

**Massachusetts Adult Proficiency Tests (MAPT) for Mathematics and Numeracy**

**Understanding and Accessing the MAPT for Math  
Score Reports<sup>1</sup>**

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and

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<sup>1</sup> Center for Educational Assessment Report No. 736. University of Massachusetts Amherst, School of Education.

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# Massachusetts Adult Proficiency Tests (MAPT) for Mathematics and Numeracy Understanding and Accessing the MAPT Score Reports

## Organization of this Guide

This interpretation guide and access manual is divided into several sections, with the goal of providing adult basic education teachers and programs with information about the content of the reports as well as how to access these reports through Cognos. The sections of this manual are:

- Looking at the Bigger Picture: MAPT Score Reports in Educational Context
- Understanding the MAPT Score Scale and Item Difficulty
- A Guide to the Individual Student Score Reports
- A Guide to the Class Score Reports
- Accessing the MAPT for Math Score Reports through Cognos
- Appendix A: Understanding Item Difficulty
- Appendix B: Quick Guides for Interpreting the Reports
- Appendix C: Learning More: Connecting Instruction to the Curriculum Frameworks (and List of Benchmarks and Page Numbers in Curriculum Frameworks)

## Introduction

The Massachusetts Adult Proficiency Tests (MAPT) for Mathematics and Numeracy are designed to measure ABE learners' knowledge and skills in math so that their progress in meeting educational goals can be evaluated. Although a primary purpose of the MAPT is to fulfill federal accountability demands under the National Reporting System, adult educators in Massachusetts want to use MAPT results to identify students' strengths and weaknesses and to inform instructional planning. It is with these aims in mind that the current MAPT for Math score reports were designed.

There are two types of MAPT for Math score reports. The first report is the **Individual Student Score Report**, which provides information about how each individual student did on a particular MAPT for Math test. The second is the **Class Score Report**, which is organized at the class level and gives ABE teachers insight into the performance of groups of students.

All items on the MAPT for Math are aligned with a benchmark from the *Massachusetts Adult Basic Education Curriculum Framework for Mathematics and Numeracy* (ACLS, 2005). **It is critical that all adult education math teachers in Massachusetts be familiar with these frameworks**, which can be accessed at <http://www.doe.mass.edu/acls/frameworks/mathnum.doc>. Because all MAPT items measure a benchmark in the framework, the student report focuses on the benchmarks measured by each item completed by a student. For each completed item, the individual student report also provides information regarding how difficult the specific item was, as well as whether the student answered the item correctly or incorrectly.

The MAPT for Math is a computerized-adaptive test, which means that as a student responds to questions (items) on the test, the OWL system keeps track of whether or not the item

was answered correctly. If a student is not doing well on a set of items, the computer chooses a slightly easier set to administer next. If the student is doing very well on a set of items, the computer will choose a slightly harder set of items. This adaptation of the test to the examinee is helpful for obtaining an accurate measure of a particular examinee's mathematics proficiency. However, it introduces some complexity for score reporting at the class level because all students within a class do not respond to the same sets of items. Furthermore, the MAPT tests taken by students within a class are likely to be very different with respect to the difficulty of sets of items. Thus, the MAPT for Math class reports are likely to look very different from score reports from other tests because the MAPT is distinct from other tests.

You need to understand a few basic points about the MAPT for Math before you learn about the score reports in detail:

1. All MAPT items are secure, which means they are confidential and cannot be included on a score report.
2. A MAPT for Math test contains 40 items that contribute to a student's score. There are also five pilot items included in each test, but these are not included in computing a student's score.
3. Each MAPT for Math test item measures a specific benchmark in the Massachusetts Adult Basic Education Curriculum Framework for Mathematics and Numeracy (<http://www.doe.mass.edu/acls/frameworks/mathnum.doc>).
4. MAPT for Math test items differ from one another in terms of difficulty. A relatively easy item is answered correctly by most ABE learners, even those who are at a low learning level. A relatively difficult item is answered correctly by very few learners, most of whom are at the highest learning levels.
5. There is not one single MAPT for Math test form (e.g., as the TABE has forms 7/8 or the REEP Prompts A through F). Instead, the specific 40 items administered to a student are chosen from a large pool of items each time a learner takes the MAPT. The computer ensures that the items selected (a) represent the intended content dictated by the test specifications and (b) are at the most appropriate difficulty level for the specific student.

Given these points, you can understand the challenges around providing specific information on students' MAPT performance at both the individual and class levels. We solve the problem somewhat for the Student Score Report by reporting **the benchmark** measured by each item, rather than reporting the item itself. This solution maintains the security of the items yet allows teachers to identify the benchmark measured by the item. We also report the **difficulty level** of the item so that teachers can better understand why a student may or may not have correctly answered an item.

For the Class Report, it is not possible to report item-level information or to report results at the benchmark level. This is because each MAPT test is composed of 40 items specifically geared to each individual student's most appropriate difficulty level, as explained in point #4. The Class Report addresses this problem by focusing on **Topics** rather than benchmarks. Thus, before interpreting the Student or Class score reports, you must gain an understanding of the "item difficulty" and "topics" concepts. These topics are detailed in Appendix B of this *Guide*.

## **Looking at the Bigger Picture: MAPT Score Reports in Educational Context<sup>2</sup>**

With the emphasis on next steps for our learners, Math instruction is vital to prepare students for post-secondary education, careers, and training.

Every statistic points to the premier importance of mathematic achievement in reaching next step goals. However, mathematics achievement remains the single biggest hurdle for students trying to attain next steps in careers, training, and post-secondary education.

Why is it crucial for us to improve adult numeracy and math skills?

- Mathematical skills are a gatekeeper for entrance into post-secondary education and training programs for adults of all ages, and significantly affect employability and career options. (*US DOE/OVAE ACI Numeracy Fact Sheet*)
- Math GED test failures exceed literacy test failures in Massachusetts (for those considered capable of potentially passing the GED within a year).
- GED 2008 statistical reports show that Massachusetts GED test-takers scored lower in math than on any of the five exams, with only 77.4% of test participants passing, 12% lower than the next most difficult test -- writing. The GED Mathematics Test "presents the greatest challenge to obtaining a GED Credential." (*GED Mathematics Training Institute*)
- Those who score poorly on quantitative literacy (math tests) are three times more likely than high scorers to require state support at some time in their lives.
- The National Assessment of Adult Literacy (NAAL) data show that 46% of all Massachusetts adults are at or below the basic level in quantitative literacy (capable of only the simplest calculations and problem solving).
- Nearly all GED students entering community college fail to place in college credit courses. One study found that "that few students reach the tipping point (10 college credits), with many adult basic skills students earning no college credits at all."
- Twice as many college-bound students require math remediation as require reading remediation.
- Math education produces greater economic returns than literacy education. On average, the more math you study, the more money you make ("84% of workers with well-paid professional jobs had taken Algebra 2 or higher").

***Knowing the facts does not change them.***

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<sup>2</sup> Text by Tricia Donovan and Luanne Teller.

Only persistent educator and student effort will change mathematics education outcomes for adult students. Using available test results, such as MAPT scores, to diagnose student strengths and weaknesses can help support our efforts to boost student achievement and move adult learners over the hurdles to their success post-GED.

In order to raise adult student mathematics achievement, we need every tool we can access. MAPT score reports are one more tool in our educator's toolbox. They offer one snapshot of student performance and provide a lens through which we can study the Frameworks to analyze for starting points and areas of concentration.

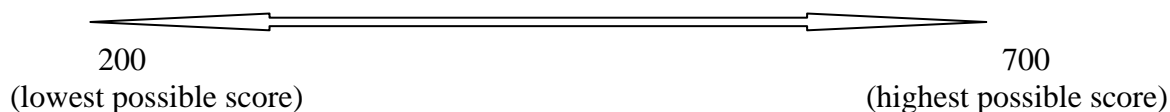
## Understanding the MAPT Score Scale and Item Difficulty

### *The Score Scale*

To explain the difficulty level of an item, we must first discuss the MAPT score scale, which ranges from 200 to 700. A score of 200 is the lowest possible score and a score of 700 is the highest possible score (see Figure 1).

Figure 1

### Illustration of MAPT for Math Score Scale



After taking the MAPT for Math, all students are given a score on this scale. How this score is calculated is mathematically complex but is based on the difficulty of an item and whether the student answered the item correctly. A student who answers many difficult items correctly will earn a higher score than a student who answers the same number of easier items correctly.<sup>3</sup> The mathematical details of this scoring, provided in the MAPT Technical Manual (Sireci et al., 2008), are based on a statistical model called *item response theory*. For our current purposes, it is only important to bear in mind these two points:

1. All students receive a score between 200 and 700.
2. Students' scores are determined by the number and the difficulty of the items they answer correctly.

### *Understanding Item Difficulty*

Item difficulty refers to how easy or hard an item is. Suppose we have two items, item A and item B. If 50% of all students answer item A correctly and 75% of those students answer item B correctly, we say item A is “more difficult” than item B. Unlike the content strand or benchmark an item measures, the difficulty level of an item is not an inherent characteristic of the item. Rather, it is determined by the number and types of students who correctly answer the item. Item difficulty is more specific than just noting that a test-taker got an item written to a benchmark right or wrong. It is possible that two questions written to the same benchmark will differ in their level of difficulty simply because one question is more challenging than the other. A much more detailed explanation of item difficulty is provided in Appendix A.

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<sup>3</sup> Essentially, this method of scoring gives students more “credit” for answering a difficult item correctly than for correctly answering an easier item.

## A Guide to the Individual Student Score Reports

Now that you understand item difficulty, we can take a look at a sample score report for a student. The individual reports can be accessed to show performance by Content Strand or by Cognitive Level. These reports are identical in format, but just differ in how items are grouped and in the information about the items. Below, we discuss the Individual Student Score Reports by Content Strand; then, the Individual Student Score Reports by Cognitive Level. Please note that beginning on page 21 of this *Guide*, we will show you how to produce these reports.

*Individual Student Score Report by Content Strand* (Figure 4, next page)

Please note the following features of the Individual Student Score Reports by Content Strand:

- The Individual Student Score Report by Content Strand is for a single test administration. Note the test date printed in the upper right-hand corner of the report. The student's score and score range (explained below) are also reported.
- The report is divided into two sections—the benchmarks associated with items the student answered correctly are located on the left side, and the benchmarks associated with items the student answered incorrectly are located on the right side.
- The items are organized by the content strands in the Curriculum Frameworks:
  - Geometry and Measurement
  - Number Sense
  - Patterns, Functions, Algebra
  - Statistics and Probability.
- Within each content strand, the items are sorted by difficulty level.
- For each item, the code for the benchmark it measures is reported, as well as a brief description of the benchmark. The full benchmark description can be obtained from the Curriculum Frameworks.

A sample Individual Student Score Report by Content Strand is presented in Figure 2.

For this particular student, note that he or she answered 27 items correctly and answered 13 items incorrectly. Please note that the actual name and site would appear on the score report, but they are blocked out here to protect confidentiality.

Figure 2

Sample MAPT for Math Student Score Report by Content Strand

Fiscal Year:	2009	Test Date:	1/8/09
Site:		Test No:	Second Test
Student:		Student Score ( Score Range ):	503 ( 478 - 528 )
Class ( Class Level ):	203( 200 - Level )	Starting Level :	04

<b>MAPT Scale</b>	<b>200</b> ←-----→ <b>700</b>
<b>Your Score Range</b>	<b>478 - 528</b>

27 Questions Answered Correctly

Benchmark		Item Dif.
<b>Geometry and Measurement</b>		
2G-4.8	Find perimeter of rectangles	556
4G-4.2	Compare Fahrenheit to Celsius	477
3G-3.1	Read and use maps/plans	469
<b>Number Sense</b>		
2N-3.7	Estimate by rounding 1st	532
4N-3.7	Add & subtract integers	494
5N-3.2	Calculate ratio & direct proportion	489
3N-1.5	Fraction, decimal & equivalents for $\frac{1}{4}$ , $\frac{1}{2}$	475
3N-3.6	Find fractional parts of whole # amounts	472
3N-2.3	Relate adding & subtracting, to 1,000,000	472
2N-3.2	Estimate in 10s or 100s, total $\leq$ 1000	466
4N-2.1	Choose operations for multi-step word prob	450
2N-2.3	Relate adding & subtracting to 1,000	431
2N-1.3	Read & compare $\frac{1}{2}$ , $\frac{1}{4}$ of things	425
<b>Patterns, Functions, and Algebra</b>		
3P-1.1	Complete whole # sequence w/2 steps	580
4P-2.1	Choose expression for multi-step word problem	500
2P-1.1	Complete repeating # patterns $\leq$ 1000	479
3P-4.1	Identify effect of one variable on another	469
2P-3.6	Describe $+ - x + =$ situations with notation	466
3P-1.1	Complete whole # sequence w/2 steps	426
2P-4.2	ID description of change with numbers	423
<b>Statistics and Probability</b>		
4S-2.4	Extract simple info from list/tables	537
2S-3.3	Support simple data statements	490
3S-3.3	Find average (mean) & range for data set	489
4S-3.3	Find mean	465
4S-4.6	Verify that numbers and % figures match	445
4S-4.1	Determine if statements connect to graph/table	442
2S-2.4	Read values on bar graph $\leq$ 1000	432

13 Questions Answered Incorrectly

Benchmark		Item Dif.
<b>Geometry and Measurement</b>		
2G-3.1	Use compass rose	529
3G-4.1	$+ - x +$ sums of dollars and cents	452
<b>Number Sense</b>		
2N-1.3	Read & compare $\frac{1}{2}$ , $\frac{1}{4}$ of things	498
4N-1.3	Compare fractions & mixed #s	497
4N-2.1	Choose operations for multi-step word prob	486
3N-3.2	Calculate w/ 3-digit whole #s	477
<b>Patterns, Functions, and Algebra</b>		
2P-3.3	Read inequalities for #s $\leq$ 1000	508
3P-3.3	Substitute #s for variables and solve	507
4P-2.2	Identify & use formulas from tables	497
<b>Statistics and Probability</b>		
5S-2.3	Infer data meaning: gaps clusters comparisons	506
3S-2.5	Read values on bar/line graph to 6 digits	506
2S-2.3	Find simple information in list/table	491
3S-1.4	Check total through sum of subtotals	461

The top section of the Individual Student Score Report by Content Strand appears as follows in Figure 3. Along the left is listed the fiscal year in which the test was taken, the site name, the student’s name, and class and class level. Class here refers to the number of the class in the SMARTT system, and class level is the level of the class as determined by the program.

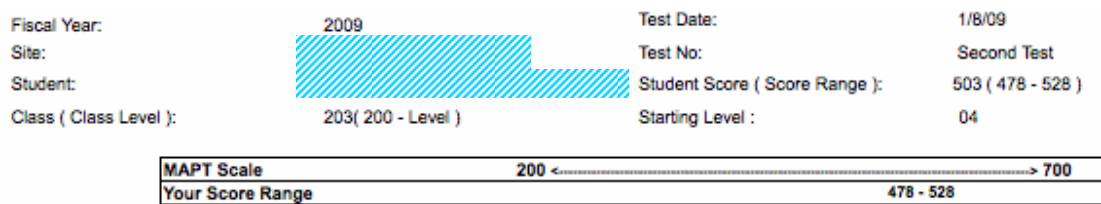
On the right side of the header is the test date (actual date of the test administration), the number of the test (first or pre-test, second optional test or third and post-test), the student’s MAPT score and the score range associated with that score, and the level at which the test was started.

The student score range acknowledges the fact that all tests are imperfect measures of student performance, and if the student were retested before learning anything new, it is likely they would not earn the exact same score. It is calculated by taking the student’s MAPT score and then adding and subtracting a *margin of error* based on the reliability of the MAPT score. How this margin of error is calculated is described in the *MAPT Technical Manual* (Sireci et al., 2008), but the important point here is that the score range acknowledges the fact that all tests are imperfect measures of student performance, and if the student were retested before learning anything new, it is likely they would not earn the exact same score. We provide the score range on the Student Score Report to give an idea of how high or low the student’s “true” mathematics proficiency is on the MAPT scale. This is especially important when comparing pre- and post-test scores to determine if a student made learning gains. If the second test score is within the score range of the first test, then the student has not exhibited any learning gains.

After the header text, there is a small table illustrating the MAPT scale in the top row. The second row provides a graphical representation of the student’s score range.

Figure 3

Detail View of the Student Score Report by Content Strand Header



Now, in Figure 4, we’d like to highlight some specific aspects of the full score report shown in Figure 2. (Figure 4 is just a detail view of the same report shown in Figure 2.)

Figure 4

Detail View of Student Score Report by Content Strand Body

27 Questions Answered Correctly			13 Questions Answered Incorrectly		
Benchmark		Item Dif.	Benchmark		Item Dif.
<b>Geometry and Measurement</b>			<b>Geometry and Measurement</b>		
2G-4.8	Find perimeter of rectangles	556	2G-3.1	Use compass rose	529
4G-4.2	Compare Fahrenheit to Celsius	477	3G-4.1	+ - x + sums of dollars and cents	452
3G-3.1	Read and use maps/plans	469			
<b>Number Sense</b>			<b>Number Sense</b>		
2N-3.7	Estimate by rounding 1st	532	2N-1.3	Read & compare $\frac{1}{2}$ , $\frac{1}{4}$ of things	498
4N-3.7	Add & subtract integers	494	4N-1.3	Compare fractions & mixed #s	497
5N-3.2	Calculate ratio & direct proportion	489	4N-2.1	Choose operations for multi-step word prob	486
3N-1.5	Fraction, decimal & equivalents for $\frac{1}{4}$ , $\frac{1}{2}$	475	3N-3.2	Calculate w/ 3-digit whole #s	477
3N-3.6	Find fractional parts of whole # amounts	472			
3N-2.3	Relate adding & subtracting, to 1,000,000	472			
2N-3.2	Estimate in 10s or 100s, total $\leq$ 1000	466			
4N-2.1	Choose operations for multi-step word prob	450			
2N-2.3	Relate adding & subtracting to 1,000	431			
2N-1.3	Read & compare $\frac{1}{2}$ , $\frac{1}{4}$ of things	425			

The body of the Individual Student Score Report by Content Strand is divided vertically into two sections. On the left are questions that a student answered correctly. In this example, the student answered 27 items correctly. On the right side of the report is a listing of the questions the student answered incorrectly (here, that is 13). Every one of the 40 scored items on a student's MAPT for Math test will appear in one of these columns.

Moving down in Figure 4, note that the each row represents a test item and lists the benchmark number that test item was written to from the ABE Math Curriculum Frameworks. It also shows the abbreviated text of the benchmarks, and an item difficulty value (computed as explained in the section on Understanding the MAPT Score Scale and Item Difficulty). The items here are grouped according to the four Strands in the Frameworks, which are Geometry and Measurement; Number Sense; Patterns, Functions, and Algebra; and Statistics and Probability. Within each Strand, test items are ordered by the item difficulty from most difficult to easiest.

### *Student Score Report by Cognitive Level (Figure 5, Page 12)*

MAPT for Math items are classified as measuring one of three cognitive levels—Analysis, Synthesis, and Evaluation; Application; or Knowledge and Comprehension. Please note the following features of the Individual Student Score Reports by Cognitive Level:

- The Individual Student Score Report by Cognitive Level is for a single test administration. Note the test date printed in the upper right-hand corner of the report. The student’s score and score range (explained below) are also reported.
- The report is divided into two sections—the benchmarks associated with items the student answered correctly are located on the left side, and the benchmarks associated with items the student answered incorrectly are located on the right side.
- The items are organized by Cognitive Levels:
  - Analysis, Synthesis, and Evaluation
  - Application
  - Knowledge and Comprehension.
- Within each cognitive level, the items are sorted by difficulty level.
- For each item, the code for the benchmark it measures is reported, as well as a brief description of the benchmark. The full benchmark description can be obtained from the Curriculum Frameworks.

### *Understanding the Cognitive Levels Measured on the MAPT*

All MAPT for Math items were written to and classified according to three cognitive levels: (a) Knowledge and Comprehension; (b) Application; and (c) Analysis, Synthesis, and Evaluation. These levels were included in specifying the content of the test to ensure that items were written to measure skills necessary for the different purposes for which math is used. These three levels represent a simplification of Bloom’s (1956) six levels of cognitive complexity. Brief descriptions of these cognitive levels follow.

#### *Knowledge and comprehension*

Knowledge refers to remembering material that was previously learned, such as specific facts, events, or principles. Examples include remembering mathematical terms and definitions or identifying terms, symbols, equations, etc. Comprehension refers to the ability to comprehend the meaning of material. Comprehension goes beyond mere memorization and is signified by an understanding of a concept. Being able to explain, translate, or summarize material are ways in which comprehension is demonstrated. The knowledge/comprehension level is characterized by both recognition of a concept and understanding the concept.

#### *Application*

Application refers to the ability to use learned material in new, but specific (concrete) situations. This cognitive level is invoked in applying rules, methods, concepts, principles, and other learned material in a realistic context. Examples include working with data in realistic context (calculating change, sales tax, discounts, etc.) and using a formula to solve a problem.

### *Analysis, synthesis, and evaluation*

Analysis refers to the ability to break material down into its component parts to understand its underlying structure and the relationships between the components. Synthesis refers to the ability to combine parts to form a new whole, which may involve creation of a product from a variety of elements. Evaluation refers to the ability to make a judgment about a situation for a given purpose or to accomplish a goal. The analysis/synthesis/evaluation cognitive level is characterized by maneuvering through complex stimuli to fully understand a problem, and using several aspects of the situation to solve the problem. This cognitive level is distinguished from application in that it typically involves situations with more than one variable, or multiple pieces of information that must be understood, deciphered, and brought back together in a logical way.

To help conceptualize how the cognitive levels differ from one another, below are examples of how a problem might be asked at each of the three different levels.

- **Knowledge and Comprehension**

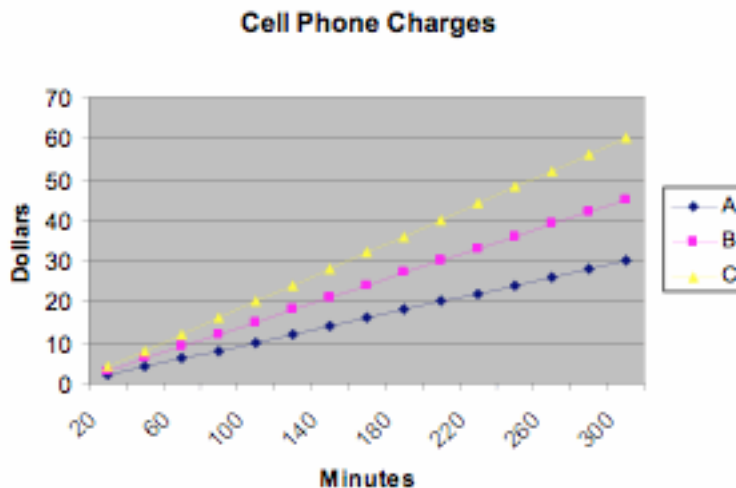
$\$24 \div 0.15$

- **Application**

How many minutes did Chan talk last month if his cell phone plan costs fifteen cents a minute and his bill was for \$24?

- **Analysis, Synthesis, and Evaluation**

Using the graph below, what is the approximate charge per minute of Plan B?



In Figure 5, we present an alternate version of the Individual Student Score Report for the same student as in Figure 2, but organized by cognitive level rather than content strand. Later in this guide, in the section entitled *Accessing the MAPT for Math Score Reports through Cognos* on page 23, we show you how to choose which version of the report you would like to view or print.

The header in the Individual Student Score Report by Cognitive Level remains the same as for the Content Strand version. Whereas in Figure 4 the items were divided into content areas, here in the body of the report the items are broken out by cognitive levels.

Figure 5

Sample MAPT for Math Student Score Report by Cognitive Level

Fiscal Year:	2009	Test Date:	1/8/09
Site:	[REDACTED]	Test No:	Second Test
Student Name:	[REDACTED]	Student Score ( Score Range ):	503 ( 478 - 528 )
Class:	203	Starting Level:	04

27 Questions Answered Correctly		13 Questions Answered Incorrectly	
Benchmark	Item Dif.	Benchmark	Item Dif.
<b>Analysis, Synthesis &amp; Evaluation</b>			
2S-3.3	Support simple data statements	490	
3G-3.1	Read and use maps/plans	469	
2N-3.2	Estimate in 10s or 100s, total <= 1000	466	
4S-3.3	Find mean	465	
4S-4.1	Determine if statements connect to graph/table	442	
<b>Application</b>			
3P-1.1	Complete whole # sequence w/2 steps	580	
2G-4.8	Find perimeter of rectangles	556	
4S-2.4	Extract simple info from list/tables	537	
4P-2.1	Choose expression for multi-step word problem	500	
4N-3.7	Add & subtract integers	494	
5N-3.2	Calculate ratio & direct proportion	489	
3S-3.3	Find average (mean) & range for data set	489	
3N-3.6	Find fractional parts of whole # amounts	472	
3P-4.1	Identify effect of one variable on another	469	
2P-3.6	Describe + - x + = situations with notation	466	
4N-2.1	Choose operations for multi-step word prob	450	
2S-2.4	Read values on bar graph <=1000	432	
2N-2.3	Relate adding & subtracting to 1,000	431	
3P-1.1	Complete whole # sequence w/2 steps	426	
2N-1.3	Read & compare 1/2, 1/4 of things	425	
2P-4.2	ID description of change with numbers	423	
<b>Knowledge &amp; Comprehension</b>			
2N-3.7	Estimate by rounding 1st	532	
2P-1.1	Complete repeating # patterns <= 1000	479	
4G-4.2	Compare Fahrenheit to Celsius	477	
3N-1.5	Fraction, decimal & equivalents for 1/4, 1/2	475	
3N-2.3	Relate adding & subtracting, to 1,000,000	472	
4S-4.6	Verify that numbers and % figures match	445	

<b>Analysis, Synthesis &amp; Evaluation</b>			
5S-2.3	Infer data meaning: gaps clusters comparisons	506	
4P-2.2	Identify & use formulas from tables	497	
4N-2.1	Choose operations for multi-step word prob	486	
<b>Application</b>			
3S-2.5	Read values on bar/line graph to 6 digits	506	
2N-1.3	Read & compare 1/2, 1/4 of things	498	
2S-2.3	Find simple information in list/table	491	
3N-3.2	Calculate w/ 3-digit whole #s	477	
3S-1.4	Check total through sum of subtotals	461	
3G-4.1	+ - x + sums of dollars and cents	452	
<b>Knowledge &amp; Comprehension</b>			
2G-3.1	Use compass rose	529	
2P-3.3	Read inequalities for #s <= 1000	508	
3P-3.3	Substitute #s for variables and solve	507	
4N-1.3	Compare fractions & mixed #s	497	

## *Interpreting the Student Score Reports*

As illustrated in Figures 2 and 5, a great deal of information is presented in these Content Strand and Cognitive Level versions of the Individual Student Score Report. The reports indicate the numbers of items answered correctly and incorrectly for the student, the benchmark measured by each item, and the difficulty level of the item. Depending on the version of the report chosen by the user, the content strand or cognitive level measured by the item is also provided. But what does all this information mean, and how can teachers use it to help the student? In this section, we provide some ideas about how to interpret the Student Score Report. These ideas focus on (a) the benchmarks, content strands, and cognitive levels measured by the items, (b) the student's score range, and (c) the difficulty levels of the items answered correctly and incorrectly.

It is particularly instructive to focus on items answered correctly and incorrectly that are located outside of the student's score range. If a student gets items wrong that are lower than the lower end of the score range, those benchmarks may be areas for instruction to focus on. Likewise, items answered correctly that are above the upper end may be areas of strength, and items answered incorrectly above the upper end of the score range are also benchmarks that may help to guide instruction as well.

In some cases, it may be helpful to consider the Individual Student Score Reports by Content Strand and Cognitive Levels together, to understand how student performance on certain items might be explained by both the content of the material tested as well as the cognitive complexity of the item.

### *Understanding "score range"*

The student score range acknowledges the fact that all tests are imperfect measures of student performance, and if the student were retested before learning anything new, it is likely they would not earn the exact same score. It is calculated by taking the student's MAPT score, and then adding and subtracting a *margin of error* based on the reliability of the MAPT score. How this margin of error is calculated is described in the *MAPT Technical Manual* (Sireci et al., 2008), but the important point here is that the score range acknowledges the fact that all tests are imperfect measures of student performance, and if the student were retested before learning anything new, it is likely they would not earn the exact same score. We provide the score range on the Student Score Report to give an idea of how high or low the student's "true" mathematics proficiency is on the MAPT scale. For example, within a score range of 478-528, scores of 503, 520 and 480 don't show gain or loss.

The score range is centered around the student's MAPT score which is a single number. For the student in Figures 2 and 5, the score is 503.<sup>4</sup> Of course, in practice, students do not take

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<sup>4</sup> To be a bit more technical without explaining the full details, the score range represents the range of scores we would expect if we tested the student over and over again. Statistically, the student's "true" score is likely to be contained within this interval 68% of the time. This means that if the student took the same exam many times over, the statistical expectation is that his or her score would be 68% likely to fall within this range.

the MAPT for Math multiple times over without any intervening instruction, and the students themselves continue to learn. The best interpretation of the score range then becomes a range of scores that is likely to contain the score that best reflects the actual student proficiency, irrespective of lucky guesses and “having a bad day.”

### *Sample interpretation*

The score report for a student is presented in Figure 6. The report is arranged by content strand. Note that the test score is 331, and the score range is 303-360. Notice that this student answered only one of the four Patterns, Functions, and Algebra questions correctly (2P-4.1). Thus, this content strand may be an area of weakness for the student<sup>5</sup>. On the other hand, we can also see that the student successfully answered five of eight Geometry and Measurement items that were included in this test administration. This content strand may be an area of relative strength.

To better understand the student’s performance, we will now consider the score range and the difficulty levels of the items. The student’s MAPT for Math test score was 331. Considering the margin of error, the score range reports that the actual range of test performance this score represents is 303-360. Given this score range, *we would generally expect* the student to correctly answer items with difficulty levels below 303 (the lower end of the score range), and be less likely to answer items with difficulty levels above 360 (the upper end of the score range). Items with difficulty levels in the middle of the score range are right about where the person scored, and that person will get some of those wrong and some of those right.

When we review the report more closely, we see that all but one of the items the student answered incorrectly were within the score range or above the upper end of score range. As a general interpretation, the student answered relatively harder items incorrectly, and this score report provides some information about what the benchmarks associated with those incorrect answers were. These are benchmarks that a teacher might want to look at and incorporate into instruction for this student.

In Patterns, Functions, and Algebra, as noted previously, the students answered just one of four questions correct. All of the items in this content strand were outside of the upper end of the student’s score range, but the one that was answered correctly was the easiest of the four by far.

Within Number Sense, benchmark 2N-3.5 appears twice, on both on the answered correctly and answered incorrectly sides. This means the student saw two questions aligned to that benchmark. The student was able to answer the slightly easier question for the benchmark correct (mapped to 374) while getting the harder items for that benchmark (mapped to 431) incorrect.


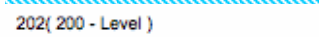
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<sup>5</sup> Do not be confused by the fact that this student saw only four Patterns, Functions, and Algebra items while the student in Figure 3 saw ten items from this content strand. The numbers of items to be administered in each content strand (and cognitive level) differ across educational functioning levels (i.e., ABE learning levels).

Another resource for understanding these reports is to refer to the Quick Reference Guide for MAPT for Math Individual Student Score Report, Content Strands, accessible through Cognos (see the later section of the Guide on accessing Cognos for how to get that document).

Figure 6

Sample MAPT for Math Student Score Report for Student with Score of 331

Fiscal Year:	2009	Test Date:	12/16/08
Site:		Test No:	First Test
Student:		Student Score ( Score Range ):	331 ( 303 - 360 )
Class ( Class Level ):	202( 200 - Level )	Starting Level :	03

<b>MAPT Scale</b>	200 <-----> 700
<b>Your Score Range</b>	303 - 360

19 Questions Answered Correctly			21 Questions Answered Incorrectly		
Benchmark		Item Dif.	Benchmark		Item Dif.
<b>Geometry and Measurement</b>			<b>Geometry and Measurement</b>		
2G-4.1	Total cost and change from whole dollars	398	2G-4.3	Measurement w/standard, non-standard units	417
3G-4.9	Use & interpret 24 hour clock	396	2G-3.1	Use compass rose	377
3G-4.11	ID perimeter as linear & area as sq. units	370	2G-4.1	Total cost and change from whole dollars	335
2G-4.2	Read digital & analog clocks	247			
2G-4.7	Personal benchmarks of temperature	200			
<b>Number Sense</b>			<b>Number Sense</b>		
2N-2.4	Apply meanings of multiplication #s to 12	406	2N-3.5	Know $\frac{1}{2}$ of even #s up to 100	431
2N-2.3	Relate adding & subtracting to 1,000	387	3N-3.11	Mult, divide by 2, 3-digit #s, check answer	429
3N-3.12	Find common % when part/whole is given	380	3N-3.9	2 decimal place word probs w/ calculator	405
2N-3.5	Know $\frac{1}{2}$ of even #s up to 100	374	2N-1.3	Read & compare $\frac{1}{2}$ , $\frac{1}{4}$ of things	402
3N-3.5	Estimate 1st then round to 6 digit total	364	2N-1.2	Identify odd /even # s to 1000	390
3N-1.2	Read, write and compare common fractions	362	3N-1.4	Read & compare 2 decimal places in context	389
2N-1.5	Count by 2, 5, or 10	274	2N-2.5	Apply meanings of division	378
			2N-1.2	Identify odd /even # s to 1000	371
			2N-2.4	Apply meanings of multiplication #s to 12	362
			4N-3.5	Find ratio & direct proportion	348
<b>Patterns, Functions, and Algebra</b>			<b>Patterns, Functions, and Algebra</b>		
2P-4.1	ID description of change with words	362	2P-4.2	ID description of change with numbers	423
			2P-4.1	ID description of change with words	404
			3P-3.7	Read integer change on horiz. & vert. axes	393
<b>Statistics and Probability</b>			<b>Statistics and Probability</b>		
3S-1.3	Choose easiest representation of info	417	3S-4.11	Identify obvious misstatements	383
5S-2.5	Compare # values on graphs/tables	412	4S-1.7	ID related table to line graph & vice versa	378
5S-2.3	Infer data meaning: gaps clusters comparisons	379	4S-5.5	State probability as a %	375
4S-2.6	Compare relative values on bar/circle graphs	343	2S-2.5	Give # comparisons on bar graphs	332
2S-1.4	Check addition with subtotals, 2 or 3 digits	339	2S-2.3	Find simple information in list/table	302
2S-2.5	Give # comparisons on bar graphs	295			

## A Guide to the Class Score Reports

The Class Score Reports are very different from the Individual Student Score Reports in the following areas:

- individual students within a class do not typically see the same questions on a MAPT test,
- the range of difficulty on MAPT tests within a class may be considerable, and
- the class-level reports summarize performance at the **topic** level rather than for individual benchmarks.

Topics represent an intermediary step between the more detailed “benchmarks” and general content strands in the Curriculum Frameworks. Through the process of developing these score reports, it was learned that while there were too few content strands to provide teachers with the finer level of interpretation desired, the level of variability across classes meant there were too many benchmarks tested within class-level groupings to allow for coherent or meaningful interpretation of the individual benchmark results. Thus, an intermediary level of reporting, called “Topics,” was created. Essentially, topics represent meaningful groupings of related benchmarks that relate to a common theme of instruction. In all cases, the benchmarks that are grouped together are from a common content strand. There are a total of nine topics, as illustrated in Table 2. A list showing which benchmarks correspond to which topics can be found in Appendix C.

Table 2

MAPT for Math Topics

<b>Content Strand</b>	<b>Topics</b>
Geometry and Measurement	Shapes Things to Measure
Number Sense	Decimal/Percentage/Fraction Operations Place Value
Patterns, Functions, Algebra	Patterns Algebra
Statistics and Probability	Data Usage Probability

The Class Score Reports can be generated to analyze test scores by Topic alone, or to analyze test scores by Topic and Cognitive Level. These options allow teachers to determine what information they would like to see on the report.

Figure 7 provides an example of a Class Score Report by Topic. The header of this Class Score Report includes the Fiscal Year, the site name (blocked out here for confidentiality), the Class Number listed in SMARTT, the number of students in the class, the number of tests the report includes, and the date on which the report was run. Note that in this example, the number of tests (39) is larger than the number of students (24). In this class, some students have taken the


test once, some have taken it twice, and perhaps some have taken it a third time by the date this report was run, all within a fiscal year. This means that when a teacher looks at this report, depending on how many times different students have taken the MAPT within a fiscal year, there may be more test administrations than students in the class report. The report may include data on more than one test administration for some students.

Refer to the body of the Class Score Report in Figure 7. Along the left margin of the table are the Strands from the Curriculum Frameworks and the Topic listings within that Strand. Along the top of the table are ranges of item difficulty on the MAPT scale (200-299, 300-399, 400-499, 500-599, and 600-700). As described earlier, each item on the MAPT is located on the MAPT scale and so falls into one of these score ranges. This is a way of characterizing item difficulty because in reporting student scores it is important to note that the adaptive nature of the MAPT results in different students within a class seeing items of different difficulty.

Consider the column headed by 200-299 in Figure 7. In the row labeled Geometry- Things to Measure, there are ten student responses in the 200-299 range, and 60% were answered correctly. This might be reflecting that the same item was seen by ten different students, or that several different items were seen by different students. The point remains: in this class, among Geometry and Measurement- Things to Measure items at the easier end (200-299) of the MAPT scale, more than half of the occasions where items in that category were presented to learners the items were answered correctly. One thing to note then, is that overall, in this class the students as a group may have a relatively good grasp of the benchmarks associated with Algebra.

Figure 7

Class Report by Content Strand and Topic

Fiscal Year: 2009  
 Site:   
 Class: 201  
 Number of Students: 24  
 Number of Tests: 39  
 Report Date: Jan 20, 2010

Percentage of Items Answered Correctly

		200 - 299		300 - 399		400 - 499		500 - 599		600 - 700	
		# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct
Geometry	Shapes	2	100%	5	60%	55	69%	62	71%	50	58%
	Things to measure	10	60%	19	63%	57	60%	100	54%	1	100%
Number Sense	Decimal/Percentage /Fraction	3	33%	26	38%	88	68%	92	63%	47	51%
	Operations	6	100%	23	48%	105	65%	37	62%	9	22%
	Place value	4	75%	6	100%	7	57%	32	62%	7	43%
Patterns, Functions, Algebra	Algebra	3	67%	5	60%	42	74%	81	78%	48	71%
	Patterns	3	67%	12	75%	61	72%	52	63%	12	33%
Statistics & Probability	Data Usage	9	100%	61	75%	103	74%	142	59%	20	45%
	Probability			2	50%	15	67%	14	43%	22	32%
Total		40	78%	159	64%	533	68%	612	63%	216	52%

Note: Total Sums the number of student responses based on the total number of student-item combinations

Number of Items per Difficulty Level Seen by Students

200 - 299	300 - 399	400 - 499	500 - 599	600 - 700
32	67	88	89	83

Moving down the 200-299 column, notice under Statistics and Probability- Data Usage, nine items were administered and all were answered correctly. As before, this might be the same question seen by nine different students or several different questions seen by a few different students, but there were nine instances of Statistics and Probability- Data Usage questions administered, and in this class all were answered correctly at the 200-299 level.

To interpret this Class Score Report, the logic outlined in the previous paragraph applies throughout. Look at the item difficulty range along the top, and then choose a strand and topic to focus on. Then, evaluate how many items within that difficulty range/strand and topic combination were presented and were answered correctly. This gives you a sense of the extent to which students in a class were able to answer questions on a given strand/topic combination correctly at a specific difficulty level.

In the example provided in Figure 7, the class overall did well on items in the 200-299 range, except for Number Sense- Decimal/Percentage/Fraction. However, because the count of items administered in that cell is low (N=3) there are too few items on which to base a strong judgment about the relative mastery of the class on benchmarks associated with that topic. On the other hand, for items in the 300-399 range, Decimal/Percentage/Fraction was answered

correctly at a lower rate (38%). In this case there were twenty-six instances of items in this category being administered (which is a better number of student responses upon which to base a judgment). In that case, this may be an area for the class to continue to focus on.

The bottom table in Figure 7 provides the actual count of items per difficulty level for the selected class. These numbers are provided to illustrate the actual numbers of items that were in the main body of the table, because in the main body of the table the counts of items are higher because many of those items are seen by more than one test-taker.

In Figure 8, the Class Score Report is enhanced by the addition of the Cognitive Level information. Interpretation of this Class Score Report by Topic and Cognitive Level is much the same as described in Figure 7 for the Class Score Report by Topic. Notice here that the topic list is repeated for each of the three Cognitive Level groupings. These cognitive level groupings were selected by math experts from the field and from UMASS Amherst who developed the MAPT for Math test specifications.<sup>6</sup>


There are a number of patterns that teachers can look for in these Class Reports by Cognitive Level. For example, look for cells with high numbers of student responses and comparatively low percent corrects. For example, in the 400-499 range, there were fourteen responses recorded to Things to Measure items in the Analysis, Synthesis, Evaluation cognitive level, but only 43% of those answers were correct. This might be something to work on. Similarly, in the 300-399 range, there were nineteen responses recorded for Decimal/Percentage/Fraction items in the Application cognitive level, and 47% of those answers were correct.

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<sup>6</sup> Sireci, S. G., Baldwin, P., Keller, L. A., Valle, M., Goodridge, B., Leonelli, E., Schmitt, M. J., Tamarkin, K., & Titzel, J. (2004). Specifications for the ACLS Mathematics and Numeracy Proficiency Tests. Center for Educational Assessment Research Report Number 513.

Figure 8

Class Report by Cognitive Level and Topic

Fiscal Year: 2009  
 Site:   
 Class: 201  
 Number of Students: 24  
 Number of Tests: 39  
 Report Date: Jan 20, 2010

Percentage of Items Answered Correctly

	200 - 299		300 - 399		400 - 499		500 - 599		600 - 700		
	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	
Analysis, Synthesis & Evaluation	Algebra						15	53%	10	70%	
	Data Usage	2	100%	13	85%	33	73%	40	52%	4	75%
	Decimal/Percentage /Fraction			4	25%	9	44%	22	55%	27	33%
	Operations					12	58%			7	14%
	Patterns			3	67%	33	79%	16	69%		
	Place value			1	100%	2	50%	9	67%		
	Probability			2	50%					7	0%
	Shapes					7	43%	3	100%	19	42%
Things to measure	1	100%			14	43%	15	33%			
Application	Algebra				8	62%	16	75%	21	76%	
	Data Usage	3	100%	25	76%	68	76%	85	66%	15	40%
	Decimal/Percentage /Fraction	2	0%	19	47%	60	75%	37	76%	14	64%
	Operations	4	100%	22	50%	52	65%	29	59%	1	100%
	Patterns			8	88%	21	71%	33	61%	12	33%
	Place value			1	100%	2	50%	8	75%	1	100%
	Probability					15	67%	14	43%	15	47%
	Shapes	1	100%			9	78%	34	71%	10	60%
Things to measure	4	50%	11	64%	24	71%	53	74%	1	100%	
Knowledge & Comprehension	Algebra	3	67%	5	60%	34	76%	50	86%	17	65%
	Data Usage	4	100%	23	70%	2	0%	17	41%	1	0%
	Decimal/Percentage /Fraction	1	100%	3	0%	19	58%	33	55%	6	100%
	Operations	2	100%	1	0%	41	66%	8	75%	1	0%
	Patterns	3	67%	1	0%	7	43%	3	67%		
	Place value	4	75%	4	100%	3	67%	15	53%	6	33%
	Shapes	1	100%	5	60%	39	72%	25	68%	21	71%
	Things to measure	5	60%	8	62%	19	58%	32	31%		
<b>Total</b>	<b>40</b>	<b>78%</b>	<b>159</b>	<b>64%</b>	<b>533</b>	<b>68%</b>	<b>612</b>	<b>63%</b>	<b>216</b>	<b>52%</b>	

Note: Total Sums the number of student responses based on the total number of student-item combinations

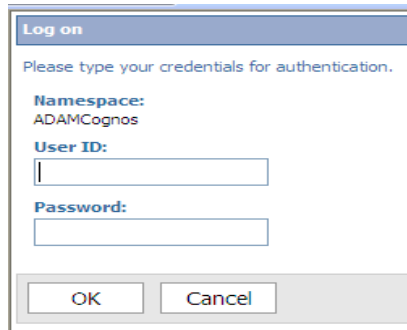
Number of Items per Difficulty Level Seen by Students

200 - 299	300 - 399	400 - 499	500 - 599	600 - 700
32	67	68	89	83

## Accessing the MAPT for Math Score Reports through COGNOS

Please note that the score reports for MAPT for Math tests that are completed each day will be available in Cognos by 5 AM the next morning.

You can access Cognos directly at: <https://smartt.doemass.org/sides>, which will bring you to the following screen:



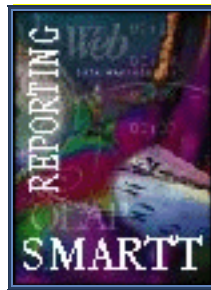
A screenshot of a 'Log on' dialog box. The title bar says 'Log on'. Below the title bar, it says 'Please type your credentials for authentication.' There are three labels: 'Namespace:' with the value 'ADAMCognos', 'User ID:' with an empty text box, and 'Password:' with an empty text box. At the bottom, there are two buttons: 'OK' and 'Cancel'.

OR

You can access Cognos through the same website used to access SMARTT: <https://smartt.doemass.org/>, where you will see the screen on the next page. The Cognos button that will connect you to the Cognos logon screen is circled.

OR

You can access Cognos the link within the SMARTT system

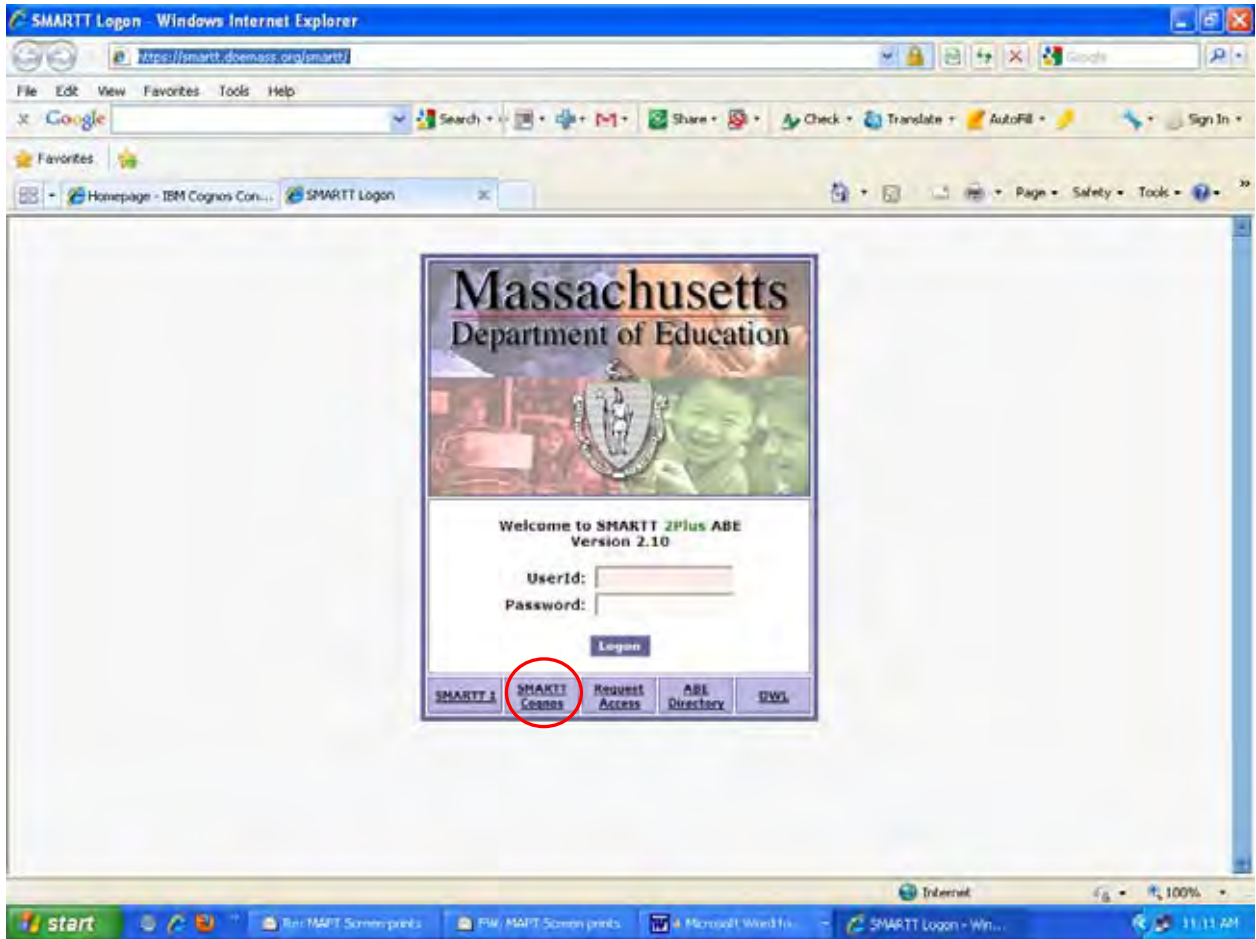


With any of these options, when you see the “log on” screen, type your Cognos ID into the “User ID” field and type your password into the “Password” field.

For training purposes, use this ID and password.

User ID = test01

Password = test1



(Note that by using this generic ID, users will not see the actual student names on any of the score reports but instead student names will be encrypted for privacy. To see actual student names on score reports, users need to use a Cognos ID requested through the Program's Director.)

### Requesting a Cognos Account

If you do not have a Cognos ID, ask your program director how to get one. Programs may receive additional Cognos access for program staff, though individual access will be available at the discretion of the Program Director. Individual staff will be able to log on and use Cognos at the MAPT Score Report trainings, and be able to view individual student names within their Site in reports that are designed at the student level back at the program.

Program Directors will have the option of either 1) having one account for each staff person or 2) having a site logon for staff to share. It is likely to be more useful for teachers or counselors to have their own account so they can save any reports they want.

Program Directors should send a list of staff for whom they would like Cognos accounts **two weeks prior** to when the Cognos Logon is needed (e.g., to be used in a MAPT Score Report

training). Requests cannot be fulfilled in less than two weeks. Send requests to Sriram Rajan [srajan@doe.mass.edu](mailto:srajan@doe.mass.edu) with the following information supplied:

- Name
- Email (if staff don't have one, give one that can be used to get them the information, such as the Program Director's)
- Official Site Name (no acronyms or abbreviations)
- Role at Program (specify Teacher, Counselor, Site Coordinator, or other)
- The staff request for what they would like the Cognos User ID to be (e.g., 1st initial and last name, or some other personally meaningful identifier)

By the end of two weeks, users will receive their logon by email, along with a generic password. When users first log in, they must create their own password. Users need to write down the user ID and password and keep them in a handy place.

ACLS will keep a list of the staff requesting logins, but users and Programs must manage their own passwords and User IDs. ACLS does not have the staff capacity to respond to large numbers of requests if users forget their login or password, so programs will need to maintain a list of staff user IDs and passwords.

When you are finished reviewing data, make sure you log off—do not just close the browser. Go to the Homepage and click “Log Off.”



Once logged in, you see the Cognos 'Welcome' page. We suggest that you keep the checkbox next to the 'Show this page in the future', as shown below, so that you will be able to access the Quick Tour whenever you want. If your computer is not set to show to see the welcome screen, you will be directed to the homepage.



Now click on the 'Cognos Connection' link as shown above and you will enter Cognos!

**Note:** Clicking on the 'Analysis Studio' link will not cause any harm, but might be confusing since you will see a blank screen that allows you to create your own data set.

*Sections of the Cognos Homepage*

After clicking on the circled link above (“Cognos Connection”), what you see in front of you is called the “Homepage.” There are three sections: Data Analysis, Standardized Reports, and Federal Reports.



## ACLS Homepage

**DATA ANALYSIS**

**Cubes**

	Name ↕	Actions
	<a href="#">Attendance</a>	
	<a href="#">Goals</a>	
	<a href="#">Student By Site</a>	
	<a href="#">Volunteers</a>	

**STANDARDIZED REPORTS**

**Adhoc Reports**

	Name ↕	Actions
	<a href="#">Massachusetts Legislative Reports</a>	More...
	<a href="#">Non Rates Based Class Reports</a>	More...
	<a href="#">Performance Reports</a>	More...
	<a href="#">Performance Standards Reports</a>	More...
	<a href="#">Performance Standards Tier Reports</a>	More...
	<a href="#">Specialty Areas</a>	More...
	<a href="#">SSN Confidentiality Release Report</a>	More...
	<a href="#">UDF Reports</a>	More...
	<a href="#">Waitlist Reports</a>	More...

**FEDERAL REPORTS**

**Federal Reports**

	Name ↕	Actions
	<a href="#">Archived Federal Reports</a>	More...
	<a href="#">Federal Reports - FY2006</a>	More...
	<a href="#">Federal Reports - FY2007</a>	More...
	<a href="#">Federal Reports - FY2008</a>	More...
	<a href="#">Federal Reports - FY2009</a>	More...
	<a href="#">Federal Reports - FY2010</a>	More...
	<a href="#">State Level Reports</a>	More...

Click on the “OWL” tab at the top (two over from the “Homepage” tab), and you will see three sections:

- **MAPT Documentation:** here you will find a copy of “Understanding and Accessing the Score Report Guides” for MAPT for Math and MAPT for Reading.

- **MAPT Cubes:** When you click on the “Analyses” tab under “MAPT Cubes,” you also have the capability of accessing a MAPT cube to design your own report. [Note: This is for users more proficient using Cognos Cube; if you are interested in pulling your own reports from Cognos, you should attend a Cognos training with the SABES regional field technologists to understand how to design cube reports first.]
  
- **MAPT Reports:** At the bottom of the “OWL” tab, you will see this list of MAPT score reports you can access:
  1. Test Count of Students by Class
  2. Student MAPT Scores by Test Number
  3. MAPT Math: Student Score Report by Content Strand
  4. MAPT Math: Class Report by Content Strand and Topic
  5. MAPT Math: Class Report by Content Strand and Topic - Customized
  6. MAPT Reading: Student Score Report by Content Standard
  7. MAPT Reading: Class Report by Content Standard and Topic
  8. MAPT Reading: Class Report by Content Standard and Topic- Customized

[Homepage](#) | [Desk Review](#) | **OWL** | [ACLs Reports](#) | [Favorite Reports](#) | [Custom Views](#) | [My Folders](#) | [Public Folders](#)

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**MAPT Documentation**

[MAPT Manual](#)  
[MAPT Math Manual](#)

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**MAPT Cubes**

**Analyses**

Name	Actions
<a href="#">MAPT - Class</a>	<a href="#">More...</a>
<a href="#">MAPT - Site</a>	<a href="#">More...</a>

---

**MAPT Reports**

**Reports**

Name	Actions
<a href="#">1 Test Count Of Students by Class</a>	<a href="#">More...</a>
<a href="#">2 Student MAPT Scores By Test Number</a>	<a href="#">More...</a>
<a href="#">3 MAPT Math: Student Score Report by Content Strand</a>	<a href="#">More...</a>
<a href="#">4 MAPT Math: Class Report By Content Strand and Topic</a>	<a href="#">More...</a>
<a href="#">5 MAPT Math : Class Report By Content Strand and Topic - Customized</a>	<a href="#">More...</a>
<a href="#">6 MAPT Reading: Student Score Report by Content Standard</a>	<a href="#">More...</a>
<a href="#">7 MAPT Reading: Class Report by Content Standard and Topic</a>	<a href="#">More...</a>
<a href="#">8 MAPT Reading: Class Report by Content Standard and Topic - Customized</a>	<a href="#">More...</a>

Let’s review how to access a MAPT for Math: Student Score Report by Content Strand under the “MAPT Reports” section. You will need to select the filters for the report.

**Adult & Community Learning Services**  
**3 MAPT Math: Student Score Report by Content Strand**

[Quick Guide](#)

The screenshot shows a web form with the following fields and options:

- Fiscal Year: 2011
- Site: [Empty]
- Class: [Empty]
- Student: [Empty]
- Test Number: [Empty]
- Report\*: Content Strand
- Finish button
- Sort By: Difficulty Level

You will need to make one selection at a time in the dropdowns and then click on “Finish.”

- Fiscal Year: 2011, 2010, 2009, or 2008
- Site: Site name within your project
- Class: Class code at your site (from SMARTT)
- Student: The student’s name whose test record you want to access
- Test Number: The test you want to access within the fiscal year—first test, second test third test, etc.
- Report: Select whether you want the report organized by Content Strand (default) or Cognitive Level.

You also have the option of sorting the Student Score Report by Difficulty Level or by Benchmark Number. The default is by difficulty level; each benchmark in the strand is sorted from highest to lowest difficulty level. If you filter the report by benchmark, each benchmark in the strand is sorted by proficiency level from highest to lowest level. Both are useful for noting patterns in correct and incorrect items.

The blue link on the top right in the screen capture up above also provides a link to a Quick Guide to help you interpret the score report. All of the Quick Guides are included in Appendix B of this interpretive guide as well, for your convenience.

Following is one additional sample of the Student Score Report. Note that this version sorts by Content Strand. You can use the drop-down menu to produce the report sorted by Cognitive Level, if you prefer.

Fiscal Year:	2010	Test Date:	7/30/09
Site:		Test No:	First Test
Student:		Student Score ( Score Range ):	419 ( 390 - 448 )
Class ( Class Level ):	205( 200 - Level )	Starting Level :	04

MAPT Scale	200	700
Your Score Range	390 - 448	

21 Questions Answered Correctly

Benchmark		Item Dif.
<b>Geometry and Measurement</b>		
4G-1.3	Compare properties of 2-D/3-D objects	440
2G-3.1	Use compass rose	377
3G-4.11	ID perimeter as linear & area as sq. units	370
2G-4.1	Total cost and change from whole dollars	335
2G-4.2	Read digital & analog clocks	247
<b>Number Sense</b>		
2N-1.3	Read & compare $\frac{1}{2}$ , $\frac{1}{4}$ of things	498
4N-2.1	Choose operations for multi-step word prob	486
3N-3.2	Calculate w/ 3-digit whole #s	477
3N-3.5	Estimate 1st then round to 6 digit total	434
2N-2.5	Apply meanings of division	378
2N-3.5	Know $\frac{1}{2}$ of even #s up to 100	374
2N-1.2	Identify odd /even # s to 1000	371
3N-1.2	Read, write and compare common fractions	362
4N-3.5	Find ratio & direct proportion	348
<b>Patterns, Functions, and Algebra</b>		
3P-3.3	Substitute #s for variables and solve	507
4P-2.1	Choose expression for multi-step word problem	500
<b>Statistics and Probability</b>		
4S-1.7	ID related table to line graph & vice versa	378
4S-5.5	State probability as a %	375
4S-2.6	Compare relative values on bar/circle graphs	343
2S-2.5	Give # comparisons on bar graphs	332
2S-2.5	Give # comparisons on bar graphs	295

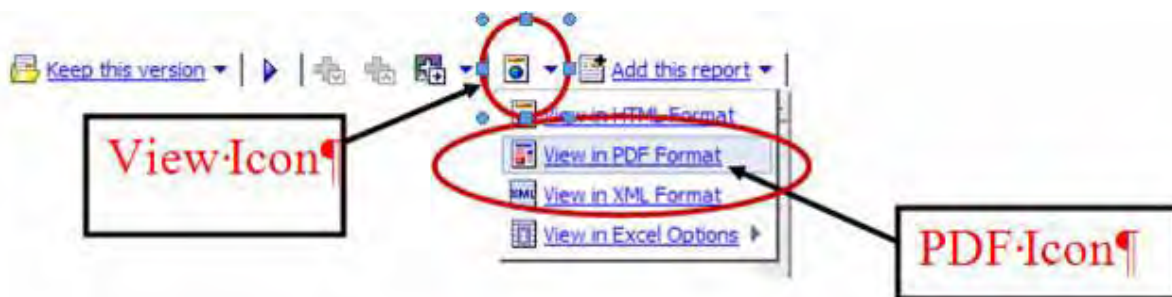
19 Questions Answered Incorrectly

Benchmark		Item Dif.
<b>Geometry and Measurement</b>		
2G-4.8	Find perimeter of rectangles	556
4G-4.2	Compare Fahrenheit to Celsius	477
3G-3.1	Read and use maps/plans	469
<b>Number Sense</b>		
4N-3.7	Add & subtract integers	494
5N-3.2	Calculate ratio & direct proportion	489
3N-3.6	Find fractional parts of whole # amounts	472
3N-3.11	Mult, divide by 2, 3-digit #s, check answer	447
3N-3.5	Estimate 1st then round to 6 digit total	364
<b>Patterns, Functions, and Algebra</b>		
3P-1.1	Complete whole # sequence w/2 steps	580
2P-3.3	Read inequalities for #s $\leq$ 1000	508
4P-2.2	Identify & use formulas from tables	497
2P-1.1	Complete repeating # patterns $\leq$ 1000	479
3P-3.4	Solve for variables in 1 step equations	450
2P-4.2	ID description of change with numbers	423
<b>Statistics and Probability</b>		
3S-2.5	Read values on bar/line graph to 6 digits	506
2S-2.3	Find simple information in list/table	491
2S-3.3	Support simple data statements	490
3S-3.3	Find average (mean) & range for data set	489
3S-5.3	Probability as ratio in multiple forms	450

## How to Print a Report

The best way to print a report in Cognos is to open the report in PDF format and select the Printer Icon from the Adobe toolbar.

Click the PDF Icon which is located under the 'View' Icon (second from the right) in the drop-down menu:



To return to the report, select “View in HTML” in the dropdown.

When accessing the reports, the speed with which reports load is related to the speed of the computer and Internet connection used.

**NOTE: To save time** when you want to select another class to view and/or print, click on the View icon (second from the right) and click on “View in HTML” in the dropdown, which brings you back to the page where you can select another class filter. This approach takes much less time than selecting the report again. You do not need to select the fiscal year and site again. You only need to select another class code. Do NOT use the BACK button.

**This is true for all reports and saves time when you want to select and print several class or student reports.**

Next let's review the Class Reports under the “MAPT Reports” tab.

4. MAPT Math: Class Report by Content Strand and Topic
5. MAPT Math: Class Topic Report by Content Strand and Topic—Customized

Take a look at the fourth report called “4 MAPT Class Report by Content Strand and Topic.”

**Adult & Community Learning Services**  
**4 MAPT MATH: Class Report By Content Strand and Topic**

[Quick Guide](#)

Fiscal Year: 2011  
 Site:  
 Class:  
 Report: \* Content Strand  
 Finish

You need to select the filters one at a time for the report. Here are the drop-down menus for the Class Report and then Click on “Finish.”

- Fiscal Year: 2011, 2010, 2009, or 2008
- Site: Site name at your project
- Class: Class code at your site (from SMARTT)
- Report: Select whether you want the report sorted by Content Strand or Cognitive Level

Next, let’s take a look at the fifth report under “OWL Reports” MAPT tab:

**5 MAPT Math: Class Report By Content Strand and Topic-Customized”**

**Adult & Community Learning Services**  
**5 MAPT Math : Class Report By Content Strand and Topic - Customized**

Fiscal Year: 2011  
 Site:  
 Students:  
 Test Number: All Tests  
 Enter a Class Name: \*  
 Finish

You will need to make a selection one at a time in the following dropdowns and then click on “Finish.”

- Fiscal Year: 2011, 2010, 2009, or 2008
- Site: Site name at your project  
You will see a list of all the students at the site. Click on the box next to each student name you want listed in the customized class report. This allows you to create a “customized” math class of students.
- Test Number: “All tests” is the default; you may instead select “All except most recent test,” or “Most recent test”
- Enter a Class Name: You should add in a name for this class report so that it is meaningful for you. THERE IS NO DEFAULT CLASS NAME; name the report whatever you want.

The screenshot shows a web interface for generating a customized class report. At the top right, there are navigation icons and a 'Keep this version' dropdown. The main heading is 'Adult & Community Learning Services' followed by '5 MAPT Math : Class Report By Content Strand and Topic - Customized'. The form includes the following fields:

- Fiscal Year: 2011 (dropdown)
- Site: Lowell PS/Green School (dropdown)
- Students: A list of student IDs with checkboxes for selection:
  - 14X2L30DUVG0-DVA6MH59IZ3HP
  - 1540VYCJS7UE-I24CAMX0HD0MU
  - 17SQ89G4TZFN-V5CKI6GM9G2IB
  - 1C1108CQGSTQ-TKRBC1KQM82QR
  - 1HQMBVPH8BEK-OZ5OR1KW6LV4A
  - 1NNDV8D99T98-RJRCUUSXW0CAA
  - 1PXN276UH0A7-MJ3WEJDBQ7AIY
  - 1QSR1MLICIX-792CMJNDA5VVA
- Test Number: All Tests (dropdown)
- Enter a Class Name: \* (text input field)
- Finish (button)

There are also 'Select all' and 'Deselect all' links next to the student list.

This class report looks the same as the original class report except that it lists the names of the students you selected. This is a customized report for a subset of students or for an individual student. You might select an individual student so that you view the number of student responses and percent correct by levels—200-299; 300-399; 400-499; 500-599, and 600-700.

**Accessing a MAPT Cube to Design Your Report (advanced users only!)**

You also have the capability of accessing a MAPT cube to design your own report. [Note: This is for users more proficient using Cognos Cube; if you are interested in pulling your own reports from Cognos, you should attend a Cognos training with the SABES regional field technologists to understand how to design cube reports first.]

For example, let's take a look at the first report under "Analyses" tab called "MAPT - Class" report.

The screenshot shows a Cognos report interface. At the top, there are navigation tabs: Homepage, Desk Review, OWL, ACLS Reports, Favorite Reports, Custom Views, My Folders, and Public Folders. Below this is a header for "MAPT Cubes" and "Analyses". A table lists two analyses: "MAPT - Class" and "MAPT - Site".

The main report area shows a table with the following structure:

- Rows: CLASS
- Columns: TIME
- Measure: # STUDENTS

	2008	2009	2010	TIME
Jewish Vocational Service	91	109	33	233
JFYNetWorks	35	37	17	89
Lawrence Adult Learning Center	143	185	68	396
Lowell PS /LHABE	0	3	9	12
Lowell PS Even Start	0	3	0	3
Lowell PS/Green School	74	126	82	282
Lowell PS/LHS	10	154	70	234
Lutheran Refugee and Immigrant Services/Worcester	2	5	5	12
Massachusetts College of Liberal Arts	0	2	20	22
Massasoit Community College Transitions	0	36	19	55
Maynard site	0	1	0	1
MCDI Adult Basic Education DOE	79	129	47	255
MCDI/STCC	159	150	61	370
MCLA/Distance Learning	6	0	0	6

On the left side, there is a "Insertable Objects" pane listing various dimensions and measures such as TIME, CLASS, TEST TYPE, CLASS TYPE, TEST, COGNITIVE LEVEL, QUESTION LEVEL, DIFFICULTY LEVEL, TEST NUMBER, SCORE CATEGORY, PRE POST, TEST CATEGORY, RACE, AGE, GENDER, LANGUAGE, and Measures.

This is a cube so that you can "drill down" to your site and then to a class. You can drag over any of the measures that you want to use for analysis. For assistance with Cube analysis, please contact a regional SABES Computer Techs.

Once you select any report you can export the report in one of the various report formats. Click on the down arrow next to the last icon in the top right tool bar to view the data in these formats:

- View in HTML, PDF, or XML Formats
- Or in various Excel formats (2000 Single Sheet, 2002, 2007, CSV)

Click on this down arrow to get the following choices

The screenshot shows a report titled "4 MAPT MATH: Class Report By Content Strand and Topic". The interface includes a toolbar with options like "Keep this version" and "Add this report". A dropdown menu is open, showing options: "View in HTML Format", "View in PDF Format", "View in XML Format", and "View in Excel Options". Below this is a "Quick Guide" link. A form section contains filters for Fiscal Year (2011), Site (Cambridge Community Learn), Class (202), and Report (Content Strand), with a "Finish" button. Below the form, summary statistics are listed: Fiscal Year: 2011, Site: Cambridge Community Learning Center, Class: 202, Number of Students: 16, Number of Tests: 33, Report Date: Jul 29, 2011. A table titled "Percentage of Items Answered Correctly" is shown below the summary.

		200 - 299		300 - 399		400 - 499		500 - 599		600 - 700	
		# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct

To make the Excel spreadsheets open more quickly, hold down the CTL key while choosing the view above.

When Excel opens, you can either select "Open" to view the file now or "Save" to view the file later. Once the report is saved in Excel, the data reflects data as of the current date. You might want to save the file with a name that has meaning to you and append the date at the end of the file name so that you remember the data reflects this time period. If you export to Excel, you have the capability to save various reports in different tabs.

The report default is the HTML or Web Page format. You might decide to view the data in the PDF Format so you can save or print it. The PDF format displays the columns to fit on the page.

### *E-mailing Reports*

You can also e-mail reports to other staff. Once you select a report, click on the drop-down arrow next to the “Keep this version” link. You will then see the options of “E-mail report” and “Save as report View.” You can cc the report to as many email addresses as you would like.

Step 1: Generate the report you want to send by email so that it appears on your screen, and then click on the envelope icon which states “E-mail Report.”

**Adult & Community Learning Center**  
**4 MAPT MATH: Class Report by Content Strand and Topic**

Keep this version | Email Report | Save as Report View

Quick Guide

Fiscal Year: 2011  
 Site: Cambridge Community Learn  
 Class: 202  
 Report: \* Content Strand  
 Finish

Fiscal Year: 2011  
 Site: Cambridge Community Learning Center  
 Class: 202  
 Number of Students: 16  
 Number of Tests: 33  
 Report Date: Jul 29, 2011

Percentage of Items Answered Correctly

		200 - 299		300 - 399		400 - 499		500 - 599		600 - 700	
		# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct

Step 2: Send the report as an attachment so that the user does not need to log into Cognos to access the report. Click on the box that states “Attach the report.” If you do not enter a message in the body of the e-mail, the report appears as text in the e-mail message. If you type a message such as the one listed below, then the report appears as an attachment for you to open and view.

To add recipients, type individual email addresses separated by semi-colons.



## Appendix A

### *Understanding Item Difficulty*

Item difficulty refers to how easy or hard an item is. Suppose we have two items, item A and item B. If 50% of all students answer item A correctly and 75% of those students answer item B correctly, we say item A is “more difficult” than item B. Unlike the content strand or benchmark an item measures, the difficulty level of an item is not an inherent characteristic of the item. Rather, it is determined by the number and types of students who correctly answer the item.

Now let’s consider a more complicated example, illustrated in Table A1.

Table A1

#### Differences in Item Difficulty

Item A	Item B
Completed by Low Intermediate students (Level 3, GLE 4.0-5.9)	Completed by High Intermediate students (Level 4, GLE 6.0-8.9)

As before, we again have two items, A and B. This time, however, different groups of students complete each item. Group 1 is a group of Low Intermediate students (i.e., Intermediate ABE Mathematics students, sometimes referred to as Level 3 or GLE 4.0–5.9). Group 2 is a group of High Intermediate students (i.e., Pre-GED students, sometimes referred to as Level 4 or GLE 6.0–8.9). We expect a larger percentage of the High Intermediate students to answer these items correctly than of the Low Intermediate students, so, in determining the difficulty level of an item, we have to account not only for the numbers of examinees who answer it correctly, but also for the skill level of those students. Item difficulty is more specific than just noting that a test-taker got an item written to a benchmark right or wrong. It is possible that two questions written to the same benchmark will differ in their level of difficulty.

To determine item difficulty, we calibrate all items onto the same scale on which students are placed—the 200 to 700 MAPT score scale. Figure A1 displays an *item characteristic curve* (ICC), which shows the probability that an examinee at a given MAPT score will answer an item correctly. The horizontal axis in the figure is the 200-to-700 MAPT score scale. The vertical axis is probability, which ranges from zero (no chance of answering the item correctly) to 1.0 (a certainty that the item will be answered correctly). The difficulty level of an item is determined by finding the point on the MAPT score scale where a student has a 50% chance of answering the item correctly. For the item displayed in Figure A1, this point is 501. A horizontal line is drawn where probability = 0.50. The arrow perpendicular to this line illustrates the location on the MAPT score scale where probability = 0.50. This point represents the difficulty level of the item.

Figure A1

Illustration of MAPT Item with Difficulty Level of 501

**After finding where the probability of correct response is 0.5, we see that the difficulty for this item is roughly 501 on the MAPT scale.**

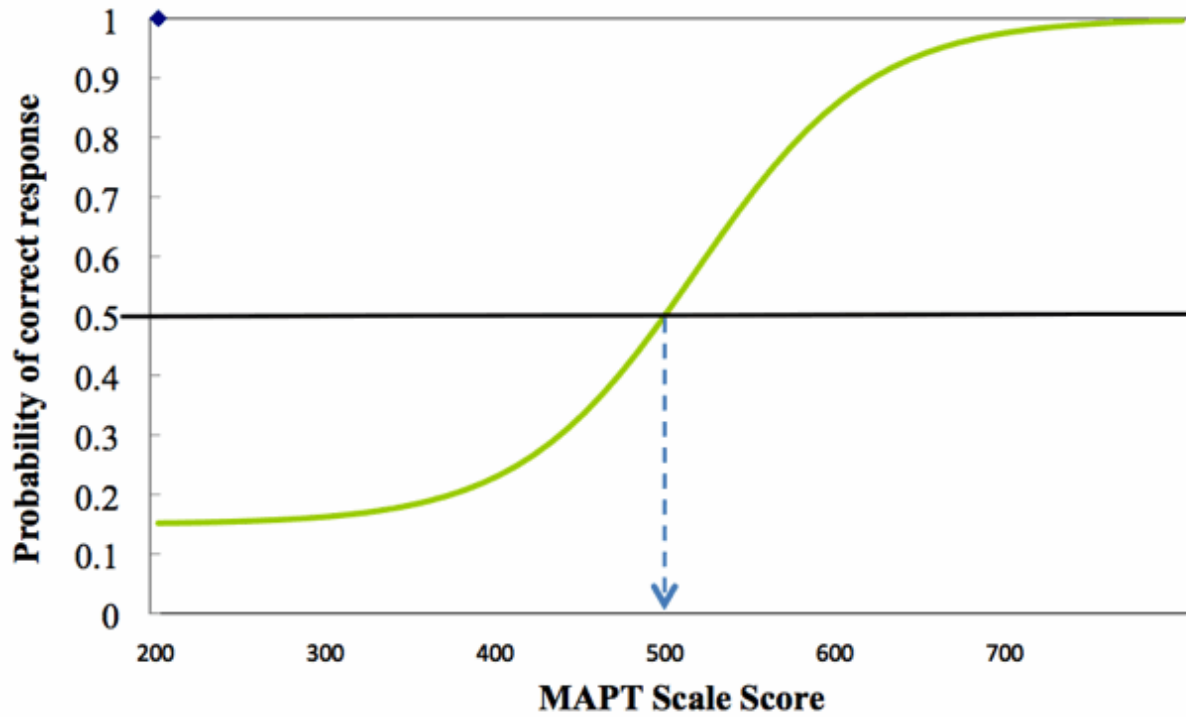


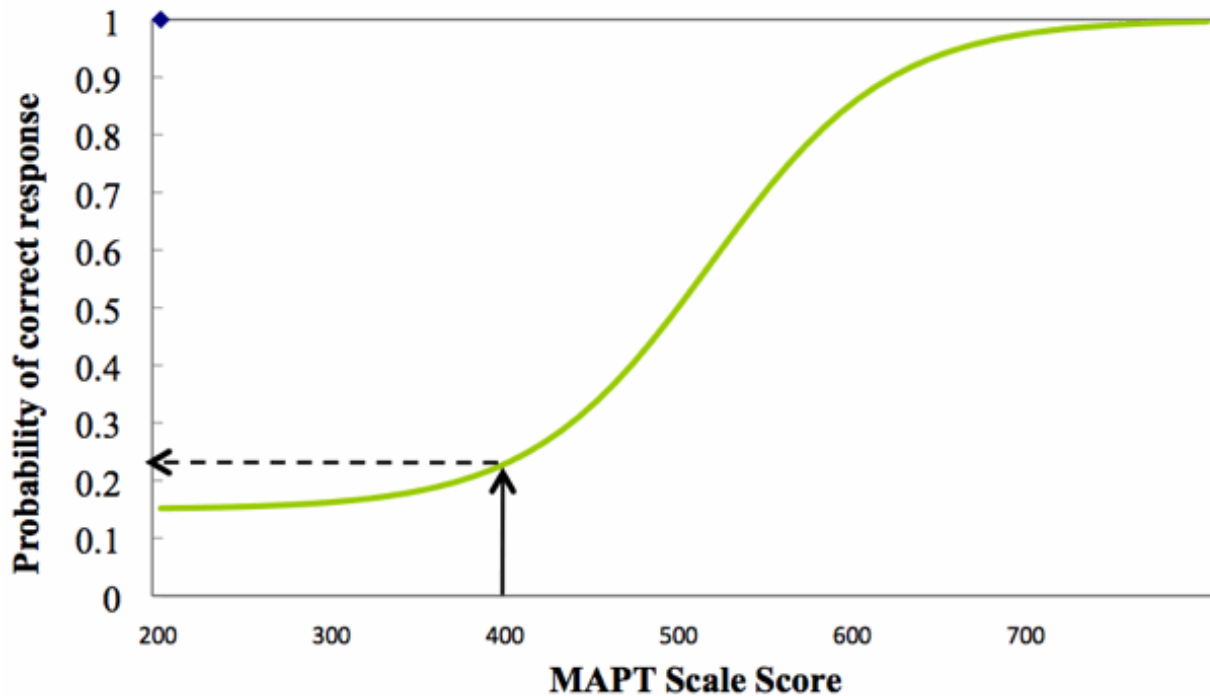
Figure A2 depicts the probability that a student with a MAPT score of 400 will correctly answer the item in Figure A1, which has a difficulty level of about 500. The probability is determined by starting on the horizontal MAPT scale axis, locating the examinee score of 400. A perpendicular line is drawn beginning on the MAPT scale, then intersecting with the item characteristic curve. The probability is found by starting at the new intersection, then drawing another perpendicular line to the vertical axis where probabilities are labeled.

By following the two arrows from the 400 point on the MAPT scale to the ICC and then to the probability axis, you can see that students who score 400 are only roughly 23% likely (i.e., probability = 0.23) to get this item correct. Therefore, this item must be more difficult than the 400 level of performance. On the other side of the spectrum, students at the 600 score level (not shown) are more than 50% likely to get this item correct, so the item is too easy to be at the 600 level. These results are reasonable considering that the actual item difficulty is 501.

Test-development norms suggest that the best place to locate an individual item on the scale is at the point where students have a 50% chance of answering the item correctly (e.g., see Goodman & Hambleton, 2005<sup>7</sup>). Therefore, a student who earns a score of 501 on the MAPT for Math has a 50% chance of correctly answering the item depicted in Figures 2 and 3, and that item is assigned a difficulty level of 501.

Figure A2

Illustration of the Probability of an Examinee with a MAPT Score of 400 Answering an Item Correctly at a MAPT Score of 400



<sup>7</sup> Goodman, D. P., & Hambleton, R. K. (2004). Student test score reports and interpretive guides: Review of current practices and suggestions for future research. *Applied Measurement in Education*, 17 (2), 145-220.

## Appendix B

### *Quick Guides for Interpreting the Reports*

In the following pages are the Quick Guides that have been developed to assist in the interpretation of the score reports. Four Quick Guides have been developed, and are included here in this order:

- Individual Student Score Report by Content Strand
- Individual Student Score Report by Cognitive Level
- Class Score Report by Topic and Content Strand
- Class Score Report by Topic and Cognitive Level

These Quick Guides are also available in Cognos as linked PDFs, as shown below.

### Quick Reference Guide to the MAPT for Math Individual Student Score Report by Content Strand

The header of the report contains basic identifying information and the student's MAPT score and score range.

Fiscal Year:	2009	Test Date:	1/8/09
Site:		Test No.:	Second Test
Student:		Student Score:	503
Class (Class Level):	203( 200 - Level )	Score Range:	478 - 528

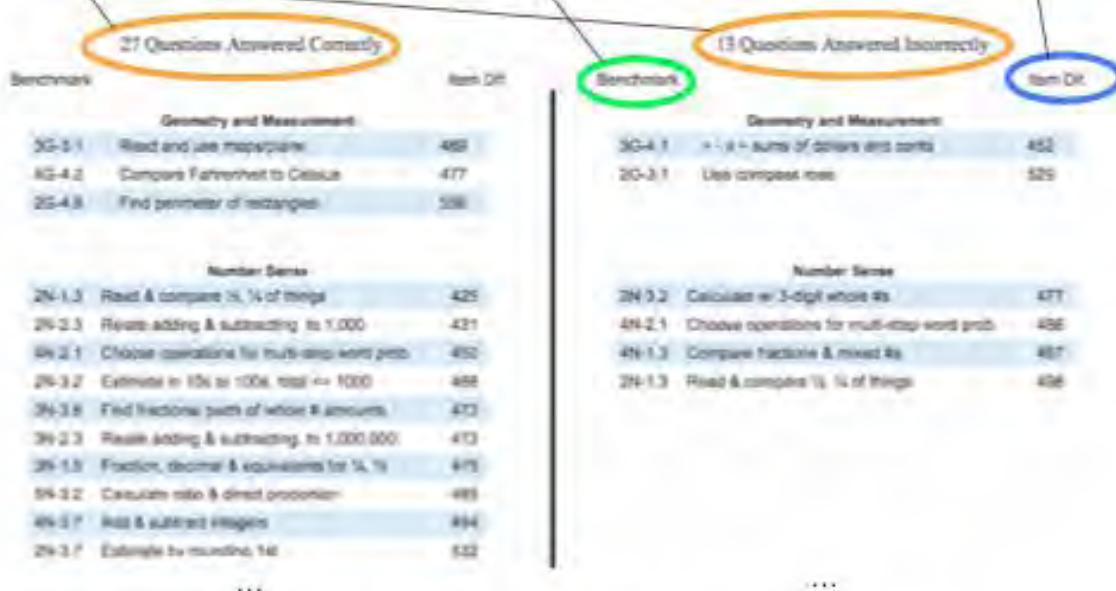
Below the header is a graphical illustration of the student's score range as it connects to the MAPT scale.



Each of the 40 items a student takes will be in one of these two columns.

Every item is aligned to a benchmark in the ABE Math Frameworks.

The item difficulty level is a value on the MAPT scale associated with a 50% probability of getting the item right.



The items in this report are organized by Content Strand. To interpret this report:

- Note the student's MAPT score (in this example, 503)
- Note the score range associated with the MAPT score (in this example, 478-528)

Using this information:

- Look for items answered incorrectly with item difficulty values lower than the students' score range (in this example, the first item on the incorrect side). These are items that by difficulty would have been expected to have been easy for the student but were not answered correctly.
- Look also for items answered incorrectly with item difficulty values higher than the student's score range- these items that were relatively hard for the student given their performance and are benchmarks to work on.
- Look for items answered correctly with item difficulty values lower than the student's score range, as these were items that were answered correctly and were relatively easy for the student.
- Look for items answered correctly with item difficulty values higher than the student's score range- these were items that were comparatively hard for the student relative to their performance but were answered correctly.

Things to consider:

- How does this information align with what content/skills were taught to students in the class? What benchmarks represent material covered that was mastered?

### Quick Reference Guide to the MAPT for Math Individual Student Score Report by Cognitive Level

The header of the report contains basic identifying information and the student's MAPT score and score range.

Fiscal Year:	2009	Test Date:	1/8/09
Site:		Test No.:	Second Test
Student:		Student Score:	503
Class ( Class Level ):	203( 200 - Level )	Score Range:	478 - 528





Below the header is a graphical illustration of the student's score range as it connects to the MAPT scale.



Each of the 40 items a student takes will be in one of these two columns.

Every item is aligned to a benchmark in the ABE Math Frameworks.

The item difficulty level is a value on the MAPT scale associated with a 50% probability of getting the item right.

																																																																																		
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4N-3.7	Add & subtract integers	494																																																																																
5N-3.2	Calculate ratio & direct proportion	489																																																																																
3S-3.3	Find average (mean) & range for data set	488																																																																																
Benchmark		Item Dif.																																																																																
<b>Analysis, Synthesis &amp; Evaluation</b>																																																																																		
5S-2.3	Inter data meaning: gaps clusters comparisons	506																																																																																
4P-2.2	Identify & use formulas from tables	497																																																																																
4N-2.1	Choose operations for multi-step word prob.	486																																																																																
<b>Application</b>																																																																																		
3S-2.5	Read values on barline graph to 6 digits	506																																																																																
2N-1.3	Read & compare 1/2, 1/4 of things	490																																																																																
2S-2.3	Find simple information in table	481																																																																																
3N-3.2	Calculate w/ 3-digit whole #s	477																																																																																
3S-1.4	Check total through sum of subtotals	451																																																																																
3G-4.1	++ x = sums of dollars and cents	452																																																																																

The items in this report are organized by Cognitive Levels. To interpret this report:

- Note the student's MAPT score (in this example, 503)
- Note the score range associated with the MAPT score (in this example, 478-528)

Using this information:


- Look for items answered incorrectly with item difficulty values lower than the student's score range (in this example, the first item on the incorrect side). These are items that by difficulty would have been expected to have been easy for the student but were not answered correctly.
- Look also for items answered incorrectly with item difficulty values higher than the student's score range- these items that were relatively hard for the student given their performance and are benchmarks to work on.
- Look for items answered correctly with item difficulty values lower than the student's score range, as these were items that were answered correctly and were relatively easy for the student.
- Look for items answered correctly with item difficulty values higher than the student's score range- these were items that were comparatively hard for the student relative to their performance but were answered correctly.

Things to consider:

- How does this information align with what content/skills were taught to students in the class? What benchmarks represent material covered that was mastered?

## Quick Reference Guide to the MAPT for Math Class Score Report by Content Strand

The header of the report contains basic identifying information and the student's MAPT score and score range.

Fiscal Year: 2009  
 Site:   
 Class: 201  
 Number of Students: 24  
 Number of Tests: 39  
 Report Date: Jan 11, 2010

In a given class, the number of students may not equal the number of tests recorded because different students will have different numbers of tests (1, 2, 3, or perhaps more) by the date this report was run within a fiscal year.

Below the header is the body of the **Class Score Report by Content Strand**.

Each item on the MAPT is mapped to the MAPT scale, and so falls into one of these score ranges.

This gives information about how many student responses were provided, and the percent of these that were answered correctly. Within each cell, these may or may not be the same item seen by more than one person, or different items seen by different people.

**Percentage of Items Answered Correctly**

Topics	Strand	200 - 299		300 - 399		400 - 499		500 - 599		600 - 700	
		# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct
Geometry	Operations									8	50%
	Shapes	2	100%	5	60%	55	63%	52	71%	44	59%
	Things to measure	10	60%	19	63%	57	60%	100	54%	1	100%
Number Sense	Data Usage									8	17%
	Decimal/Percentage/Fraction	3	33%	26	38%	73	67%	60	63%	41	66%
	Operations	8	100%	23	48%	106	65%	28	67%	9	22%
Patterns, Functions, Algebra	Patterns					3	60%	9	78%		
	Place value	4	75%	6	100%	7	57%	32	62%	7	43%
	Things to measure					10	60%				
Statistics & Probability	Algebra	3	67%	5	60%	42	74%	61	76%	48	71%
	Patterns	5	67%	12	75%	61	72%	53	63%	12	33%
	Data Usage	9	100%	61	75%	103	74%	142	59%	20	46%
	Probability			2	50%	15	67%	14	43%	22	32%
		<b>40</b>	<b>76%</b>	<b>159</b>	<b>64%</b>	<b>533</b>	<b>66%</b>	<b>612</b>	<b>63%</b>	<b>216</b>	<b>52%</b>

Note: Total sums the number of student responses based on the total number of student-item combinations.

Number of Items per Difficulty Level Seen by Students				
200 - 299	300 - 399	400 - 499	500 - 599	600 - 700
52	67	66	60	63

To interpret this report:

- Note the Difficulty Range of Items (along the top of the table)
- Identify a strand and topic combination you want to look at.
- Note the number of student responses and the percent of these that were answered correctly for the cell you are interested in.

Using this information:

- If the number of student responses is less than 5, be aware that this is a relatively small number of items and any conclusions to be drawn are likely to be unreliable.
- Where the number of student responses is greater than 5, look at the percent correct.
  - If the percent correct is high, that represents higher numbers of correct answers to those items in that difficulty range and greater mastery of skills among members of the class as a group.
  - If the percent correct is low, that represents lower numbers of correct answers to those items in that difficulty range and a lower degree of mastery of skills among members of the class as a group.

## Quick Reference Guide to the MAPT for Math Class Score Report by Cognitive Level

The header of the report contains basic identifying information and the student's MAPT score and score range.

Fiscal Year:	2009
Site:	██████████
Class:	201
Number of Students:	24
Number of Tests:	39
Report Date:	Jan 11 2010

In a given class, the number of students may not equal the number of tests recorded because different students will have different numbers of tests (1, 2, 3, or perhaps more) by the date this report was run within a fiscal year.

Below the header is the body of the **Class Score Report by Cognitive Level**.

Each item on the MAPT is mapped to the MAPT scale, and so falls into one of these score ranges.

This gives information about how many student responses were provided, and the percent of these that were answered correctly. Within each cell, these may or may not be the same item seen by more than one person, or different items seen by different people.

Percentage of Items Answered Correctly

Cognitive Levels	Topics	200 - 299		300 - 399		400 - 499		500 - 599		600 - 700	
		# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct	# Student Responses	% Correct
Analysis, Synthesis & Evaluation	Algebra							15	52%	10	70%
	Data Usage	2	100%	13	85%	33	73%	40	52%	4	75%
	Decimal/Percentage /Fraction			4	25%	9	44%	22	55%	27	33%
	Operations					12	58%			7	14%
	Patterns			3	67%	33	79%	18	69%		
	Place value			1	100%	2	50%	9	67%		
	Probability									7	0%
	Shapes					7	43%	3	100%	19	42%
	Things to measure	1	100%			14	43%	15	33%		
	Algebra					8	52%	16	75%	21	78%
Application	Data Usage	3	100%	25	78%	68	76%	65	65%	15	40%
	Decimal/Percentage /Fraction	2	0%	19	47%	60	73%	37	78%	14	64%
	Operations	4	100%	22	50%	52	65%	29	58%	1	100%
	Patterns			8	88%	21	71%	33	61%	12	33%
	Place value			1	100%	2	50%	8	75%	1	100%
	Probability					15	67%	14	43%	18	47%
	Shapes	1	100%			8	78%	34	71%	10	50%
	Things to measure	4	50%	11	64%	24	71%	53	74%	1	100%
	Algebra	3	87%	5	60%	34	78%	50	88%	17	65%
	Data Usage	4	100%	23	70%	2	0%	17	47%	7	0%
Knowledge & Comprehension	Decimal/Percentage /Fraction	1	100%	3	0%	19	58%	32	55%	8	100%
	Operations	2	100%	1	0%	41	56%	8	72%	1	0%
	Patterns	3	87%	1	0%	7	43%	3	67%		
	Place value	4	75%	4	100%	3	67%	15	52%	8	33%
	Shapes	1	100%	5	80%	39	72%	25	58%	21	71%
	Things to measure	5	80%	8	52%	19	58%	32	31%		
	<b>Total</b>	<b>40</b>	<b>78%</b>	<b>139</b>	<b>64%</b>	<b>533</b>	<b>68%</b>	<b>612</b>	<b>63%</b>	<b>218</b>	<b>52%</b>

Note: Total Sums the number of student responses based on the total number of student-item combinations.

Number of Items per Difficulty Level Seen by Students

200 - 299	300 - 399	400 - 499	500 - 599	600 - 700
32	67	68	85	81

To interpret this report:

- Note the Difficulty Range of Items (along the top of the table)
- Identify a cognitive level and topic combination you want to look at.
- Note the number of student responses and the percent of these that were answered correctly for the cell you are interested in.

Using this information:

- If the number of student responses is less than 5, be aware that this is a relatively small number of items and any conclusions to be drawn are likely to be unreliable.
- Where the number of student responses is greater than 5, look at the percent correct.
  - If the percent correct is high, that represents higher numbers of correct answers to those items in that difficulty range and greater mastery of skills among members of the class as a group.
  - If the percent correct is low, that represents lower numbers of correct answers to those items in that difficulty range and a lower degree of mastery of skills among members of the class as a group.

## Appendix C

### *Learning More:*

#### *Connecting Math Instruction to the Massachusetts Adult Basic Education Curriculum Frameworks for Mathematics and Numeracy*

Up to this point in the *Guide*, we have described the content of MAPT for Math score reports and how to interpret them. Interpretation is difficult without being familiar with the Massachusetts Adult Basic Education Curriculum Frameworks for Mathematics and Numeracy. Adult educators across the state worked hard to create these Frameworks to guide teachers how to best meet learners' needs in mathematics and numeracy. Since every MAPT for Math item is designed to measure a benchmark specified in the framework, we suggest all adult educators are familiar with these frameworks before interpreting MAPT scores and discussing results with students.

The frameworks can be found at

<http://www.doe.mass.edu/acls/frameworks/mathnum.doc>

By interpreting students' performance on the MAPT for Math with respect to the *Frameworks*, adult educators can plan instruction around specific topics and benchmarks.

In this appendix we provide a listing of the benchmarks contained in the *Frameworks*, but the benchmarks are abbreviated and so they are not likely to be very informative for determining lesson plans and other instructional interventions. For this reason, the page numbers in the Frameworks where more complete information on the benchmarks can be found are also listed.

## Benchmarks by Topic

In this Appendix, we provide a listing of all of the Mathematics and Numeracy benchmarks by their strand/topic classification to aid in interpretation of the Class Score reports. All benchmarks in the Massachusetts Adult Basic Education Curriculum Frameworks are listed here, but some are not measured by the MAPT (i.e., they are not amenable to assessing via a multiple-choice item format).

Strand/Topic <i>G&amp;M= Geometry and Measurement NS= Number Sense PFA= Patterns, Functions, Algebra S&amp;P= Statistics and Probability</i>	Benchmark Number	Shortened Benchmark Text	Curriculum Framework Page for Full Benchmark Text and Related Information
G&M: Shapes	2G-1.1	Know properties of 2-D shapes	39
G&M: Shapes	2G-1.2	Recognize shapes in the environment	39
G&M: Shapes	2G-2.1	Find line of symmetry in shapes	39
G&M: Shapes	2G-2.2	Find multiple lines of symmetry	39
G&M: Shapes	2G-3.1	Use compass rose	40
G&M: Shapes	2G-3.2	Use map/directory with coordinate grid	40
G&M: Shapes	2G-4.8	Find perimeter of rectangles	41
G&M: Shapes	2G-4.9	Find area of rectangles	41
G&M: Shapes	3G-1.1	Compare properties of 2-D & 3-D objects	56
G&M: Shapes	3G-1.2	Locate and understand right angles	56
G&M: Shapes	3G-2.1	Estimate line of symmetry in shapes	56
G&M: Shapes	3G-2.2	ID multiple lines of symmetry in shapes	56
G&M: Shapes	3G-2.3	Identify line of symmetry in shapes	56
G&M: Shapes	3G-3.1	Read and use maps/plans	56
G&M: Shapes	3G-3.2	Locate translations of 2-D shapes on grids	56
G&M: Shapes	3G-4.11	ID perimeter as linear & area as sq. units	58
G&M: Shapes	3G-4.3	Read scales w/ marked, unmarked labels	57
G&M: Shapes	4G-1.1	Use radius, diameter, circumference of circle	73
G&M: Shapes	4G-1.2	Read measure of angles on protractor	73
G&M: Shapes	4G-1.3	Compare properties of 2-D/3-D objects	73
G&M: Shapes	4G-1.4	Identify congruent/similar shapes	73
G&M: Shapes	4G-1.5	Identify types of angles	73
G&M: Shapes	4G-1.6	Relate angles of parallel lines/transversal	74
G&M: Shapes	4G-1.7	Identify names of triangles by properties	74
G&M: Shapes	4G-1.8	Estimate measure of angle using benchmarks	74
G&M: Shapes	4G-2.1	Estimate line of symmetry in shapes	74
G&M: Shapes	4G-2.2	Find multiple lines of symmetry in shapes	74
G&M: Shapes	4G-3.1	Read & use scales and distance on map	75
G&M: Shapes	4G-3.2	ID the measure of 3-D shapes drawn to scale	75
G&M: Shapes	4G-3.3	Find translations of 2-D shapes on a grid	75
G&M: Shapes	4G-3.4	Locate points on x-y axes / grid	75
G&M: Shapes	4G-4.8	Find volume of 3 D shapes	77
G&M: Shapes	4G-4.9	Find perimeter/area of combo shapes	77
G&M: Shapes	5G-1.3	Use spatial visualization with geometric figures	90
G&M: Shapes	5G-1.5	Use triangle properties to solve problems	90
G&M: Shapes	5G-1.6	Solve problems with right triangles	91
G&M: Shapes	5G-1.7	Read measure angles on protractor	91
G&M: Shapes	5G-2.1	Use coordinates w/geometric figures	91
G&M: Shapes	5G-4.2	ID effect of linear change on geom. measures	92
G&M: Shapes	5G-4.4	Find area involving inscribed figures	92

<b>Strand/Topic</b> <i>G&amp;M= Geometry and Measurement</i> <i>NS= Number Sense</i> <i>PFA= Patterns, Functions, Algebra</i> <i>S&amp;P= Statistics and Probability</i>	<b>Benchmark Number</b>	<b>Shortened Benchmark Text</b>	<b>Curriculum Framework Page for Full Benchmark Text and Related Information</b>
G&M: Shapes	6G-1.1	Solve problems with geometric figures	104
G&M: Shapes	6G-1.2	Solve problems with right triangles	104
G&M: Shapes	6G-1.3	Use spatial visualization with geom. figures	104
G&M: Shapes	6G-2.1	Use coordinates of translations & rotations	105
G&M: Shapes	6G-3.1	Give coordinates for translation of shapes	105
G&M: Shapes	6G-4.2	ID effect of linear change on geom. measures	105
G&M: Things to measure	2G-4.1	Total cost and change from whole dollars	40
G&M: Things to measure	2G-4.2	Read digital & analog clocks	40
G&M: Things to measure	2G-4.3	Measurement w/standard, non-standard units	40
G&M: Things to measure	2G-4.4	Measurement Instruments with common units	40
G&M: Things to measure	2G-4.5	Know common unit relationships	41
G&M: Things to measure	2G-4.6	Compare positive Fahrenheit temperatures	41
G&M: Things to measure	2G-4.7	Personal benchmarks of temperature	41
G&M: Things to measure	3G-4.1	+ - x ÷ sums of dollars and cents	57
G&M: Things to measure	3G-4.10	Calculate change in times	58
G&M: Things to measure	3G-4.12	Estimate, compare weights in common units	58
G&M: Things to measure	3G-4.2	Relationships of distance, time, speed	57
G&M: Things to measure	3G-4.4	Read ruler <= 1/8" metric ruler cm, mm	57
G&M: Things to measure	3G-4.5	Compare inches & centimeters	57
G&M: Things to measure	3G-4.6	Convert units of measure in the same system	57
G&M: Things to measure	3G-4.7	Solve problems w/weight & capacity	57
G&M: Things to measure	3G-4.8	Read positive/negative Fahrenheit temps.	58
G&M: Things to measure	3G-4.9	Use & interpret 24 hour clock	58
G&M: Things to measure	4G-4.1	Convert units of measure in different systems	75
G&M: Things to measure	4G-4.2	Compare Fahrenheit to Celsius	75
G&M: Things to measure	4G-4.3	Relate distance, time, speed	76
G&M: Things to measure	4G-4.4	Read to 1/16" & mm on metric ruler	76
G&M: Things to measure	4G-4.5	Match metric units to images	76
G&M: Things to measure	4G-4.6	Compare grams ounces, liters qts, informally	76
G&M: Things to measure	4G-4.7	Read measurement instruments w/familiar units	77
G&M: Things to measure	5G-1.1	Apply ratio/proportion in familiar situations	90
G&M: Things to measure	5G-1.2	Use metric units to describe environment	90
G&M: Things to measure	5G-1.4	Choose formulas for area & volume	90
G&M: Things to measure	5G-3.1	Find slope, y-intercept, & intersection of lines	91
G&M: Things to measure	5G-4.1	Solve & estimate area weight mass etc...	92
G&M: Things to measure	5G-4.3	Calculate rates of change from data	92
G&M: Things to measure	5G-4.5	Convert between Fahrenheit & Celsius	92
G&M: Things to measure	6G-4.1	Solve & estimate area weight mass etc...	105
NS: Decimal/Percentage/Fraction	2N-1.3	Read & compare 1/2, 1/4 of things	30
NS: Decimal/Percentage/Fraction	2N-1.4	Use 50% = 1/2	30
NS: Decimal/Percentage/Fraction	2N-3.5	Know 1/2 of even #'s up to 100	34
NS: Decimal/Percentage/Fraction	3N-1.2	Read, write and compare common fractions	42
NS: Decimal/Percentage/Fraction	3N-1.3	Use equivalent forms of common fractions	42
NS: Decimal/Percentage/Fraction	3N-1.4	Read & compare 2 decimal places in context	43
NS: Decimal/Percentage/Fraction	3N-1.5	Fraction, decimal & equivalents for 1/4, 1/2	43
NS: Decimal/Percentage/Fraction	3N-1.8	Relate % to ratio, part of 100	43
NS: Decimal/Percentage/Fraction	3N-2.1	Relate unit fraction to division by whole #	44
NS: Decimal/Percentage/Fraction	3N-3. 9	2 decimal place word probs w/ calculator	46
NS: Decimal/Percentage/Fraction	3N-3.12	Find common % when part/whole is given	47

<b>Strand/Topic</b> <i>G&amp;M= Geometry and Measurement</i> <i>NS= Number Sense</i> <i>PFA= Patterns, Functions, Algebra</i> <i>S&amp;P= Statistics and Probability</i>	<b>Benchmark Number</b>	<b>Shortened Benchmark Text</b>	<b>Curriculum Framework Page for Full Benchmark Text and Related Information</b>
NS: Decimal/Percentage/Fraction	3N-3.4	Basic calculations w/ \$	45
NS: Decimal/Percentage/Fraction	3N-3.6	Find fractional parts of whole # amounts	45
NS: Decimal/Percentage/Fraction	3N-3.7	Use fractions and % to find part of whole #s	45
NS: Decimal/Percentage/Fraction	4N-1.10	Solve 1-step % problems w/ratio, proportion	60
NS: Decimal/Percentage/Fraction	4N-1.11	Use equivalent forms of common fractions	61
NS: Decimal/Percentage/Fraction	4N-1.3	Compare fractions & mixed #s	59
NS: Decimal/Percentage/Fraction	4N-1.4	Read & compare decimals to 3 places	59
NS: Decimal/Percentage/Fraction	4N-1.5	Use fractions & decimal equivalents	60
NS: Decimal/Percentage/Fraction	4N-1.6	Convert fractions to decimals	60
NS: Decimal/Percentage/Fraction	4N-1.7	Compare simple %	60
NS: Decimal/Percentage/Fraction	4N-1.8	Find simple % of increase, decrease	60
NS: Decimal/Percentage/Fraction	4N-1.9	Find part of whole with fractions, %, decimals	60
NS: Decimal/Percentage/Fraction	4N-2.3	Describe relationships w/ ratios	61
NS: Decimal/Percentage/Fraction	4N-3.1	Round decimals in context	62
NS: Decimal/Percentage/Fraction	4N-3.2	+ - x ÷ decimals to 3 places	62
NS: Decimal/Percentage/Fraction	4N-3.3	Numbers as fractions of each other	62
NS: Decimal/Percentage/Fraction	4N-3.4	Common fractions + - x ÷	62
NS: Decimal/Percentage/Fraction	4N-3.5	Find ratio & direct proportion	63
NS: Decimal/Percentage/Fraction	5N-1.2	Read & compare fractions & mixed #s	78
NS: Decimal/Percentage/Fraction	5N-1.3	Read & compare decimal #s of any size	78
NS: Decimal/Percentage/Fraction	5N-1.4	Compare % , and % of increase/decrease	78
NS: Decimal/Percentage/Fraction	5N-1.5	ID & use equivalent fractions, decimals, %	78
NS: Decimal/Percentage/Fraction	5N-2.1	ID effects of operations w/fractions	79
NS: Decimal/Percentage/Fraction	5N-2.3	Relate unit fraction to division by whole #	79
NS: Decimal/Percentage/Fraction	5N-2.4	Convert = fractions, decimals, %	79
NS: Decimal/Percentage/Fraction	5N-3.1	+, -, x, ÷ any size decimals	80
NS: Decimal/Percentage/Fraction	5N-3.2	Calculate ratio & direct proportion	80
NS: Decimal/Percentage/Fraction	5N-3.3	+, -, x, ÷ using fractions & mixed #s	80
NS: Decimal/Percentage/Fraction	5N-3.5	Compute w/% to solve problems in context	80
NS: Decimal/Percentage/Fraction	6N-1.2	Read, write, compare fractions & mixed #s	93
NS: Decimal/Percentage/Fraction	6N-1.3	Read, write, order & compare decimal #s	93
NS: Decimal/Percentage/Fraction	6N-1.4	Compare % , % of increase/decrease	93
NS: Decimal/Percentage/Fraction	6N-1.5	ID & use equivalent fractions, decimals, %	93
NS: Decimal/Percentage/Fraction	6N-2.1	Recognize assoc. comm. distrib. props.	94
NS: Decimal/Percentage/Fraction	6N-3.1	+, -, x, ÷ decimals to 3 places	94
NS: Decimal/Percentage/Fraction	6N-3.2	Calculate ratio & direct proportion	94
NS: Decimal/Percentage/Fraction	6N-3.3	+, -, x, ÷ using fractions	94
NS: Decimal/Percentage/Fraction	6N-3.5	Compute w/ %	95
NS: Operations	2N-1.5	Count by 2, 5, or 10	31
NS: Operations	2N-2.1	Different meanings of addition	31
NS: Operations	2N-2.2	Subtraction strategies 2, 3-digit #s	31
NS: Operations	2N-2.3	Relate adding & subtracting to 1,000	31
NS: Operations	2N-2.4	Apply meanings of multiplication #s to 12	31
NS: Operations	2N-2.5	Apply meanings of division	32
NS: Operations	2N-2.6	Relate mult & div of 1, 2-digit #s	32
NS: Operations	2N-3.1	Add 2, 3-digit whole #s	33
NS: Operations	2N-3.3	Subtract 2, 3-digit whole #s	33
NS: Operations	2N-3.4	Multiply 2-digit #s by 1,2,3,4,5,10,11	34
NS: Operations	2N-3.6	Divide 2-digit whole #s by 1-digit whole #s.	34

<b>Strand/Topic</b> <i>G&amp;M= Geometry and Measurement</i> <i>NS= Number Sense</i> <i>PFA= Patterns, Functions, Algebra</i> <i>S&amp;P= Statistics and Probability</i>	<b>Benchmark Number</b>	<b>Shortened Benchmark Text</b>	<b>Curriculum Framework Page for Full Benchmark Text and Related Information</b>
NS: Operations	2N-3.8	Calculator Check whole # operations	34
NS: Operations	3N-1.7	Read, compute squares & cubes of whole #s	43
NS: Operations	3N-2.2	Relate square to square root	44
NS: Operations	3N-2.3	Relate adding & subtracting, to 1,000,000	44
NS: Operations	3N-2.4	Choose operation for 1-step word problem	44
NS: Operations	3N-2.5	Exponents as repeated multiplication	44
NS: Operations	3N-3.1	Divide by 2, 3 digit whole #s, interpret remainders	44
NS: Operations	3N-3.10	+ & - #s to 1,000,000 & check answers	46
NS: Operations	3N-3.11	Mult, divide by 2, 3-digit #s, check answer	47
NS: Operations	3N-3.2	Calculate w/ 3-digit whole #s	44
NS: Operations	3N-3.3	Multiply, divide whole #s by 10, 100	45
NS: Operations	3N-3.8	Find squares, sq. roots & cubes of whole #s	45
NS: Operations	4N-2.1	Choose operations for multi-step word prob	61
NS: Operations	4N-2.2	Perform multiplication accurately	61
NS: Operations	4N-2.4	Read & compute with exponents	61
NS: Operations	4N-2.5	Find exact or estimated square roots	61
NS: Operations	4N-3.10	+ & - all #s, check answers	63
NS: Operations	4N-3.11	Multiply, divide, check answers	63
NS: Operations	4N-3.6	Use correct order of operations	63
NS: Operations	4N-3.7	Add & subtract integers	63
NS: Operations	4N-3.9	Whole #s, fractions, decimals, % w/ calculator	63
NS: Operations	5N-1.6	Read #s in scientific notation	79
NS: Operations	5N-2.2	Understand effects of operations w/ integers	79
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PFA: Algebra	2P-3.3	Read inequalities for #s ≤ 1000	36
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PFA: Algebra	3P-3.3	Substitute #s for variables and solve	49
PFA: Algebra	3P-3.4	Solve for variables in 1 step equations	49
PFA: Algebra	3P-3.5	Identify #s using # line	49
PFA: Algebra	3P-3.6	Read inequalities for #s $\leq 1,000,000$	50
PFA: Algebra	3P-3.7	Read integer change on horiz. & vert. axes	50
PFA: Algebra	4P-2.1	Choose expression for multi-step word problem	65
PFA: Algebra	4P-3.1	Use & interpret $+ - \times \div =$	65
PFA: Algebra	4P-3.10	Read statements of Inequality for all integers	67
PFA: Algebra	4P-3.11	Solve multi-step equations	67
PFA: Algebra	4P-3.2	Read & ID number operations for $( ) , \times , \div$	66
PFA: Algebra	4P-3.3	Use correct order of operations	66
PFA: Algebra	4P-3.4	Substitute for variables in $+ -$ expressions	66
PFA: Algebra	4P-3.5	Substitute for variables in $\times , \div$ expressions	66
PFA: Algebra	4P-3.6	Substitute whole #s in formulas	66
PFA: Algebra	4P-3.7	Understand positive & negative integers	66
PFA: Algebra	4P-3.8	Understand integer addition, subtraction	67
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PFA: Algebra	5P-2.4	Identify graphs using different techniques	83
PFA: Algebra	5P-3.1	Solve multi-step equations	83
PFA: Algebra	5P-3.2	Evaluate formulas	83
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PFA: Algebra	6P-3.5	Recognize & use direct/indirect variation	97
PFA: Patterns	2P-1.1	Complete repeating # patterns $\leq 1000$	35
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PFA: Patterns	2P-4.1	ID description of change with words	36
PFA: Patterns	2P-4.2	ID description of change with numbers	36
PFA: Patterns	3P-1.1	Complete whole # sequence w/2 steps	48
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PFA: Patterns	3P-1.3	Identify simple patterns in tables	48
PFA: Patterns	3P-2.2	Identify , use formulas from applied tables	48
PFA: Patterns	3P-4.1	Identify effect of one variable on another	50
PFA: Patterns	3P-4.2	Compare rates of change in situations	50
PFA: Patterns	4P-1.1	Complete # sequences w/2-step progression	65
PFA: Patterns	4P-1.2	Recognize & create repeating patterns	65
PFA: Patterns	4P-1.3	Generalize relationships within tables	65
PFA: Patterns	4P-2.2	Identify & use formulas from tables	65
PFA: Patterns	4P-4.1	Analyze linear change in graphs	67
PFA: Patterns	5P-1.1	Complete repeating & growing patterns	82
PFA: Patterns	5P-1.2	Identify patterns in graphs & tables	82
PFA: Patterns	5P-2.1	Match equations to graphs	82
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PFA: Patterns	5P-2.5	ID linear/non-linear real-world graphs	83
PFA: Patterns	5P-4.1	Interpret rates of change from graph/# data	83
PFA: Patterns	6P-1.1	Extend complex types of patterns	96
PFA: Patterns	6P-1.2	Contrast linear/exponential growth	96
PFA: Patterns	6P-2.1 (6P-3.2)	Convert tables, graphs, words, equations	96
PFA: Patterns	6P-2.2	Show patterns with formulas and graphs	96
PFA: Patterns	6P-2.3	ID graphs using different techniques	96
PFA: Patterns	6P-2.4	ID linear/non-linear real world graphs	97
PFA: Patterns	6P-3.1	Recognize same function in problems situations	97
PFA: Patterns	6P-4.1	Interpret rates of change from graph/# data	97
S&P: Data Usage	2S-1.1	Gather data to answer questions	37
S&P: Data Usage	2S-1.2	Group objects or responses by 1 criterion	37
S&P: Data Usage	2S-1.3	Communicate with list, table, or diagram	37
S&P: Data Usage	2S-1.4	Check addition with subtotals, 2 or 3 digits	37
S&P: Data Usage	2S-2.1	Identify graphs/tables	37
S&P: Data Usage	2S-2.2	Find graphs/tables from external sources	37
S&P: Data Usage	2S-2.3	Find simple information in list/table	37
S&P: Data Usage	2S-2.4	Read values on bar graph $\leq 1000$	37
S&P: Data Usage	2S-2.5	Give # comparisons on bar graphs	38
S&P: Data Usage	2S-3.1	Match graphs/tables to statements	38
S&P: Data Usage	2S-3.2	Determine graph connection to a statement	38
S&P: Data Usage	2S-3.3	Support simple data statements	38
S&P: Data Usage	2S-3.4	Identify relative amounts & misstatements	38
S&P: Data usage	3S-1.1	Select data to answer posed questions	51
S&P: Data usage	3S-1.2	Group objects/responses by a criterion	51
S&P: Data usage	3S-1.3	Choose easiest representation of info	51
S&P: Data usage	3S-1.4	Check total through sum of subtotals	51
S&P: Data usage	3S-1.5	Choose correct categorical data on plots	51
S&P: Data usage	3S-2.1	ID graphs/tables in available resources	52
S&P: Data usage	3S-2.2	Find graphs/tables in external sources	52
S&P: Data usage	3S-2.3	Identify graphs & tables by type	52
S&P: Data usage	3S-2.4	Extract simple info from list/table	52
S&P: Data usage	3S-2.5	Read values on bar/line graph to 6 digits	52
S&P: Data usage	3S-2.6	Identify # comparisons on bar graphs	52
S&P: Data usage	3S-3.1	Identify min, max, spread, shape of data	53
S&P: Data usage	3S-3.2	Use "most of" statements to describe data	53
S&P: Data usage	3S-3.3	Find average (mean) & range for data set	53
S&P: Data usage	3S-3.4	Find median	53
S&P: Data usage	3S-4.1	Match graphs & tables w/statements	53
S&P: Data usage	3S-4.10	Recognize misleading data manipulation	54
S&P: Data usage	3S-4.11	Identify obvious misstatements	54
S&P: Data usage	3S-4.12	Use "double" "half" & 50% statements	54
S&P: Data usage	3S-4.2	Determine relevance of graphs & tables	53
S&P: Data usage	3S-4.3	Identify relative amounts & misstatements	53
S&P: Data usage	3S-4.4	Support simple statements w/data	53
S&P: Data usage	3S-4.5	Estimation (most) to support arguments	54
S&P: Data usage	3S-4.6	Judge statements of double, half, 50%	54
S&P: Data usage	3S-4.7	Know when % figures don't add to 100%	54
S&P: Data usage	3S-4.8	Use mean & median to describe data	54

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S&P: Data usage	3S-4.9	Recognize misleading info w/ bar widths	54
S&P: Data usage	4S-1.1	ID data to answer questions about life	68
S&P: Data usage	4S-1.2	Group objects/responses by 1 or 2 criteria	68
S&P: Data usage	4S-1.3	Choose best graph to represent of info	68
S&P: Data usage	4S-1.4	Use subtotals to check total	68
S&P: Data usage	4S-1.5	Match data to bar graph, fraction pie chart	68
S&P: Data usage	4S-1.6	ID related bar graph & circle graph	68
S&P: Data usage	4S-1.7	ID related table to line graph & vice versa	68
S&P: Data usage	4S-2.1	Identify graphs/tables	69
S&P: Data usage	4S-2.2	Find graphs/tables in external sources	69
S&P: Data usage	4S-2.3	Identify graphs from tables	69
S&P: Data usage	4S-2.4	Extract simple info from list/tables	69
S&P: Data usage	4S-2.5	Read values on a bar/line/circle graph	69
S&P: Data usage	4S-2.6	Compare relative values on bar/circle graphs	69
S&P: Data usage	4S-3.1	Identify min, max, spread, shape of data	70
S&P: Data usage	4S-3.2	Use "most of" statements to describe data	70
S&P: Data usage	4S-3.3	Find mean	70
S&P: Data usage	4S-3.4	Find median & mode	70
S&P: Data usage	4S-3.5	ID effect of spread on mean & median	70
S&P: Data usage	4S-4.1	Determine if statements connect to graph/table	71
S&P: Data usage	4S-4.2	Identify relative amounts & misstatements	71
S&P: Data usage	4S-4.3	ID statements supporting/rejecting data trends	71
S&P: Data usage	4S-4.4	Evaluate "double" "half" & 50% statements	71
S&P: Data usage	4S-4.5	ID accuracy of statements w/3x, 4x, ¼, 1/10	71
S&P: Data usage	4S-4.6	Verify that numbers and % figures match	71
S&P: Data usage	4S-4.7	Confirm or deny statements with graphs	71
S&P: Data usage	5S-1.1	ID numerical or categorical life questions	84
S&P: Data usage	5S-1.2	Choose data which responds to questions	84
S&P: Data usage	5S-1.3	ID data w/appropriate representation	84
S&P: Data usage	5S-1.4	ID comparative data on a question	84
S&P: Data usage	5S-1.5	Read double bar/line graph	84
S&P: Data usage	5S-2.1	Identify graphs & tables	85
S&P: Data usage	5S-2.2	Know likely locations of graphs & tables	85
S&P: Data usage	5S-2.3	Infer data meaning: gaps clusters comparisons	85
S&P: Data usage	5S-2.4	Match words to bar/line/circle graphs & tables	85
S&P: Data usage	5S-2.5	Compare # values on graphs/tables	85
S&P: Data usage	5S-3.1	ID min/max, range shape & central tendencies	86
S&P: Data usage	5S-3.2	Identify spread effect on mean & median	86
S&P: Data usage	5S-4.1	Choose best graph to support a position	86
S&P: Data usage	5S-4.10	Confirm or deny statements with graphs	88
S&P: Data usage	5S-4.2	Support arguments w/data & representations	86
S&P: Data usage	5S-4.3	Covert graphs to narratives	87
S&P: Data usage	5S-4.4	Confirm or deny arguments via data trends	87
S&P: Data usage	5S-4.5	Find impact of spread on mean, median, mode	87
S&P: Data usage	5S-4.6	ID misleading representations on graphs	88
S&P: Data usage	5S-4.7	Recognize misleading data manipulation	88
S&P: Data usage	5S-4.8	Match graph to data, story	88
S&P: Data usage	5S-4.9	Impact of data compression on argument	88
S&P: Data usage	6S-1.1	ID numerical or categorical life questions	98

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S&P: Data usage	6S-1.3	Choose appropriate representation of data	98
S&P: Data usage	6S-1.4	ID comparative data for a question	98
S&P: Data usage	6S-1.5	Read double bar/line graphs	98
S&P: Data usage	6S-16	Know how to use a spreadsheet on a computer	98
S&P: Data usage	6S-2.1	Identify graphs & tables	99
S&P: Data usage	6S-2.2	ID likely locations of graphs & tables	99
S&P: Data usage	6S-2.3	Relate words to all types of graphs & tables	99
S&P: Data usage	6S-2.4	Compare relative values on graphs/tables	99
S&P: Data usage	6S-2.5	Infer meaning from gaps clusters comparisons	99
S&P: Data usage	6S-2.6	Infer consequences related to data outcomes	99
S&P: Data usage	6S-3.1	ID data min max spread shape range	100
S&P: Data usage	6S-3.2	Use "most of" statements to describe data	100
S&P: Data usage	6S-3.3	Find mean	100
S&P: Data usage	6S-3.4	Find median	100
S&P: Data usage	6S-3.5	Identify effect of spread on mean & median	100
S&P: Data usage	6S-4.1	Confirm or deny arguments via data trends	100
S&P: Data usage	6S-4.10	Show different aspects of data	102
S&P: Data usage	6S-4.11	ID impact of data compression on argument	102
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S&P: Data usage	6S-4.13	ID simple sample biases	102
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S&P: Data usage	6S-4.3	ID mean, median, mode as central tendencies	101
S&P: Data usage	6S-4.4	Determine impact of spread on mean, median	101
S&P: Data usage	6S-4.5	Choose mean or median as appropriate	101
S&P: Data usage	6S-4.6	ID misleading info with bar widths	101
S&P: Data usage	6S-4.7	See scale distortions in research materials	101
S&P: Data usage	6S-4.8	Recognize wedge size distortions	102
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S&P: Probability	2S-4.1	Identify events as likely/unlikely	38
S&P: Probability	2S-4.2	Find probability in concrete situations	38
S&P: Probability	3S-5.1	Identify events as likely/unlikely	55
S&P: Probability	3S-5.2	Basic probability in concrete situations	55
S&P: Probability	3S-5.3	Probability as ratio in multiple forms	55
S&P: Probability	4S-5.1	Identify events as likely/unlikely	72
S&P: Probability	4S-5.2	Basic probability in concrete situations	72
S&P: Probability	4S-5.3	State probability as a ratio fraction	72
S&P: Probability	4S-5.4	Find probability of independent events	72
S&P: Probability	4S-5.5	State probability as a %	72
S&P: Probability	5S-5.1	Probability of independent/dependent events	89
S&P: Probability	5S-5.2	Find # of possible combinations	89
S&P: Probability	6S-5.1	ID events as likely/unlikely	103
S&P: Probability	6S-5.2	Find basic probability in concrete situations	103
S&P: Probability	6S-5.3	Use probability as a ratio fraction	103
S&P: Probability	6S-5.4	Use probability as a %	103
S&P: Probability	6S-5.5	Find probability of indep/dependent events	103