	10	9
25	0.36	0.70	0.86	11	12	12	13	12
24	0.32	0.66	0.84	14	15	15	16	15
23	0.29	0.62	0.82	18	19	19	21	19
22	0.25	0.58	0.80	22	24	24	26	24
21	0.22	0.55	0.78	27	29	29	31	29
20	**0.19**	**0.51**	**0.76**	**32**	**35**	**35**	**37**	**35**
19	0.16	0.47	0.73	38	41	41	44	42
18	0.14	0.43	0.71	44	47	48	50	48
17	0.12	0.39	0.68	50	53	54	56	55
16	0.11	0.35	0.65	56	60	61	63	62
15	0.09	0.31	0.61	63	66	68	69	68

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ROUND 3 RATING AND LUNCH BREAK

- Highlight the one row for Level 2 and the one row for Level 4 on the rating sheet that best reflect what you see as their probabilities of achieving an A, B, or C grade.
- Ratings should reflect your individual judgment.
- When finished, hand in the rating sheet to the facilitators and break for lunch.
- Return for afternoon session in one hour.

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ROUND 2 LEVEL 2 AND LEVEL 4 RATING FORM IN MATH

	Probability of Success			Percentage At/Above				
ACT Score	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
28	0.51	0.77	0.87	5	6	5	7	6
27	0.45	0.73	0.85	7	8	7	10	9
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55
16	0.05	0.22	0.51	59	64	66	69	71
15	0.04	0.19	0.46	73	78	80	83	82

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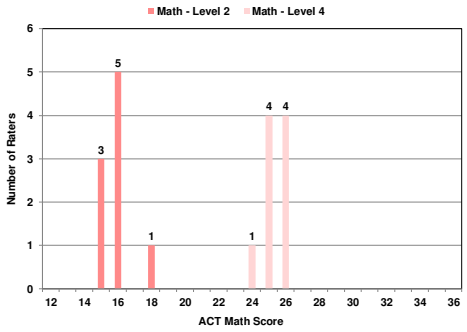
ROUND 3 RESULTS

MATH RATINGS FOR LEVELS 2 AND 4



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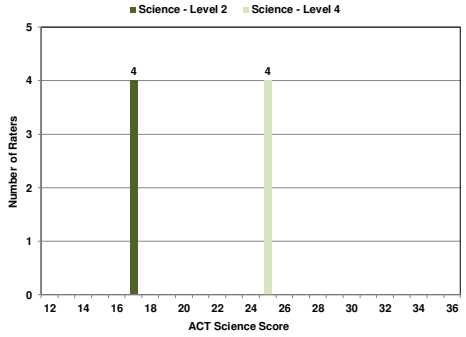
SCIENCE RATINGS FOR LEVELS 2 AND 4



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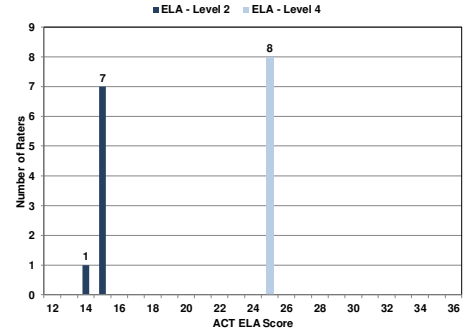
ELA RATINGS FOR LEVELS 2 AND 4



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ACHIEVEMENT LEVEL IMPACT

	ACT Score	Probability A	Probability B or higher	Probability C or higher	Percentage At or Above AZ Census Juniors 2022	Percentage At or Above Census State Juniors 2022	Percentage At or Above Census State Juniors 2021	Percentage At or Above Census State Juniors 2020	Percentage At or Above Census State Juniors 2019
Mathematics									
Level 4	25	0.34	0.64	0.80	13	14	14	17	16
Level 3 (R2)	19	0.11	0.35	0.63	32	34	36	40	38
Level 2	16	0.05	0.22	0.51	59	64	66	69	71
Science									
Level 4	25	0.25	0.60	0.84	9	13	12	16	14
Level 3 (R2)	21	0.12	0.41	0.71	28	36	35	39	37
Level 2	17	0.05	0.23	0.57	54	63	63	68	65
ELA									
Level 4	25	0.36	0.70	0.86	11	12	12	13	12
Level 3 (R2)	18	0.14	0.43	0.71	44	47	48	50	48
Level 2	15	0.09	0.31	0.61	63	66	68	69	68

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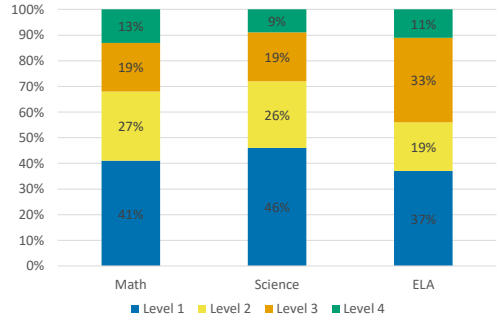
ACHIEVEMENT LEVEL IMPACT



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AZ STATE TEST PERFORMANCE: MATH

Math Achievement Level	Percent At or Above						
	2019					2021	
	Grade 8	Algebra I	Algebra II	Geometry	ACT Math	Grade 8	Grade 10
Level 4	18	15	14	9	14	11	5
Level 3	41	43	40	37	33	26	26
Level 2	59	61	61	58	50	43	46
Level 1	41	39	40	42	50	56	53

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AZ STATE TEST PERFORMANCE: SCIENCE

Science Achievement Level	Percent At or Above			
	2019			
	Grade 8	2022 Cohort	2021 Cohort	ACT Science
Level 4	24	22	13	11
Level 3	50	45	30	24
Level 2	72	66	48	48
Level 1	27	34	52	51

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AZ STATE TEST PERFORMANCE: ELA

ELA Achievement Level	Percent At or Above					
	2019				2021	
	Grade 8	Grade 10	Grade 11	ACT ELA	Grade 8	Grade 10
Level 4	13	10	13	13	11	9
Level 3	38	33	33	29	34	33
Level 2	59	48	49	51	55	50
Level 1	40	51	51	49	45	51

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NAEP ACHIEVEMENT LEVELS: MATH

Mathematics Achievement Level	Percent At or Above		
	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	9	10	3
Proficient	31	34	24
Basic	68	69	59
Below Basic	32	31	40

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NAEP ACHIEVEMENT LEVELS: SCIENCE

Science Achievement Level	Percent At or Above		
	2015 Grade 8	2019 Grade 8	2019 Grade 12
	AZ	National public	National public
Advanced	1	2	2
Proficient	25	35	22
Basic	61	67	59
Below Basic	39	33	41

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NAEP ACHIEVEMENT LEVELS: READING

Reading Achievement Level	Percent At or Above		
	2019 Grade 8		2019 Grade 12
	AZ	National public	National public
Advanced	3	4	6
Proficient	30	33	37
Basic	69	72	70
Below Basic	31	27	30

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ACT OUTCOMES DATA SOURCES

College Enrollment Rates

- **ACT-Tested Graduating Classes of 2018-2020**
- **All U.S. ACT-Tested high school graduates (ACT-tested rate varies from state to state; about 50% national and 70% AZ)**
- **Enrollment Data from National Student Clearinghouse**
- **Each student's most recent ACT scores**
- **ELA not presented because non-representative samples who took writing; English and reading are presented**
  - 9-15% of AZ graduates took writing in 2018-2020
  - 41-47% of national graduates took writing in 2018-2020

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COLLEGE ENROLLMENT RATES - MATH

		Percent Enrolled					
ACT Math Score=		AZ Grad 2020	AZ Grad 2019	AZ Grad 2018	National Grad 2020	National Grad 2019	National Grad 2018
Level 4	25	69	73	78	77	82	83
Level 3 (R2)	19	53	58	58	65	70	69
Level 2	16	33	41	40	47	52	50

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COLLEGE ENROLLMENT RATES - SCIENCE

		Percent Enrolled					
ACT Science Score=		AZ Grad 2020	AZ Grad 2019	AZ Grad 2018	National Grad 2020	National Grad 2019	National Grad 2018
Level 4	25	69	79	78	77	83	83
Level 3 (R2)	21	60	63	64	67	73	72
Level 2	17	38	43	48	50	54	56

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COLLEGE ENROLLMENT RATES - ELA

		Percent Enrolled					
ACT English Score=		AZ Grad 2020	AZ Grad 2019	AZ Grad 2018	National Grad 2020	National Grad 2019	National Grad 2018
Level 4	25	74	79	78	78	83	83
Level 3 (R2)	18	49	57	57	60	65	65
Level 2	15	37	44	45	49	53	52

		Percent Enrolled					
ACT Reading Score=		AZ Grad 2020	AZ Grad 2019	AZ Grad 2018	National Grad 2020	National Grad 2019	National Grad 2018
Level 4	25	64	71	71	73	78	78
Level 3 (R2)	18	43	49	50	55	58	60
Level 2	15	32	40	40	46	49	50

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ACT OUTCOMES DATA SOURCES

Long Term Outcomes Study (Noble & Radunzel, 2012)

- **National sample of 194,000 ACT-tested students enrolled in college 2000-2006, at 43 2-year and 61 4-year colleges**
- **Second year retention & 6-year degree completion rates by ACT score**
- **ELA scores were not available at the time of this study; English and reading are presented**

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ESTIMATED COLLEGE DEGREE COMPLETION RATES (2012 STUDY)

	Completed Associate's or Bachelor's Degree in 6 Years		
		ACT Score =	Percentage At or Above
Math	Level 4	25	54
	Level 3 (R2)	19	38
	Level 2	16	31
Science	Level 4	25	48
	Level 3 (R2)	21	39
	Level 2	17	31
English	Level 4	25	54
	Level 3 (R2)	18	38
	Level 2	15	32
Reading	Level 4	25	45
	Level 3 (R2)	18	35
	Level 2	15	31

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DISCUSSION

- How did your ratings compare with those of others?
- How did ratings in each subject area compare with ratings of the other subject areas?
- How does the additional impact information provided influence your ratings of the three cut scores?
- Which information is the most important in making your choice of cut scores?
  - Math
  - Science
  - ELA

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COHERENCE OF CUT SCORES ACROSS 3 LEVELS

- How did your ratings in each subject area compare with ratings in other subject areas?
- Is it important to have similar probabilities of success for each cut score in each subject area? Why or why not?
- Do you have any additional questions or concerns before making your final cut score recommendations?

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ACHIEVEMENT LEVEL IMPACT

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
Mathematics									
Level 4	25	0.34	0.64	0.80	13	14	14	17	16
Level 3 (R2)	19	0.11	0.35	0.63	32	34	36	40	38
Level 2	16	0.05	0.22	0.51	59	64	66	69	71
Science									
Level 4	25	0.25	0.60	0.84	9	13	12	16	14
Level 3 (R2)	21	0.12	0.41	0.71	28	36	35	39	37
Level 2	17	0.05	0.23	0.57	54	63	63	68	65
ELA									
Level 4	25	0.36	0.70	0.86	11	12	12	13	12
Level 3 (R2)	18	0.14	0.43	0.71	44	47	48	50	48
Level 2	15	0.09	0.31	0.61	63	66	68	69	68

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NEXT STEPS

- We will shortly complete the final round of ratings, followed by an evaluation, during which time we will tally the final recommended cut scores.
- After briefly reporting the final recommendations we will conclude the standard setting.
- After this meeting, ACT will deliver a report and recommendations to ADE.
- The Arizona Board of Education will determine the final cut scores.

- THANK YOU for participating!

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INSTRUCTIONS FOR SETTING FINAL RECOMMENDED CUT SCORES

SETTING LEVEL 2, 3, AND 4 ACHIEVEMENT LEVELS

Task:

- Think about students *minimally* at Level 2, 3, and 4 in each subject area.
- Think about their likelihood of success in their first-year, entry-level college course in each subject area (College Algebra, English and Social Science courses, or College Biology).
- Highlight the one row for Level 2, one row for Level 3, and one row for Level 4 on the rating sheet that best reflect what you see as their probabilities of achieving an A, B, or C grade.
- When finished, hand the rating sheets to the facilitators and complete the evaluation form.

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FINAL RATING FORM IN MATH

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
28	0.51	0.77	0.87	5	6	5	7	6
27	0.45	0.73	0.85	7	8	7	10	9
26	0.39	0.69	0.83	10	11	11	14	12
25	0.34	0.64	0.80	13	14	14	17	16
24	0.29	0.59	0.78	16	18	17	21	19
23	0.23	0.55	0.75	19	21	20	25	23
22	**0.20**	**0.51**	**0.73**	**21**	**24**	**24**	**28**	**25**
21	0.16	0.46	0.70	25	27	27	32	30
20	0.13	0.40	0.66	27	31	31	35	32
19	0.11	0.35	0.63	32	34	36	40	38
18	0.09	0.30	0.60	37	40	42	46	43
17	0.07	0.26	0.56	47	51	51	55	55
16	0.05	0.22	0.51	59	64	66	69	71
15	0.04	0.19	0.46	73	78	80	83	82

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FINAL RATING FORM IN SCIENCE

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
28	0.41	0.73	0.89	4	6	6	7	7
27	0.36	0.69	0.88	5	7	7	9	8
26	0.30	0.64	0.86	7	10	9	11	11
25	0.25	0.60	0.84	9	13	12	16	14
24	0.21	0.55	0.81	14	18	18	21	20
23	**0.18**	**0.51**	**0.79**	**19**	**25**	**24**	**27**	**26**
22	0.14	0.46	0.75	23	29	30	33	31
21	0.12	0.41	0.71	28	36	35	39	37
20	0.10	0.36	0.68	33	41	41	46	42
19	0.08	0.31	0.65	39	49	50	53	50
18	0.06	0.27	0.61	46	57	56	59	58
17	0.05	0.23	0.57	54	63	63	68	65
16	0.04	0.19	0.52	61	72	71	74	73
15	0.03	0.16	0.47	69	78	77	80	78

26

FINAL RATING FORM IN ELA

ACT Score	Probability of Success			Percentage At/Above				
	A prob	B or higher prob	C or higher prob	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
28	0.49	0.79	0.90	5	5	5	6	5
27	0.45	0.77	0.89	6	7	7	8	7
26	0.40	0.73	0.87	8	9	9	10	9
25	0.36	0.70	0.86	11	12	12	13	12
24	0.32	0.66	0.84	14	15	15	16	15
23	0.29	0.62	0.82	18	19	19	21	19
22	0.25	0.58	0.80	22	24	24	26	24
21	0.22	0.55	0.78	27	29	29	31	29
20	**0.19**	**0.51**	**0.76**	**32**	**35**	**35**	**37**	**35**
19	0.16	0.47	0.73	38	41	41	44	42
18	0.14	0.43	0.71	44	47	48	50	48
17	0.12	0.39	0.68	50	53	54	56	55
16	0.11	0.35	0.65	56	60	61	63	62
15	0.09	0.31	0.61	63	66	68	69	68

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NEXT STEPS

- 15 minute break
- Please complete the final round of ratings – Level 2, Level 3, and Level 4 – and hand in the rating sheets to the facilitators.
- Please complete the evaluation form.
- After briefly reporting the final recommendations we will conclude the standard setting.

- THANK YOU for participating!

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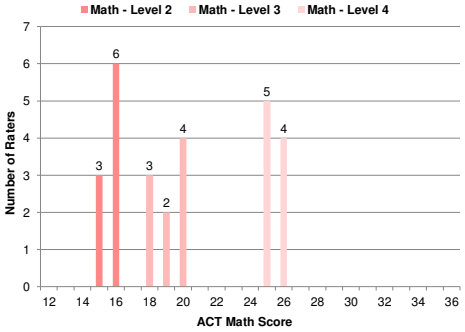
ARIZONA STANDARD SETTING RESULTS

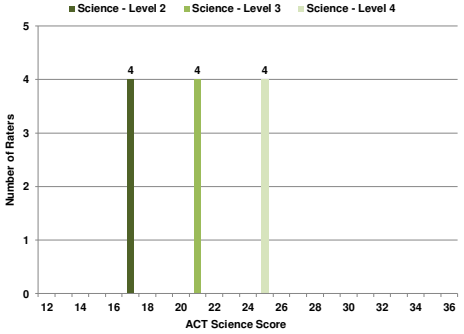
JULY 6-7, 2022 • PHOENIX, AZ

MATH FINAL RATINGS FOR LEVELS 2, 3, AND 4



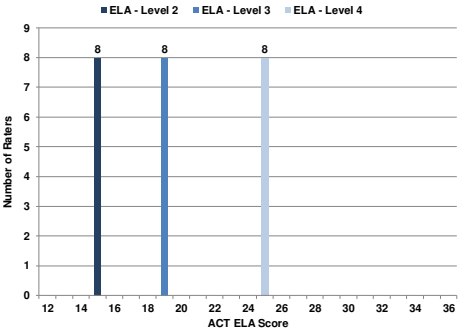
2

SCIENCE FINAL RATINGS FOR LEVELS 2, 3, AND 4



3

ELA FINAL RATINGS FOR LEVELS 2, 3, AND 4



4

FINAL RESULTS

		Probability			Percentage At or Above				
	ACT Score	A	B or higher	C or higher	AZ Census Juniors 2022	Census State Juniors 2022	Census State Juniors 2021	Census State Juniors 2020	Census State Juniors 2019
Mathematics									
Level 4	25	0.34	0.64	0.80	13	14	14	17	16
Level 3	19	0.11	0.35	0.63	32	34	36	40	38
Level 2	16	0.05	0.22	0.51	59	64	66	69	71
Science									
Level 4	25	0.25	0.60	0.84	9	13	12	16	14
Level 3	21	0.12	0.41	0.71	28	36	35	39	37
Level 2	17	0.05	0.23	0.57	54	63	63	68	65
ELA									
Level 4	25	0.36	0.70	0.86	11	12	12	13	12
Level 3	19	0.16	0.47	0.73	38	41	41	44	42
Level 2	15	0.09	0.31	0.61	63	66	68	69	68

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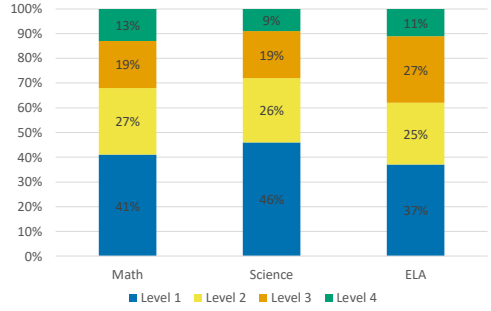
FINAL RESULTS



6

NEXT STEPS

- After this meeting, ACT will deliver a report and your recommendations to the Arizona Department of Education.
- The Arizona Department of Education will determine the final cut scores.
- THANK YOU for participating!

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