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ACT Reporting Category Interpretation Guide

Version 1.0

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Abstract

ACT reporting categories and ACT Readiness Ranges are new features added to the ACT score reports starting in fall 2016. For each reporting category, the number correct score, the maximum points possible, the percent correct, and the ACT Readiness Range, along with an indicator of whether the reporting category score falls within the Readiness Range are provided. In the format of questions and answers, this document first gives an introduction of the reporting categories in terms of what they are, how they are reported, and how they are related to the previous subscores. Then, based on results from 12 ACT forms administered to randomly equivalent groups of about 3,000 examinees in each, information is provided on the technical characteristics of the reporting category scores, including score reliability, standard error of measurement, and classification consistency of the ACT Readiness Ranges. This document is intended to facilitate the interpretation of reporting category scores and the ACT Readiness Ranges.

What are the ACT reporting categories?

The ACT reporting categories are new scores reported on the ACT® score reports beginning in fall 2016. There are three reporting categories each for English, reading, and science, and eight reporting categories for mathematics. These scores break overall test performance into smaller categories that can be used to identify components of the subject area that are relative strengths or weaknesses for each test taker.

Tables 1 through 4 provide a description of the ACT reporting categories for each subject, including the target range of items within each reporting category. The number of items within a reporting category may fluctuate slightly across forms though the total number of items within a subject is the same across forms. Older ACT test forms may deviate slightly from these target ranges, but new forms are built to match the target ranges as closely as possible.

Table 1. ACT English Reporting Categories

Reporting Category Labels and Descriptions	Target Ranges	
	Number of Items	Percentage of Test
Production of Writing <ul style="list-style-type: none"> • Demonstrate an understanding of, and control over, the rhetorical aspects of texts • Identify purposes of parts of texts • Determine whether a text or parts of text have met the goal • Evaluate the relevance of material in terms of a text’s focus • Use various strategies to ensure that a text is logically organized, flows smoothly, and has an effective introduction and conclusion 	22-24	29-32%
Knowledge of Language <ul style="list-style-type: none"> • Demonstrate effective language use through ensuring precision and concision in word choice and maintaining consistency in style and tone 	11-13	15-17%
Conventions of Standard English <ul style="list-style-type: none"> • Apply understanding of relationships between and among clauses, placement of modifiers, and shifts in sentence construction • Edit text to conform to Standard English usage • Edit text to conform to Standard English punctuation 	39-41	52-55%
TOTAL	75	100%

Table 2. ACT Mathematics Reporting Categories

Reporting Category Labels and Descriptions	Target Ranges	
	Number of Items	Percentage of Test
Preparing for Higher Math	34-36	57-60%
Number & Quantity <ul style="list-style-type: none"> • Demonstrate knowledge of real and complex number systems • Understand and reason with numerical quantities in many forms, including integer and rational exponents, vectors, and matrices 	4-6	7-10%
Algebra <ul style="list-style-type: none"> • Solve, graph, and model multiple types of expressions • Employ different kinds of equations, for example, linear, polynomial, radical, and exponential • Find solutions to systems of equations, even when represented by simple matrices, and apply their knowledge to applications 	7-9	12-15%
Functions <ul style="list-style-type: none"> • Understand function definition, notation, representation, and application for linear, radical, piecewise, polynomial, logarithmic, and other functions • Manipulate and translate functions • Apply important features of graphs 	7-9	12-15%
Geometry <ul style="list-style-type: none"> • Define and apply knowledge of shapes and solids, such as congruence and similarity relationships or surface area and volume measurement • Understand composition of objects • Solve for missing values in triangles, circles, and other figures, including using trigonometric ratios and equations of conic sections 	7-9	12-15%
Statistics & Probability <ul style="list-style-type: none"> • Describe center and spread of distributions • Apply and analyze data collection methods • Understand and model relationships in bivariate data • Calculate probabilities including the related sample spaces 	5-7	8-12%
Integrating Essential Skills <ul style="list-style-type: none"> • Use essential skills (i.e., concepts typically learned before 8th grade, for example, rates, percentages, proportional relationships, area, surface area, volume, average, median, etc.) to... <ul style="list-style-type: none"> ○ Solve problems of increasing complexity ○ Combine skills in a longer chain of steps ○ Apply skills in more varied contexts ○ Understand more connections ○ Become more fluent 	24-26	40-43%
Modeling* <ul style="list-style-type: none"> • Produce, interpret, understand, evaluate, and improve models 	≥ 16	≥27%
TOTAL	60	100%

*Each modeling item is also included in another reporting category.

Table 3. ACT Reading Reporting Categories

Reporting Category Labels and Descriptions	Target Ranges	
	Number of Items	Percentage of Test
Key Ideas and Details <ul style="list-style-type: none"> Determine central ideas and themes Summarize information and ideas accurately Make logical inferences Understand sequential, comparative, and cause-effect relationships 	22-24	55-60%
Craft and Structure <ul style="list-style-type: none"> Determine the meaning of words and phrases Analyze an author's word choice rhetorically Analyze text structure Understand authorial purpose and perspective Analyze characters' points of view Differentiate between various perspectives and sources of information 	10-12	25-30%
Integration of Knowledge and Ideas <ul style="list-style-type: none"> Understand authors' claims Differentiate facts and opinions Use evidence to make connections between different texts that are related by topic Analyze how authors construct arguments Evaluate reasoning and evidence from various sources 	6-7	15-18%
TOTAL	40	100%

Table 4. ACT Science Reporting Categories

Reporting Category Labels and Descriptions	Target Ranges	
	Number of Items	Percentage of Test
Interpretation of Data <ul style="list-style-type: none"> Manipulate and analyze scientific data presented in tables, graphs, and diagrams (e.g., recognize trends in data, translate tabular data into graphs, interpolate and extrapolate, and reason mathematically) 	18-22	45-55%
Scientific Investigation <ul style="list-style-type: none"> Understand experimental tools, procedures, and design (e.g., identify variables and controls) Compare, extend, and modify experiments (e.g., predict the results of additional trials) 	8-12	20-30%
Evaluation of Models, Inferences, and Experimental Results <ul style="list-style-type: none"> Judge the validity of scientific information Formulate conclusions and predictions based on scientific information (e.g., determine which explanation for a scientific phenomenon is supported by new findings) 	10-14	25-35%
TOTAL	40	100%

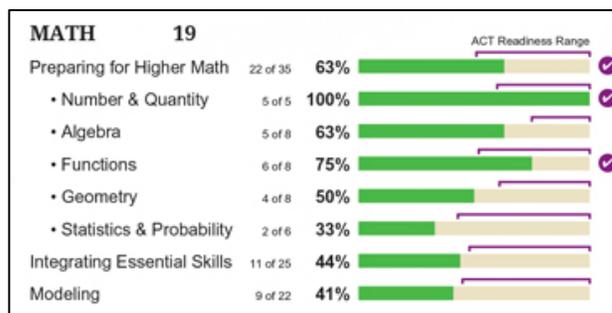
How do the ACT reporting categories relate to the previous ACT subscores?

The ACT reporting categories replace the previous ACT subscores for English, reading, and mathematics, and also add reporting categories for science. The new reporting categories, which are reported beginning in fall 2016, are designed to provide information better aligned with college and career readiness standards.

Some of the ACT reporting categories measure skills similar to the previous subscores, leading to high correlations between the new ACT reporting category scores and the previous ACT subscores. For example, the previous *Usage/Mechanics* subscore for English and the new *Conventions of Standard English* reporting category scores are very highly related. Likewise, the *Intermediate Algebra/Coordinate Geometry* subscore is very highly related to the *Preparing for Higher Math* reporting category. However, for other ACT reporting categories, the scores are based on different skill sets and are only moderately correlated with previous subscores. As an example, the previous reading subscores were content-based (e.g., *Social Studies/Sciences* and *Arts/Literature*) and are only moderately correlated with the reading *Integration of Knowledge and Ideas* reporting category.

What information is reported for the ACT reporting categories?

Underneath the overall subject test scale score on the student score report is a list of the reporting categories and scores. For each reporting category, the total number of items, the number of correct responses, the percent of correct responses, and the ACT Readiness Range, along with an indicator of whether the reporting category score falls within the Readiness Range (✓) are provided.



What is the ACT Readiness Range and how is it determined for the reporting categories?

ACT student data are used to create a predictive relationship between the ACT College Readiness Benchmark score on the overall test and each of the test's reporting categories. So, for example, a Readiness Range is developed for each of the three English reporting categories. For the first reporting category, student scores on the overall English test and scores on the *Production of Writing* reporting category are used to estimate the predictive relationship between the two scores. This relationship is then used to identify the minimum percent correct value for the reporting category that corresponds to the benchmark score on the overall English test. Students with percent correct values at or above the minimum percent correct value obtained during this process are considered to be within the ACT Readiness Range. The same process is repeated to determine Readiness Ranges for the *Knowledge of Language* and *Conventions of Standard English* reporting categories.

The Readiness Range is intended to provide more meaningful comparisons of student performance across reporting categories. A comparison of percent correct values may lead to incorrect conclusions about student strengths and weaknesses because the difficulty of the items within each reporting category is likely to differ. However, even the Readiness Ranges must be interpreted cautiously because some of the reporting categories are based on a small number of items. In fact, when the Readiness Ranges were retroactively applied to a sample of 12 ACT forms administered in 2015 to randomly

equivalent groups of about 3,000 examinees in each, the percent of students within the ACT Readiness Range varied somewhat dramatically across forms for certain reporting categories. Table 5 provides the minimum, maximum, and the maximum difference in the percent of students within the ACT Readiness Ranges across the 12 forms for each reporting category. These differences cannot be attributed to group differences as the administration of these forms was designed to achieve very similar samples of students across forms. These fluctuations in the percent of students within the Readiness Range is largely a function of how many items are within a particular reporting category. For example, the percent of students within the ACT Readiness Range varied less than 5% across the 12 forms for *Conventions of Standard English* which has about 40 items, but varied more than 20% across forms for *Number & Quantity* which has about 5 items. More information on the stability of reporting category scores is provided in the *Technical Characteristics* section below.

Table 5. Percent of Students within the ACT Readiness Range across Twelve 2015 Forms Administered to Randomly Equivalent Groups of Examinees

Test/Reporting Categories	Median # of Items	Percent of Students within the ACT Readiness Range		
		Minimum	Maximum	Difference
English				
Production of Writing	23	62.70	68.91	6.21
Knowledge of Language	12	60.51	73.67	13.16
Conventions of Standard English	40	64.75	69.56	4.81
Mathematics				
Preparing for Higher Math	35	40.35	48.67	8.32
Number & Quantity	5	29.88	52.64	22.76
Algebra	8	38.66	59.57	20.91
Functions	8	35.84	56.12	20.28
Geometry	8	37.36	57.08	19.72
Statistics & Probability	6	35.17	58.95	23.78
Integrating Essential Skills	25	41.84	49.90	8.06
Modeling	24	38.89	51.92	13.03
Reading				
Key Ideas & Details	23	47.42	56.01	8.59
Craft & Structure	11	45.76	58.71	12.95
Integration of Knowledge & Ideas	6	40.15	67.57	27.42
Science				
Interpretation of Data	18	38.87	52.23	13.36
Scientific Investigation	10	33.38	57.45	24.07
Evaluation of Models, Inferences, & Experimental Results	12	36.92	51.13	14.21

How can the ACT reporting category scores be used?

For each reporting category, the total number of items, the number of correct responses, the percent of correct responses, and the ACT Readiness Range are provided. Because the items in different reporting categories may vary in difficulty, comparing the number of points earned and the percent correct values

across the reporting categories is problematic. However, the ACT Readiness Range provides information with a consistent interpretation, that is, whether the student’s performance in a particular reporting category is above or below the typical performance of students who meet the ACT College Readiness Benchmark on the subject test. This information provides an at-a-glance score profile that can be used to identify student strengths and areas for improvement. Students can use this information to focus their remediation efforts so they can better prepare themselves for college success.

Figure 1 provides an example score report for each of the four ACT subject areas and their corresponding reporting categories. Using science as an example, this hypothetical student received an overall score of 18 which is below the College Readiness Benchmark score of 23. This score indicates that overall the student would benefit from additional science coursework or remediation so that he or she is adequately prepared for college. However, a closer look at the student’s reporting category score profile reveals that the student is struggling more with some concepts than with others. For skills related to *Interpretation of Data*, the student only answered 56% of the items correctly which falls below the ACT Readiness Range for that reporting category. However, on the next reporting category, *Scientific Investigation*, the student was able to answer 70% of the items correctly, which was a score high enough to fall within the ACT Readiness Range. On the last reporting category, *Evaluation of Models, Inferences, and Experimental Results*, the student answered only 36% of the items correctly and will need to improve their performance in order to be prepared for success in college on these types of science skills. These results suggest that this student would benefit most from additional practice, coursework, or remediation in the science skills related to the first and third reporting categories, though more caution is needed when interpreting reporting category scores based on small numbers of items.

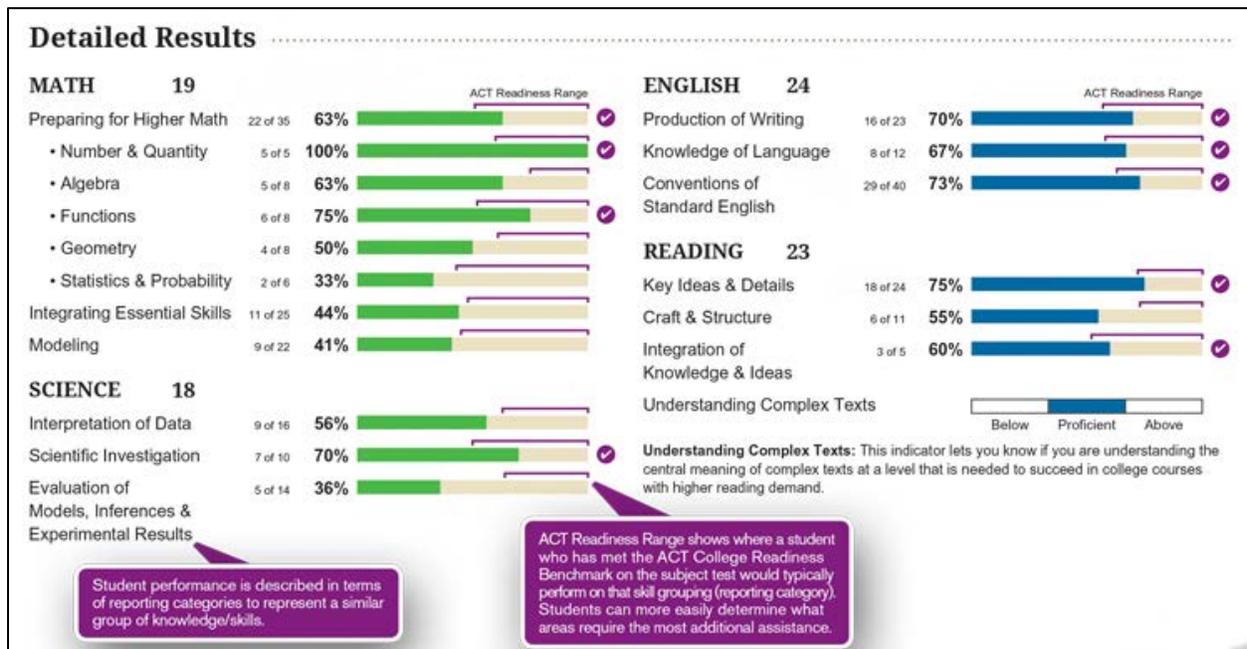


Figure 1. Example ACT Student Score Report

By breaking down the overall score into smaller component skills, it is also possible to learn more about individual students. For example, three students might all have an overall science score of 18. However, the score profile for each student may reveal a different pattern of strengths and weaknesses. Figure 2

provides an example of three students each having one reporting category score within the ACT Readiness Range and two reporting category scores below the ACT Readiness Ranges. Student 1, represented by the green line, has a profile similar to the one described in Figure 1, with a relative strength in the second reporting category (RC2), and relative weaknesses in the first (RC1) and third reporting categories (RC3). Student 2, represented by the blue line, shows a relative strength in RC1 but relative weaknesses in RC2 and RC3. Student 3, represented by the orange line, demonstrates the best performance in RC3 relative to the other two reporting categories. This example serves to illustrate the usefulness of the reporting category scores. Even though these three students may have the same overall science score of 18, the subskills that should be the focus for improvement are different for each student. Without the reporting category scores, students lack information about which skills or concepts they need to focus on to improve their preparation for college success.

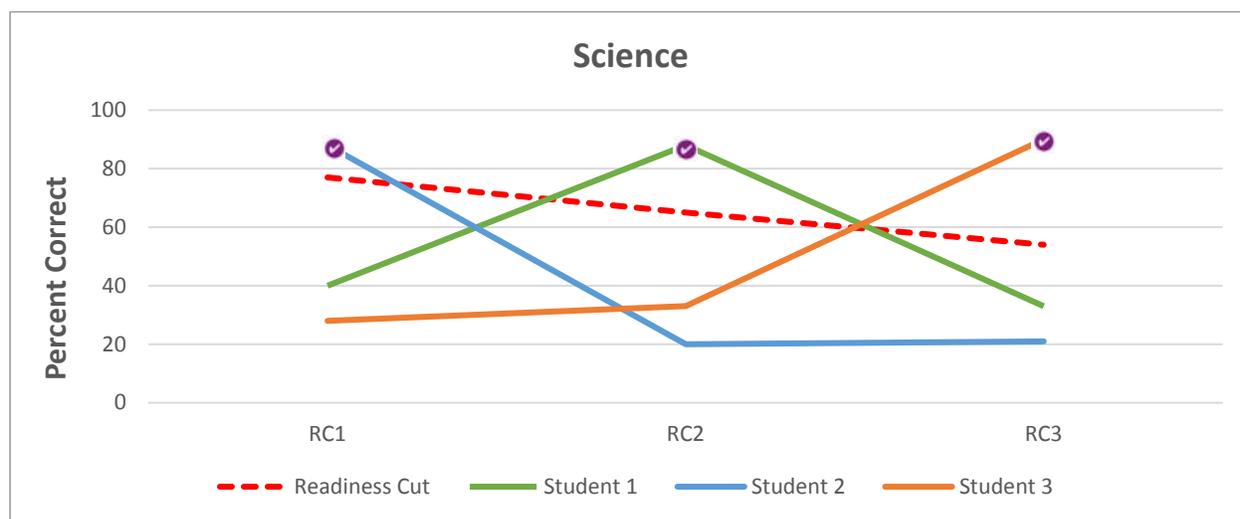


Figure 2. Example ACT Science Score Profiles

What are the technical characteristics of the ACT reporting categories?

Reliability is a measure of the consistency of student scores. Reliability values range from 0 to 1 with 0 representing completely unreliable scores and 1 representing perfectly reliable scores.

The standard error of measurement (SEM) is another measure that quantifies score consistency, but it is quantified in terms of score points. For example, an SEM of approximately 2 for the number of correct responses on a reporting category indicates that students' number of correct responses is likely to vary within a range of plus or minus 2 if a different set of items on this reporting category were administered. In the case of the SEM, for a given reporting category, smaller numbers are better because they reflect a higher degree of consistency and confidence in the reported score.

Reliability and SEM for the ACT reporting categories are provided in Table 6. These values were calculated using 12 forms administered in 2015 to randomly equivalent groups of approximately 3,000 students per form.

Table 6. Reliability and SEM for the ACT Reporting Category Scores

Test/Reporting Categories	Median # of Items	Reliability			SEM Number Correct Score			SEM Percent Correct Score		
		Median	Min	Max	Median	Min	Max	Median	Min	Max
English										
Production of Writing	23	0.81	0.77	0.82	2.07	1.99	2.12	9.02	8.64	9.20
Knowledge of Language	12	0.67	0.61	0.72	1.46	1.36	1.52	12.20	11.35	12.66
Conventions of Standard English	40	0.86	0.84	0.88	2.67	2.58	2.74	6.67	6.44	6.86
Mathematics										
Preparing for Higher Math	35	0.84	0.80	0.86	2.51	2.47	2.56	7.17	7.05	7.31
Number & Quantity	5	0.35	0.26	0.54	0.95	0.89	1.00	19.02	17.71	20.05
Algebra	8	0.54	0.49	0.65	1.19	1.13	1.23	14.82	14.15	15.39
Functions	8	0.59	0.45	0.65	1.20	1.15	1.24	14.99	14.35	15.56
Geometry	8	0.55	0.48	0.60	1.22	1.13	1.26	15.20	14.13	15.76
Statistics & Probability	6	0.42	0.34	0.51	1.06	1.01	1.09	17.62	16.80	18.10
Integrating Essential Skills	25	0.81	0.77	0.84	2.11	2.07	2.17	8.43	8.26	8.66
Modeling	24	0.79	0.71	0.84	2.07	1.73	2.32	8.73	7.75	10.79
Reading										
Key Ideas & Details	23	0.78	0.73	0.80	2.10	2.02	2.21	8.99	8.21	9.23
Craft & Structure	11	0.60	0.54	0.65	1.45	1.32	1.54	13.17	12.85	14.72
Integration of Knowledge & Ideas	6	0.43	0.34	0.55	1.09	0.82	1.14	18.63	17.01	21.14
Science										
Interpretation of Data	18	0.72	0.60	0.76	1.77	1.51	1.88	10.01	9.32	10.86
Scientific Investigation	10	0.59	0.47	0.69	1.39	1.17	1.71	13.28	11.26	16.74
Evaluation of Models, Inferences, & Experimental Results	12	0.61	0.45	0.74	1.55	1.28	1.69	12.95	10.56	16.00

For some of the reporting categories, particularly those with very few items, the reliability is much lower than is typically seen on an overall subject test. Less stability in the reporting category scores is the trade-off of having scores based on fewer items. However, the reporting category scores are not intended for high stakes decisions, but instead are intended to guide instruction and help identify students' strengths and weaknesses.

Caution is needed when comparing the SEM of number correct scores across reporting categories with different numbers of items. Although the SEM values based on the number correct score scale do not appear larger for the reporting categories with a smaller number of items, an SEM of approximately 1 for scores based on 5-8 items represents more uncertainty compared to an SEM of approximately 2 for 23-25 items. Another way to compare the SEM values is to use the percent correct score scale. A comparison of the percent correct SEM values shows the expected pattern where reporting categories with lower numbers of items have higher SEM values. For example, the *Number & Quantity* reporting category, which contains approximately 5 items, has a median SEM of 0.95 on the number correct scale, but a median SEM of 19.02 on the percent correct scale. If a student received a score of 4 out of 5 (80%), a range of plus or minus 19% would put the likely score for this student anywhere from 61% to 99%. This amount of variability around the student's scores makes it difficult to be confident about whether the student falls within or below the ACT Readiness Range.

Classification consistency provides an indication of the stability of student classifications. In the case of the ACT reporting categories, the classification of interest is whether or not the student falls within the ACT Readiness Range. Conceptually, classification consistency values indicate the proportion of students who would receive the same classification if tested a second time. Using Table 7 as an example, if 100 students take the ACT twice, then classification consistency is the proportion of students who are either below the Readiness Range for a particular reporting category based on both tests, or within the Readiness Range for a particular reporting category based on both tests. Consistent classifications are highlighted in yellow. Twenty students in this example were below the Readiness Range on both the initial test and the re-test. Fifty students in this example were within the Readiness Range on both the initial test and the re-test. Therefore, 70 out of 100 students were classified consistently.

Table 7. Classification Consistency Example

Classification on Initial Test	Classification on Re-Test			Total
		Below Readiness Range	Within Readiness Range	
Below Readiness Range		20	20	40
Within Readiness Range		10	50	60
	Total	30	70	100

However, since many students only take the test once, we only have one classification. Models have been developed to estimate classification consistency even with a single classification per student. One such model, developed by Livingston and Lewis (1995),¹ was used to calculate classification consistency for the ACT reporting categories. Classification consistency values can range from 0 to 1 with values closer to 1 indicating more stable classifications. Higher stability in student classifications is desired so that score users can be confident in the classification they received (i.e., below the ACT Readiness Range or within the ACT Readiness Range).

Classification consistency of 12 forms administered in 2015 is reported in Table 8. Median classification consistency values ranged from 0.61 to 0.85 across reporting categories. As expected, lower classification consistency values were observed for reporting categories with fewer items.

The results in Tables 6 and 8 highlight the need for caution when interpreting student scores and classifications based on small numbers of items. Reporting category scores are reported for remediation and targeted instruction, not for college admissions or placement decisions.

¹ Livingston, S. A., and Lewis, C. (1995). Estimating the consistency and accuracy of classifications based on test scores. *Journal of Educational Measurement*, 32(2), 179–197.

Table 8. Classification Consistency Values for the ACT Readiness Ranges

Test/Reporting Categories	Median # of Items	Classification Consistency		
		Median	Min	Max
English				
Production of Writing	23	0.82	0.79	0.83
Knowledge of Language	12	0.76	0.75	0.82
Conventions of Standard English	40	0.85	0.83	0.86
Mathematics				
Preparing for Higher Math	35	0.83	0.81	0.85
Number & Quantity	5	0.61	0.58	0.72
Algebra	8	0.68	0.66	0.75
Functions	8	0.72	0.67	0.75
Geometry	8	0.69	0.66	0.73
Statistics & Probability	6	0.66	0.61	0.70
Integrating Essential Skills	25	0.81	0.79	0.84
Modeling	24	0.81	0.76	0.83
Reading				
Key Ideas & Details	23	0.80	0.78	0.82
Craft & Structure	11	0.73	0.69	0.75
Integration of Knowledge & Ideas	6	0.65	0.60	0.70
Science				
Interpretation of Data	18	0.77	0.73	0.79
Scientific Investigation	10	0.71	0.68	0.76
Evaluation of Models, Inferences, & Experimental Results	12	0.73	0.68	0.80